National Aeronautics and
Space Administration
Langley Research Center

Scientific and Technical
Information Program Office

Scientific and Technical Aerospace Reports

STAR

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NASA STI Program ... in Profile

Since its founding, NASA has been dedicated to the advancement of aeronautics and space science. The NASA scientific and technical information (STI) program plays a key part in helping NASA maintain this important role.

The NASA STI program operates under the auspices of the Agency Chief Information Officer. It collects, organizes, provides for archiving, and disseminates NASA's STI. The NASA STI program provides access to the NASA Aeronautics and Space Database and its public interface, the NASA Technical Report Server, thus providing one of the largest collections of aeronautical and space science STI in the world. Results are published in both non-NASA channels and by NASA in the NASA STI Report Series, which includes the following report types:

- TECHNICAL PUBLICATION. Reports of completed research or a major significant phase of research that present the results of NASA Programs and include extensive data or theoretical analysis. Includes compilations of significant scientific and technical data and information deemed to be of continuing reference value. NASA counterpart of peer-reviewed formal professional papers but has less stringent limitations on manuscript length and extent of graphic presentations.

- TECHNICAL MEMORANDUM. Scientific and technical findings that are preliminary or of specialized interest, e.g., quick release reports, working papers, and bibliographies that contain minimal annotation. Does not contain extensive analysis.

- CONTRACTOR REPORT. Scientific and technical findings by NASA-sponsored contractors and grantees.

- CONFERENCE PUBLICATION. Collected papers from scientific and technical conferences, symposia, seminars, or other meetings sponsored or co-sponsored by NASA.

- SPECIAL PUBLICATION. Scientific, technical, or historical information from NASA programs, projects, and missions, often concerned with subjects having substantial public interest.

- TECHNICAL TRANSLATION. English-language translations of foreign scientific and technical material pertinent to NASA's mission.

Specialized services also include creating custom thesauri, building customized databases, and organizing and publishing research results.

For more information about the NASA STI program, see the following:

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- E-mail your question via the Internet to help@sti.nasa.gov

- Fax your question to the NASA STI Help Desk at (301) 621-0134

- Phone the NASA STI Help Desk at (301) 621-0390

- Write to:
  NASA STI Help Desk
  NASA Center for AeroSpace Information
  7115 Standard Drive
  Hanover, MD 21076-1320

Introduction

Scientific and Technical Aerospace Reports (*STAR*) is an online information resource listing citations and abstracts of NASA and worldwide aerospace-related scientific and technical information (STI). Updated biweekly, *STAR* highlights the most recent additions to the NASA Aeronautics and Space Database. Through this resource, the NASA STI Program provides timely access to the most current aerospace-related research and development (R&D) results.

STAR subject coverage includes all aspects of aeronautics and space research and development, supporting basic and applied research, and application, as well as aerospace aspects of Earth resources, energy development, conservation, oceanography, environmental protection, urban transportation and other topics of high national priority. The listing is arranged first by 11 broad subject divisions, then within these divisions by 76 subject categories and includes two indexes: subject and author.

STAR includes citations to R&D results reported in:

- NASA, NASA contractor, and NASA grantee reports
- Reports issued by other U.S. Government agencies, domestic and foreign institution, universities, and private firms
- Translations
- NASA-owned patents and patent applications
- Other U.S. Government agency and foreign patents and patent applications
- Domestic and foreign dissertations and theses

The NASA STI Program

The NASA STI Program was established to support the objectives of NASA's missions and research to advance aeronautics and space science. By sharing information, the NASA STI Program ensures that the U.S. maintains its preeminence in aerospace-related industries and education, minimizes duplication of research, and increases research productivity.

Through the NASA Center for AeroSpace Information (CASI), the NASA STI Program acquires, processes, archives, announces, and disseminates both NASA's internal STI and world-wide STI. The results of 20th and 21st century aeronautics and aerospace research and development, a worldwide investment totaling billions of dollars, have been captured, organized, and stored in the NASA Aeronautics and Space Database. New information is continually announced and made available as it is acquired, making this a dynamic and historical collection of value to business, industry, academia, federal institutions, and the general public.

The STI Program offers products and tools that allow efficient access to the wealth of information derived from global R&D efforts. In addition, customized services are available to help tailor this valuable resource to meet your specific needs.

For more information on the most up-to-date NASA STI, visit the STI Program's Web site at http://www.sti.nasa.gov.

NASA STI Availability Information

NASA Center for AeroSpace Information (CASI)

Through NASA CASI, the NASA STI Program offers many information products and services to the aerospace community and to the public, including access to a selection of full text of the NASA STI. Free registration with the program is available to NASA, U.S. Government agencies and contractors. To register, contact CASI at help@sti.nasa.gov. Others should visit the program at www.sti.nasa.gov. The 'search selected databases' button provides access to the NASA Technical Reports Server (NTRS) – the publicly available contents of the NASA Aeronautics and Space Database.

Each citation in *STAR* indicates a 'Source of Availability.' When CASI is indicated, the user can order this information directly from CASI using the STI Online Order Form, e-mail to help@sti.nasa.gov, or telephone the STI Help Desk at 301-621-0390. Before ordering you may access price code tables for STI documents and videos. When information is not available from CASI, the source of the information is indicated when known.

NASA STI is also available to the public through Federal information organizations. NASA CASI disseminates publicly available NASA STI to the National Technical Information Service (NTIS) and to the Federal Depository Library Program (FDLP) through the Government Printing Office (GPO). In addition, NASA patents are available online from the U.S. Patent and Trademark Office.

National Technical Information Service (NTIS)

The National Technical Information Service serves the American public as a central resource for unlimited, unclassified U.S. Government scientific, technical, engineering, and business related information. For more than 50 years NTIS has provided businesses, universities, and the public timely access to well over 2 million publications covering over 350 subject areas. Visit NTIS at http://www.ntis.gov.

The Federal Depository Library Program (FDLP)

The U.S. Congress established the **Federal Depository Library Program** to ensure access for the American public to U.S. Government information. The program acquires and disseminates information products from all three branches of the U.S. Government to nearly 1,300 Federal depository libraries nationwide. The libraries maintain these information products as part of their existing collections and are responsible for assuring that the public has free access to the information. Locate the Federal depository libraries at http://www.gpoaccess.gov/index.html.

The U.S. Patent and Trademark Office (USPTO)

The U.S. Patent and Trademark Office provides online access to full text patents and patent applications. The database includes patents back to 1976 plus some pre-1975 patents. Visit the USPTO at http://www.uspto.gov/patft/.

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Subject Term Index

Personal Author Index

SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

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VOLUME 45, NUMBER 5 MARCH 20, 2007

01
AERONAUTICS (GENERAL)

Includes general research topics related to manned and unmanned aircraft and the problems of flight within the Earth's atmosphere. Also includes manufacturing, maintenance, and repair of aircraft. For specific topics in aeronautics, see categories 02 through 09. For information related to space vehicles see 12 Astronautics.

20070006641 Boeing Co., Chicago, IL, USA

Method and Apparatus for On-Board Autonomous Pair Catalog Generation

Needelman, D. D.; Li, R.; Fowell, R. A.; Lai, P. C.; 24 Jun 04; 13 pp.; In English

Patent Info.: Filed Filed 24 Jun 04; US-Patent-Appl-SN-10-710 178

Report No.(s): PB2007-102744; No Copyright; Avail.: CASI: A03, Hardcopy

A system (18) includes: (a) A vehicle (12) includes an attitude or angular velocity control system (38), a plurality of star trackers or star sensors (22) each having a field of view (28); (b) a memory (30) having a star catalog (32), an allocated area for a star pair catalog (58) and a reference table (56) stored therein; and (c) a processor (24) coupled to the attitude or angular velocity control system (38), the star trackers or star sensors (22), and the memory (30). The processor (24) populates the star pair catalog (58), using the method described herein. The processor (24) then periodically determines the vehicle inertial attitude or angular velocity or sensor alignment, based, in part, on the star pair catalog (58) and reference table (56). The novel ability of the software to autonomously populate the star pair catalog (58) allows users to avoid uploading a large amount of data, and the problems associated with such an upload.

NTIS

Astronomical Catalogs; Autonomy; Catalogs (Publications); Star Trackers

20070006754 NASA Langley Research Center, Hampton, VA, USA, Boeing Phantom Works, Huntington Beach, CA, USA

Blended Wing Body (BWB) Boundary Layer Ingestion (BLI) Inlet Configuration and System Studies

Kawai, Ronald T.; Friedman, Douglas M.; Serrano, Leonel; December 2006; 26 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): NAS3-01140; WBS 22-714-05-05

Report No.(s): NASA/CR-2006-214534; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070006754

A study was conducted to determine the potential reduction in fuel burned for BLI (boundary layer ingestion) inlets on a BWB (blended wing body) airplane employing AFC (active flow control). The BWB is a revolutionary type airplane configuration with engines on the aft upper surface where thick boundary layer offers the greatest opportunity for ram drag reduction. AFC is an emerging technology for boundary layer control. Several BLI inlet configurations were analyzed in the NASA-developed RANS Overflow CFD code. The study determined that, while large reductions in ram drag result from BLI, lower inlet pressure recovery produces engine performance penalties that largely offset this ram drag reduction. AFC could, however, enable a short BLI inlet that allows surface mounting of the engine which, when coupled with a short diffuser, would significantly reduce drag and weight for a potential 10% reduction in fuel burned. Continuing studies are therefore recommended to achieve this reduction in fuel burned considering the use of more modest amounts of BLI coupled with both AFC and PFC (Passive Flow Control) to produce a fail-operational system.

Author

Aerodynamic Configurations; Blended-Wing-Body Configurations; Active Control; Computational Fluid Dynamics; Drag Reduction; Flow Distribution; Ingestion (Engines); Automatic Frequency Control

20070006770 Lawrence Livermore National Lab., Livermore, CA USA
Aerodynamic Drag Reduction Apparatus for Wheeled Vehicles in Ground Effect
Oretega, J. M.; Salari, K.; 24 Feb 04; 10 pp.; In English
Contract(s)/Grant(s): DE-W-7405-ENG-48
Patent Info.: Filed Filed 24 Feb 04; US-Patent-Appl-SN-10-786 531
Report No.(s): PB2007-102846; No Copyright; Avail.: CASI: A02, Hardcopy

An apparatus for reducing the aerodynamic drag of a wheeled vehicle in a flowstream, the vehicle having a vehicle body and a wheel assembly supporting the vehicle body. The apparatus includes a baffle assembly adapted to be positioned upstream of the wheel assembly for deflecting airflow away from the wheel assembly so as to reduce the incident pressure on the wheel assembly.

NTIS

Aerodynamic Drag; Drag Reduction; Ground Effect (Aerodynamics)

20070007319 NASA Langley Research Center, Hampton, VA, USA
Turbulent Aeroheating Testing of Mars Science Laboratory Entry Vehicle in Perfect-Gas Nitrogen
Hollis, Brian R.; Collier, Arnold S.; 2007; 20 pp.; In English; 45th AIAA Aerospace Sciences Meeting and Exhibit, 8-11 Jan. 2007, Reno, NV, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 732759.07.05
Report No.(s): AIAA Paper 2007-1208; Copyright; Avail.: CASI: A03, Hardcopy

An experimental investigation of turbulent aeroheating on the Mars Science Laboratory entry vehicle heat shield has been conducted in the Arnold Engineering Development Center Hypervelocity Wind Tunnel No. 9. Testing was performed on a 6-in. (0.1524 m) diameter MSL model in pure N2 gas in the tunnel s Mach 8 and Mach 10 nozzles at free stream Reynolds numbers of 4.1x10(exp 6)/ft to 49x10(exp 6)/ft (1.3x10(exp 7)/m to 16x10(exp 7)/m) and 1.2x10(exp 6)/ft to 19x10(exp 6)/ft (0.39x10(exp 7)/m to 62x10(exp 7)/m), respectively. These conditions were sufficient to span the regime of boundary-layer flow from completely laminar to fully-developed turbulent flow over the entire forebody. A supporting aeroheating test was also conducted in the Langley Research Center 20-Inch Mach 6 Air Tunnel at free stream Reynolds number of 1x10(exp 6)/ft to 7x10(exp 6)/ft (0.36x10(exp 7)/m to 2.2x10(exp 7)/m) in order to help corroborate the Tunnel 9 results. A complementary computational fluid dynamics study was conducted in parallel to the wind tunnel testing. Laminar and turbulent predictions were generated for all wind tunnel test conditions and comparisons were performed with the data for the purpose of helping to define uncertainty margins on predictions for aeroheating environments during entry into the Martian atmosphere. Data from both wind tunnel tests and comparisons with the predictions are presented herein. It was concluded from these comparisons that for perfect-gas conditions, the computational tools could predict fully-laminar or fully-turbulent heating conditions to within 10% of the experimental data

Author

Aerodynamic Heating; Turbulent Flow; Heat Shielding; Wind Tunnel Tests; Boundary Layer Flow; Hypersonic Speed

20070008225 NASA Langley Research Center, Hampton, VA, USA
Preliminary Considerations for Classifying Hazards of Unmanned Aircraft Systems
Hayhurst, Kelly J.; Maddalon, Jeffrey M.; Miner, Paul S.; Szatkowski, George N.; Ulrey, Michael L.; DeWalt, Michael P.; Spitzer, Cary R.; February 2007; 78 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): WU 457280.02.07.07
Report No.(s): NASA/TM-2007-214539; L-19299; Copyright; Avail.: CASI: A05, Hardcopy

The use of unmanned aircraft in national airspace has been characterized as the next great step forward in the evolution of civil aviation. To make routine and safe operation of these aircraft a reality, a number of technological and regulatory challenges must be overcome. This report discusses some of the regulatory challenges with respect to deriving safety and reliability requirements for unmanned aircraft. In particular, definitions of hazards and their classification are discussed and applied to a preliminary functional hazard assessment of a generic unmanned system.

Author

Reliability; Pilotless Aircraft; Civil Aviation

02
AERODYNAMICS

Includes aerodynamics of flight vehicles, test bodies, airframe components and combinations, wings, and control surfaces. Also includes aerodynamics of rotors, stators, fans, and other elements of turbomachinery. For related information see also 34 Fluid Mechanics and Thermodynamics.

20070006633 Nanjing Univ. of Aeronautics and Astronautics, Nanjing, China
Journal of Nanjing University of Aeronautics & Astronautics, Volume 38, Number 3, June 2006
Dewang, L.; Jun. 2006; 136 pp.; In Chinese
Report No.(s): PB2007-103395; Copyright; Avail.: National Technical Information Service (NTIS)

Partial Contents: Adaptive Observer for Nonlinear System Based on Lyapunov Approach; Digital Control Techniques for Inverters; Improvement of Control Method and Current Sensing of Half Bridge Dual Buck Inverter; Pole Pairs Selection of IPM Synchronous Machine; Control Principle and Implementation of New Doubly-Salient Generator; Mechanisms of Possible Failures in Doubly Salient Permanent Magnet Motor; Nonlinear Modeling and No-Load Simulation for Field-Winding Doubly Salient Generator; Two Different Magnetization Manners in Surface-Mounted Permanent Magnet Machine; Implementation of 3-D Space Vector Modulation Algorithm in abc Coordinate Based on FPGA; Improved Impedance Criterion; Ellipsoidal Basis Functional Neural Network Based on Rough K-Means; Robust Adaptive Beamformer for Antenna on Micro Air Vehicle; Simulation Design of Wide-Band Improved B-Sandwich Antenna-Radome in Mobile Communication; Metadata Integration of Engineering Data Warehouse System Based on Metamodel; Design and Implementation of Load Balancing in Web Server Cluster System; Online Optimization Selection Model in Point-to-Point Data Transmission Network; Parameter Design of Landing Gear Shock Absorber for Flexible Airplane.

NTIS
Aeronautical Engineering; Astronautics; Universities

20070006636 Nanjing Univ. of Aeronautics and Astronautics, Nanjing, China
Journal of Nanjing University of Aeronautics & Astronautics, Volume 38, Number 6, December 2006
DeWang, L.; Dec. 2006; 168 pp.; In Chinese
Report No.(s): PB2007-103396; Copyright; Avail.: National Technical Information Service (NTIS)

Partial Contents: Scattering Analysis for Arbitrary Target RCS Using Multiresolution Time-Domain (MRTD) Scheme; Design of Frequency Reconfigurable Hilbert Fractal Slot Antenna; CDRC-ADI-FDTD Method for EM Wave Propagation and Scatter in Plasmas; Application of SSOR Preconditioning Technique in TDFEM for 2-D Electromagnetic Analysis; Miniaturization and Bandwidth Extension of Microstrip Antenna; On Logical Foundation for Incomplete Information Database; Space-Time Adaptive Processing Using Multiple Constraints of Real Weighs Based on a Direct Data Domain Approach; Storage-Optimal Key Sharing with Authentication in Sensor Networks; Compound Security Protocol and Its Verification; Non-Euclidean Type of Possibilistic C-Means Clustering; Fast Clustering Algorithm Based on Hypersphere of Multidimensional Space; Clustering Method Based on Semantic Similarity; Clustering Basal Users Based Recommendation Algorithm Using Multiple-Level Similarity; New Range Alignment Algorithm for ISAR Based on Maximum Modified Kurtosis.

NTIS
Universities; Aeronautical Engineering; Astronautics

20070006637 Nanjing Univ. of Aeronautics and Astronautics, Nanjing, China
Transactions of Nanjing University of Aeronautics & Astronautics, Vol. 23, No. 4, December 2006
Dec. 2006; 90 pp.; In English
Report No.(s): PB2007-103398; Copyright; Avail.: National Technical Information Service (NTIS)

Partial Contents: Effects of Incoming Flow Asymmetry on Shock Train Structures in Constant-Area Isolators; Evolution Analysis of TS Wave and High-Order Harmonic Waves in Boundary Layers; New Rod-Shaped Ultrasonic Micromotor and Its Driving Principle; Heuristic Particle Swarm Optimization Algorithm for Air Combat Decision-Making on CMTA; Three-Phase Bridge Inverter for 9 kW Doubly Salient Permanent Magnet Motor; Low Cost Implementation of Speed Sensor1ess Induction Motor Control Using Stator Flux; Design and Realization of SINS/Two-Antenna GPS Integrated Navigation System; Secure Data Synchronization Exchange Service Application Program Interface Based on SyncML; Fast Screening Out True Negative Regions for Microcalcification Detection in Digital Mammograms; Hardware-Based Voxelization for True 3-D Display; Vehicle Segmentation and Shadow Handler Based on Extremum Image; Investigation of Foam-Metal Interface Behaviors During Mold Filling of Magnesium Alloy LFC Process; Pareto Front Capture Using

Deterministic Optimization Methods in Multi criterion Aerodynamic Design; Conservative Difference Scheme Based on Numerical Analysis for Nonlinear Schridinger Equation with Wave Operator.
NTIS
Aeronautical Engineering; Astronautics; Universities

20070006789 National Inst. for Occupational Safety and Health, Washington, DC, USA
Survey and Analysis of Air Transportation Safety Among Air Carrier Operators and Pilots in Alaska
Nov. 2006; 65 pp.; In English
Report No.(s): PB2007-104858; DHHS/PUB/NIOSH-2007-102; No Copyright; Avail.: CASI: A04, Hardcopy

Because aviation crashes are one of the leading causes of occupational fatalities in Alaska, investigators at the Alaska Field Station of the National Institute for Occupational Safety and Health contracted with the Institute of Social and Economic Research at the University of Alaska Anchorage to administer two statewide aviation safety surveys, one of air carrier operators and one of active commercial pilots. Both surveys addressed pilot and company demographics; number of pilot flight hours (total, aircraft type, and instrument hours); flying experience in Alaska; and attitudes about safety, flying practices, and other salient risk factors. Surveys from 153 commuter, air taxi, and public-use operators were received at a 79% response rate. Survey results were used to create an industry profile, compare operators' responses to their pilots' responses, and analyze and compare responses of operators with high fatal accident rates (designated 'cases') to operators without high fatal accident rates (designated 'controls'). Results indicated that the average case pilot had less career flight experience than the average control pilot and worked 10 hours a week more. Case operators were less likely to consider pilot fatigue a problem when scheduling flights and more likely to depend financially on timely delivery of bypass mail. Case pilots were three times as likely as controls to fly daily into unknown weather conditions. Nearly 90% of the case pilots reported that they never flew when so fatigued that they wanted to decline the flight, compared to 64% of control pilots. The findings suggest that the combination of pilot inexperience and longer work hours and work weeks may contribute to Alaska's high pilot fatality rate. Results of the operator-pilot comparisons suggest that financial pressures on operators may influence their views on what measures would be effective in preventing crashes. Many of the responses received in these surveys were consistent with the goals of three major, recently-implemented aviation safety programs in Alaska: the Medallion Foundation, the Federal Aviation Administration's Circle of Safety, and Capstone.
NTIS
Air Transportation; Aircraft Accidents; Health; Safety; Surveys

20070006854 NASA Langley Research Center, Hampton, VA, USA
Summary of the Third AIAA CFD Drag Prediction Workshop
Vassberg, John C.; Tinoco, Edward N.; Mani, Mori; Brodersen, Olaf P.; Eisfeld, Bernhard; Wahls, Richard A.; Morrison, Joseph H.; Zickuhr, Tom; Laflin, Kelly R.; Mavriplis, DImitri J.; [2007]; 37 pp.; In English; 45th AIAA Aerospace Sciences Meeting and Exhibit, 8-11 Jan. 2007, Reno, NV, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 732759.07.02
Report No.(s): AIAA Paper 2007-0260; Copyright; Avail.: CASI: A03, Hardcopy

The workshop focused on the prediction of both absolute and differential drag levels for wing-body and wing-al;one configurations of that are representative of transonic transport aircraft. The baseline DLR-F6 wing-body geometry, previously utilized in DPW-II, is also augmented with a side-body fairing to help reduce the complexity of the flow physics in the wing-body juncture region. In addition, two new wing-alone geometries have been developed for the DPW-II. Numerical calculations are performed using industry-relevant test cases that include lift-specific and fixed-alpha flight conditions, as well as full drag polars. Drag, lift, and pitching moment predictions from previous Reynolds-Averaged Navier-Stokes computational fluid Dynamics Methods are presented, focused on fully-turbulent flows. Solutions are performed on structured, unstructured, and hybrid grid systems. The structured grid sets include point-matched multi-block meshes and over-set grid systems. The unstructured and hybrid grid sets are comprised of tetrahedral, pyramid, and prismatic elements. Effort was made to provide a high-quality and parametrically consistent family of grids for each grid type about each configuration under study. The wing-body families are comprised of a coarse, medium, and fine grid, while the wing-alone families also include an extra-fine mesh. These mesh sequences are utilized to help determine how the provided flow solutions fair with respect to asymptotic grid convergence, and are used to estimate an absolute drag of each configuration.
Author
Drag; Pitching Moments; Body-Wing Configurations; Wings; Unstructured Grids (Mathematics); Structured Grids (Mathematics); Transport Aircraft; Navier-Stokes Equation; Fluid Dynamics; Computational Fluid Dynamics; Aerodynamic Configurations

20070007608 Naval Postgraduate School, Monterey, CA USA

Optimal Guidance Command Generation and Tracking for Reusable Launch Vehicle Reentry (Preprint)

Bollino, Kevin P; Oppenheimer, Michael W; Doman, David B; Jun 2006; 26 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-A03D

Report No.(s): AD-A460810; AFRL-VA-WP-TP-2006-326; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460810

The objective of this work is to develop a robust guidance and control architecture for autonomous reusable launch vehicles that incorporates elements of recent advances in the areas of optimal trajectory generation and reconfigurable control. This work integrates three separately developed methods to form a coherent architecture with the potential to manage control effector failures, vehicle structural/aerodynamic degradation, uncertainty, and external disturbances. Outer-loop guidance commands in the form of body-frame angular rates (roll, pitch, and yaw) are generated from an optimal reference trajectory that is computed off-line with a direct pseudospectral method and then tracked by a reconfigurable inner-loop control law. The appropriate open-loop state histories from the pseudo-four-degree-of-freedom reference trajectory are converted using a modified backstepping approach that complements the inner-loop control law in a six-degree-of-freedom simulation. The inner-loop control law is capable of reacting and compensating for off-nominal conditions by employing nonlinear reconfigurable control allocation, dynamic inversion, and model-following/anti-windup prefilters. The results show that the inner loop control can adequately track the desired optimal guidance commands; thus, confirming that applicability of this control architecture for future development involving on-line, optimal trajectory generation and high-fidelity guidance and control for reentry vehicles.

DTIC

Maneuverable Reentry Bodies; Reusable Launch Vehicles

20070008406 Illinois Univ. at Urbana-Champaign, Savoy, IL, USA

Visual Flight Rules (VFR) Flight into Adverse Weather: An Empirical Investigation of Factors Affecting Pilot Decision Making

Wiegmann, D. A.; Goh, J.; Nov. 2000; 20 pp.; In English

Contract(s)/Grant(s): DTFA-00-G-010

Report No.(s): PB2007-105609; ARL-00-15; No Copyright; Avail.: CASI: A03, Hardcopy

Pilots' decisions to continue or divert from a visual flight rules flight (VFR) into instrument meteorological conditions (IMC) were investigated using a dynamic simulation of a hypothetical cross-country flight. Differences in situation assessment, risk perception and motivation between pilots who chose to continue or divert from a VFR flight into IMC situation were examined. Results indicate that the simulation was successful in identifying pilots who would choose to either continue or divert and that differences existed between these two groups of pilots. Accuracy of visibility estimates, appraisal of ones own skill and judgment and frequency of risk-taking behavior were most important in predicting whether a pilot would continue or divert the flight. Findings suggest that overconfidence in personal ability and inaccurate diagnoses of visibility conditions precipitate VFR flight into IMC. More research is needed, however, to identify effective methods for remedying these problems.

NTIS

Decision Making; Visual Flight Rules; Weather; Aircraft Pilots

20070008717 Air Force Research Lab., Wright-Patterson AFB, OH USA

Ablation Modeling for Dynamic Simulation of Reentry Vehicles (Preprint)

Doman, David B; Blake, William; Jul 2006; 21 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-A03D

Report No.(s): AD-A461446; AFRL-VA-WP-TP-2006-327; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461446

The collection of methods described in this manuscript can be used in a dynamic simulation to provide estimates of the mass properties and aerodynamic forces and moments as a reentry vehicle ablates due to aerodynamic heating. Vehicles that experience relatively low peak heating with reusable thermal protection systems such as the shuttle, experience little if any ablation. At the other extreme, ballistic reentry vehicles and interplanetary probes can experience very high peak heat loads that cause the thermal protection material to ablate. A number of vehicle characteristics change as a result of ablation. The mass properties of the vehicle change due to the loss of material and the aerodynamic forces and moments acting on the vehicle change as a result of the an ablating outer mold line (OML). These changes can affect aerodynamic as well as guidance

and control system performance. Empirical methods are described in this paper that can be used to translate limited test data into a rough, but representative model that can be used to estimate the effects of ablation on a vehicle's ability to follow a prescribed trajectory and on guidance and control performance and robustness.
DTIC
Ablation; Aerodynamic Heating; Reentry Vehicles; Simulation

03
AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; airport ground operations; flight safety and hazards; and aircraft accidents. Systems and hardware specific to ground operations of aircraft and to airport construction are covered in 09 Research and Support Facilities (Air). Air traffic control is covered in 04 Aircraft Communications and Navigation. For related information see also 16 Space Transportation and Safety and 85 Technology Utilization and Surface Transportation.

20070006660 Federal Aviation Administration, Washington, DC USA
Federal Aviation Administration Fiscal Year 2007 Business Plan: Security and Hazardous Materials
January 2007; 25 pp.; In English
Report No.(s): PB2007-106317; No Copyright; Avail.: CASI: A03, Hardcopy

ASH Security and Hazardous Materials (ASH) has the primary responsibility for critical infrastructure protection, emergency operations, contingency planning, and the safe transportation of hazardous materials in air commerce. ASH has four major program areas and staff offices that assist in carrying out this function. ASH assists the FAA in accomplishing its mission by linking the ASH Strategic and Business Plans directly to the FAA Flight Plan. ASH has responsibility for the hazardous materials program, a major safety program within the FAA, and important roles in critical infrastructure protection and emergency operations. These areas are vital to FAA's successful accomplishment of its mission. The protection of FAA's critical infrastructure is a national and homeland security concern that continues to receive a high level of attention. In recognition of the impact that the National Airspace System (NAS) has on our country's transportation infrastructure, ASH develops and implements policy to protect FAA employees, contractors, facilities, and assets. ASH conducts assessments and inspections at FAA facilities to determine compliance with facility security, communications security, and classified information orders and directives. ASH manages the ID media program for the agency, conducts suitability investigations of employees and contractors, and investigations of employees, non-employees, contractors and airmen suspected of violating FAA orders and regulations. Additionally, ASH is responsible for developing and implementing national policy on hazardous materials through inspections, training, and outreach to those involved in the hazardous materials industry worldwide. The Washington Operations Center Complex (WOCC) is located in ASH, as well as the Emergency Operations Division, which provides crisis management support, including fielding contingency communications and classified messaging equipment, and Continuity of Operations (COOP) planning and implementation. ASH also supports the national security responsibilities of the FAA through the National Security Coordination Division.
NTIS
Ashes; Commerce; Hazardous Materials; Protection; Security

20070006661 Federal Aviation Administration, Washington, DC USA
Federal Aviation Administration Fiscal Year 2007 Business Plan: Airports
January 2007; 21 pp.; In English
Report No.(s): PB2007-106318; No Copyright; Avail.: CASI: A03, Hardcopy

Safety is the Federal Aviation Administration's (FAA) primary responsibility. Our dedication to keeping airports safe is central to the public's interest, as well as the economic health of aviation. As an organization, the Office of Airports (ARP) provides leadership to the airport and aviation community to ensure that the National Plan of Integrated Airport Systems (NPIAS) is planned and developed to meet FAA mission goals. The ARP organization has a continuing stake in the safety, security, capacity, financial, and environmental aspects of airports. Indeed, the organization's major business challenge is to improve the safety, capacity, and condition of U.S. airports and to maintain a level on investment for airport infrastructure projects that benefits the National Airspace System.
NTIS
Airports; Commerce; Runways; Safety

20070006662 Federal Aviation Administration, Washington, DC USA
Federal Aviation Administration Fiscal Year 2007 Business Plan: Government and Industry Affairs
January 2007; 6 pp.; In English
Report No.(s): PB2007-106323; No Copyright; Avail.: CASI: A02, Hardcopy

The first impression, and indeed, in some cases, the only contact Members of Congress and their staff have with the Federal Aviation Administration is with the Office of Government and Industry Affairs. This customer-oriented office, small by comparison to most every other organization in the FAA, works directly for the Administrator, and is the principal linkage between the agency and the legislative branch of government. AGI works with other staff organizations to coordinate and present the FAA's legislative message. It is AGI that must work with other organizations within the FAA to facilitate their relations with Congress. And it is AGI that must consistently monitor and gage the interest and needs of the members and leadership on Capitol Hill. This relationship also extends to coordinator our legislative initiatives and responses with the Department of Transportation. This kind of vigorous outreach is not limited to Congress. AGI also serves as liaison with the aviation industry, from manufacturers to carriers, and with other aviation related organizations. Additionally, AGI also serves as the principal point of contact for state and local governments.

NTIS
Commerce; Industries; Aircraft Industry

20070006663 Federal Aviation Administration, Washington, DC USA
Federal Aviation Administration Fiscal Year 2007 Business Plan: Human Resource Management
January 2007; 20 pp.; In English
Report No.(s): PB2007-106324; No Copyright; Avail.: CASI: A03, Hardcopy

People are the foundation for FAA's mission accomplishment. The FAA's Flight Plan stresses that success will ultimately depend on the capabilities, effectiveness and efficiency of the men and women - the human capital - of the FAA, to bring the Flight Plan to life. The Office of Human Resource Management (AHR) advises on and supports the management of FAA's people. AHR's human capital strategies go hand-in-glove with the FAA Flight Plan goals and vision, and are closely aligned with the President's Management Agenda - Strategic Management of Human Capital (PMA). AHR supports Flight Plan goals and PMA by creating innovative, flexible, and efficient personnel systems and policies. AHR systems and policies are designed to make the organization more effective with stronger leadership, increased commitment of individual workers to fulfill organization-wide goals, and a better prepared, better trained, safer workforce. AHR's FY 2007 Business Plan reflects AHR's responsibilities in the FAA FY 2007-2011 Flight Plan and all Human Resource core responsibilities. Besides functioning as Flight Plan Organizational Excellence Goal co-lead, AHR has the lead for 3 Performance Targets and 10 strategic initiatives in the Flight Plan.

NTIS
Commerce; Human Resources; Management Methods

20070006664 Federal Aviation Administration, Washington, DC USA
Federal Aviation Administration Fiscal Year 2007 Business Plan: Chief Counsel
January 2007; 12 pp.; In English
Report No.(s): PB2007-106325; No Copyright; Avail.: CASI: A03, Hardcopy

The Federal Aviation Administration (FAA) is responsible for providing a safe and efficient air traffic system that meets the needs of a wide range of stakeholders. Within the FAA, the Office of the Chief Counsel (AGC) furnishes legal services to the FAA Administrator and all agency organizations worldwide. AGC's principal legal practice areas include: legislation, international affairs, enforcement, regulations, procurement, airports and environmental law, personnel and labor law, litigation, and general law applicable to the executive branch such as Ethics, Freedom of Information Act (FOIA) and Privacy Act compliance. Additionally, AGC houses both the FAA's Dispute Resolution Specialist responsible for implementing the provisions of the Administrative Dispute Resolution Act within the agency; and the Office of Dispute Resolution for Acquisition (ODRA), which serves as the Administrator's adjudicatory body in acquisition-related matters. AGC attorneys represent the agency before a variety of forums, including the National Transportation Safety Board (NTSB), the Merit Systems Protection Board (MSPB), the Equal Employment Opportunity Commission (EEOC), the FAA's Office of Dispute Resolution for Acquisition (ODRA), and the USA federal courts. AGC also works closely with the Office of the General Counsel of the Department of Transportation on issues that are common to modal administrations or that are of national significance to the aviation industry.

NTIS
Commerce; Safety

20070006665 Federal Aviation Administration, Washington, DC USA
Federal Aviation Administration Fiscal Year 2007 Business Plan: Financial Services
January 2007; 12 pp.; In English
Report No.(s): PB2007-106328; No Copyright; Avail.: CASI: A03, Hardcopy

The Office of the Assistant Administrator for Financial Services/Chief Financial Officer (ABA) serves as the Federal Aviation Administration's (FAA) primary resource steward. Our team has responsibility for managing the agency's $13.75 billion budget request, overseeing and maintaining financial systems, and spearheading government-wide management reforms such as the President's Management Agenda designed to improve the business of government and ensure resources are managed with integrity. ABA's key strategic efforts are anchored in the FAA's Flight Plan under the 'Organizational Excellence' goal. We lead the agency's efforts to achieve the Cost Control Program and Clean Audit Performance Targets and directly support activities in the Employee Attitude Survey and Conflict Resolution Strategic Initiatives. By providing FAA's Lines of Business (LOB) and Staff Offices (SO) with an effective management environment and key business tools and resources, we indirectly support the organization's Increase Safety, Greater Capacity, and International Leadership goals. In addition to our strategic work directly tied to the agency's Flight Plan, we have fundamental responsibilities key to maintaining a strong agency-wide foundation of accountability and financial management. This work is organized as Core Business in our Business Plan.

NTIS
Commerce; Financial Management; Industries

20070006667 Federal Aviation Administration, Washington, DC USA
Federal Aviation Administration Fiscal Year 2007 Business Plan: Aviation Policy, Planning and Environment
January 2007; 23 pp.; In English
Report No.(s): PB2007-106326; No Copyright; Avail.: CASI: A03, Hardcopy

The Office of Aviation, Policy, Planning, and Environment (AEP) provides critical support to the Administrator and FAA organizations in two major program areas: (1) Planning and policy development (2) Environment and energy programs development and management AEP's focus in these program areas includes internal, domestic, and international aspects. Internally, AEP staffs the Administrator on policy issues. In addition, AEP is the focal point for all agency strategic and business planning, and staffs two Congressionally-mandated agency oversight bodies: the Management Advisory Council and Air Traffic Services Committee. Domestically, AEP forecasts future aviation demand, compiles and publishes data on air traffic activity and other aviation statistics, and reviews airport-sponsored benefit-cost analyses related to expenditure of Airport Improvement Program funds and competition plans. The office performs cost-benefit analyses of all proposed FAA regulations. AEP also prepares reports to Congress on economic, environmental and regulatory issues, and manages facilities environmental programs. AEP researches and analyzes FAA finances, taxes, airport and airway trust funds, and cost allocation. This work leads into AEP's responsibility to manage and staff the FAA reauthorization process to include both funding and programmatic. AEP also leads development of agency initiatives to address system congestion. Internationally, AEP represents the USA at the International Civil Aviation Organization (ICAO) and several other international venues. AEP leads U.S. work with the international community to establish guidance material on aviation economics issues, and in setting global aircraft noise and engine emissions standards.

NTIS
Commerce; Management Planning; Policies

20070006669 Federal Aviation Administration, Washington, DC USA
Federal Aviation Administration Fiscal Year 2007 Business Plan: Civil Rights
January 2007; 9 pp.; In English
Report No.(s): PB2007-106327; No Copyright; Avail.: CASI: A02, Hardcopy

Federal Aviation Administration (FAA) employees maintain, operate and oversee the largest and most complex aviation system in the world, with a safety record that is second to none. To maintain this achievement, the FAA must be a world-class organization. Equal employment opportunity and diversity management in the federal workplace are keys to accomplishing this goal. They require leadership; integration of equal employment opportunity (EEO) into the agency's strategic mission; management and program accountability; proactive prevention of unlawful discrimination; efficiency and legal compliance with EEO mandates. FAA federally-operated and assisted transportation programs must also ensure equal opportunity for all beneficiaries and potential beneficiaries of our programs. The FAA Office of Civil Rights' (ACR) performance goals focus on the strategic goal areas of Organizational Excellence and Greater Capacity. Within the goal of Organizational Excellence, ACR will ensure that FAA maintains a Model EEO Program, as required by the new Equal Employment Opportunity Commission

Management Directive (MD-715). Within the goal of Greater Capacity, ACR will provide technical assistance, review and approve airport plans for fostering participation in the contracting and concession arena by businesses owned and controlled by disadvantaged persons.
NTIS
Commerce; Civil Aviation; Leadership

20070006774 Federal Aviation Administration, Washington, DC USA
Plan for the Future: 2006-2015. The Federal Aviation Administration's 10-Year Strategy for the Air Traffic Control Workforce
Jun. 2006; 79 pp.; In English
Report No.(s): PB2007-106340; Copyright; Avail.: National Technical Information Service (NTIS)

The Federal Aviation Administration employs nearly 15,000 air traffic controllers, responsible for safely and efficiently guiding aircraft from takeoff to landing through the nations airspace and through oceanic airspace where the USA has jurisdiction. Over the next 10 years, fiscal year (FY) 2006 through FY 2015, approximately 70 percent of the agencys controller workforce will become eligible to retire. In addition to retirements, controllers are lost due to promotions, internal transfers, resignations, training failures, removal and death. Total losses over the next 10 years are expected to be approximately 10,300. In December 2004, the FAA published A Plan for the Future, The Federal Aviation Administrations 10-Year Strategy for the Air Traffic Control Workforce. This blueprint outlined the agencys plan to hire and train controllers. Additionally, the plan outlined FAA initiatives to achieve staff savings through workplace efficiencies and improved productivity, and initiatives to achieve cost savings. Because the plan relies on traffic projections, controller retirement and other loss projections, the FAA will be updating the plan annually to reflect the latest data in its controller-loss model and traffic forecasts and will be issued in April of each year. This is the first update report to the FAAs December 2004 plan.
NTIS
Air Traffic Control; Air Traffic Controllers (Personnel); Management

20070006776 Federal Aviation Administration, Washington, DC USA
FAA (Federal Aviation Administration) Flight Plan, 2007-2011: Charting the Path for the Next Generation
January 2007; 56 pp.; In English
Report No.(s): PB2007-106332; No Copyright; Avail.: CASI: A04, Hardcopy

The USA sets the pace for aviation. When it comes to performance, we lead the way. This fourth edition of the Flight Plan is a report card of how we got there. Our safety record is unparalleled in the history of transportation. Weve achieved it by systematically identifying, analyzing and addressing each facet. The results are without issue. Travel aboard a commercial jet is so safe that the odds of an accident are described by a fraction of a decimal. Weve never been content to accept the status quo and were still focused on making it better. Weve trained our sights on the year 2025 19 years away. The demand for air travel could triple by that time, and the need to fly safely and on time will not change. But to reach that place, weve got to begin laying the foundation now. The Flight Plan is the roadmap that leads us there. Its especially important because even though our system remains safe, events like the Comair 5191 accident point to the need for continuous improvement. Indeed, before that crash, a record 2.7 billion passengers flew aboard commercial jets without an onboard fatality. Thats nine times the population of this country. Our commitment to continuously improve that track record is unwavering.
NTIS
Charts; Flight Plans; Civil Aviation; Air Transportation

20070006777 Federal Aviation Administration, Washington, DC USA
Federal Aviation Administration Fiscal Year 2007 Business Plan: Information Services
January 2007; 14 pp.; In English
Report No.(s): PB2007-106322; No Copyright; Avail.: CASI: A03, Hardcopy

The Federal Aviation Administration (FAA) is responsible for providing a safe and efficient national aviation system. Within the FAA, the Assistant Administrator for Information Services and Chief Information Officer (AIO) has the primary responsibility to formulate agency information technology (IT) policy and strategy, to protect agency IT assets from cyber-attacks, to ensure alignment between IT investment and agency business needs, and to improve agency IT processes. Information is critical to the operation and mission of the FAA. IT drives the creation, processing, and delivery of that information in every major agency business process. Agency spending on IT accounts for approximately $2.5 billion annually,

the largest cost item after salaries and benefits. The FAA Flight Plan recognizes both the cost and criticality of IT in the International Leadership and Organizational Excellence Goals.
NTIS
Commerce; Information Systems; National Aviation System

20070006778 Federal Aviation Administration, Washington, DC USA
Federal Aviation Administration Budget in Brief, Fiscal Year 2008
Feb. 2007; 21 pp.; In English
Report No.(s): PB2007-106330; No Copyright; Avail.: CASI: A03, Hardcopy

Safety is our primary concern. Our efforts, in concert with those of our stake holders, to improve operations have led to the safest period in aviation safety. At the same time, the demand for FAA services has never been greater. We oversee about 50,000 flights per day. In 1995, the system supported about 545 million passengers. In 2005, it was 739 million. Forecasts call for one billion passengers annually by 2015. Given the anticipated growth not only in terms of passengers, but in the number of aircraft as well we know that our services must adapt to meet the demand. We also know that the complexity of the future operating environment with evolving fleet mixes, new aircraft, technology, and the environmental constraints must be approached in partnership with our customers. The preparation for these changes already is well under way. The federal governments commitment to being ready for the future is gathered in one vision, the Next Generation Air Transportation System (NextGen). This budget demonstrates a long-term commitment to NextGen, not as pie-in-the-sky vision, but as embodied by tangible systems, processes, and management energy that will lead us to the future. The budget request also emphasizes our need for a stable funding source that is based on our costs and the services we provide. Most of FAAs current funding comes from the Airport and Airway Trust Fund, which in turn is funded primarily through ticket taxes (and other taxes to lesser extents). All of these taxes are scheduled to expire in September 2007, which coincides with the end of the current authorization for FAA programs under Vision 100.
NTIS
Federal Budgets; Civil Aviation; Air Transportation

20070006780 Federal Aviation Administration, Washington, DC USA
Federal Aviation Administration Fiscal Year 2007 Business Plan: International Aviation
January 2007; 23 pp.; In English
Report No.(s): PB2007-106321; No Copyright; Avail.: CASI: A03, Hardcopy

The Federal Aviation Administration (FAA) Assistant Administrator for International Aviation (API), in cooperation with FAA stakeholders, has developed the FY 2007 API Business Plan in support of the agency's FY 2007 Flight Plan International Leadership Goal. The FY 2007 API Business Plan is comprised of four Performance Targets: Aviation Safety Leadership: While the worldwide commercial accident rate has improved over the past decade, the rate is higher in certain markets with significant future growth. API will cooperate with key international partners to ensure the highest levels of safety and efficiency in the global system. GPS-Based Technologies: Expand the use of GPS technologies to improve safety of flight operations and optimize efficiencies. API will cooperate with key international partners to implement the concepts of the Next Generation Air Transportation System (NextGen). Bilateral Safety Agreements: Conclude agreements that will facilitate an increase in the ability of key partners to exchange aviation products, services, and technologies with the USA. API will help negotiate and conclude agreements bilaterally and multilaterally. External Funding: Increase funding to support aviation safety and infrastructure programs. API will conduct outreach efforts to obtain funding from the US government, multilateral development banks, and industry.
NTIS
Commerce; Civil Aviation; International Cooperation

20070006782 Federal Aviation Administration, Washington, DC USA
Federal Aviation Administration Fiscal Year 2007 Business Plan: Communications
January 2007; 12 pp.; In English
Report No.(s): PB2007-106320; No Copyright; Avail.: CASI: A03, Hardcopy

The Office of Communications (AOC) is responsible for the development, executive direction and overall management of the Ageny's national external and internal communications programs. In addition, the office manages the corporate web management and brand identity programs. For external communications, the office works with the news media to provide the public with accurate, timely, useful and important information about the agency's goals, policies, activities and operations. As

part of that mission, Communications actively promotes FAA activities that deal with Safety, Capacity, International Leadership and Organizational Excellence. For internal communications, the office works to provide employees with timely, accurate and useful information about agency activities and their jobs. The office publishes FocusFAA, the employee newsletter, maintains the employee web homepage, and uses other communications methods to keep employees apprised of news and other information relevant to their jobs.
NTIS
Air Transportation; Commerce; Communication

20070006785 Federal Aviation Administration, Washington, DC USA
Federal Aviation Administration Fiscal Year 2007 Business Plan: Regions and Center Operations
January 2007; 27 pp.; In English
Report No.(s): PB2007-106319; No Copyright; Avail.: CASI: A03, Hardcopy

The Assistant Administrator for Regions and Center Operations (ARC) plays a pivotal role in meeting the FAA mission by providing cross-organizational leadership at all levels of the organization to ensure that operational programs supported by multiple lines of business are delivered on time and in the most efficient and effective manner possible. ARC has an equally vital role as a provider of high quality, corporately shared services including financial systems and operations; emergency readiness through command, control, and communications; enterprise-wide information services and business application development; technical and management training; and logistics services such as acquisition, real estate, materiel management, and National Airspace System supply and support. Each of these products and services are part of the vital support infrastructure needed to maintain strong, safe, and efficient national and international aviation systems. ARC fills FAA's critical need for a corporate 'integrator' to look beyond a single line of business to ensure that organizations and multiple stakeholders are communicating and collaborating to meet Agency commitments.
NTIS
Commerce; Leadership; Project Management; Safety

20070007397 Naval Postgraduate School, Monterey, CA USA
OPNAV N432D Responsibilities and Impact on Budget Formulation for the Navy Flying Hour Program
Jarvis, David K; Dec 2006; 81 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460409; No Copyright; Avail.: CASI: A05, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460409

OPNAV N432D serves as the Navy's resident expert on the Flying Hour Program (FHP) and the chief agent in the management of FHP funding. The Navy utilizes the Department of Defense Planning, Programming, Budgeting and Execution System (PPBES) to provide the resources for the FHP. Due to the complexity of the PPBES and the FHP management procedures and processes, new officers assigned to N432D spend a large portion of their first year on the job merely observing and learning their jobs, which results in reduced productivity. The purpose of this professional report is to identify the responsibilities, key knowledge areas and tasks of N432D Aviation FHP Officers and to analyze their role and impact in the budget formulation process for the Navy FHP. This document provides a one-source reference for new members of N432D to improve their productivity in their first year on the job.
DTIC
Military Aviation; Navy; Productivity

20070007402 Lockheed Martin Advanced Technology Labs., Cherry Hill, NJ USA
Multi-UAV Collaborative Sensor Management for UAV Team Survivability
Stoneking, Craig; DiBona, Phil; Hughes, Adria; Aug 2006; 14 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W911W6-04-C-0053
Report No.(s): AD-A460418; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460418

Collaboration among a team of unmanned sensor platforms can provide significant operational advantages through improved situational awareness (SA). Recent work on the Army Aviation Technology Directorate (AATD) sponsored Survivability Planner Associate Rerouter (SPAR) program, as well as separate internally funded research and development (in parallel with the SPAR contract) has provided insights into the challenges related to managing collaborative sensing in support of survivability of a team comprising manned aircraft and multiple sensor-bearing UAVs. This paper will discuss technical challenges related to multi-UAV collaborative sensor management, including sensor resource allocation, sensor platform

positioning for collaborative sensing, and integration of collaborative sensing behavior into a comprehensive multi-UAV control system. The paper will also discuss recent, ongoing, and planned investigations into approaches for addressing these challenges.
DTIC
Aircraft; Pilotless Aircraft

20070007412 Naval Postgraduate School, Monterey, CA USA
The Relationship Between Naval Aviation Mishaps and Squadron Maintenance Safety Climate
Brittingham, Cynthia J; Dec 2006; 95 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460440; No Copyright; Avail.: CASI: A05, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460440

Naval Aviation has been known for over half a century as being one of the most fascinating professions. Although aircrew may always play a role in the mishap rate, the Navy has shifted its focus to aviation maintenance safety climate as a possible indicator of a future mishap. The School of Aviation Safety developed and implemented a survey, the Maintenance Climate Assessment Survey (MCAS), to assess the safety climate of Naval Aviation squadrons. Researchers have begun reviewing the possible direct relationship between the maintainer, how they view their squadron s climate and aviation mishaps. This thesis examines the construct of squadron maintenance safety climate survey and its relationship to aviation mishaps. The raw data employed includes MCAS responses from 126,058 maintainers between August 2000 and August 2005. This study finds that the MCAS survey construction needs to be revised. The findings are substantial to verify that most questions are formulated to focus on the same factor. Since the survey requires reconstruction, the question of whether it can determine the likelihood of mishaps was never visited. Revising the survey, based on psychometrics, may produce more significant results and gauge maintenance safety climate based on separate and distinct factors.
DTIC
Aircraft Maintenance; Aircraft Safety; Climate; Flight Safety; Maintenance; Military Aviation; Safety

20070007428 Naval Postgraduate School, Monterey, CA USA
Modeling the Adoption Process of the Flight Training Synthetic Environment Technology (FTSET) in the Turkish Army Aviation (TUAA)
Boztas, Omer; Dec 2006; 101 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460475; No Copyright; Avail.: CASI: A06, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460475

The motivation for using Flight Training Synthetic Environment Technology (FTSET) in military aviation is to create a cost-efficient and a risk-managed training environment. However, deciding on the appropriate mix of synthetic versus actual flight training remains a great unresolved issue. Further, FTSET usage and its adoption level may vary across the aviation community and flight training curricula. Turkish Army Aviation (TUAA) has employed FTSET in helicopter flight training since 1990. Since then, it has exhibited three different FTSET support usage patterns, which include an initial phase of lower support rates until 1997, a substantial increase phase from 1997-2001, and a leveling-off phase, where growth stagnated, from 2001-2006. The author hypothesized that this sequential phasing can be explained in terms of the organizational culture in which the FTSET is employed, organizational changes that favor FTSET usage and increasing FTSET expertise in the usage, and the current FTSET's limited technical capability and sole support for one type of helicopter. To test this hypothesis, the author developed a systems dynamics model of the FTSET adoption process that has three interrelated sectors: Technology Improvement and Acquisition, Technology Adoption, and Technology Discarding. The Diffusion Model also is used as a framework to help explain the TUAA's FTSET adoption process from 1990 to 2006. The purpose is to understand this adoption process and to generate a policy for the current and future FTSET adoption process.
DTIC
Allocations; Flight Simulation; Flight Training

20070007452 Air Force Research Lab., Rome, NY USA
A Semantic Web Application for the Air Tasking Order
Frantz, Albert; Franco, Milvio; Jun 2005; 12 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460520; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460520

The purpose of this in-house exploratory development was to investigate using Semantic Web technologies for Command

and Control (C2) applications. This paper describes a Semantic Web application we developed for the Air Tasking Order (ATO), the document used to assign aircraft to perform specific missions. We used existing Semantic Web tools to construct an ATO knowledge base. The knowledge base is used to select potential air missions to reassign to strike time sensitive targets by the computer. This paper introduces Semantic Web technologies, followed by a discussion of the design and implementation of our ATO knowledge base. We conclude that the current Semantic Web tools are mature enough for computers to assist in fairly sophisticated C2 domain modeling and reasoning.
DTIC
Aircraft; Command and Control; Semantics

20070007554 Civil Aeromedical Inst., Oklahoma City, OK USA
The Influence of Visibility, Cloud Ceiling, Financial Incentive, and Personality Factors on General Aviation Pilots' Willingness to Take Off Into Marginal Weather, Part 1: The Data and Preliminary Conclusions
Knecht, William; Harris, Howard; Shappell, Scott; Apr 2005; 44 pp.; In English
Report No.(s): AD-A460734; DOT/FAA/AM-05/7; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460734

Adverse weather is the leading cause of fatalities in general aviation (GA). In this research, influences of ground visibility, cloud ceiling height, financial incentive, and personality were tested on 60 GA pilots' willingness to take off into simulated adverse weather. Results suggested that pilots do not see 'weather' as a monolithic cognitive construct but, rather, as an interaction between its separate factors. This was supported by the finding that the multiplicative statistical effect of visibility and ceiling could better predict takeoff than could the linear effect of either variable considered separately. Also found was a statistical trend toward financial incentive being able to predict takeoffs. However, none of the 10 personality tests (incorporating over 500 separate response items) could predict takeoff.
DTIC
Civil Aviation; General Aviation Aircraft; Incentives; Personality; Pilots; Visibility; Weather

20070007597 Civil Aeromedical Inst., Oklahoma City, OK USA
Epidemiology of Toxicological Factors in Civil Aviation Accident Pilot Fatalities, 1999-2003
Chaturvedi, Arvind K; Craft, Kristi J; Canfield, Dennis V; Whinnery, James E; Nov 2005; 17 pp.; In English
Report No.(s): AD-A460798; DOT/FAA/AM-05/20; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460798

Prevalence of drug and ethanol use in aviation is monitored by the Federal Aviation Administration (FAA). Under such monitoring, epidemiological studies for the 1989-1993 and 11994-1998 periods indicated lower percentages of the presence of illegal (abused) drugs than that of prescription and nonprescription drugs in aviation accident pilot fatalities. In continuation of these studies, an epidemiological assessment was made for an additional period of 5 years. Postmortem samples from aviation accident pilot fatalities submitted to the FAA Civil Aerospace Medical Institute (CAMI) are toxicologically analyzed, and those analytical findings are stored in a database. This CAMI database was examined for the period of 19992003 for the presence of controlled substances of Schedules IV, prescription and nonprescription drugs, and ethanol in the pilot fatalities. Out of 1629 fatal aviation accidents from which CAMI received biosamples, there were 1587 accidents wherein pilots were fatally injured. Drugs and/or ethanol were found in 830 of the 1587 fatalities. Controlled substances of Schedules I and II and Schedules IIIV were detected in 113 and 42 pilots, respectively. Prescription drugs were present in 315 pilots, nonprescription drugs in 259 pilots, and ethanol in 101 pilots. Controlled substances of Schedules I and II were detected in only 5 of the 122 First-Class medical certificate-holding airline transport pilots. In addition to the controlled substances, many of the prescription and nonprescription drugs found in the fatalities have the potential for impairing performance, thereby adversely affecting the ability of an individual to optimally pilot an aircraft.
DTIC
Aircraft Accidents; Civil Aviation; Epidemiology; Pilots; Toxicology

20070007599 Army Command and General Staff Coll., Fort Leavenworth, KS USA
Integrating Coexistent Combat and Conventional Airspace with Contingency Areas
Esch, John B; Dec 15, 2006; 100 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460800; No Copyright; Avail.: CASI: A05, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460800

During past contingency operations and against a backdrop of competing geopolitical and economic goals, the US

military, its allies, and coalition partners found it necessary to integrate combat and conventional airspaces to support military objectives. The airspace management personnel who planned and executed these operations faced the challenge of combining two, distinct airspace control systems within a coexistent environment. The first system, combat airspace control provided under the theater air ground system, directly supported the joint task force commander's operations through safely and efficiently controlling airspace over the joint operations area. The second system, conventional air traffic services, handled civil and noncombat aircraft in host nation airspace, inclusive of, or adjacent to the joint operations area. The distinctions between these two systems are established in aircraft separation standards and techniques, and the significant fact that combat and conventional operations vie for use of the same airspace.
DTIC
Air Traffic Control; Airspace; Combat; Contingency; Systems Integration

20070007614 Civil Aeromedical Inst., Oklahoma City, OK USA
Aeromedical Aspects of Findings from Aircraft-Assisted Pilot Suicides in the USA, 1993-2002
Johnson, Robert D; Lewis, Russell J; Whinnery, James E; Forster, Estrella M; Mar 2006; 14 pp.; In English
Report No.(s): AD-A460820; DOT/FAA/AM-06/5; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460820

All aviation accidents are tragic, but few are more avoidable than aircraft-assisted suicide. Aircraft-assisted suicide may precipitate as a result of clinical depression, marital or financial difficulties, or numerous other problems. While aircraft-assisted suicide attempts almost always result in pilot fatalities, they also have the serious and unfortunate potential to cause collateral damage to property and life. The Civil Aerospace Medical Institute (CAMI) was interested in evaluating the epidemiological, toxicological, and aeromedical findings from pilots involved in aircraft-assisted suicides. Case histories, accident information, and the declaration of suicide as the probable cause in the aviation accidents were obtained from the National Transportation Safety Board (NTSB). Toxicological information was obtained from CAMI's Bioaeronautical Sciences Research Laboratory. Other relevant information was obtained from medical certification data systems. Over a 10-year period, 1993-2002, there were 3,648 fatal aviation accidents. Of these, the NTSB determined that 16 were aircraft-assisted suicides. Of these 16 accidents, 15 were from intentional crashing of an aircraft, and 1 was due to a student pilot exiting the aircraft while inflight. All 16 aircraft were operated as general aviation. All pilots involved in these aircraft-assisted suicides were male, with a median age of 40 (range 15-67) years. The pilot was the sole occupant of each aircraft that was intentionally crashed. Toxicological findings for 7 of the 14 pilots for which test specimens were available were negative for disqualifying substances, whereas 4 contained ethanol at various levels, 2 were found positive for benzodiazepines, 1 was positive for marijuana, 1 was positive for cocaine, and 1 was positive for venlafaxine. These limited data indicate that 50% of accidents classified by the NTSB as aircraft-assisted pilot suicide involve at least one, if not more, disqualifying drug(s).
DTIC
Accident Investigation; Aerospace Medicine; Aircraft Accidents; Epidemiology; General Aviation Aircraft; Pilots; Toxicology; United States

20070007621 Civil Aeromedical Inst., Oklahoma City, OK USA
Interpretation of Carboxyhemoglobin and Cyanide Concentrations in Relation to Aviation Accidents
Canfield, Dennis V; Chaturvedi, Arvind K; Dubowski, Kurt M; May 2005; 8 pp.; In English
Report No.(s): AD-A460835; DOT/FAA/AM-05/9; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460835

Carbon monoxide (CO) and hydrogen cyanide (HCN) are combustion products of organic material, but their production depends on material constituents and environmental conditions. Non-nitrogenous organic materials generate CO, whereas nitrogenous organic materials also produce HCN. For fire-involved aviation accidents, it is important to determine if the fire occurred during flight or after the crash and to establish the source(s) of the toxic gases. Therefore, this study was pursued. Bio-specimens from aviation accident fatalities (cases) are submitted to the Civil Aerospace Medical Institute for analyses. In blood, CO is analyzed as carboxyhemoglobin (COHb) and HCN as cyanide (CN-). These analytical data are stored in a database, and this database was searched for the period of 19902002 for the presence of COHb and CN- in the submitted cases. Out of 5945 cases, there were 223 (4%) cases wherein COHb was  10%. Of the 223 cases, fire was reported with 201, no fire with 21, and undetermined fire status with 1. CN- concentrations were at or above 0.25 ug/mL in 103 of the 201 fire-related cases. None of the 21 non-fire cases had CN-, but nicotine was detected in 9 of the cases. All non-fire cases with COHb 30% (4 cases) were associated with exhaust leaks. Of the 223 cases, COHb-CN-Fractional Toxic Concentration (FTCs) was lethal only in 31 cases with elevated CN- levels. The presence of COHb and CN-

in elevated concentrations in the blood of victims who died on impact would indicate an in-flight fire. In the absence of fire and CN-, the elevated COHb concentrations would suggest an exhaust leak, particularly at COHb 20%. Findings of this study also suggest that, in addition to COHb, CN- contributes to the detrimental effects of fire-associated aviation accident fatalities.
DTIC
Aircraft Accidents; Carboxyhemoglobin; Carboxylic Acids; Cyanides; Toxicity

20070007627 Civil Aeromedical Inst., Oklahoma City, OK USA
Poppy Seed Consumption or Opiate Use: The Determination of Thebaine and Opiates of Abuse in Postmortem Fluids and Tissues
Johnson, Robert D; Lewis, Russell J; Hattrup, Rachael A; Jun 2005; 15 pp.; In English
Report No.(s): AD-A460858; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460858

Opiates are some of the most widely prescribed drugs in America. Some opiate compounds are highly addictive and are often abused. Opiate abuse transcends all social, racial, and economic boundaries. Demonstrating the presence or absence of opiate compounds in postmortem fluids and/or tissues derived from fatal civil aviation accidents can have serious legal consequences and may help determine the cause of impairment and/or death. However, the consumption of poppy seed products can result in a positive opiate drug test. Therefore, the interpretation of positive opiate results must be viewed with caution. We have developed a simple method for the simultaneous determination of 8 opiate compounds from one extraction. These compounds are hydrocodone, dihydrocodeine, codeine, oxycodone, hydromorphone, 6-monoacetylmorphine, morphine, and thebaine. The inclusion of thebaine is notable as it is an indicator of poppy seed consumption and may help explain morphine/codeine positives in cases where no opiate use was indicated. This method incorporates a Zymark RapidTrace automated solid-phase extraction system, gas chromatography/mass spectrometry, and trimethyl silane (TMS) and oxime-TMS derivitives. The limits of detection ranged from 0.78-12.5 ng/mL. The linear dynamic range for most analytes was 6.25-1600 ng/mL. The extraction efficiencies ranged from 70-103%. We applied this method to 8 separate aviation fatalities where opiate compounds had previously been detected. The specimens analyzed for the determination of these 8 opiate compounds were blood, urine, liver, kidney, and skeletal muscle. This method has proven to be simple, robust, and accurate for the simultaneous determination of 8 opiate compounds in postmortem fluids and tissues.
DTIC
Accident Investigation; Alkaloids; Seeds; Toxicology

20070007633 Civil Aeromedical Inst., Oklahoma City, OK USA
Human Error and General Aviation Accidents: A Comprehensive, Fine-Grained Analysis Using HFACS
Wiegmann, Douglas; Faaborg, Troy; Boquet, Albert; Detwiler, Cristy; Holcomb, Kali; Shappell, Scott; Dec 2005; 22 pp.; In English
Report No.(s): AD-A460866; DOT/FAA/AM-05/24; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460866

The Human Factors Analysis and Classification System (HFACS) is a theoretically based tool for investigating and analyzing human error associated with accidents and incidents. Previous research performed at both the University of Illinois and the Civil Aerospace Medical Institute has successfully shown that HFACS can be reliably used to analyze the underlying human causes of both commercial and general aviation (GA) accidents. These analyses have helped to identify general trends in the types of human factors issues and aircrew errors that have contributed to civil aviation accidents. The next step was to identify the exact nature of the human errors identified. The following questions of interest were addressed: (1) Which unsafe acts are associated with the largest percentage of accidents?; (2) Has the percentage of accidents associated with each unsafe act changed over the years?; (3) Does the pattern of unsafe acts differ across fatal and non-fatal accidents?; (4) Do the patterns of unsafe acts for fatal and non-fatal accidents differ across years?; (5) How often is each error type the 'primary' cause of an accident?; (6) Do seminal unsafe acts differ across years or as a function of accident severity (fatal vs. non-fatal)?; and (7) What are the exact types of errors committed within each error category, and do these types of errors differ across accident severity or seminal events? The purpose of this research effort was to address these questions by performing a fine-grained HFACS analysis of the individual human causal factors associated with GA accidents, and to assist in the generation of intervention programs. The report details the findings and offers an approach for developing interventions to address them.
DTIC
Aircraft Accidents; Classifications; Coding; Errors; Flight Crews; General Aviation Aircraft; Human Factors Engineering; Pilot Error

20070007638 Civil Aeromedical Inst., Oklahoma City, OK USA

Reexamination of Color Vision Standards, Part I: Status of Color Use in ATC Displays and Demography of Color-Deficit Controllers

Xing, Jing; Schroeder, David J; Feb 2006; 21 pp.; In English

Report No.(s): AD-A460875; DOT/FAA/AM-06/2; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460875

This report describes the status of color use in current air traffic control (ATC) displays. It represents the first step in an effort to reexamine the color vision standards for air traffic controllers. The current job-related color vision tests used by the FAA are based on an analysis of ATC tasks conducted in the 1980s. Over the past decade, many color displays have been introduced, meanwhile, the job-related screening tests for applicants are still based on the earlier data. This report is part of a study to reexamine the current color vision standards for air traffic controllers. The authors first performed a demographic study to identify the number of controllers in the current ATC workforce with color vision deficiencies. The results indicated that there are 152 color-deficient controllers in eight of the nine FAA regions across the country. To understand how colors are being used in ATC displays, and how they may affect the job performance of color-deficient controllers, the authors collected and analyzed information about color displays from nine ATC facilities, including three air traffic control towers, three TRACONs, and three en route centers. The main findings are summarized as follows: (1) All the basic colors and some non-basic colors are being used in ATC displays; (2) Critical information typically involves the use of red or yellow colors; and (3) Colors are used mainly for three purposes (i.e., drawing attention, identifying information, and organizing information). Yet, none of the colors is used exclusively for a single purpose across facilities. The results raise questions regarding the adequacy of the current job-related color vision tests, given today's task requirements. The authors also discuss several possible solutions to bridge the discrepancies between the current color vision standards and the extensive use of color displays.

DTIC

Air Traffic Control; Air Traffic Controllers (Personnel); Color; Color Vision; Controllers; Defects; Demography; Display Devices; Human-Computer Interface; Requirements; Vision

20070007642 Civil Aeromedical Inst., Oklahoma City, OK USA

Static Sector Characteristics and Operational Errors

Goldman, Scott; Manning, Carol; Pfleiderer, Elaine; Mar 2006; 16 pp.; In English

Report No.(s): AD-A460882; DOT/FAA/AM-06/4; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460882

This study was conducted to determine if static sector characteristics are related to the occurrence of operational errors (OEs) at the Indianapolis Air Route Traffic Control Center (ZID). The authors sought to determine whether factors that predicted OEs at the Atlanta Air Route Traffic Control Center (ZTL) in a study conducted by Rodgers et al. (1998) would also predict OE occurrence at other facilities. The data consisted of a 3-year sample of OEs that had occurred in ZID airspace. Sectors were treated as the unit of analysis (n=40). The static characteristics included the following: number of major airports, cubic volume in nautical miles (nm), sector strata, number of shelves, number of VORTACs, number of satellite airports, and number of intersections. Pearson correlations revealed that only sector size ($r = -.31$, $p = .049$) and sector altitude strata ($r = .31$, $p = .049$) were significantly correlated with the number of OEs. The static sector characteristics were entered into a regression procedure as predictors with the number of OEs as the criterion. The regression analysis produced a model containing cubic volume in nautical miles, number of major airports, and sector strata as significant predictors. This model accounted for 43% of the variance in OEs ($R=.65$). No other static sector characteristics were significant predictors of OE incidence in this sample. The correlation between cubic volume in nautical miles and number of OEs indicated that, as sector size decreased, the number of OEs increased. However, the predictive utility of cubic volume in nm may be due to underlying dynamic traffic characteristics inherent in different-sized sectors rather than a direct relationship between sector size and incidence of OEs. The regression analysis suggests that static sector characteristics can account for some of the variance in OE occurrence in ZID airspace and can increase our understanding of the factors that lead to an OE.

DTIC

Air Traffic Control; Error Analysis; Errors; Static Characteristics; Terminal Facilities

20070007647 Civil Aeromedical Inst., Oklahoma City, OK USA

Beneath the Tip of the Iceberg: A Human Factors Analysis of General Aviation Accidents in Alaska Versus the Rest of the USA

Detwiler, Cristy; Hackworth, Carla; Holcomb, Kali; Boquet, Albert; Pfleiderer, Elaine; Wiegmann, Douglas; Shappell, Scott; Mar 2006; 14 pp.; In English

Report No.(s): AD-A460891; DOT/FAA/AM-06/7; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460891

Historically, general aviation (GA) accidents have been overlooked and their impact under-appreciated when compared with those in the commercial or military sector. Recently however, the Federal Aviation Administration and other governmental and civilian organizations have focused their attention on one piece of this proverbial 'iceberg,' that being GA accidents occurring in Alaska. This study examines more than 17,000 GA accidents using the Human Factors Analysis and Classification System. Comparisons of Alaska to the rest of the U.S. (RoUS) included traditional demographic and environmental variables, as well as the human errors committed by aircrews. Overall, categorical differences among unsafe acts (decision errors, skill-based errors, perceptual errors, and violations) committed by pilots involved in accidents in Alaska and those in the RoUS were minimal. However, a closer inspection of the data revealed notable variations in the specific forms these unsafe acts took within the accident record. Specifically, skill-based errors associated with loss of directional control were more likely to occur in Alaska than the rest of the U.S. Likewise, the decision to utilize unsuitable terrain was more likely to occur in Alaska. Additionally, accidents in Alaska were associated with violations concerning Visual Flight Rules into Instrument Meteorological Conditions. These data provide valuable information for those government and civilian programs tasked with improving GA safety in Alaska and the RoUS.

DTIC

Aircraft Accident Investigation; Aircraft Accidents; Flight Crews; General Aviation Aircraft; Human Factors Engineering; United States; Visual Flight Rules

20070007689 Civil Aeromedical Inst., Oklahoma City, OK USA

Reexamination of Color Vision Standards, Part 3: Analysis of the Effects of Color Vision Deficiencies in Using ATC Displays

Xing, Jing; May 2006; 22 pp.; In English

Report No.(s): AD-A460956; DOT/FAA/AM-06/11; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460956

This report assesses the effect of color use in air traffic control (ATC) displays for users who have color vision deficiencies, denoted as color deficient (CD). Color is extensively used in many ATC displays, yet the color vision standard used by the Federal Aviation Administration (FAA) allows certain types of CDs to enter the ATC workforce. Many guidelines for color use in visual displays state that color use should be accompanied by achromatic redundant cues to avoid misinterpretation by CD users. However, little has been documented in guidelines about the effect of redundant cues. Therefore, it is necessary to understand how CD personnel use color-coded information in displays and whether redundant cues are helpful. Previously, the authors collected data about color use in displays from many ATC facilities. They also developed computational algorithms that could assess the effects of color vision deficiencies on the performance of color-related ATC tasks. The algorithms compared the effectiveness of using color-coded information between observers with normal color vision and CDs. The algorithms also considered the effectiveness of redundant visual cues relative to colors. In this report, they applied the algorithms to six ATC displays to estimate their efficient use by CDs. The main findings included the following: (1) critical color-coded information may not capture the attention of CDs in many applications; (2) there are instances in which CDs may not reliably identify types of information that are encoded in colors; and (3) in many instances color use makes text reading slower and less accurate for CDs. These results indicate that CDs may not be able to use color displays as efficiently as users with normal vision. In addition, the authors identified situations in which no redundant cues were used for task-critical color usages. Moreover, they estimated that most redundant cues were not as effective as color or were not effective at all for the given task.

DTIC

Air Traffic Control; Air Traffic Controllers (Personnel); Color; Color Vision; Cues; Defects; Display Devices; Vision

20070007695 Air Expeditionary Force Battlelab, Mountain Home AFB, CO USA

Air Warfare Battlelab Initiative for Stabilized Portable Optical Target Tracking Receiver (SPOTTR)

Pendley, Mark M; Jun 2005; 12 pp.; In English; Original contains color illustrations

Report No.(s): AD-A460972; ICCRTS-149; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460972

This paper will address a current problem in Close Air Support (CAS) targeting and a solution that should greatly enhance our C2 operations in the Global War on Terror. During CAS operations, a Joint Terminal Attack Controller (JTAC) is a qualified Service member who, from a forward position on the ground, directs the actions of combat aircraft engaged in CAS and other offensive operations. Oftentimes the CAS pilot is required to have the target in sight before weapons delivery. The target talk-on from the JTAC to the CAS pilot can take too long for timely target engagement. This paper will address a concept to improve our C2 operations by speeding up the targeting process, using SPOTTR in combat operations.
DTIC
Lasers; Optical Tracking; Receivers; Support Systems; Tracking (Position); Warfare

20070008313 Sandia National Labs., Albuquerque, NM USA
Physical Security and Vulnerability Modeling for Infrastructure Facilities
Jones, D. A.; Davis, C. E.; Turnquist, M. A.; Nozick, K.; Jul. 01, 2006; 33 pp.; In English
Report No.(s): DE2006-893151; SAND2006-4155; No Copyright; Avail.: Department of Energy Information Bridge
A model of malicious intrusions in infrastructure facilities is developed, using a network representation of the system structure together with Markov models of intruder progress and strategy. This structure provides an explicit mechanism to estimate the probability of successful breaches of physical security, and to evaluate potential improvements. Simulation is used to analyze varying levels of imperfect information on the part of the intruders in planning their attacks. An example of an intruder attempting to place an explosive device on an airplane at an airport gate illustrates the structure and potential application of the model.
NTIS
Intrusion; Security; Vulnerability; Models

20070008403 Illinois Univ. at Urbana-Champaign, Savoy, IL, USA
Development and Initial Validation of a Safety Culture Survey for Commercial Aviation
Wiegmann, D. A.; von Thaden, T. L.; Mitchell, A. A.; Sharma, G.; Zhang, H.; Feb. 2003; 62 pp.; In English
Contract(s)/Grant(s): DTFA-01-G-015
Report No.(s): PB2007-105603; AHFD-03-3; No Copyright; Avail.: CASI: A04, Hardcopy
The purpose of this study was to develop and initially validate a survey to assess safety culture within the commercial aviation industry. Based on a previous review of safety culture research, five global components of safety culture were identified including Organizational Commitment, Management Involvement, Employee Empowerment, Reward Systems, and Reporting Systems. Subsequent to this, an 86 item, 7-point Likert scale survey was developed to assess these cultural factors as they relate to pilots at a regional, FAR Part 135 scheduled air carrier. The goal was to allow employees throughout the airline (from line pilot to top-level management) to give their personal assessment of these organizational factors, taking into account the operational constraints of the airline and its personnel. Non-regulated organizational factors were targeted to help highlight possible areas of improvement in the airline. Feedback was also gathered from the airline on the techniques employed by the survey to measure safety cultural factors. The results from this survey indicated positive overall airline performance in relation to organizational safety factors. However, specific factors revealed areas in need of organizational attention for improvement. These target issues included areas of vulnerability perceived by the pilots. The results also allowed for refinement of the assessment instrument to improve its usability and validity. Future endeavors in this area will allow researchers to proactively pinpoint specific latent organizational factors in need of improvement that may be addressed to develop better patterns of organizational communication and overall safety.
NTIS
Airline Operations; Commercial Aircraft; Flight Safety; Safety; Surveys

20070008457 Civil Aeromedical Inst., Oklahoma City, OK USA
Relationship of Air Traffic Control Specialist Age to En Route Operational Errors
Broach, Dana; Schroeder, David J; Dec 2005; 21 pp.; In English
Report No.(s): AD-A460816; DOT/FAA/AM-05/22; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460816
Public Law 92-297, passed in 1971, requires that air traffic control specialists (ATCSs) hired after May 16, 1972 retire at age 56. The underlying rationale was that as controllers aged, the cumulative effects of stress, fatigue (from shift work), and age-related cognitive changes created a safety risk (U.S. House of Representatives, 1971). This hypothesis has been considered in two recent studies of en route operational errors (OEs). The Center for Naval Analyses (CNA, 1995) found no relationship

between controller age and OEs. Broach (1999) reported that the probability of involvement in an OE increased with age. The purpose of this study was to re-examine the hypothesis that controller age, controlling for experience, was related to OEs. En route OE records (3,054) were matched with nonsupervisory ATCS staffing records for the period FY1997-2003. Poisson regression was used to model OE count as a function of the explanatory variables age and experience using the SPSS (trademark) version 11.5 General Loglinear (GENLOG) procedure. Overall, the Poisson regression model fit the data poorly (Likelihood Ratio 2 = 283.81, p \h .001). The Generalized Log Odds Ratio was used to estimate the odds ratio for age. The odds of OE involvement for older controllers (GE age 56) were 1.02 times greater than the odds for younger (LE age 55) controllers, with a 95% confidence interval of 0.42 to 1.64. This range of odds indicated that neither age group was less or more likely than the other to be involved in an OE, controlling for experience. The analysis does not support the hypothesis that older controllers are at greater risk of involvement in an OE. These results suggest that the original rationale for the mandatory retirement of controllers may need to be re-examined. Additional research on age and ATCS performance is recommended.
DTIC
Air Traffic Control; Air Traffic Controllers (Personnel); Controllers; Errors; Routes

20070008458 Civil Aeromedical Inst., Oklahoma City, OK USA
Guidance for Medical Screening of Commercial Aerospace Passengers
Antunano, Melchor J; Baisden, Denise L; Davis, Jeffrey; Hastings, John D; Jennings, Richard; Jones, David; Jordan, Jon L; Mohler, Stanley R; Ruehle, Charles; Salazar, Guillermo J; Jan 2006; 9 pp.; In English
Report No.(s): AD-A460819; DOT/FAA/AM-06/1; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460819

This document provides general guidance for operators of manned commercial aerospace flights (suborbital and orbital) in the medical assessment of prospective passengers. This guidance is designed to identify those individuals who have medical conditions that may result in an inflight medical emergency or inflight death, or may compromise in any other way the health and safety of any occupants (crew members and passengers) onboard a commercial aerospace vehicle. Space flight exposes individuals to an environment that is far more hazardous than what is experienced by passengers who fly onboard current airline transports. With orbital and suborbital flights, pre-existing medical conditions can be aggravated or exacerbated by exposure to environmental and operational stressors such as acceleration, microgravity, and solar/cosmic radiation, among others.
DTIC
Aerospace Medicine; Aerospace Vehicles; Passengers; Space Flight

20070008461 Civil Aeromedical Inst., Oklahoma City, OK USA
New Refractive Surgery Procedures and Their Implications for Aviation Safety
Nakagawara, Van B; Wood, Kathryn J; Montgomery, Ron W; Apr 2006; 47 pp.; In English
Report No.(s): AD-A460896; DOT/FAA/AM-06/9; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460896

Since the early 1980s, civil airmen have been allowed to correct refractive error (i.e., myopia, hyperopia, astigmatism) with corrective surgery. Prior Federal Aviation Administration research studies have shown that the number of civil airmen with refractive surgery continues to increase. A study that reviewed refractive surgery use in civil airmen for the years 1994-96, reported that the largest percentage had radial keratotomy (RK). A similar study that reported on the years 1996-2001, however, showed that there had been a substantial increase in the percentage of airmen with laser refractive surgery, i.e., photorefractive keratectomy (PRK) and laser in situ keratomileusis (LASIK). A reference guide on refractive surgery was published in September of 1998 (DOT/FAA/AM-98/25); however, at that time long-term clinical data on PRK and LASIK were not available. The introduction of new refractive surgical techniques (e.g., laser epithelial keratomileusis [LASEK], laser thermal keratoplasty [LTK], conductive keratoplasty [CK], Intacs , phakic IOLs, and presbyopia surgeries) and technology (e.g., wavefront-guided systems, Femtosecond Lasers, inlays, and onlays) has further added to concerns regarding the use of refractive surgical procedures by aviators. In order to provide the aviation community with information to formulate administrative decisions and policies associated with existing and emerging refractive surgical procedures, this paper reviews current procedures and discusses their applicability in the civil aviation environment.
DTIC
Aerospace Medicine; Aircraft Safety; Certification; Flight Safety; Lasers; Refractivity; Surgery

20070008589 Space and Naval Warfare Systems Center, San Diego, CA USA
Estimating Position and Motion of Mobile Profiled Targets
Custy, John; McDonnell, John; Gizzi, Nicholas J; Jan 2002; 8 pp.; In English
Report No.(s): AD-A461183; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461183

Sensor observations of mobile time-critical, or pop-up targets are typically brief and punctuated by long, irregularly sized invervals. However, maintaining or at least estimating the positions and motions of time-critical targets is of utmost importance for reducing their threat to naval aviators and other naval assets. The TEMMPTS software tool processes data from a variety of sources to determine the regions where time-critical targets are most likely to be found, and thus forms the first link in an estimate-search destroy chain for such targets. Presented here is an overview of the TEMMPTS project, a description of some of the most important design objectives for the TEMMPTS tool, and a discussion of the work underway to meet those objectives.
DTIC
Detectors; Estimating; Software Development Tools; Targets

20070008619 Civil Aeromedical Inst., Oklahoma City, OK USA
Comparison of Pilot Medical History and Medications Found In Postmortem Specimens
Canfield, Dennis V; Salazar, Guillermo J; Lewis, Russell J; Whinnery, James E; May 2006; 7 pp.; In English
Report No.(s): AD-A461233; DOT/FAA/AM-06/12; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461233

Pilots are required by FAA regulations to report all medications and medical conditions to the FAA Office of Aerospace Medicine for review as to the overall suitability of the pilot for flight activities. Following a fatal aviation accident, specimens from deceased pilots are collected by local pathologists and sent to the Bioaeronautical Sciences Research Laboratory (BSRL) for toxicological analysis. The results of such tests are entered into the BSRL Forensic Case Management System. This database was searched to identify all pilots found positive for medications used to treat cardiovascular, psychological, or neurological conditions over the period 1 Jan 1993 through 31 Dec 2003. These medical conditions were selected because of their potential to rapidly incapacitate a pilot inflight. Some of the medications found may have been administered by health care workers as part of emergency medical treatment after the accident. The laboratory conducted toxicological evaluations on 4,143 pilots during the study period. Psychotropic drugs were found in 223 pilots (5%), 14 of whom reported a psychological condition on their medical application. Only 1 of these 14 pilots reported the psychotropic medication found after the accident. Cardiovascular medications were found in 149 pilots (4%), 69 of whom reported a cardiovascular disease. Cardiovascular medications were reported by 29 of these 69 pilots. Neurological medications were found in 15 cases (0.4%), only 1 of whom reported having a neurological condition. None of these 15 pilots had reported the neurological drugs on his/her medical application. Based on the drugs screened for by the laboratory, the authors successfully identified 93% of the medications reported by the pilots. Pilots involved in fatal accidents taking psychotropic or neurological medications rarely reported the medication or their underlying medical condition with the FAA Aerospace Medical Certification program, as required.
DTIC
Aircraft Accidents; Cardiovascular System; Diseases; Heart Diseases; Nervous System; Neurology; Pilots; Psychotropic Drugs; Toxicology

20070008624 Civil Aeromedical Inst., Oklahoma City, OK USA
Reweighting AT-SAT to Mitigate Group Score Differences
Dattel, Andrew R; King, Raymond E; Jul 2006; 12 pp.; In English
Report No.(s): AD-A461242; DOT/FAA/AM-06/16; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461242

The Air Traffic Selection and Training (AT-SAT) test battery is the selection tool for applicants for Air Traffic Control Specialist (ATCS) positions within the FAA who have not previously been employed as an air traffic controller. AT-SAT is an aptitude test developed to predict the likelihood of successfully learning ATCS skills. Before operational use, however, concerns were raised about the low passing rate of incumbent ATCS personnel who participated in the initial research and score differences between groups, which could result in possible unfair discrimination. To address these concerns, the subscores of AT-SAT were reweighted, and the additive constant was changed to yield a new total score. This study compares the original and new scoring methods using data from 724 developmental ATCSs who volunteered to take the AT-SAT. An average increase of 4.86 points was found with the new scoring method; the notional passing rate (achieving a score \g/= 70)

changed from 58.8% to 80%. American Indian/Alaskan Native, Hispanic, and black participants showed the greatest average increase in overall scores (i.e., 6.97, 6.98, and 7.02, respectively). The increase in scores of Hispanic and black participants was significantly higher than the increase in scores for white participants [F(4,689) = 6.186, p \h .001]. However, a chi square analysis showed no differences between groups for the participants whose failing score with the original scoring method changed to a passing score with the new method. A Spearman rank correlation coefficient of .85 was found between the two scoring methods, indicating that the ranking of individual participants did not change significantly. No differences were found between groups in rank ordering of the two scoring methods, and no significant gender differences were found between the scoring methods. The study found that the new weighting formula has benefited all groups and is likely to reduce the potential of adverse impact.
DTIC
Air Traffic Controllers (Personnel); Aptitude; Personnel Selection; Psychological Tests; Scoring; Weighting Functions

20070008679 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Optimal Dynamic Soaring for Full Size Sailplanes
Gordon, Randel J; Sep 2006; 185 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461327; AFIT/GAE/ENY06-S04; XC-412TH-LG; No Copyright; Avail.: CASI: A09, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461327

Dynamic soaring is a unique flying technique designed to allow air vehicles to extract energy from horizontal wind shears. Dynamic soaring has been used by seabirds like the Albatross to fly hundreds of kilometers a day across the ocean. Small hobby radio controlled sailplanes have also used this technique to achieve sustained speeds of over 200 miles per hour from just a simple hand toss. Dynamic soaring, however, has never before been studied for use on full size aircraft. The primary goal of this research was to prove or disprove the viability of dynamic soaring for enhancing a full size aircraft's total energy by using a manned sailplane as a demonstration air vehicle. The results of this study will have a direct impact on the sport of soaring, as well as the design of the next generation of large, sailplane-like, robotic planetary explorers for the National Aeronautics and Space Administration (NASA). This research began with a point mass optimization study of an L-23 Super Blanik sailplane. The primary goal of this study was to develop and analyze optimal dynamic soaring trajectories for full size sailplanes. A prototype 6 degrees of freedom (DOF) flight simulator was then developed at the Air Force Research Laboratory's Aerospace Vehicles Technology Assessment and Simulation Branch (AFRL/VACD) and implemented on their Large Amplitude Multi-Mode Aerospace Research Simulator (LAMARS). This simulator helped to validate the dynamic soaring aircraft equations of motion derived for this research and built operational simulator development experience. This experience was then incorporated into a full dynamic soaring research simulator developed at the NASA Dryden Flight Research Facility (NASA DFRC). This NASA simulator was used to develop advanced dynamic soaring flight displays, flight test techniques, and aircrew coordination procedures. Flight test were successfully accomplished using an Super Blanik sailplane and advanced weather monitoring equipment.
DTIC
Aerospace Vehicles; Aircraft; Equations of Motion; Flight Simulators; Gliders; Soaring; Wind Shear

20070008703 Civil Aeromedical Inst., Oklahoma City, OK USA
Developing Temporal Markers to Profile Operational Errors
Pounds, Julia; Rodgers, Mark D; Thompson, Deborah; Jack, Daniel G; Aug 2006; 17 pp.; In English
Report No.(s): AD-A461407; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461407

A commonly held view is that system and human vulnerabilities, whether they emerge at a common moment or over a situation, can form links in a chain of events resulting in an air traffic operational error (OE). However, this truism has not led to the development of better techniques for profiling this progression. If we generally accept that OEs evolve over time, then OEs have temporal characteristics. By better understanding these temporal characteristics, we will better understand how vulnerabilities become links in a chain so that resources can be allocated effectively to develop mitigation strategies. Two activities were conducted to develop the temporal markers (TMs) framework. First, air traffic subject matter experts identified objective (or calculable) points that can be identified a traffic situation. These points could differ at the point in time they occur, but they would occur in some form in most, if not all, OEs. A list of TMs was generated and tested using archival en route OEs. Using the framework is straightforward. This preliminary evidence suggests that temporal profiling could help to discover trends across OEs that are not currently being systematically examined. A larger set of OEs could be tested with this

method to accomplish this. Ultimately, the technique should be used for all OEs in the national airspace so that a TM database could be developed for OE trend analysis.
DTIC
Air Traffic; Errors; Markers

20070008704 Civil Aeromedical Inst., Oklahoma City, OK USA
A Human Factors Review of the Operational Error Literature
Schroeder, David; Bailey, Larry; Pounds, Julia; Manning, Carol; Aug 2006; 66 pp.; In English
Report No.(s): AD-A461408; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461408

This report reviews available documents concerning research and initiatives to reduce operational errors (OEs). It provides a brief history of OE investigation and reporting. It describes 154 documents published from 1960-2005 and 222 OE reduction initiatives implemented from 1986 to 2005. Materials are classified by (1) type of study and (2) human and other contributing factors (using the JANUS taxonomy). An analysis of the literature identified several consistent findings. OEs were related to the amount of traffic (measured nationally rather than by position, early time on position, and pilot/controller miscommunications (especially hearback/readback errors). Initiatives included developing national and local QA activities, providing resources to supervisors to help them perform their jobs, and skills training to address controller mental processes. Many ATO initiatives involved controller training, teamwork, and communications. Research and operations seemed to focus on the same 6 areas: (a) training and experience, (b) teamwork, (c) pilot-ATC communications, (d) Human Machine Interaction (HMI) and equipment, e) airspace/surface, and f) traffic. This review concluded that, historically, much (sometimes redundant) research was conducted that generated little new information about why OEs occurred.
DTIC
Air Traffic; Air Traffic Control; Errors; Human Factors Engineering; Surveys

20070008720 Civil Aeromedical Inst., Oklahoma City, OK USA
The Sublimation Rate of Dry Ice Packaged in Commonly Used Quantities by the Air Cargo Industry
Caldwell, Douglas C; Lewis, Russell J; Shaffstall, Robert M; Johnson, Robert D; Aug 2006; 8 pp.; In English
Report No.(s): AD-A461451; DOT-FAA-AM-06-19; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461451

Dry ice is used as a refrigerant for the shipment of perishable goods in the aviation industry. The sublimation of dry ice can, however, lead to incapacitating levels of carbon dioxide in the aircraft cabin environment, as exemplified by the National Transportation Safety Board's (NTSB's) probable cause determination in a 1998 Brownsville, Texas, incapacitation incident. This incident prompted the NTSB to request that the Federal Aviation Administration (FAA) revisit the dry ice sublimation rate published in FAA Advisory Circular AC 103-4. The sublimation rate used in AC 103-4 to calculate permissible dry ice loads was based on a study where a single, large piece of dry ice (100 lb block) was used. Today, the majority of dry ice shipments contain smaller amounts of dry ice obtained in pellet form (\h 5 lb). This study focuses on the sublimation rate of dry ice packed in such commonly encountered amounts. In this study, approximately 5 lb of dry ice, in pellet form, was added to each of 20 pre-weighed TheromoSafe shipping containers. The boxes were then weighed to obtain 'preflight' weights and placed in an altitude chamber located at the FAA's Civil Aerospace Medical Institute. The chamber was depressurized to an altitude of 8000 ft at a rate of 1000 ft/min. The total 'flight' time was 6 h. The containers were then removed and immediately weighed to obtain 'post-flight' measurements. Using the differences in weight as well as the total flight time, an average sublimation rate of 2.0 +/- 0.3%/h was determined. Results indicate that the sublimation rate is greater when dry ice is packaged in pellet form in small quantities. These results contrast the Pan American Airlines study that employed one solid 100-lb block of dry ice. The current study improves air cargo safety by providing a sublimation rate for dry ice shipped in small, more representative quantities. The updated sublimation rate can be used to calculate safe dry ice loads for containers commonly used today.
DTIC
Air Cargo; Aircraft Accidents; Amount; Carbon Dioxide; Drying; Ice; Industries; Sublimation

20070008741 Air Force Research Lab., Wright-Patterson AFB, OH USA
Control Allocation for Overactuated Systems
Oppenheimer, Michael W; Doman, David B; Apr 2006; 9 pp.; In English
Report No.(s): AD-A461485; AFRL-VA-WP-TP-2006-321; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461485

Much emphasis has been placed on overactuated systems for air vehicles. Overactuating an air vehicle provides a certain amount of redundancy for the flight control system, thus potentially allowing for recovery from off-nominal conditions. Due to this redundancy, control allocation algorithms are typically utilized to compute a unique solution to the overactuated problem. Control allocators compute the commands that are applied to the actuators so that a certain set of forces or moments are generated by the control effectors. Usually, control allocation problems are formulated as optimization problems so that all of the available degrees of freedom can be utilized and, when sufficient control power exists, secondary objectives can be achieved. In this work, a survey of control allocation techniques will be given.
DTIC
Allocations; Control Theory

20070008774 USAF Counterproliferation Center, Maxwell AFB, AL USA
Shoulder Launched Missiles (A.K.A. MANPADS): The Ominous Threat to Commercial Aviation
Whitmire, James C; Dec 2006; 87 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461534; No Copyright; Avail.: CASI: A05, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461534

The USA faces a multitude of security challenges in today's post-September 11, 2001, era. One glaring threat to the nation's economic well-being and public safety is the commercial aviation industry's vulnerability to shoulder-launched missiles, also known as MANPADS (Man Portable Air Defense Systems). This industry sustains the flow of goods and services in today's globally connected economy and is critical to the American way of life. Currently, 27 terrorist groups, including Al Qaeda, have confirmed or reported possession of MANPADS. Since 1994, there have been 10 high-profile attempts to target commercial aircraft, with four being shot down. Furthermore, MANPADS fit Al Qaeda's mode of operation perfectly and are relatively easy to use, convenient to transport, widely available, inexpensive, and lethal. This capability coupled with Al Qaeda's direction from its leader, Osama bin Laden, 'to kill Americans and their allies -- civilians and military,' is a potentially catastrophic combination. With the means and motive to inflict harm in place, and its propensity to favor economic, symbolic, and mass casualty targets, all that remains is opportunity. It is only a matter of time before Al Qaeda penetrates a seam and strikes a USA carrier at home or abroad. Time is of the essence and a scenario that could exceed the economic impact of 9/11 lies in the balance. This paper reviews the histories of MANPADS use by non-state groups and MANPADS seizures; describes the technical aspects of various MANPAD systems; examines the worldwide proliferation of MANPAD systems among non-state groups; explores the probable economic and psycho-social repercussions of a MANPADS attack on a commercial airliner; and provides a strategy template that combines offensive operations, counterproliferation, and interdiction activities abroad while increasing security, countermeasures, vulnerability reduction, and risk management measures at home.
DTIC
Airline Operations; Commercial Aircraft; Missiles; Security; Shoulders; Surface to Air Missiles; Vulnerability

20070008811 California Univ., Santa Cruz, CA USA
Collision Avoidance and Resolution Multiple Access
Garces, Rodrigo; Mar 1999; 174 pp.; In English
Report No.(s): AD-A461579; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461579

Multiple-access interference constitutes a major cause of throughput degradation in wireless networks. The focus of this thesis is the design and analysis of medium access control protocols that mitigate multiple access interference by resolving collisions of small control packets used to avoid the collision of much larger data packets. An upper bound on the average cost of resolving collisions using a deterministic tree-splitting algorithm is derived. This bound is then applied to the compute the average channel utilization in a fully connected network with a large number of stations. Under light-load conditions., collision avoidance and resolution (CARMA) protocols achieve the same average throughput as floor acquisition multiple access (FAMA) protocols. It is also shown that, as the arrival rate of RTSs increases, the throughput achieved by CARMA protocols is close to the maximum throughput that any FAMA protocol can achieve when propagation delays and the control packets used to acquire the floor are much smaller than the data packet trains sent by stations.
DTIC
Collision Avoidance; Multiple Access

20070008814 California Univ., Santa Cruz, CA USA
A Channel-Hopping Protocol for Ad-Hoc Networks
Tzamaloukas, Asimakis; Garcia-Luna-Aceves, J J; Jan 2000; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-97-2-0338
Report No.(s): AD-A461583; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461583
No abstract available
Collision Avoidance; Frequency Hopping; Local Area Networks; Protocol (Computers)

20070008952 Optical Sciences Corp., Huntsville, AL USA
BRITE II Characterization and Application to a New Advanced Flight Motion Simulator
Beasley, D B; Saylor, Daniel A; Buford, Jim; Jan 2003; 12 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461793; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461793
Hardware-in-the-loop testing has, for many years, been an integral part of the modeling and simulation efforts at the U.S. Army Aviation and Missile Command's (AMCOM) Aviation and Missile Research, Engineering, and Development Center (AMRDEC). AMCOM's history includes the development, characterization, and implementation of several unique technologies for the creation of synthetic environments in the visible and infrared regions and AMCOM has continued significant efforts in these areas. Recently, AMCOM has been testing and characterizing a new state-of-the-art resistor array projector and advanced flight motion simulator (FMS). This paper describes recent test and integration activities of the Honeywell BRITE II emitter array and its integration into an infrared scene projector (IRSP) compatible with a new Carco Flight Motion Simulator (FMS).
DTIC
Characterization; Flight Simulators; Motion Simulators

20070008961 Combustion Research and Flow Technology, Inc., Dublin, PA USA
F/A-18C to E Wing Morphing Study for the Abrupt Wing Stall Program
Green, Bradford E; Ott, James D; Jan 2003; 31 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461808; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461808
In an effort to determine the impact of various wing parameters on the abrupt wing stall phenomenon encountered by the pre-production F/A-18E, various characteristics of the F/A-18C wing were modified to reflect the design changes incorporated into the F/A-18E wing. The parameters evaluated during this study included thickness, camber, twist, leading-edge radius, leading-edge flap-chord ratio and the addition of a leading-edge snag. The wing parameters were modified independently and then in combination to determine their impact on the abrupt stall. Several potential computational Figures of Merit were evaluated to determine their utility for the prediction of an abrupt wing stall. One of the most promising Figures of Merit for indicating the onset of an abrupt stall was found to be the wingroot bending-moment coefficient. Using this Figure of Merit, it was determined that the incorporation of a leading-edge snag, the reduction of leading-edge flap-chord ratio and the elimination of camber are the likely contributors to the abrupt stall phenomenon encountered by the aircraft.
DTIC
Aerodynamic Stalling; Angle of Attack; Computational Fluid Dynamics; Figure of Merit; Wings

20070008978 Idaho Univ., Moscow, ID USA
Two-Hydrophone Heading and Range Sensor Applied to Formation-Flying for AUVs
Reeder, C A; Odell, D L; Okamoto, A; Anderson, M J; Edwards, D B; Jan 2004; 8 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-03-1-0634
Report No.(s): AD-A461849; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461849
One form of cooperative behavior for a group of AUVs is to fly in formation while performing tasks. A necessary component for formation-flying is that the vehicles must sense their relative positions. Assuming that each vehicle is capable of sensing its inertial position using an acoustic long-baseline ranging system, the relative vehicle position can be determined by exchanging this data. The penalty for this approach is that exchanging inertial position data consumes communications

bandwidth. Alternately, relative position may be obtained by intercepting acoustic ranging signals used to determine inertial position, obviating the need for exchange of position data. We explore the use of a two-hydrophone sensor to measure relative heading of two vehicles in a formation. It is assumed that a broad-band navigation signal emanating from one vehicle is intercepted by another vehicle containing the sensor. Relative heading is extracted from the time delay between the two hydrophones. Cross-correlation is used to determine time delay. A model is proposed that predicts stochastic precision and bias for the sensor. For a fixed ranging waveform, precision and bias are dependent upon signal-to-noise ratio, relative range and relative heading. This dependence means that the sensor will be most useful for certain combinations of range and heading. Measurements were performed to determine the precision of the two-hydrophone arrangement as a relative heading sensor. Simulations were used to explore the performance of formation-flying controllers that employ the two-hydrophone sensor. The controller used a saturating linear output feedback control law to simultaneously follow inertial waypoints and maintained formation. The simulations showed that this controller would be able to use relative heading provided by the two-hydrophone sensor to maintain formations in which the vehicles are approximately abreast.
DTIC
Formation Flying; Hydrophones; Underwater Vehicles

20070009058 Army Aeromedical Research Lab., Fort Rucker, AL USA
A Novel Approach in Facilitating Aviation Emergency Procedure Learning and Recall through an Intuitive Pictorial System
Estrada, Arthur; Keeley, Jennifer A; LeDuc, Patricia A; Bass, Julie M; Rouse, Tiffany N; Ramiccio, John G; Rowe, Terri L; Jan 2007; 136 pp.; In English
Contract(s)/Grant(s): Proj-878
Report No.(s): AD-A461463; USAARL-2007-07; No Copyright; Avail.: CASI: A07, Hardcopy

Research has demonstrated that providing students with memorization techniques improved their ability to recall information. This study employed a pretest-posttest, control group design to test the effectiveness of a novel mnemonic strategy: the Intuitive Pictorial System (IPS). Descriptive and inferential statistics, along with correlation, were used to assess the study data, which determined statistically significant differences between the IPS and traditional training methods. Although the study's findings did not show the IPS as producing performance gains superior to that of the traditional method, user assessments and symbol recognition performance demonstrated the utility and merit of the system as an augmentation. The manner in which the symbols were able to facilitate the recall of uncommon, unfamiliar terms and phrases in a naive population to a level comparable to that of highly-experienced pilots in just one week highlighted the IPS's capacity to aid in the encoding of information into long-term memory. This information could lead to important innovations to current U.S. Army teaching methods and aviation safety.
DTIC
Education; Emergencies; Graphic Arts; Mnemonics

04
AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes all modes of communication with and between aircraft; air navigation systems (satellite and ground based); and air traffic control. For related information see also 06 Avionics and Aircraft Instrumentation; 17 Space Communications, Spacecraft Communications, Command and Tracking; and 32 Communications and Radar.

20070007590 Civil Aeromedical Inst., Oklahoma City, OK USA
Relationship of the Aircraft Mix Index With Performance and Objective Workload Evaluation Research Measures and Controllers' Subjective Complexity Ratings
Pfleiderer, Elaine M; Aug 2005; 18 pp.; In English
Report No.(s): AD-A460790; DOT/FAA/AM-05/16; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460790

Aircraft mix (i.e., the mix of aircraft with different performance characteristics in a sector) has been repeatedly cited as a complexity factor in en route air traffic control. However, scant attention has been directed to a statistical examination of this relationship. The present study is the third in a series of investigations designed to define, quantify, and assess the validity of aircraft mix as a contributor to traffic complexity. Eighteen 30-minute samples of System Analysis Recording data were collected from the Fort Worth and Atlanta en route centers. Performance and Objective Workload Evaluation Research (POWER) measures and the Aircraft Mix Index (Pfleiderer, 2003a) were computed in 6-minute intervals for each of the 36

samples. Principal Components Analysis of the combined data sets produced four components with eigenvalues \g1 accounting for approximately 71% of the variance. The Aircraft Mix Index was most closely associated with Component 1, which was composed of variables generally associated with traffic complexity. These variables were used as predictors against a criterion of controllers' subjective 'Complexity' ratings in multiple regression analyses of low- and high-altitude sector samples. The Aircraft Mix Index failed to contribute significantly to the explained variance in the both the low-altitude (R=.69; R2=.47) and high-altitude (R=.57; R2=.33) sector models. In the aggregate, the results suggest that although aircraft mix appears to be associated with traffic complexity, it may not be as influential as other complexity factors in the en route environment.
DTIC
Air Traffic Controllers (Personnel); Controllers; Ratings; Workloads (Psychophysiology)

20070007619 Civil Aeromedical Inst., Oklahoma City, OK USA
Terminal Radar Approach Control: Measures of Voice Communications System Performance
Prinzo, O V; McClellan, Mark; Oct 2005; 24 pp.; In English
Report No.(s): AD-A460833; DOT-FAA-AM-05-19; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460833

Effective communications in the National Airspace System (NAS) is an essential safety component of successful air travel. As the NAS migrates from its current ground infrastructure and voice communications system to one that encompasses both ground and airborne systems, digital data transmission may become the principal communication medium. As technological advances lead to innovations in communications system development, these emerging systems will be evaluated against the existing legacy system's performance parameters such as setup delay, voice streaming, pause duration, and message propagation. The data presented here are but a first step in providing objective and quantifiable communications system performance metrics that may prove valuable to communication systems developers and personnel charged with evaluating, certifying, and deploying the next generation of communications systems. The authors analyzed nearly 8,000 transmissions that represented the busiest air-ground communications from the five terminal radar approach control facilities with the highest number of operations in the contiguous USA. Typically, setup delays lasted 81 ms, voice streaming 2568 ms, pause duration 127 ms, and message propagation 73 ms for a total of 2849 ms per transmission. On average, transmissions were separated by 1736 ms of silence. Disruptions to efficient information transfer can result from blocked, stepped-on, and clipped transmissions - but they are rare events and occurred in only 1.16% of the sampled transmissions. A comparison between aircraft with and without disruptions revealed that when a disruption was present, an average of 14.54 messages were transmitted, compared with an average of 9.90 messages when no disruption was present. Even so, there appears to be some type of a detection mechanism in place to alert the controller to the presence o
DTIC
Air Traffic Control; Radar; Telecommunication; Voice Communication

05
AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes all stages of design of aircraft and aircraft structures and systems. Also includes aircraft testing, performance and evaluation, and aircraft and flight simulation technology. For related information see also 18 Spacecraft Design, Testing and Performance and 39 Structural Mechanics. For land transportation vehicles see 85 Technology Utilization and Surface Transportation.

20070006847 NASA Glenn Research Center, Cleveland, OH, USA
Design of Oil-Lubricated Machine for Life and Reliability
Zaretsky, Erwin V.; January 2007; 17 pp.; In English; Seventh International Symposium on Tribology (INSYCONT 2006), 14-16 Sep. 2006, Cracow, Poland; Original contains black and white illustrations
Contract(s)/Grant(s): WBS 561581.02.07.03.03.01
Report No.(s): NASA/TM-2007-214362; E-15577; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070006847

In the post-World War II era, the major technology drivers for improving the life, reliability, and performance of rolling-element bearings and gears have been the jet engine and the helicopter. By the late 1950s, most of the materials used for bearings and gears in the aerospace industry had been introduced into use. By the early 1960s, the life of most steels was increased over that experienced in the early 1940s, primarily by the introduction of vacuum degassing and vacuum melting processes in the late 1950s. The development of elastohydrodynamic (EHD) theory showed that most rolling bearings and

gears have a thin film separating the contacting bodies during motion and it is that film which affects their lives. Computer programs modeling bearing and gear dynamics that incorporate probabilistic life prediction methods and EHD theory enable optimization of rotating machinery based on life and reliability. With improved manufacturing and processing, the potential improvement in bearing and gear life can be as much as 80 times that attainable in the early 1950s. The work presented summarizes the use of laboratory fatigue data for bearings and gears coupled with probabilistic life prediction and EHD theories to predict the life and reliability of a commercial turboprop gearbox. The resulting predictions are compared with field data.
Author
Gears; Life (Durability); Reliability; Transmissions (Machine Elements); Lubrication; Elastohydrodynamics; Service Life

20070007366 Ambirad Ltd., West Midlands, UK
Aircraft Hangar Heating: A Guide to Application and Selection
Feb 25, 2004; 32 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460235; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460235
PRESENTATION: (1) Company introduction; (2) Hangar heating - factors to consider; (3) Comparison of heating systems (case study - benefits and limitations); (4) Product overview; (5) Open forum.
DTIC
Aircraft; Hangars; Heating

20070007378 Mitre Corp., Bedford, MA USA
An Early Look at the UML Profile for Schedulability, Performance, and Time for Engineering Large Scale Airborne C2ISR Platforms
Wheeler, Thomas M; Jan 2004; 5 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8721-04-C-0001
Report No.(s): AD-A460266; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460266
This paper discusses an investigation into the utility of the Object Management Group's UML Profile for Schedulability, Performance, and Time (RT-UML Profile) for engineering a next generation of network centric, large-scale Command, Control, Intelligence, Surveillance, and Reconnaissance (C2ISR) aircraft. This activity applied the Profile in analysis of a multi-aircraft scenario, loosely based on DARPA's AMSTE research program. In this configuration, two aircraft, each with sensing capability, collaborate in real-time to develop precision targeting information for ground targets which is sent directly to in-flight munitions. This collaboration presents stressing, real-time requirements on a number of distributed, physically distinct platforms. The 'RT-UML Profile' was used in conjunction with two commercial tools to perform analysis of the timing needs. Results of this activity indicate (1) the Profile assists engineers in developing better insight into temporal properties; (2) the Profile fits well within the DoD development processes; (3) use of sequence diagrams scales well for defining system load; and (4) the Profile should more directly support threads that span software processes and physical resources.
DTIC
Aircraft; Command and Control; Computer Programming; Flying Platforms; Performance Prediction; Programming Languages; Reliability Engineering; Software Engineering

20070007393 Naval Postgraduate School, Monterey, CA USA
Increasing Operational Availability of H-60 Calibration Support Equipment
Bevel, Kenneth D; Johnson, Kelly M; Stonaker, RObert N; Dec 2006; 94 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460402; No Copyright; Avail.: CASI: A05, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460402
The purpose of this MBA Project was to identify inefficiencies in the H-60 support equipment calibration process at Naval Air Station, North Island and analyze their impact on operational availability. To conduct this analysis, the researchers mapped the standard calibration process at North Island from beginning to end from a using unit perspective. After identifying the process, the researchers calculated the inherent and operational availability and determined the impacts of process inefficiencies on asset operational availability. The researchers proposed changes to reduce the effects of process inefficiencies on using unit asset availability and provided guidance for further study.
DTIC
Calibrating; H-60 Helicopter; Helicopters

20070007395 Naval Postgraduate School, Monterey, CA USA

Commander Naval Air Forces (CNAF) Aircraft Operations Maintenance (AOM): An Examination of Effectiveness in Maintaining and Operating an Aging Aircraft Fleet

Jones, Lawrence R; Cuskey, Jeffrey R; Dec 2006; 123 pp.; In English; Original contains color illustrations

Report No.(s): AD-A460404; No Copyright; Avail.: CASI: A06, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460404

Naval aviation serves as a vital component of many air and ground task organized forces vying for a share of the Department of Defense (DoD) budget. The decisions in the 1990s to reduce purchases of new equipment left the Navy with aging fleets of aircraft that are increasingly expensive to maintain. This situation coupled with the cost of the Global War on Terror has created a cycle in which more funds are spent maintaining older equipment at the expense of new purchases. This has lead to still older equipment and higher maintenance costs. The increases in the costs of operating and maintaining aging military equipment have created a budgetary crisis in the Department of Defense. The Commander Naval Air Forces (CNAF), Commander, Naval Air Force, U.S. Pacific Fleet (COMNAVAIRPAC), and Commander, Naval Air Force, U.S. Atlantic Fleet (COMNAVAIRLANT), face the great challenge of effectively vying for their share of the 37 percent of the DoD budget that pays for the day-to-day costs of Operation and Maintenance (O&M). Precisely identifying budgeting and costs for sustaining Aircraft Operations Maintenance (AOM) of the Navy's aging fleet of aircraft is vital to preserving an essential component of current war fighting doctrine. Unfortunately, establishing the association between age and costs is complex. Costs are likely to be affected by an aircraft's age, component technology, the number of flight hours, manner in which it is flown, and the resources devoted to maintenance. Therefore, to better identify costs and maintenance trends of value to Naval aviation, the cost drivers for AOM should be investigated. The purpose of this study is to analyze the effectiveness of the aircraft maintenance process in conjunction with actions to remove impediments to non-deployed aviation readiness.

DTIC

Logistics; Maintenance; Military Aircraft; Military Aviation; Military Operations

20070007407 Naval Postgraduate School, Monterey, CA USA

Evaluating Leadership's Approach to Implementing Organizational Change Across the Naval Aviation Enterprise With a Focus on the Development of Fleet Readiness Centers

Sacco, Christopher M; Lovell, Jason D; Dec 2006; 185 pp.; In English; Original contains color illustrations

Report No.(s): AD-A460430; No Copyright; Avail.: CASI: A09, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460430

NAVAIR is currently realigning its aviation maintenance infrastructure to fall under the overarching umbrella of the newly minted Naval Aviation Enterprise (NAE). This realignment will call for a new enterprise-wide strategy and structure. Hierarchies and relationships are being redefined throughout the enterprise, resulting in entirely new organizational structures that are functionally equivalent to industry's small business units. This realignment, which will eliminate Intermediate level maintenance as it exists today, presents a myriad of challenges to the Fleet in the terms of achieving business efficiencies and employee relationship management. This MBA Project evaluates, by survey, how effectively the U. S. Navy and Marine Corps have managed the change effort as they continue to realign their Intermediate and Depot level units under the new FRC construct.

DTIC

Maintenance; Military Aviation

20070007432 Boeing Co., Seattle, WA USA

Managing Virtual Networks on Large-Scale Projects

Noll, David; Jan 2006; 8 pp.; In English; Original contains color illustrations

Report No.(s): AD-A460479; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460479

The complexity of Boeing's 787 Program is too great for the formal planned information and communication network structure to fully meet the needs of companies, managers, and employees located throughout the world. By observing the 787 program it became apparent that identification, creation, and nurturing of networks are an important new skill set for managers. In this large-scale systems integration environment, Process Integration Teams and the Partner Working Group were networks designed by managers to fill communication gaps. Employees also responded by forming learning networks to help them acquire knowledge they need to be successful. This is compounded by the evolving nature of the 787 program, which can make today's networks obsolete and require new networks to be created in the future. Managers must continue to ensure that

current networks add value and identify potential new communication and information gaps that will need networks to fill them.
DTIC
Commercial Aircraft; Communication Networks; Life (Durability); Production Engineering; Project Management; Wide Area Networks

20070007511 Naval Ship Research and Development Center, Bethesda, MD USA
Motions and Hull-Induced Bridging-Structure Loads for a Small Waterplane Area, Twin-Hulled, Attack Aircraft Carrier in Waves
Jones, Harry D; Gerzina, David M; Aug 1973; 76 pp.; In English
Contract(s)/Grant(s): Proj-1-1568-205
Report No.(s): AD-A460641; DTNSRDC-3819; No Copyright; Avail.: CASI: A05, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460641

An experimental investigation was performed with a model in the maneuvering and sea-keeping facility at the Naval Ship Research and Development Center to determine the characteristics of a proposed small waterplane area, twin-hulled, attack aircraft carrier in waves. Motions of the model were measured, together with the forces and moments induced by the hulls on the cross structure spanning the two hulls. Experimental data were compiled in head, bow, beam, quartering, and following regular waves in addition to long-crested, irregular head and beam waves. Some powering measurements were also made in regular head waves.
DTIC
Aircraft Carriers; Attack Aircraft; Carrier Waves; Hulls (Structures); Loads (Forces)

20070007547 Library of Congress, Washington, DC USA
Coast Guard Deepwater Program: Background, Oversight Issues, and Options for Congress
O'Rourke, Ronald; Dec 18, 2006; 15 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460708; CRS-RL33753; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460708

The Integrated Deepwater Systems (IDS) program, or Deepwater program for short, is a $24-billion, 25-year project to replace and modernize the Coast Guard's aging fleet of deepwater-capable ships and aircraft. It is the largest and most complex acquisition effort in Coast Guard history, encompassing 91 new cutters, 124 new small surface craft, and 244 new or modernized airplanes, helicopters, and unmanned aerial vehicles (UAVs). The issue for Congress is whether to approve, reject, or modify the Administration's annual funding requests and overall approach for the program. The Coast Guard is pursuing the Deepwater program as a system-of-systems acquisition project, under which a combination of cutters, patrol boats, aircraft, and supporting assets is to be procured as a single, integrated package. To execute this system-of-systems acquisition approach, the Coast Guard is using a lead system integrator (LSI) -- a private-sector entity responsible for designing, building, and integrating the various elements of the package. Potential options for Congress regarding the Deepwater program include but are not limited to the following: continuing with the program as currently planned; instituting additional or stricter reporting requirements; compressing the acquisition period from 25 years to 15 or 10 years; replacing ICGS as the LSI; dropping the use of an LSI in favor of direct Coast Guard management and integration of the program; and replacing the Deepwater program with a series of separate procurement programs for replacing individual classes of cutters, boats, and aircraft. The Coast Guard's FY2007 budget requested $934.431 million for the Deepwater acquisition program. The conference report (H.Rept. 109-699 of September 28, 2006) on H.R. 5441/P.L. 109-295, the FY2007 Department of Homeland Security (DHS) appropriations act, provides a total $1,144.566 million in FY2007 funds for the Deepwater program.
DTIC
Acquisition; Coasts; Deep Water; Integrators; Large Scale Integration; Water Depth

20070007576 Civil Aeromedical Inst., Oklahoma City, OK USA
Fatality and Injury Rates for Two Types of Rotorcraft Accidents
Palmerton, David; Oct 2005; 9 pp.; In English
Report No.(s): AD-A460769; DOT-FAA-AM-05-17; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460769

An analysis of the frequency of four different types of rotorcraft accidents was conducted to determine if the number of fatalities and injuries between accident conditions was different. Accidents involving rollover, no rollover, fire, and no fire

were studied to determine if accidents with a rollover or fire might be creating evacuation delays that contribute to the fatality and injury rates. A search of the FAA Accident Incident Data System from January1986 to March 1997 produced 2704 accident records for this analysis. A Chi-Square test for independence was used to determine the difference between the rollover and no rollover and fire and no fire accident categories. Further analysis were performed on combinations of the two main categories to determine if an event such as a rollover and fire produced more fatalities or injuries than a rollover without a fire. There were more fatalities in the no rollover category (P=.0001) and more injuries in the rollover group (P=.001). Accidents with a fire produced more fatalities than accidents without a fire, (P=.0001). Rollover accidents without a fire produced more fatalities (P=.0001) than no rollovers without a fire, and more injuries were produced in the rollover no fire group (P=.0001) than the no rollover no fire category. The group of accidents where the rotorcraft rolled and caught fire lead to more fatalities (P=.0001), and the no rollover group with fire generated more fatalities (P=.0001). Rollover accidents injure more pople, and accidents with no rollover kill more occupants. It appears as if the no rollover condition produces greater impact forces, preventing the rotorcraft from bouncing and rolling; consequently, the higher fatality rate. Fires produce more fatalities but not more injuries. Autopsy data might explain this, but smoke inhallation during the evacuation and the speed of the evacuatio

DTIC

Accidents; Aerospace Medicine; Injuries; Mortality; Rotary Wing Aircraft

20070007580 Air Force Research Lab., Wright-Patterson AFB, OH USA

A Hypersonic Vehicle Model Developed With Piston Theory (Preprint)

Oppenheimer, Michael W; Doman, David B; Jul 2006; 26 pp.; In English

Contract(s)/Grant(s): Proj-A03D

Report No.(s): AD-A460775; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460775

For high Mach number flows, M greater or equal to 4, piston theory has been used to calculate the pressures on the surfaces of a vehicle. In a two-dimensional flow, a perpendicular column of fluid stays intact as it passes over a solid surface. Thus, the pressure at the surface can be calculated assuming the surface were a piston moving into a column of fluid. In this work, first-order piston theory is used to calculate the forces, moments, and stability derivatives for longitudinal motion of a hypersonic vehicle. Piston theory predicts a relationship between the local pressure on a surface and the normal component of fluid velocity produced by the surface's motion. The advantage of piston theory over other techniques, such as Prandtl-Meyer flow or Newtonian impact theory, is that unsteady aerodynamic effects can be included in the model. The unsteady effects, considered in this work, include perturbations in the linear velocities and angular rate. This provides a more accurate model that agrees more closely with models derived using computational fluid dynamics or those derived by solving Euler equations. Additionally, piston theory yields an analytical model for the longitudinal motion of the vehicle, thus allowing design trade studies to be performed while still providing insight into the physics of the problem.

DTIC

Hypersonic Vehicles; Piston Theory; Pistons

20070007594 Army Command and General Staff Coll., Fort Leavenworth, KS USA

The Perception of the P-16 in the USA: A Historical Analysis

Sartorius, Matthias F; Dec 15, 2006; 96 pp.; In English

Report No.(s): AD-A460795; No Copyright; Avail.: CASI: A05, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460795

The Swiss firm Flug und Fahrzeugwerke Altenrhein AG (FFA) developed a combat aircraft for the Swiss Air Force. The aircraft, known as the P-16, first flew in April 1955 and achieved supersonic flight for the first time in August 1956. The Swiss government was sufficiently impressed with the P-16 that an order for 100 airframes was placed in 1958. Unfortunately, the crash of two prototypes caused the order to be suspended. While the cause of the accident was a relatively minor defect in the aircraft's hydraulic system that was easily corrected, the Swiss government remained convinced that the design was faulty and cancelled the order. In reality, the Swiss government did not mention all the other reasons for the cancellation. The P-16 became a victim of a change in the Swiss concept of aerial warfare. Unfortunately, the cancellation of the P-16 led to the Swiss aircraft industry's inability to develop a jet airplane, but its design later led to the success of the business jet called the Learjet. This study analyzes changes in the Swiss concept of aerial warfare, the procurement politics of the Swiss Military Department, the U.S. Air Force's perceptions of and interest in the P-16, and the aircraft's modification into the popular Learjet 23.

DTIC

Cancellation; Fighter Aircraft; Government Procurement; Histories; Jet Aircraft; Switzerland

20070007609 Air Force Research Lab., Wright-Patterson AFB, OH USA

Urban Simulation Environment (Preprint)

Stoor, Bradley J; Pruett, Stanley H; Duquette, Matthew M; Subr, Robert C; MtCastle, Tim; Jun 2006; 11 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-A096

Report No.(s): AD-A460811; AFRL-VA-WP-TP-2006-328; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460811

Air Force Research Laboratory (AFRL) researchers at the Aerospace Vehicles Technology Assessment and Simulation (AVTAS) Laboratory are developing a realistic urban simulation environment. The near term objective is to provide an appropriate environment to study the performance of cooperative control algorithms for Unmanned Air Vehicles (UAV) in and around the urban landscape. Additionally, operator-in-the-loop interfaces that interact with the cooperative control algorithms will be implemented providing the capability to explore the various facets of UAV control. The simulation environment will include multiple urban databases for visualization, UAV aerodynamics and control models, camera models, articulated human models, and ground vehicle models to serve as clutter and potential targets. Wind and turbulence models will be also be integrated to elicit realistic UAV behavior. The levels of fidelity can be varied depending on available resources and design of the experimental study.

DTIC

Cities; Flight Simulation; Simulation

20070007629 Civil Aeromedical Inst., Oklahoma City, OK USA

Medical Surveillance Programs for Aircraft Maintenance Personnel Performing Nondestructive Inspection and Testing

Nakagawara, Van B; Montgomery, Ronald W; Good, Gregory W; Nov 2005; 14 pp.; In English

Report No.(s): AD-A460862; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA460862

Visual inspection and nondestructive inspection and testing (NDI/NDT) are performed routinely to ensure that aircraft are maintained in safe operating condition. Inspectors must make critical judgments about the condition of aircraft and aircraft components using their eyes, basic visual aids, and complicated NDI/NDT techniques to detect anomalies. Failure to detect observable defects has been implicated in several aviation accidents. This study examines the medical surveillance programs employed by aircraft maintenance facilities in the USA, including specific vision standards and tests used for inspection personnel. We interviewed medical surveillance program personnel from nine major aircraft maintenance facilities and repair stations by phone or in person. The current vision standards for inspectors at each of the facilities surveyed were extracted from internal facility documents. Additionally, we reviewed the vision screening tests used for medical surveillance of inspection personnel. There were differences in the vision standards for near vision (Snellen 20/20 and 20/25, Jaeger #1 and #2, Ortho Rater #8) distant vision (20/25, 20/30, none), color vision (distinguish and differentiate contrast among colors, colors in the methods, normal color vision), and test intervals (annual, 2-year) at the facilities surveyed. Vision screening tests used in the medical surveillance programs at these facilities were equally diverse, including choice of vision screening instruments (Stereo Optical, Titmus), wall charts, reading cards, and pseudoisochromatic plate color vision screening tests. Medical surveillance programs for the aircraft maintenance facilities we surveyed differed considerably for both vision standards and screening tests used to evaluate vision performance of inspectors. The use of uniform vision standards and test methods would provide quality control and facilitate a more accurate evaluation of the visual capabilities for inspection personnel.

DTIC

Maintenance; Nondestructive Tests; Personnel; Surveillance; Vision; Visual Perception

20070007632 Civil Aeromedical Inst., Oklahoma City, OK USA

The LC/MS Quantitation of Vardenafil (Levitra) in Postmortem Biological Specimens

Johnson, Robert D; Lewis, Russell J; Angier, Mike K; Jan 2006; 13 pp.; In English

Report No.(s): AD-A460865; DOT-FAA-AM-06-17; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460865

During the investigation of aviation accidents, postmortem specimens from accident victims are submitted to the Federal Aviation Administration's Civil Aerospace Medical Institute (CAMI) for toxicological analysis. As new medications are introduced to the market and are subsequently used by aviation accident victims, CAMI's forensic toxicology laboratory is tasked with developing analytical methods for the determination of these compounds. This report presents a rapid and reliable method for the identification and quantitation of vardenafil (Levitra) in biological specimens. This procedure utilizes sildenafil-d8, which structurally is closely related to vardenafil, as an internal standard for more accurate and reliable

quantitation. The method incorporates solid phase extraction and LC/MS/MS and MS/MS/MS utilizing an atmospheric pressure chemical ionization ion trap mass spectrometer in the positive chemical ionization mode. Solid-phase extraction proved to be exceptionally efficient providing recoveries that ranged from 94-97%. The limit of detection for vardenafil was determined to be 0.19 ng/mL. The linear dynamic range for this compound was 0.39 - 200 ng/mL. This method was successfully applied to postmortem fluid and tissue specimens obtained from an aviation accident victim. This novel analytical procedure proved to be simple, accurate, and robust for the identification and quantitation of vardenafil in postmortem specimens.
DTIC
Aircraft Accidents; Toxicology

20070007648 Civil Aeromedical Inst., Oklahoma City, OK USA
Human Factors Implications of Unmanned Aircraft Accidents: Flight-Control Problems
Williams, Kevin W; Apr 2006; 9 pp.; In English
Report No.(s): AD-A460892; DOT/FAA/AM-06/8; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460892

This research focuses on three types of flight control problems associated with unmanned aircraft systems. The three flight control problems are: 1) external pilot difficulties with inconsistent mapping of the controls to the movement of the aircraft; 2) difficulties associated with the transfer of control from one control location to another during the flight; and 3) problems associated the automation of flight control. Specific accidents associated with each type of control problem are given as examples. The accidents involve several different aircraft systems that are currently in use. Solutions for each type of control problem are offered.
DTIC
Aircraft Accidents; Flight Control; Human Factors Engineering; Pilotless Aircraft

20070007649 Civil Aeromedical Inst., Oklahoma City, OK USA
Vaporized Hydrogen Peroxide (VHP) Decontamination of a Section of a Boeing 747 Cabin
Shaffstall, Robert M; Garner, Robert P; Bishop, Joshua; Cameron-Landis, Lora; Eddington, Donald L; Hau, Gwen; Spera, Shawn; Mielnik, Thaddeus; Thomas, James A; Apr 2006; 14 pp.; In English
Report No.(s): AD-A460897; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460897

The use of STERIS Corporation's Vaporized Hydrogen Peroxide (VHP)* technology as a potential biocide for aircraft decontamination was demonstrated in a cabin section of the Aircraft Environment Research Facility (an FAA-owned Boeing 747). When exposed to an appropriate concentration of VHP vapor in the cabin test section, biological indicators inoculated with 106 colony forming units of Geobacillus stearothermophilus spores demonstrated a total suppression of culture growth. Efficacy was demonstrated with and without seats in the test section of the aircraft. The importance of adequate air mixing was also demonstrated. *VHP is a registered trademark of the STERIS Corporation.
DTIC
Aircraft Compartments; Boeing 747 Aircraft; Decontamination; Hydrogen Peroxide; Pesticides; Vaporizing

20070008031 Deputy Chief of Staff for Logistics (Army), Washington, DC USA
Tactical Equipment Maintenance Facilities (TEMF) Update to the Industry Workshop
Lugo, Jaime; Feb 25, 2004; 6 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460438; No Copyright; Avail.: CASI: A02, Hardcopy

THREE COMPONENTS: (1) Doctrine/Policy (Two level maintenance - Must support broad spectrum of equipment); (2) Transformation to Future Force (CSA's initiatives - Three ID & 101st - STRYKER); (3) Army Standard (Define requirement - Develop proposed Army standard).
DTIC
Industries; Maintenance

20070008044 Civil Aeromedical Inst., Oklahoma City, OK USA
Solar Radiation Alert System
Copeland, Kyle; Sauer, Herbert H; Friedberg, Wallace; Jul 2005; 13 pp.; In English
Report No.(s): AD-A460733; DOT-FAA-AM-05-14; No Copyright; Avail.: CASI: A03, Hardcopy

A solar radiation alert (SRA) system has been developed to continuously evaluate measurements of high-energy protons made by instruments on Geosynchronous Operational Environmental satellites. If the measurements indicate the likelihood of a substantial elevation of effective dose rates at aircraft flight altitudes, the Civil Aerospace Medical Institute issues an SRA to the aviation community via the National Oceanic and Atmospheric Administration Weather Wire Service. This report describes the methodology of the SRA system. A Monte Carlo particle transport code was used to estimate the fluences of secondary particles (protons, neutrons, pions, kaons, photons, electrons, and muons) in selected energy ranges at specific altitudes. Coefficients to convert particle fluence to effective dose incorporate radiation-weighting factors and tissue-weighting factors recommended by the International Commission on Radiological Protection, except that the radiation-weighting factor for protons was changed from five to two, as recommended by the National Council on Radiation Protection and Measurements. Effective dose rates from solar-proton-induced ionizing radiation in the earth's atmosphere at high geomagnetic latitudes were calculated for the solar proton event of 20 January 2005. The event started at 06:50 Universal Time, and within 5 minutes, dose rates at 60,000, 40,000, and 30,000 ft (relative to mean sea level) reached maximum values of: 140, 55, and 21 microsieverts per hour, respectively.
DTIC
Ejection; Geomagnetism; Protons; Solar Cosmic Rays; Solar Protons; Solar Radiation; Space Weather; Warning Systems; Weather

20070008045 Civil Aeromedical Inst., Oklahoma City, OK USA
Pilot Willingness to Take Off Into Marginal Weather. Part 2. Antecedent Overfitting with Forward Stepwise Logistic Regression
Knecht, William R; Aug 2005; 17 pp.; In English
Report No.(s): AD-A460841; DOT/FAA/AM-05/15; No Copyright; Avail.: CASI: A03, Hardcopy

Adverse weather is the leading cause of fatalities in general aviation (GA). In prior research, influences of ground visibility, cloud ceiling height, financial incentive, and personality were tested on 60 GA pilots' willingness to take off into simulated adverse weather. Results suggested that pilots did not see 'weather' as a monolithic cognitive construct but, rather, as an interaction between its separate factors. However, methodological issues arose during the use of logistic regression in modeling the effect of 60+ candidate predictors on the outcome variable of takeoff into adverse weather. It was found quite possible to obtain false 'significance' for models comprised merely of random numbers, even when the number of model predictors was limited to a conventional 1/10. Therefore, Monte Carlo simulations were used to derive unbiased estimates of model significance and R2 values. Research in correction for this case/candidate predictor ratio effect is relatively new and noteworthy, particularly in the social sciences. It was given the name 'antecedent overfitting' to contrast with the more commonly known 'postcedent' type, which is based on a small case/model predictor ratio.
DTIC
Conditions; General Aviation Aircraft; Hazards; Regression Analysis; Visibility

20070008046 North Dakota State Univ., Fargo, ND USA
Enhancing Coordination and Collaboration in Unmanned Air Vehicle (UAV) Crews
Hinsz, Verlin B; Oct 27, 2006; 5 pp.; In English
Contract(s)/Grant(s): F49620-03-1-0353
Report No.(s): AD-A460842; No Copyright; Avail.: CASI: A01, Hardcopy

This research tests the efficacy of instructions to increase collaboration and coordination among crew members of a UAV ground-control station. The performance of this research depended upon the development of a UAV synthetic task environment (BRUTE) which was accomplished by upgrading a research tool developed by AFRL. This effort resulted in development of a theoretical perspective of coordination and collaboration in teams as well as a general framework for understanding team interaction and performance in dynamic task environments. The research found limited effectiveness of coordination and collaboration instructions on synthetic crew performance or member situation awareness. The research for that spatial orientation predicted performance of the AVO and SO functions in a UAV, while no effect of personality factors was uncovered. This research effort also led to a conceptual advance in the prediction of unitary team performance from member individual difference scores. A novel finding from this research was that both independent and interdependent self-construal increased as a function of engaging in a series of missions as members of UAV operator teams.
DTIC
Coordination; Drone Vehicles; Flight Crews; Pilotless Aircraft

20070008370 NASA Glenn Research Center, Cleveland, OH, USA

NASA Aeroelasticity Handbook Volume 2: Design Guides Part 2

Ramsey, John K., Editor; November 2006; 596 pp.; In English; See also 20070008371 - 20070008392; Original contains black and white illustrations

Contract(s)/Grant(s): WBS 56158102.08.03.04.04; 22.297.10.06

Report No.(s): NASA/TP-2006-212490-VOL2-PT 2; E-14035; Copyright; Avail.: CASI: A25, Hardcopy

The NASA Aeroelasticity Handbook comprises a database (in three formats) of NACA and NASA aeroelasticity flutter data through 1998 and a collection of aeroelasticity design guides. The Microsoft Access format provides the capability to search for specific data, retrieve it, and present it in a tabular or graphical form unique to the application. The full-text NACA and NASA documents from which the data originated are provided in portable document format (PDF), and these are hyperlinked to their respective data records. This provides full access to all available information from the data source. Two other electronic formats, one delimited by commas and the other by spaces, are provided for use with other software capable of reading text files. To the best of the author s knowledge, this database represents the most extensive collection of NACA and NASA flutter data in electronic form compiled to date by NASA. Volume 2 of the handbook contains a convenient collection of aeroelastic design guides covering fixed wings, turbomachinery, propellers and rotors, panels, and model scaling. This handbook provides an interactive database and design guides for use in the preliminary aeroelastic design of aerospace systems and can also be used in validating or calibrating flutter-prediction software.

Author

Aeroelasticity; Flutter Analysis; Aerospace Systems; Fixed Wings; Turbomachinery; Prediction Analysis Techniques; Handbooks

20070008371 Dynamic Engineering, Inc., Newport News, VA, USA

Flutter Model Technology

Busan, Ron; NASA Aeroelasticity Handbook Volume 2: Design Guides Part 2; November 2006, pp. 7-1 - 7-46; In English; See also 20070008370; Copyright; Avail.: CASI: A03, Hardcopy

Wind tunnel testing of dynamically scaled models plays a key role in assuring that new or modified aircraft will be free of flutter within their flight envelopes. Typically, about one-quarter of the total resources allocated to the flutter clearance of fighter type aircraft are for wind tunnel flutter model test programs. Dynamically scaled models are also widely used in research studies such as active control of aeroelastic response, buffet alleviation, and validation of theoretical or computational methods. The purpose of this paper is to summarize the critical design considerations involved with designing and fabricating flutter model hardware once the basic requirements have been determined. An exhaustive treatment of all the analytical and testing considerations associated with flutter phenomena is beyond the scope of this work. Analytical and testing techniques will only be discussed with regard to their relation to the design, fabrication, and calibration of the hardware prior to tunnel testing. The paper is organized as follows: Sections 2 and 3 present some design basics followed by a more detailed discussion of the design process for specific types of flutter model construction. Sections 4 through 7 discuss instrumentation, calibration techniques, load testing, and documentation. Section 8 is a case study of the design and analysis process for a set of supersonic flutter model components. The design, analysis, fabrication, and calibration of flutter models involve many challenging and critical techniques. Engineers sometimes accuse the flutter model designer of practicing a mixture of intuition and art in addition to sound engineering practice. The intuition and art in many ways determine the eventual technical success of the model, but only if it is otherwise soundly engineered using techniques such as those presented in this paper. All photographs included in this paper were supplied courtesy of Allied Aerospace, Newport News, Virginia.

Derived from text

Aircraft Models; Flutter Analysis; Supersonic Flutter; Wind Tunnel Tests; Technology Utilization; Fabrication

20070008372 NASA Langley Research Center, Hampton, VA, USA

Structural Testing for Static Failure, Flutter, and Other Scary Things

Ricketts, Rodney H.; NASA Aeroelasticity Handbook Volume 2: Design Guides Part 2; November 2006, pp. 6-1 - 6-23; In English; See also 20070008370; Copyright; Avail.: CASI: A03, Hardcopy

Ground test and flight test methods are described that may be used to highlight potential structural problems that occur on aircraft. Primary interest is focused on light-weight general aviation airplanes. The structural problems described include static strength failure, aileron reversal, static divergence, and flutter. An example of each of the problems is discussed to illustrate how the data acquired during the tests may be used to predict the occurrence of the structural problem. While this report gives some rules of thumb for the prediction of structural problems, it is not intended to be used explicitly as a structural

analysis handbook. However, many such handbooks are included in the reference list.
Author
Structural Analysis; Flight Tests; Ground Tests; Flutter; Structural Failure

20070008373 Sikorsky Aircraft, Stratford, CT, USA
Influence of Pitch Axis Location and Orientation on Rotor Aeroelastic Stability
Miao, Wen-Liu; NASA Aeroelasticity Handbook Volume 2: Design Guides Part 2; November 2006, pp. 12-1 - 12-16; In English; See also 20070008370; Copyright; Avail.: CASI: A03, Hardcopy

The aeroelastic and aeromechanical stability problems of the rotor and the coupled rotor-airframe system are reviewed. The interrelationship of the various subcategories of aeroelastic stability is discussed. The key element that influences the rotor aeroelastic stability, namely the spacial location and orientation of the blade pitch axis, is illustrated. Design parameters that enhance the stability characteristics are discussed.
Author
Aeroelasticity; Stability; Pitch (Inclination); Position (Location); Rotor Blades; Aircraft Design

20070008374 NASA Langley Research Center, Hampton, VA, USA
Airframe Structural Dynamic Considerations in Rotor Design Optimization
Kvaternik, Raymond G.; Murthy, T. Sreekanta; NASA Aeroelasticity Handbook Volume 2: Design Guides Part 2; November 2006, pp. 13-1 - 13-13; In English; See also 20070008370; Copyright; Avail.: CASI: A03, Hardcopy

The paper gives an overview and discussion of those aspects of airframe structural dynamics that have a strong influence on rotor design optimization. Primary emphasis is on vibration requirements. The vibration problem is described, the key vibratory forces are identified, the role of airframe response in rotor design is summarized, and the types of constraints which need to be imposed on rotor design due to airframe dynamics are discussed. The paper concludes with some considerations of ground and air resonance constraints on rotor design.
Author
Airframes; Design Optimization; Rotor Blades; Dynamic Structural Analysis; Helicopter Design

20070008375 McDonnell-Douglas Astronautics Co., Saint Louis, MO, USA
Design Procedures for Flutter-Free Surface Panels
Laurenson, Robert M.; McPherson, J. I.; NASA Aeroelasticity Handbook Volume 2: Design Guides Part 2; November 2006, pp. 20-1 - 20-67; In English; See also 20070008370; Copyright; Avail.: CASI: A04, Hardcopy

An approach for the design of lightweight external surface panel configurations to preclude panel flutter has been developed. Design procedures were developed for flat orthotropic panels under the interacting influence of parameters such as support flexibility, inplane loads, pressure differential, and flow angularity. The relationships required to define these design procedures were based on theoretical panel flutter analyses. Where possible, the design procedures were verified through comparison with available experimental panel flutter data.
Author
Flutter Analysis; Panel Flutter; Aircraft Configurations; Aircraft Design

20070008376 NASA Langley Research Center, Hampton, VA, USA
Fundamental Dynamic Considerations in Tilt-Proprotor VTOL Aircraft Design-I
Gaffey, Troy M.; Yen, Ying G.; Kvaternik, Raymond G.; NASA Aeroelasticity Handbook Volume 2: Design Guides Part 2; November 2006, pp. 14-1 - 14-13; In English; See also 20070008370; Copyright; Avail.: CASI: A03, Hardcopy

Tiltrotor aircraft operating at high speeds in the airplane mode of flight can exhibit a variety of dynamic aeroelastic phenomena that are driven by the aerodynamic forces and moments generated by the large proprotors characterizing such configurations. In particular, these aircraft are susceptible to a proprotor/pylon aeroelastic instability akin to propeller whirl flutter. Such an instability was first encountered during full-scale testing of the Bell XV-3 tiltrotor in the NASA Ames 40- by 80-foot Wind Tunnel in 1962. Extensive analytical and experimental studies of small dynamically scaled models were conducted by Bell subsequent to this incident and led to both an explanation for and a means of eliminating the instability. Both government and industry undertook a number of other studies in the subject area over the next decade or so. Taken as a whole, these early studies helped to establish key elements of the technology base needed to later successfully address the issue of proprotor/pylon/wing aeroelastic stability in the design of the Bell XV-15 tiltrotor research aircraft in the mid-1970s, the Bell/Boeing V-22 Osprey in the mid-1980s, and the Bell/Agusta BA609 in the late 1990s. The Aeroelasticity Branch at

NASA Langley Research Center has been actively involved in tiltrotor aeroelastic research since 1968, when a joint NASA/Bell test of a 0.133-scale semi-span dynamic aeroelastic model of a proposed Bell tiltrotor design (designated the Model 266) was conducted in the Transonic Dynamics Tunnel. The results of this investigation were reported by T.M. Gaffey, J.G. Yen, and R.G. Kvaternik in a paper entitled 'Analysis and Model Tests of the Proprotor Dynamics of a Tilt-Proprotor VTOL Aircraft' that was presented at the Air Force V/STOL Technology and Planning Conference in Las Vegas, NV, September 23-25, 1969. Although the paper addresses a specific tiltrotor design, the discussion of key structural and kinematic design parameters and design guidelines for ensuring acceptable proprotor/pylon/wing stability and blade flapping response is not applicable only to the Model 266. This is so because the structural dynamics of the wing and the blades are presented and discussed in terms of their nondimensional per-rev natural frequencies (i.e., their natural frequencies divided by the rotor rotational speed). Because of the broader applicability of this discussion, this section of the paper is reproduced below.
Author
Aircraft Design; Tilt Rotor Aircraft; Dynamic Structural Analysis; Aeroelasticity; Flutter; Structural Design; Rotor Aerodynamics

20070008377 NASA Glenn Research Center, Cleveland, OH, USA
Bibliography on Propfan Aeroelasticity
Ramsey, John K.; NASA Aeroelasticity Handbook Volume 2: Design Guides Part 2; November 2006, pp. 18-1 - 18-3; In English; See also 20070008370; Copyright; Avail.: CASI: A01, Hardcopy

In the early 1970's, fuel prices increased substantially, adversely affecting airline budgets. In response to this situation, NASA and industry began research efforts to develop advanced turboprops, known as propfans, to improve aircraft fuel efficiency. Propfans are characterized by thin highly swept blades as shown in figure 1. The propfan, when combined with the turbine engine, could provide improved fuel efficiency compared to an equivalent-technology turbofan engine. It was recognized that efficiency could be improved by removing the swirl created by single-rotation propfans. To accomplish this, NASA and industry began research on both tractor and pusher counterrotating propfans, wherein the aft blade row would recover the swirl. The counterrotating propfan could also provide increased power over a single-rotating propfan of the same tip diameter. Shown in figure 2, is a pusher configuration of a counterrotating propfan, known as the counterrotating unducted fan. The following bibliography lists aeroelasticity related publications applicable to the propfan.
Author
Prop-Fan Technology; Turbofan Engines; Aeroelasticity; Counter Rotation; Propeller Fans

20070008378 ZONA Technology, Inc., Scottsdale, AZ, USA
Flutter Prevention Handbook: A Preliminary Collection, Part A, Flutter Model Design and Ground Vibration Testing
Liu, D. D.; Sarhaddi, D.; Piolenc, F. M.; Wasserman, Lee S.; NASA Aeroelasticity Handbook Volume 2: Design Guides Part 2; November 2006, pp. 2-1 - 2-28; In English; See also 20070008370; Copyright; Avail.: CASI: A03, Hardcopy

In this article, the author presents his in-depth research/development and summarizes his lifelong experience in three major areas of flutter testing, namely, Flutter Model Design, Flight Flutter Testing and Aircraft Ground Vibration Testing. For flutter prevention, seven essential cases of flutter are selected for discussion in which cause and cure for each case are clearly displayed.
Author
Flutter Analysis; Ground Tests; Vibration; Flight Tests; Flutter

20070008379 NASA Glenn Research Center, Cleveland, OH, USA
Bibliography on the Aeroelasticity of Labyrinth Seals
NASA Aeroelasticity Handbook Volume 2: Design Guides Part 2; November 2006, pp. 11-1; In English; See also 20070008370; Copyright; Avail.: CASI: A01, Hardcopy

The following bibliography was excerpted from the Engineering Design Guide, Volume 1A, Rotating Machinery, NASA Glenn Research Center. Alford, J.S.: Protection of Labyrinth Seals From Flexural Vibration. ASME J. Eng. Power, vol. 86, 1964, pp. 141-147. Abbott, D.R.: Advances in Labyrinth Seal Aeroelastic Instability Prediction and Prevention. ASME Paper 80-GT-151, 1980. Alford, J.S.: Labyrinth Seal Designs Have Benefited From Development and Service Experience. SAE Paper 710435, 1971. Alford, J.S.: Nature, Causes, and Prevention of Labyrinth Air Seal Failures, J. Aircraft, vol. 12, 1975, pp. 313-318. Alford, J.S.: Protecting Turbomachinery From Unstable and Oscillatory Flows. ASME J. Eng. Power, vol. 89, 1967, pp. 513-527. Campbell, W.: Protection of Steam Turbine Disk Wheels From Axial Vibration. Proceedings of the ASME Conference 1924, Paper no. 1920, 1924. Ehrich, F.: Aeroelastic Instability in Labyrinth Seals. ASME Paper 68-GT-32, 1968.

Halila, E.E.; Lenahan, D.T.; Thomas, T.T.: Energy Efficient Engine High Pressure Turbine Test Hardware Detailed Design Report. NASA CR-167955, 1982. Lewis, D.A.; Platt, C.E.; and Smith, E.B.: Aeroelastic Instability in F100 Labyrinth Air Seals. AIAA Paper 78-1087, 1978. Stodola, Aurel: Steam and Gas Turbines, With a Supplement on the Prospects of the Thermal Prime Mover. McGraw-Hill, New York, NY, 1927 (reprinted 1945).
Author
Bibliographies; Conferences; Gas Turbines; Turbomachinery; Steam Turbines; Engine Tests

20070008380 NASA Glenn Research Center, Cleveland, OH, USA
Bibliography on Supersonic Through-Flow Fan Aeroelasticity
Ramsey, John K.; NASA Aeroelasticity Handbook Volume 2: Design Guides Part 2; November 2006, pp. 10-1 - 10-3; In English; See also 20070008370; Copyright; Avail.: CASI: A01, Hardcopy

In the late 1980's and early 1990's there was an increased interest in providing efficient supersonic propulsion technology for supersonic transport applications. One concept that showed promise was the supersonic throughflow fan (SSTF) engine. A detailed description of this engine and its benefits, as well as associated research, is given in references 1 and 2 and is described briefly here. This engine concept was anticipated to realize a 12 percent improvement in installed specific fuel consumption and a 25 percent reduction in installed weight compared with a non afterburning turbofan. The SSTF processes the intake airflow at supersonic throughflow velocities, thereby eliminating the need for a conventional supersonic inlet system. Thus, the inlet weight reduction realized by using the SSTF was estimated to be about one-half that of conventional supersonic inlets. Other advantages include fewer fan stages required to achieve a given pressure ratio, less boundary-layer bleed drag, better pressure recovery, and better matching of bypass ratio variations to flight Mach number. Experimental research on the SSTF concept was extremely limited prior to NASA's research efforts in the late 1980's and early 1990's. A listing of aeroelasticity related publications applicable to the supersonic throughflow fan is given.
Author (revised)
Aeroelasticity; Bibliographies; Supersonic Flow; Turbofans; Air Flow

20070008381 ZONA Technology, Inc., Scottsdale, AZ, USA
Flutter Prevention Handbook: A Preliminary Collection, Part C, Flutter Occurrence on Eighteen High Performance Military Aircraft
Liu, D. D.; Sarhaddi, D.; Piolenc, F. M.; Roberts, William; NASA Aeroelasticity Handbook Volume 2: Design Guides Part 2; November 2006, pp. 4-1 - 4-43; In English; See also 20070008370; Copyright; Avail.: CASI: A03, Hardcopy

This paper records the concurrent development of flutter analysis, numerical modeling techniques, ground vibration testing and in-flight flutter testing at three companies. Airplanes of 18 distinct types serve as illustrative examples, covering subsonic, supersonic and hypersonic regimes. Of these, half showed flaws in flutter design and half did not. Initially, analysis was not supplemented with scale model testing. As soon as scaled model technology was brought into regular use, the risk attendant on full dependence on analysis-namely that flutter might appear after production had begun-was steadily reduced. Several examples are included. Other major developments were the finite element methods for both structural and aerodynamic analysis. Piston theory, once available, found immediate application in the X15 with its Mach 7 speed. Another significant development was the use of item by item structural scaling on a flutter model for the delta wing, Mach 3, F108, and its use on the Space Shuttle for development of a 1/4 scale model of the entire 'stack' for early ground vibration tests. Three variables-stiffness, chordwise c.g. and control surface balance-were found to be the major determinants of success in preventing flutter. Satisfactory criteria based on this approach are given. The criteria show the great difficulty of building large airplanes with thin wings for use at high speed and show that accident rates are increased when the stiffness requirements are compromised. The author s experience at the FAA sheds light on the distinct flutter prevention criteria applying to both military and civil aircraft. Civil transports are fail safe structures and in addition, damage identified by a Damage Tolerance Assessment is included in the flutter analysis. Flutter has nearly disappeared as a primary cause for an accident as a result of the complete program of flutter prevention. Because of its import on safety the stiffness criteria have also been useful in assessing new designs.
Author
Aerodynamic Characteristics; Flutter Analysis; Control Surfaces; Design Analysis; Fighter Aircraft; High Speed; Structural Analysis; Vibration Tests

20070008382 General Electric Aircraft Engines, Cincinnati, OH, USA
Aeroelasticity in Axial Flow Turbomachines
Kielb, Robert E.; Imregun, Mehmet; NASA Aeroelasticity Handbook Volume 2: Design Guides Part 2; November 2006, pp. 9-1 - 9-45; In English; See also 20070008370; Copyright; Avail.: CASI: A03, Hardcopy

Dr. Kielb will present six sections, five of which describe methods for aeroelastic design of turbomachinery blading. The sixth section examines experimental methods to evaluate aeroelastic behavior, with emphasis on full scale engine testing. The design sections start with a description of the selection of aeroelastic models used during the conceptual, preliminary and detailed design phases. The two most critical aeroelastic phenomena to consider in design are flutter and forced response. The flutter design sections contain a description of the steps in the design process and give examples of typical steady and unsteady pressure distributions, mode shapes, and work distributions over the airfoil surfaces. The sensitivity of stability calculations to variations in the steady aerodynamic loads and mode shapes are also described. The forced response design sections begin with a description of the design analysis process. Excitations due to wakes, bow waves (potential), shock waves, and inlet distortion are described in detail. Examples of typical forced response calculations are provided, including sensitivity to variations in the input parameters. The probabilistic design section examines the role of statistical methods in the aeromechanical design process and describes methods being currently developed. In the damping section damping mechanisms are described with emphasis on platform damper analysis methods. The section on full scale engine testing begins with a description of vibration measurement techniques and the methods of defining the limiting vibratory stresses. Next, characteristics of typical vibratory stress signals for flutter, forced response, and transient response are reviewed. The section concludes with a description of stress mapping techniques.
Derived from text
Aeroelasticity; Axial Flow; Flutter; Turbomachinery; Rotor Blades (Turbomachinery)

20070008383 Princeton Univ., NJ, USA
Panel Flutter
Dowell, E. H.; NASA Aeroelasticity Handbook Volume 2: Design Guides Part 2; November 2006, pp. 19-1 - 19-23; In English; See also 20070008370; Copyright; Avail.: CASI: A03, Hardcopy

Panel flutter is a self-excited, dynamic-aeroelastic instability of thin plate or shell-like components of a vehicle. It occurs most frequently, though not exclusively, in a supersonic flow. At subsonic speeds, the instability more often takes the form of a static divergence or aeroelastic buckling. Flutter is caused and maintained by an interaction among the aerodynamic, inertial, and elastic forces of the system. Initially, the amplitude of the motion of an unstable panel increases exponentially with time, although frequently the amplitude is limited because of nonlinearities, usually structural. Panels are normally designed to avoid flutter. If it should occur during flight, however, then limited-amplitude and limited-duration flutter may be tolerated for some vehicles as long as the amplitude and duration do not cause: (1) structural failure of the panel or supporting structure due to fatigue, (2) functional failure of equipment attached to the structure, or (3) excessive noise levels in space vehicle compartments near the fluttering panel. Panel flutter has occurred on a number of flight vehicles. Early experience, largely aircraft, is surveyed in reference 1. More recently, panel flutter has occurred on the X-15 during flight operation (ref. 2), during wind tunnel tests in the development program of the X-20 (refs. 3 through 5), on Titan II and III (ref. 6), and on the S-IVB (ref. 7). The structural damage resulting from panel flutter was judged destructive on the X-15 and the X-20. The structure of these vehicles was stiffened to prevent panel flutter throughout the flight envelope. For the Titans and S-IVB, the flutter was judged nondestructive because it was determined that the severity and duration of the flutter would not be great enough to degrade unacceptably the structural integrity of the panel. Hence, no stiffening was added (and no weight penalty incurred) to prevent flutter of these panels. This monograph is concerned with the prediction of panel flutter, determination of its occurrence, design for its prevention, and evaluation of its severity. Theoretical analyses recommended for the prediction of flutter stability boundaries, vibration amplitudes, and frequencies for several types of panels are described. Vibration tests and wind tunnel tests are recommended for certain panels and environmental flow conditions to provide information for design or verification of analysis. Appropriate design margins on flutter stability boundaries are given and general criteria are presented for evaluating the severity of possible short-duration, limited-amplitude panel flutter on non-reusable vehicles. The occurrence of flutter in a particular panel configuration depends upon the mass, damping, and stiffness of the panel; local Mach number, dynamic pressure, density; in-plane flow angularity; and, for some conditions, boundary layer profile and thickness. The parameters affecting panel stiffness which are reflected in panel natural frequencies include the panel length, thickness, material modulus, length-to-width ratio, edge conditions, curvature, orthotropy (variation in stiffness with direction), in-plane loads, transverse pressure differential across the panel, and acoustic cavity (closed-in space) beneath the panel. For some configurations geometric imperfections in the panel may be important as well. Related NASA design criteria monographs include those on natural vibration modal analysis (ref. 8); structural vibration prediction (ref. 9); and flutter, buzz, and divergence of lifting surfaces (ref. 10).
Derived from text
Flutter Analysis; Panel Flutter; Aeroelasticity; Wind Tunnel Tests; Aircraft Design; X-15 Aircraft; X-20 Aircraft

20070008384 McDonnell Aircraft Co., Saint Louis, MO, USA

Design Criteria for the Prediction and Prevention of Panel Flutter, Volume 1, Criteria Presentation

Lemley, Clark E.; NASA Aeroelasticity Handbook Volume 2: Design Guides Part 2; November 2006, pp. 21-1 - 21-41; In English; See also 20070008370; Copyright; Avail.: CASI: A03, Hardcopy

The program described in this report was performed to bring together all available data from wind tunnel test, flight test, vibration test, thermal test, and theoretical investigations to form comprehensive panel flutter design criteria. Procedures were developed which are applicable to the environment and various panel structural arrangements for transonic, supersonic, and hypersonic aircraft; aerospace reentry vehicles, and boosters. This report presents a set of criteria for the design of flutter-free panels. The design procedure provides for initially establishing the required thickness at neutral stability of a flat, unstressed, unswept panel. Thickness corrections are then made to account for various parameters that are known to affect panel flutter boundaries. Reference 1 presents the results of background investigations and supplemental analyses that provide the bases for establishing the criteria of this report. An extensive bibliography is also presented in reference 1.

Author

Flight Tests; Flutter Analysis; Panel Flutter; Wind Tunnel Tests; Aircraft Design; Performance Prediction

20070008385 ZONA Technology, Inc., Scottsdale, AZ, USA

Flutter Prevention Handbook: A Preliminary Collection, Part D, Aeroservoelastic Instability, Case Study A

Liu, D. D.; Sarhaddi, D.; Piolenc, F. M.; Peloubet, Raymond P., Jr.; NASA Aeroelasticity Handbook Volume 2: Design Guides Part 2; November 2006, pp. 5-1 - 5-27; In English; See also 20070008370; Copyright; Avail.: CASI: A03, Hardcopy

The author presents two cases of aeroservoelastic instability, in which configurations that were flutter-stable without their flight control systems becomes unstable at certain regimes with the control systems engaged. Part A discusses a high performance fighter with fly-by-wire control which showed antisymmetric oscillation in early flight tests. Flutter analysis and wind tunnel tests showed the aircraft minus flight control system was stable. The Nyquist Criterion was used to calculate the stability of the airplane with the control system engaged; it showed an unstable antisymmetric oscillation mode very close in frequency to that observed in flight. Calculated control loop gain adjustments were tested in flight and found to correct the problem. Part B concerns a fighter prototype with fly-by-wire control which showed a pitching motion in a narrow range of high-subsonic Mach numbers, at a frequency well below that of the first symmetric vibration mode of the structure and well above the rigid-body short-period mode. Subsequent flight tests showed that reducing the pitch loop gain eliminated the problem. Although the immediate problem was solved, two methods for measuring the open-loop frequency response function of the flight control system without actually opening the feedback loops were applied during flight tests. Both methods are explained and discussed.

Author

Aeroservoelasticity; Flutter Analysis; Stability; Aircraft Configurations; Wing Panels; Panel Flutter

20070008386 NASA Langley Research Center, Hampton, VA, USA

Fundamental Dynamic Considerations in Tilt-Proprotor VTOL Aircraft Design-II

Kvaternik, Raymond G.; NASA Aeroelasticity Handbook Volume 2: Design Guides Part 2; November 2006, pp. 15-1 - 15-35; In English; See also 20070008370; Copyright; Avail.: CASI: A03, Hardcopy

Tiltrotor aircraft operating at high speeds in the airplane mode of flight can exhibit a variety of dynamic aeroelastic phenomena that are driven by the aerodynamic forces and moments generated by the large proprotors characterizing such configurations. In particular, these aircraft are susceptible to a proprotor/pylon aeroelastic instability akin to propeller whirl flutter. Such an instability was first encountered during full-scale testing of the Bell XV-3 tiltrotor in the NASA Ames 40- by 80-foot Wind Tunnel in 1962. Extensive analytical and experimental studies of small dynamically scaled models were conducted by Bell subsequent to this incident and led to both an explanation for and a means of eliminating the instability. Both government and industry undertook a number of additional fundamental studies in the subject area over the next decade or so. These early studies helped to establish key elements of the technology base needed to successfully address the issue of proprotor/pylon/wing aeroelastic stability during design. The Aeroelasticity Branch at NASA Langley Research Center has been involved in tiltrotor aeroelastic research since 1968, when a joint NASA/Bell test of a 0.133-scale semi-span dynamic aeroelastic model of a proposed Bell tiltrotor design (designated the Model 266) was conducted in the Transonic Dynamics Tunnel (TDT). Several other cooperative experimental studies were conducted in the TDT over the next several years using a variety of models. The analytical and experimental work conducted as part of these investigations was documented in a Ph.D. dissertation (R.G. Kvaternik: 'Studies in Tilt-Rotor VTOL Aircraft Aeroelasticity,' Case Western Reserve University, June 1973). Chapter 4 of this treatise contains the results of extensive analytical trend studies that were conducted to identify the effects of key structural design parameters on proprotor/pylon/wing stability, the proprotorgenerated hub forces and moments

governing system stability, and rotor flapping behavior. Although the specific configuration chosen to be the basis of these parametric studies is the Bell Model 266, the results are presented and discussed in a manner providing useful design guidelines that are not limited to this specific design. Because of the broader applicability of this discussion, this chapter of the dissertation is reproduced below.
Author
Design Analysis; Tilt Rotor Aircraft; Rotor Aerodynamics; Vertical Takeoff Aircraft; Dynamic Models; Aerodynamic Forces; Aeroelasticity

20070008387 Army Aerostructures Directorate, Hampton, VA, USA
Parametric Studies for Tiltrotor Aeroelastic Stability in High-Speed Flight
Nixon, Mark W.; NASA Aeroelasticity Handbook Volume 2: Design Guides Part 2; November 2006, pp. 16-1 - 16-15; In English; See also 20070008370; Copyright; Avail.: CASI: A03, Hardcopy

The influence of several system design parameters on tiltrotor aeroelastic stability is examined for the highspeed (axial) flight mode. The results are based on a math model in which the wing is assumed to be cantilevered and is represented by beam finite elements having vertical bending, chordwise bending, and torsional degrees of freedom. A quasi-steady aerodynamic model is used for both the wing and rotor system. Coupling of the rotor flapping modes with the wing elastic modes produces a whirl motion, typical of tiltrotors, that can become unstable at high speeds. The sensitivity of this instability with respect to rotor frequencies, wing stiffnesses, and forward wing sweep is examined. Some important new trends are identified regarding the role of blade lag dynamics and forward wing sweep in tiltrotor aeroelastic stability. Two important conclusions based on these trend studies are that the blade lag frequency may be tuned to improve tiltrotor stability, and forward wing sweep is destabilizing because of changes in rotor force components associated with the sweep.
Author
Tilt Rotor Aircraft; Aerodynamic Characteristics; Aeroelasticity; Stability; High Speed; Design Analysis

20070008388 NASA Langley Research Center, Hampton, VA, USA
Review of Propeller-Rotor Whirl Flutter
Reed, Wilmer H., III; NASA Aeroelasticity Handbook Volume 2: Design Guides Part 2; November 2006, pp. 17-1 - 17-21; In English; See also 20070008370; Copyright; Avail.: CASI: A03, Hardcopy

A survey is made of the state of the art of propeller-whirl flutter, a precession-type instability that can occur on a flexibly mounted aircraft engine-propeller combination. This report reviews the literature relating to this problem from the time it first became of concern on conventional turboprop and V/STOL aircraft. Included in the survey are a description of the basic mechanism of whirl flutter, a summary of generalized trend studies on idealized systems, the status of methods for predicting propeller aerodynamic coefficients, the effects of flapping hinged blades and twisted flexible blades on whirl flutter, and some approaches for including propeller whirl modes as a part of the flutter evaluation for complete aircraft. Also, brief consideration is given to the response of flexibly mounted propeller-nacelle systems to random atmospheric turbulence. Whirl flutter of conventional propeller-nacelle systems is now a reasonably well understood phenomenon and amenable to analysis. For propeller-rotor systems with flapping blades, however, comparisons between experiment and theory suggest the need for further refinements in the mathematical model.
Author
Flutter; Rotor Aerodynamics; Turboprop Aircraft; Aerodynamic Coefficients; Flapping; Rotors

20070008389 Massachusetts Inst. of Tech., Cambridge, MA, USA
Aeroelastic Model Theory
Bisplinghoff, Raymond L.; Ashley, Holt; Halfman, Robert L.; NASA Aeroelasticity Handbook Volume 2: Design Guides Part 2; November 2006, pp. 22-1 - 22-19; In English; See also 20070008370; Copyright; Avail.: CASI: A03, Hardcopy

Experimental investigations in the field of aeroelasticity have served two major purposes. They have been the guiding influence necessary to the development of useful theory and they have produced solutions to immediate practical problems in the large areas where existing theory is not yet dependable. Particularly in dealing with flutter, the testing of wind-tunnel models with properly scaled mass and stiffness properties has often been more rewarding than equivalent efforts using analytical techniques or even full-scale airplanes. In the course of this experimentation many new and valuable methods and techniques have been developed and have been transmitted only by word of mouth and by published paper. In order to provide a more adequate source of information, a presentation of the basic concepts of model theory is presented herein. An intelligent approach to the design and use of models requires a thorough comprehension of model theory, which is the subject of this

monograph. Appendix A describes the nomenclature, and appendix B discusses the dynamic equilibrium of the unrestrained elastic airplane. Appendix C discusses the twisting of a two-dimensional wing. The equations of equilibrium for a swept wing are presented in appendix D, followed by a presentation of classical two-degree-of-freedom flutter in appendix E.
Author
Aeroelasticity; Flutter Analysis; Wind Tunnel Models; Swept Wings; Degrees of Freedom

20070008390 ZONA Technology, Inc., Scottsdale, AZ, USA
Flutter Prevention Handbook: A Preliminary Collection, Part B, Aerodynamic and Mass Balance Effects on Control Surface Flutter
Liu, D. D.; Sarhaddi, D.; Piolenc, F. M.; Donham, RobertE.; Watts, George A.; NASA Aeroelasticity Handbook Volume 2: Design Guides Part 2; November 2006, pp. 3-1 - 3-24; In English; See also 20070008370; Copyright; Avail.: CASI: A03, Hardcopy

Six cases of flutter of full scale aircraft or wind tunnel models, shown in the table below, are discussed as to flutter type, cause and correction. Also included are descriptions of several control surface/tab systems and how they function. Mass and aerodynamic balance types and design rules are also discussed. It is imperative that flutter not occur within the useable flight envelope of an aircraft and that a safe-speed margin beyond envelope boundaries be maintained. Furthermore, flutter margins must be attained efficiently, to forestall the accumulation of excessive structure or ballast weight that could compromise payload. A companion consideration to flutter in flight vehicle design is the provision of sufficient structure stiffness to prevent static aeroelastic divergence, control reversal and excessively large stability derivatives. Though not the primary subject of this handbook, static aeroelasticity methodology can be useful in the analysis of certain types of flutter and this is briefly discussed. The common features of classical flutter phenomena and means of detecting them theoretically and experimentally are explored. Standard rules for designing aerodynamic geometry, internal structural arrangements and mass balance distributions to minimize the possibility of flutter without large weight penalties are discussed. The cases cited are of flutter encountered, during the design/development phase of actual aircraft, in flight or in dynamically scaled wind tunnel model tests. In some cases flutter occurred despite application of the rules of good design for flutter prevention.
Author
Aeroelasticity; Flutter; Control Surfaces; Tabs (Control Surfaces); Stability Derivatives; Mass Distribution; Aerodynamic Balance

20070008391 General Motors Corp., Indianapolis, IN, USA
Forced Vibration and Flutter Design Methodology
Snyder, Lynn E.; Burns, Donald W.; NASA Aeroelasticity Handbook Volume 2: Design Guides Part 2; November 2006, pp. 8-1 - 8-34; In English; See also 20070008370; Copyright; Avail.: CASI: A03, Hardcopy

Prevention of high cycle fatigue in turbomachinery components is the aim of the structural designer. High cycle fatigue considerations account for a significant percentage of development and operational costs of a gas turbine engine. In development, costly time delays and redesign efforts may be incurred due to high cycle fatigue failures of components. Decreased reliability, shortened time between overhauls, and increased need for spares may be associated with high cycle fatigue failures. These also add to the costs of operation of gas turbine engines. Based on the accumulated knowledge of the cause of high cycle fatigue, empirical and analytical design tools to aid the designer have been and continue to be developed. Proper application of these design aids leads to the ultimate goal of eliminating high cycle fatigue from gas turbine engines through judicious design of turbomachinery components. This chapter will cover the aeroelastic principles and considerations of designing blades, disks and vanes to avoid high cycle fatigue failures. Two types of vibration that can cause high cycle fatigue, flutter and forced vibration, will first be defined and the basic governing equations discussed. Next, under forced vibration design the areas of source definition, types of components, vibratory mode shape definitions and basic steps in design for adequate high cycle fatigue life will be presented. For clarification a forced vibration design example will be shown using a high performance turbine blade/disk component. Finally, types of flutter, dominant flutter parameters, and flutter procedures and design parameters will be discussed. The overall emphasis of this chapter is on application to initial design of blades, disks and vanes of aeroeleastic criteria to prevent high cycle fatigue failures.
Author
Flutter; Aeroelasticity; Design Analysis; Vibration Mode; Turbomachinery; Gas Turbine Engines; Life (Durability)

20070008392 NASA Langley Research Center, Hampton, VA, USA
Some Remarks on the Use of Scale Models
Kvaternik, Raymond G.; NASA Aeroelasticity Handbook Volume 2: Design Guides Part 2; November 2006, pp. 23-1 - 23-4; In English; See also 20070008370; Copyright; Avail.: CASI: A01, Hardcopy

Aeroelastically-scaled wind-tunnel models have played an important role in the design, development, and verification process in diverse fields of engineering, including aerospace engineering (see, for example refs. 1 to 6). Their use is particularly prolific in the field of aeronautics wherein dynamic aeroelastic (i.e., flutter) models are extensively employed both to substantiate that an aircraft design is free of aeroelastic instabilities within its flight envelope, and to validate analyses. Analytical capabilities for addressing aeroelastic design issues of aircraft have improved significantly over the years. However, because aircraft have continued to increase in structural and aerodynamic complexity, the need to rely on wind-tunnel tests of subscale models to verify predicted behavior and performance before entering the flight test stage of a development program remains. Such models are also widely used in research investigations dealing with such issues as active control of aeroelastic stability and response, buffet load alleviation, and for the validation of analytical and computational methods used in design. The importance of subscale models for helicopter research has been recognized as early as 1953 (refs. 7 and 8). Subscale models have also played a valuable, although perhaps less prominent, role in the design and development of helicopters, tiltrotors, and V/STOL aircraft (for example, see refs. 5, 6, 9, and 10). Both government and industry have acknowledged the significance and role of subscale models in rotorcraft research and development on many occasions. For example, references 11 and 12 emphasized the importance of a properly conducted wind-tunnel test program that includes both model-scale and full-scale testing to reduce the technical risk of a rotorcraft development program, and to lessen the chance for surprises in the flight test stage.

Author

Aeroelasticity; Aerospace Engineering; Scale Models; Wind Tunnel Models; Aircraft Design; Rotary Wing Aircraft; Wind Tunnel Tests

20070008565 Analysas Corp., Washington, DC USA

Final Work Plan and Quality Assurance Project Plan Remediation Investigations and Feasibility Studies of the Helicopter Hangar Area and the Fire Training Area at Fort George G. Meade, Maryland

May 5, 1995; 68 pp.; In English

Contract(s)/Grant(s): DAA15-93-D-0010

Report No.(s): AD-A461143; No Copyright; Avail.: CASI: A04, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461143

The purpose of this investigation is to conduct a remedial investigation/feasibility study at the HHA and FTA sites at Fort Meade. As part of the analyses, data gaps will be identified. Previous studies have been conducted by Arthur D. Little, Inc., and EA engineering, Science and Technology, Inc. The RI/FS process is designed to collect sufficient data of demonstrable quality, which can then be used to assess potential risks to human health and the environment, develop/evaluate remedial alternatives, and select a preferred remedial action. In general, data obtained during the RI phase is used to evaluate the nature, extent, and migration of contaminants at sites that are known or believed to have been adversely impacted by past hazardous waste or hazardous materials handling practices. The FS phase evaluates potential remedial action with regard to effectiveness, risk reduction or mitigation, implementability, and cost.

DTIC

Education; Feasibility; Fire Control; Fires; Hangars; Helicopters; Project Planning; Quality Control; Training Devices

20070008570 Analysas Corp., Washington, DC USA

Final Quality Assurance Plan for the Remedial Investigations and Feasibility Studies of the Helicopter Hangar Area and the Fire Training Area at Fort George G. Meade, Maryland

May 5, 1995; 73 pp.; In English

Contract(s)/Grant(s): DAA15-93-D-0010

Report No.(s): AD-A461153; No Copyright; Avail.: CASI: A04, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461153

The Quality Assurance (QA) reviews under this task order for the U.S. Army Environmental Center (USAEC), formerly the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA), are systematic evaluations of four aspects of the Helicopter Hangar Area (HIjA) Remedial Investigations and Feasibility Studies (RI/F S) at Fort George G. Meade, Maryland (FGGM) The four aspects are: (1) overall project activities and documents; (2) field/geotechnical activities; (3) laboratory analysis activities; and (4) data files and packages. The overall project and field Quality Assurance reviews will be undertaken by the Analysas project QA officer or his designee. The laboratory Quality Assurance reviews will be accomplished by our subcontracted laboratory, PACE Environmental Laboratories (PACE), with QA oversight provided by the Analysas project QA

officer or his designee. The Analysas project QA officer will also review USAEC data packages from PACE.
DTIC
Education; Feasibility; Fire Control; Fires; Hangars; Helicopters; Quality Control; Training Devices

20070008630 Carnegie-Mellon Univ., Pittsburgh, PA USA
IETM Usability: Using Empirical Studies to Improve Performance Aiding
Siegel, Jane; Hyder, Elaine; Moffett, Jack; Nawrocki, Elise; May 14, 2001; 42 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-00-1-0727
Report No.(s): AD-A461255; CMU-CS-01-131; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461255

Substantial expectations have been set about the effectiveness and role that high level Interactive Electronic Technical Manuals (IETMs) for performance aiding will play in enabling lesser skilled U.S. Navy maintainers to perform their jobs. This empirical study about the design and effectiveness of high level IETMs provides baseline and comparative data about two high level IETM interfaces used for one F/A-18 aircraft maintenance task. Eight maintainers whose experience levels varied from new (less than one month) to very experienced (more than eight years) participated in this study. Both baseline and with IETM data collection efforts occurred at China Lake Naval Weapons Station. Study results include performance data and insights about needed improvements to attain correctness, speed, and ease of use in information search, navigation and magnification activities. Differences in expert and novice preferences and performance were documented to inform future adaptive interface design efforts. The maintainers who participated were unanimously enthused about the possibility of having improved IETMs on small mobile computers for performance aiding in the near future.
DTIC
Data Acquisition; Fighter Aircraft; Jet Aircraft; Maintenance

20070008644 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
An Investigation of the Effects of Boundary Avoidance on Pilot Tracking
Warren, Randy D; Dec 2006; 104 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461272; AFIT/GAE/ENY/06-S11; No Copyright; Avail.: CASI: A06, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461272

ilot-Involved Oscillations (PIOs) remain a significant issue in the design, testing and operations of aerospace vehicles. Traditional methods for predicting, describing, and analyzing these events have provided the community with improved methods for minimizing the occurrences of PIOs. However, these events continue to occur over a wide range of aerospace vehicle types and over a wide range of pilot acumen. The introduction of boundary avoidance tracking (BAT) by Mr. William Gray in 2005 added a missing piece to the PIO puzzle. This theory presented that PIOs may result from increasing pilot gain resulting not from maintaining a specified condition, but avoiding imposed limits or boundaries on a specified task. The initial modeling and simulation conducted by Mr. Gray has provided the community with a starting point for applying this theory to the analysis of PIO events. This thesis characterizes BAT in the dynamic flight environment. Through the analysis of repeated BAT events in a T-38C aircraft, initial characteristic parameters for BAT have been identified and developed. The key BAT parameters were found to be independent of pilot and exhibited some dependence on aircraft load factor. Overall, BAT was successfully demonstrated and characterized during this research and the results will provide the community with a better understanding of the role BAT plays in PIO prediction and analysis.
DTIC
Avoidance; Boundaries; Pilots

20070008674 Office of Force Transformation, Washington, DC USA
The Mobilus Initiative: Creating A New Component of the US Aerospace Industry Centered Upon Transport Airships
Woodgerd, Michael; Jan 2004; 18 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461320; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461320

The USA requires greater mobility to meet burgeoning military and commercial demands. The US aerospace industry shows signs of faltering; improving the efficiency of the existing air transportation system and its components cannot by itself provide enough overall gain in capability to meet future commercial and military needs. Only Lighter-Than-Air (LTA) technology--derided, often wildly misunderstood and largely ignored for the last 50 years--actually offers the potential to

provide tremendous increases in volume, speed and accessibility for air movement around the world. LTA technology offers new types of aircraft, more complete utilization of airspace, and supports a more fully networked concept to air transportation. This article describes the key military/civilian/aerospace industry needs and opportunities to show how transport airships offer a common solution to multiple problem sets. The bulk of the paper describes the Mobilus Initiative in greater detail. Mobilus is fundamentally a Vision upon which many individuals and entities can focus effort and also the method to build a major new sector of the US, and then the world, aerospace industry. By building a broad, firm industrial base of airships and related LTA applications (stratospheric airships, for example) and building it in a new and commercially driven manner, our Nation gains mobility and economic power; perhaps even a dominant place in world aviation. Mobilus provides a coherent, logical development plan. The analysis of multiple platforms developmental paths, the high-payoff commercial applications, the methodology of how multiple public-private partnerships would create this broad capability will be the first of its kind. It will support the collaborative approach that will drive development across a broad array of technical types, varied geographic areas, and accelerate the broad capability faster than the old style approach of traditional contracts focused on one type of platform.
DTIC
Aerospace Industry; Airships

20070008701 Clemson Univ., SC USA
Developing a Methodology for Assessing Safety Programs Targeting Human Error in Aviation
Shappell, Scott; Wiegmann, Douglas; Nov 2006; 13 pp.; In English
Report No.(s): AD-A461400; DOT/FAA/AM-06/24; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461400

There is a need to develop an effective methodology for generating comprehensive intervention strategies that map current and proposed safety programs onto well-established types of human error. Two separate studies were conducted using recommendations from NTSB accident investigations and several joint FAA and industry working groups. The goal of the studies was to validate a proposed framework for developing and examining safety initiatives that target human error in aviation. The results suggest five approaches to reducing human factors associated with aviation accidents. When combined with the Human Factors Analysis and Classification System, the resulting Human Factors Intervention Matrix will provide a useful tool for evaluating current and proposed aviation safety programs.
DTIC
Aircraft Safety; Flight Safety; Human Performance; Pilot Error; Safety

20070008750 Texas Univ., San Antonio, TX USA
Simulation of Recurring Automated Inspections on Probability-Of-Fracture Estimates PREPRINT
Shook, B D\g; Millwater, H R; Enright, M P; Hudak, Jr , S J; Francis, W L; Apr 2006; 41 pp.; In English
Contract(s)/Grant(s): F33615-03-2-5203; Proj-4347
Report No.(s): AD-A461499; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461499

On-board sensors that can detect and size a crack in a structural component are being developed and will be deployed to enhance structural health monitoring and prognosis. This research examines the simulation of recurring automated inspection resulting from simulated on-board 'crack' sensors, and their potential effect on reducing the probability-of-fracture of structural components. The concept of a probability of detection (POD) curve is used to characterize the performance of the sensor, as done for traditional inspections. However, we assert that recurring inspections for an automated system should be modeled as dependent with respect to the first inspection due to the largely repeatable aspects of the sensor and data collection system. This assertion has a large effect on the computed probability of detecting a crack and alleviates the substantial over prediction of sensor efficacy generated using the assumption of independent inspections for automated systems. Furthermore, it is demonstrated that the fundamental feature that determines the efficacy of a recurring automated on-board sensor is the probability of detecting a crack of critical size, i.e., the size that will cause fracture, and this feature is by and large separate from the shape of the POD curve. This information can be used to determine the required accuracy of an on-board automated inspection to achieve a specified reliability of a structural component. The methodology is demonstrated using fatigue and fracture of a representative titanium compressor disk from a gas turbine aircraft engine but is applicable to any structural system with recurring automated inspections.
DTIC
Aircraft Engines; Detection; Detectors; Estimates; Fracturing; Inspection; Pods (External Stores); Probability Theory; Simulation

20070008768 Dayton Univ. Research Inst., OH USA
Analytical Modeling of Lamb Waves for Structural Health Monitoring (Preprint)
Olson, Steven E; DeSimio, Martin P; Derriso, Mark M; Mar 2006; 11 pp.; In English
Contract(s)/Grant(s): Proj-A01K
Report No.(s): AD-A461524; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461524

Structural health monitoring techniques are being developed to reduce cost, increase availability, and maintain safety of current and future air vehicle systems. Various techniques have been investigated depending on the scale of the damage to be detected. For example, damage such as fastener failure may have a more global effect on the structural dynamics and therefore modal-based damage detection techniques may be suitable. This paper focuses on detecting smaller scale damage, such as cracking or corrosion, which typically has a highly localized effect on the system dynamics. The use of Lamb waves, guided elastic waves in a plate, has shown promise in detecting such highly localized damage due to the relatively short wavelengths of the propagating waves. However, the Lamb wave behavior, is fairly complex as various waveforms may exist and the waves are dispersive, so the wave speed is a function of frequency. To examine the complex Lamb wave behavior, analytical models are being developed. This paper explores the use of explicit time integration finite element analysis. Key modeling issues are addressed including appropriate time increments and element lengths for accurate, yet efficient, solutions and the material properties used for the media through which the wave propagates. With these issues addressed, attention is focused on the effects of damage on the Lamb waves and the use various excitation waveforms. Lastly, potential improvements through advanced techniques, such as beamforming, are discussed.
DTIC
Crack Propagation; Health; Lamb Waves; Mathematical Models; Models

20070008770 Dayton Univ. Research Inst., OH USA
Beamforming of Lamb Waves for Structural Health Monitoring (Preprint)
Olson, Steven E; DeSimio, Martin P; Derriso, Mark M; Apr 2006; 11 pp.; In English
Contract(s)/Grant(s): FA8650-04-D-3446; Proj-A01K
Report No.(s): AD-A461527; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461527

Structural health monitoring techniques are being developed to reduce operations and support costs, increase availability, and maintain safety of current and future air vehicle systems. The use of Lamb waves, guided elastic waves in a plate, has shown promise in detecting localized damage, such as cracking or corrosion, due to the short wavelengths of the propagating waves. The use of such techniques for structural health monitoring of simple plate and shell structures are significantly more complex and advanced techniques may be required. One advanced technique involves using an array of piezoelectric transducers to generate or sense elastic waves in the structure under inspection. By adjusting the spacing and/or phasing between the piezoelectric transducers, transmitted or received waves can be focused in a specific direction. This paper presents details on the analytical modeling and experimental testing of beam forming, using an array of piezoelectric transducers on an aluminum panel. Results are shown to compare well with theoretical predictions.
DTIC
Beamforming; Health; Lamb Waves; Piezoelectric Transducers

20070008778 Air Force Research Lab., Wright-Patterson AFB, OH USA
Efficient Reconfiguration and Recovery From Damage for Air Vehicles (Preprint)
Oppenheimer, Michael W; Doman, David B; Jul 2006; 32 pp.; In English
Contract(s)/Grant(s): Proj-A03D
Report No.(s): AD-A461540; AFRL-VA-WP-TP-2006-323; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461540

The integration of health management, fault detection and isolation with trajectory reshaping and adaptive guidance and control is a natural and necessary step in producing reliable and responsive autonomous aerospace vehicles. The benefits of reconfigurable control and trajectory reshaping have been demonstrated; however, in many cases these results relied upon the assumption that IVHM/FDI systems provided specific information to the algorithms. Requirements on IVHM/FDI from the perspective of guidance, control and trajectory reshaping have been listed and some opportunities for synergistic information exchange between the two systems have been identified.
DTIC
Aerospace Vehicles; Autonomy; Damage; Fault Detection; Health

20070008808 Naval Research Lab., Washington, DC USA

Infrared Data Link using a Multiple Quantum Well Modulating Retro-reflector on a Small Rotary-Wing UAV

Rabinovich, W S; Gilbreath, G C; Bovais, Chris; Cochrell, Kerry; Burris, H R; Ferraro, Mena; Vilcheck, Michael; Mahon, Rita; Goins, Kim; Sokolsky, Ilene; Vasques, John; Meehan, Timothy; Barbehenn, Robin; Katzer, D S; Ikossi-Ansatasiou, K; Jan 2007; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A461576; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461576

This paper describes a recent demonstration of an optical data link between a small rotary-wing unmanned airborne vehicle (UAV) and a ground based laser interrogator using the NRL multiple quantum well modulating retro-reflector (MRR). MRR systems couple an optical retro-reflector, such as a corner-cube, and an electro-optic shutter to allow two-way optical communications using a laser, telescope and pointertracker on only one platform. The NRL MRR uses a semiconductor based multiple quantum well (MQW) shutter capable of modulation rates above 1 Mbps. The MQW modulating retro-reflector has the advantages of being compact, lightweight, and very low power. Up to an order of magnitude in onboard power can be saved using a small array of these devices instead of the RF equivalent. In the demonstration a 400 Kbps optical link to a flying UAV at a range of 100-200 feet was shown. The device itself is capable of over 6 Mbps.

DTIC

Data Links; Electro-Optics; Infrared Radiation; Modulation; Optical Communication; Quantum Wells; Reflectors; Remotely Piloted Vehicles; Retroreflectors; Rotary Wings

20070008849 Institute for Scientific Research, Fairmont, WV USA

Increased UAV Task Assignment Performance Through Parallelized Genetic Algorithms (Preprint)

Darrah, Marjorie A; Niland, William M; Stolarik, Brian M; Walp, Lance E; Aug 2006; 10 pp.; In English

Contract(s)/Grant(s): FA8650-06-2-3654; Proj-A052

Report No.(s): AD-A461621; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461621

This paper explores the parallelization of a Genetic Algorithm (GA) utilized for task assignment of a team of Unmanned Air Vehicles conducting a Suppression of Enemy Air Defense mission. The GA has been developed and implemented in the Multi-UAV simulation environment for testing. The algorithm has been parallelized with each UAV acting as an independent processor. Two different implementations are explored, one where each UAV independently runs a GA, and the best overall solution is selected at the end, and one where the UAVs exchange information several times during the evolution of generations. The results of these implementations are compared to the original, non-parallelized GA performance.

DTIC

Drone Aircraft; Genetic Algorithms; Human Performance; Tasks

20070008857 Naval Research Advisory Committee, Arlington, VA USA

Lighter-Than-Air Systems for Future Naval Missions

Bowes, W C; Engelland, J; Fernandez, F L; Fratarangelo, P; Kohn, Jr , E R; Lister, M J; Neal, W A; Polmar, N; Rumpf, R L; Smith, T B; Apr 2006; 110 pp.; In English; Original contains color illustrations

Report No.(s): AD-A461633; NRAC-06-2; NRAC-06-01; No Copyright; Avail.: CASI: A06, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461633

The Panel concluded that several Lighter-Than-Air (LTA) vehicles now available could provide the endurance and station-keeping needed for persistent ISR, communications relay, and electronic warfare. These vehicles can provide a desired long range communication relay for the Marine Corps and can perform port and harbor security missions at low costs. LTA vehicles offer the potential to provide an enhanced capability for high-altitude (greater than 60,000 feet) communications and surveillance at significantly lower cost than current heavier-than-air vehicles. LTA vehicles also could provide the capability to lift and deliver more than 500 tons of material or personnel to an operational area. While this capability does not exist today, with significant technology development, LTA vehicles could carry out these missions.

DTIC

Airships; Military Aircraft

20070008913 Civil Aeromedical Inst., Oklahoma City, OK USA

A Review of Recent Laser Illumination Events in the Aviation Environment

Nakagawara, Van B; Wood, Kathryn J; Mongomery, Ron W; Oct 2006; 11 pp.; In English

Report No.(s): AD-A461728; DOT/FAA/AM-06/23; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461728

Flight crewmember exposure to laser light, while operating an aircraft at night, has resulted in glare, flashblindness, and afterimage. Temporary visual impairment and the distraction, disorientation, and discomfort that can accompany it often result in hazardous situations. A database of aviation reports involving laser illumination of flight crewmembers has been established and maintained at the Civil Aerospace Medical Institute. A review of recent laser illumination reports was initiated to investigate the significance of these events. Reports of high-intensity light illumination of aircraft were collected from Federal Aviation Administration (FAA) regional offices, Transportation Security Administration, Department of Homeland Security/ Federal Bureau of Investigation Information Bulletins, the FAA's Office of Accident Investigation, newspaper articles, and interviews with pilots submitted by the airline industry. Reports that involved laser exposures of civilian aircraft in the USA were analyzed for the 13-month period (January 1, 2004 - January 31, 2005). There were 90 reported instances of laser illumination during the study period. A total of 53 reports involved laser exposure of commercial aircraft. Lasers illuminated the cockpit in 41 (46%) of the incidents. Of those, 13 (32%) incidents resulted in visual impairment or distraction to a pilot, including 1 incident that reportedly resulted in ocular injury. Nearly 96% of these reports occurred in the last 3 months of the study period. There were no aviation accidents in which laser light illumination was found to be a contributing factor. The study of laser illumination incidents in the national airspace system can identify the operational problems that result from such events. Improved reporting and analysis of laser events enhances aviation safety.
DTIC
Aircraft; Aircraft Safety; Flight Safety; Laser Beams; Lasers

20070008948 Combustion Research and Flow Technology, Inc., Dublin, PA USA
CFD Support for Jet Noise Reduction Concept Design and Evaluation for F/A 18 E/F Aircraft
Dash, S M; Kenzakowski, D C; Kannepalli, C; Jan 2003; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-02-1-0380
Report No.(s): AD-A461788; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461788

CFD is being used to support the design and evaluation of varied passive concepts which have the potential to reduce jet noise on an F/A 18 E/F supersonic fighter aircraft. One aspect of the CFD support work entails basic concept evaluation which is being performed in collaboration with laboratory studies of Krothapalli at FSU and Seiner at NCPA/U.Miss. Concepts evaluated to date include microjets, chevrons and hybrid devices. CFD is supporting the optimization of these designs and evaluating how they will perform on a real engine. A new jet noise code is being evaluated which has the promise of quantifying the noise reduction obtainable. A major role is that of ascertaining the effect of plume/plume interactions as well as installation /aerodynamic effects which requires a very detailed, CPU intensive studies. Improvements to the CFD in the areas of RANS turbulence modeling are improving overall accuracy, while efficiency upgrades have been achieved via use of adaptive gridding on massively parallel architectures, as well as by use of new parabolized approximations.
DTIC
Computational Fluid Dynamics; Fighter Aircraft; Jet Aircraft Noise; Noise Reduction

20070008985 Lumir Research Inst., Grayslake, IL USA
Distributed Mission Operations Within-Simulator Training Effectiveness Baseline Study. Volume 1. Summary Report
Schreiber, Brian T; Bennett, Jr , Winston; Jul 2006; 36 pp.; In English
Contract(s)/Grant(s): F41624-97-D-5000; Proj-1123
Report No.(s): AD-A461866; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461866

Distributed Mission Operations (DMO) training consists of multiplayer networked environments enabling warfighting training on higher-order individual and team-oriented skills. Surprisingly, only sparse DMO training effectiveness literature can be found and very few studies contain objective data. The dataset used in this research represents the largest DMO effectiveness dataset known to exist today (76 teams/384 pilots on over 3,000 engagements), containing 33 months' worth of multi-faceted DMO data, including objective data from the simulators, multiple participant surveys, subject matter expert (SME) ratings of performance, and knowledge structure tests. Observed performance differences between the pre- and post-test mirror-image point-defense assessment sessions served as the primary basis for the evaluation. Results were dramatic: On the post-test, 58.33% fewer enemy strikers reached their target and there were 54.77% fewer F-16 mortalities. Furthermore, there were corroborating significant improvements from the numerous measured skill metrics (e.g., weapons employment), SME expert observer ratings, and participant self-report opinion ratings. These converging results provide substantial evidence that pilots become much more proficient on key aspects of combat mission objectives as a function of training within the simulator. Finding highly significant performance differences across multiple datasets between the pre- and

post-tests with a combat-ready participant pool in a complex task/environment forms a formidable argument that DMO training yields considerable within-simulator warfighter competency improvement. In this report, we summarize the different dataset classes, overview the primary hypotheses and results associated with each, and discuss the convergence of the datasets to illustrate the 'big picture' DMO training effectiveness. As such, more detailed hypotheses, analyses, and discussions are contained in separate reports (Vols. II through V).
DTIC
Combat; Distributed Interactive Simulation; Education; Simulation; Training Simulators

20070008986 Lumir Research Inst., Grayslake, IL USA
Distributed Mission Operations Within-Simulator Training Effectiveness Baseline Study. Volume 2. Metric Development and Objectively Quantifying the Degree of Learning
Schreiber, Brian T; Stock, William A; Bennett, Jr , Winston; Jul 2006; 42 pp.; In English
Contract(s)/Grant(s): F41624-97-D-5000; Proj-1123
Report No.(s): AD-A461867; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461867

The current work reports only the objective data from AFRL-HE-AZ-TR-2006-0015, Volume I, Distributed Mission Operations Within-Simulator Training Effectiveness: Summary Report, but here we expand the reporting of objective data both in depth and breadth. We examined F-16 pilots participating in week-long Distributed Mission Operation (DMO) training exercises and compared extensive computer-collected data between beginning-of-week and end-of-week pilot performance on mirror-image scenarios. The DMO research environment in Mesa, AZ consisted of four high-fidelity F-16 simulators and one high-fidelity Airborne Warning and Control System simulator. Participating F-16 teams flew over 40 total scenarios according to a five-day syllabus, book-ended on Monday and Friday by mirror-image point defense air combat benchmark scenarios. Seven mission outcome measures were found to be significantly better on Friday than Monday: A 58.33% decrease in enemy strikers reaching their target, 38.10% greater distance from the base the F-16s disposed of the strikers, 54.77% fewer F-16 mortalities, 75.26% more enemy striker kills (before reaching base), 6.82% higher proportion of Viper Advanced Medium Range Air-to-Air Missile (AMRAAM) shots resulting in a kill, 51.60% lower proportion of enemy Alamo missile shots resulting in a kill, and a highly impressive 314.21% increase in an overall summary scoring scheme developed by subject matter experts. Significant trends were also found for a number of other metrics assessing skills. Of all the measures investigated in the current work, not a single offensive/defensive trade-off was observed, which significantly strengthens our conclusion that significant within-simulator learning took place.
DTIC
Combat; Education; Learning; Performance Tests; Simulation; Training Simulators

20070009044 Analysas Corp., Washington, DC USA
Final Work Plan for the Remediation Investigations and Feasibility Studies of the Helicopter Hangar Area and the Fire Training Area at Fort George G. Meade, Maryland
May 5, 1995; 70 pp.; In English
Contract(s)/Grant(s): DAA15-93-D-0010
Report No.(s): AD-A460593; No Copyright; Avail.: CASI: A04, Hardcopy

This Work Plan has been prepared to address the Remedial Investigation/ Feasibility Study (RI/FS) activities being conducted at the Helicopter Hangar Area (HHA) and the Fire Training Area (FTA) at Fort George G. Meade (FGGM), Maryland. It has been prepared for the U.S. Army Environmental Center (USAEC) to fulfill the requirements of deliverable ELIN A004 under Delivery Task Orders 0002 and 0003 of Contract DAAA15-93-D-0010. This Work Plan has been developed in accordance with Geotechnical Requirements for Drilling Monitor Wells Data Acquisition and Reports (USATHAMA, 1987); USATHAMA Quality Assurance Plan (USATHAMA, 1990); Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (USEPA, 1988); Risk Assessment Guidance for Superfund. Volumes I and II (USEPA, 1989); Community Relations in Superfund: A Handbook (USEPA, 1988) and Superfund Public Health Evaluation Manual (USEPA, 1986).
DTIC
Education; Feasibility; Fires; Hangars; Helicopters; Training Devices

20070009159 Institute for Scientific Research, Fairmont, WV USA

Multiple UAV Task Allocation for an Electronic Warfare Mission Comparing Genetic Algorithms and Simulated Annealing (Preprint)

Darrah, Marjorie A; Niland, William; Stolarik, Brian; Aug 2006; 10 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8650-04-C-3402; Proj-A052

Report No.(s): AD-A462016; No Copyright; Avail.: CASI: A02, Hardcopy

This paper compares two algorithms applied to the task allocation of multiple Unmanned Aerial Vehicles (UAVs) for an electronic warfare mission. The electronic warfare mission scenario is discussed and a review of both the genetic algorithm and simulated annealing algorithm is given. The encoding of the problem and the functions and operations needed to implement each algorithm is outlined and compared. The algorithms were implemented and tested in Matlab. A discussion of the performance analysis for the time to convergence and quality of solutions in a fixed period of time is given.

DTIC

Algorithms; Allocations; Annealing; Electronic Warfare; Genetic Algorithms; Simulated Annealing

20070009160 Air Force Research Lab., Wright-Patterson AFB, OH USA

An Aerothermal Flexible Mode Analysis of a Hypersonic Vehicle (Postprint)

Williams, Trevor; Bolender, Michael A; Bowman, David B; Morataya, Oscar; Jul 2006; 25 pp.; In English

Contract(s)/Grant(s): Proj-A03D

Report No.(s): AD-A462017; No Copyright; Avail.: CASI: A03, Hardcopy

This paper describes a method for the determination of the flexible modes of an air-breathing hypersonic vehicle. The method outlined here takes into account changes in vehicle mass and structural temperature over the duration of the vehicle's trajectory. A simple sizing program is outlined to estimate the vehicle volume, mass, and planform requirements for a dual-cycle (rocket and scramjet) powered vehicle. It is shown that the varying mass effects dominate the frequencies and mode-shapes over the structural heating effects. We then discuss the effects of the structural modes on the transmission zeros.

DTIC

Aerothermodynamics; Hypersonic Vehicles; Supersonic Combustion Ramjet Engines; Thermal Analysis

20070009279 Illinois Univ., Urbana-Champaign, IL USA

Automation Reliability in Unmanned Aerial Vehicle Control: A Reliance-Compliance Model of Automation Dependence in High Workload

Dixon, Stephen R; Wickens, Christopher D; Jan 2006; 14 pp.; In English

Contract(s)/Grant(s): MAAD-6021000-01

Report No.(s): AD-A462195; No Copyright; Avail.: CASI: A03, Hardcopy

Objective: Two experiments were conducted in which participants navigated a simulated unmanned aerial vehicle (UAV) through a series of mission legs while searching for targets and monitoring system parameters. The goal of the study was to highlight the qualitatively different effects of automation false alarms and misses as they relate to operator compliance and reliance, respectively. Background: Background data suggest that automation false alarms cause reduced compliance, whereas misses cause reduced reliance. Method: In two studies, 32 and 24 participants, including some licensed pilots, performed in-lab UAV simulations that presented the visual world and collected dependent measures. Results: Results indicated that with the low-reliability aids, false alarms correlated with poorer performance in the system failure task, whereas misses correlated with poorer performance in the concurrent tasks. Conclusion: Compliance and reliance do appear to be affected by false alarms and misses, respectively, and are relatively independent of each other. Application: Practical implications are that automated aids must be fairly reliable to provide global benefits and that false alarms and misses have qualitatively different effects on performance.

DTIC

Man Machine Systems; Pilotless Aircraft; Reliability; Workloads (Psychophysiology)

07
AIRCRAFT PROPULSION AND POWER

Includes primary propulsion systems and related systems and components, e.g., gas turbine engines, compressors, and fuel systems; and onboard auxiliary power plants for aircraft. For related information see also 20 Spacecraft Propulsion and Power; 28 Propellants and Fuels; and 44 Energy Production and Conversion.

20070006648 Honeywell International, Inc., Morristown, NJ, USA
Performance and Durability Improvement in Compressor Structure Design
Nguyen, L. D.; Wheeler, M.; Ockenfels, G.; James, D. K.; Zurmehly, G. E.; 15 Jan 04; 17 pp.; In English
Contract(s)/Grant(s): N00019-01-C-3002
Patent Info.: Filed Filed 15 Jan 04; US-Patent-Appl-SN-10-759 928
Report No.(s): PB2007-102771; No Copyright; Avail.: CASI: A03, Hardcopy

An integral assembly that may improve control over thermal and mechanical behaviors of assembly structures during various transient operation conditions is disclosed. The integral assembly comprises a continuous ring disposed coaxial with, and orthogonal to a central axis, the continuous ring comprising a plurality of surfaces, the plurality of surfaces having a continuous outer surface and a continuous inner surface; the plurality of surfaces being characterized by a continuous cross section having a first cross sectional dimension longitudinally disposed parallel to the central axis; the plurality of surfaces comprising a bell mouth surface in physical communication with a compressor shroud surface; the compressor shroud surface being in physical communication with a diffuser surface; and the diffuser surface being in physical communication with the bell mouth surface. The integral assembly comprising a compressor shroud is also provided. An auxiliary power unit including the integral assembly, and a method of making the integral assembly are also disclosed.
NTIS
Compressors; Durability; Structural Engineering

20070006849 NASA Glenn Research Center, Cleveland, OH, USA
Development and Testing of a Radial Halbach Magnetic Bearing
Eichenberg, Dennis J.; Gallo, Christopher A.; Thompson, William K.; December 2006; 40 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): WBS 561581.02.08.03.06.04
Report No.(s): NASA/TM-2006-214477; E-15769; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070006849

The NASA John H. Glenn Research Center has developed and tested a revolutionary Radial Halbach Magnetic Bearing. The objective of this work is to develop a viable non-contact magnetic bearing utilizing Halbach arrays for all-electric flight, and many other applications. This concept will help reduce harmful emissions, reduce the Nation s dependence on fossil fuels and mitigate many of the concerns and limitations encountered in conventional axial bearings such as bearing wear, leaks, seals and friction loss. The Radial Halbach Magnetic Bearing is inherently stable and requires no active feedback control system or superconductivity as required in many magnetic bearing designs. The Radial Halbach Magnetic Bearing is useful for very high speed applications including turbines, instrumentation, medical applications, manufacturing equipment, and space power systems such as flywheels. Magnetic fields suspend and support a rotor assembly within a stator. Advanced technologies developed for particle accelerators, and currently under development for maglev trains and rocket launchers, served as the basis for this application. Experimental hardware was successfully designed and developed to validate the basic principles and analyses. The report concludes that the implementation of Radial Halbach Magnetic Bearings can provide significant improvements in rotational system performance and reliability.
Author
Magnetic Bearings; Active Control; Spacecraft Power Supplies; Particle Accelerators; Magnetic Suspension; Fossil Fuels

20070006850 NASA Glenn Research Center, Cleveland, OH, USA
Torque Production in a Halbach Machine
Eichenberg, Dennis J.; Gallo, Christopher A.; Thompson, William K.; Vrnak, Daniel R.; December 2006; 19 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): WBS 561581.02.08.03.06.04
Report No.(s): NASA/TM-2006-214478; E-15770; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070006850

The NASA John H. Glenn Research Center initiated the investigation of torque production in a Halbach machine for the

Levitated Ducted Fan (LDF) Project to obtain empirical data in determining the feasibility of using a Halbach motor for the project. LDF is a breakthrough technology for 'Electric Flight' with the development of a clean, quiet, electric propulsor system. Benefits include zero emissions, decreased dependence on fossil fuels, increased efficiency, increased reliability, reduced maintenance, and decreased operating noise levels. A commercial permanent magnet brushless motor rotor was tested with a custom stator. An innovative rotor utilizing a Halbach array was designed and developed to fit directly into the same stator. The magnets are oriented at 90deg to the adjacent magnet, which cancels the magnetic field on the inside of the rotor and strengthens the field on the outside of the rotor. A direct comparison of the commercial rotor and the Halbach rotor was made. In addition, various test models were designed and developed to validate the basic principles described, and the theoretical work that was performed. The report concludes that a Halbach array based motor can provide significant improvements in electric motor performance and reliability.
Author
Torque; Electric Motors; Permanent Magnets; Magnetic Fields

20070006851 NASA Glenn Research Center, Cleveland, OH, USA
Development of a 32 Inch Diameter Levitated Ducted Fan Conceptual Design
Eichenberg, Dennis J.; Gallo, Christopher a.; Solano, Paul A.; Thompson, William K.; Vrnak, Daniel R.; December 2006; 40 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): WBS 561581.02.08.03.06.04
Report No.(s): NASA/TM-2006-212281; E-15773; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070006851

The NASA John H. Glenn Research Center has developed a revolutionary 32 in. diameter Levitated Ducted Fan (LDF) conceptual design. The objective of this work is to develop a viable non-contact propulsion system utilizing Halbach arrays for all-electric flight, and many other applications. This concept will help to reduce harmful emissions, reduce the Nation s dependence on fossil fuels, and mitigate many of the concerns and limitations encountered in conventional aircraft propulsors. The physical layout consists of a ducted fan drum rotor with blades attached at the outer diameter and supported by a stress tuner ring at the inner diameter. The rotor is contained within a stator. This concept exploits the unique physical dimensions and large available surface area to optimize a custom, integrated, electromagnetic system that provides both the levitation and propulsion functions. The rotor is driven by modulated electromagnetic fields between the rotor and the stator. When set in motion, the time varying magnetic fields interact with passive coils in the stator assembly to produce repulsive forces between the stator and the rotor providing magnetic suspension. LDF can provide significant improvements in aviation efficiency, reliability, and safety, and has potential application in ultra-efficient motors, computers, and space power systems.
Author
Ducted Fans; Spacecraft Power Supplies; Magnetic Fields; Reliability; Fossil Fuels; Flight Safety; Electromagnetic Fields

20070007315 NASA Glenn Research Center, Cleveland, OH, USA
A Probabilistic System Analysis of Intelligent Propulsion System Technologies
Tong, Michael T.; [2007]; 9 pp.; In English; Proceedings of GT2007. ASME Turbo Expo 2007: Power for Land, Sea and Air, 14-17 May 2007, Montreal, Canada; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 561581.02.08.03.13.04
Report No.(s): GT2007-27914; Copyright; Avail.: CASI: A02, Hardcopy

NASA s Intelligent Propulsion System Technology (Propulsion 21) project focuses on developing adaptive technologies that will enable commercial gas turbine engines to produce fewer emissions and less noise while increasing reliability. It features adaptive technologies that have included active tip-clearance control for turbine and compressor, active combustion control, turbine aero-thermal and flow control, and enabling technologies such as sensors which are reliable at high operating temperatures and are minimally intrusive. A probabilistic system analysis is performed to evaluate the impact of these technologies on aircraft CO2 (directly proportional to fuel burn) and LTO (landing and takeoff) NO(x) reductions. A 300-passenger aircraft, with two 396-kN thrust (85,000-pound) engines is chosen for the study. The results show that NASA s Intelligent Propulsion System technologies have the potential to significantly reduce the CO2 and NO(x) emissions. The results are used to support informed decisionmaking on the development of the intelligent propulsion system technology portfolio for CO2 and NO(x) reductions.
Author
Propulsion; Combustion Control; Systems Analysis; Operating Temperature; Compressors; Aerodynamic Heating; Carbon Dioxide

20070007321 NASA Glenn Research Center, Cleveland, OH, USA

Low-Emission Hydrogen Combustors for Gas Turbines Using Lean Direct Injection

Marek, C. John; Smith, Timothy D.; Kundu, Krishna; [2007]; 34 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 22-066-10-12; Copyright; Avail.: CASI: A03, Hardcopy

One of the key technology challenges for the use of hydrogen in gas turbine engines is the performance of the combustion system, in particular the fuel injectors. To investigate the combustion performance of gaseous hydrogen fuel injectors flame tube combustor experiments were performed. Tests were conducted to measure the nitrogen oxide (NO(x)) emissions and combustion performance at inlet conditions of 588 to 811 K, 0.4 to 1.4 MPa, and equivalence ratios up to 0.48. All the injectors were based on Lean Direct Injection (LDI) technology with multiple injection points and quick mixing. One challenge to hydrogen-based premixing combustion systems is flashback since hydrogen has a reaction rate over 7 times that of Jet-A. To reduce the risk, design mixing times were kept short and velocities high to minimize flashback. Five fuel injector designs were tested in 6.35- and 8.9-cm-diameter flame tubes with non-vitiated heated air and gaseous hydrogen. Data is presented on measurements of NO(x) emissions and combustion efficiency for the hydrogen injectors at 2.540, 7.937, and 13.652 cm from the injector face. Results show that for some configurations, NO(x) emissions are comparable to that of state of the art Jet-A LDI combustor concepts.

Author

Combustion Chambers; Combustion Efficiency; Hydrogen Fuels; Reaction Kinetics; Nitrogen Oxides; Fuel Injection

20070008286 Marshall, Gerstein and Borun, LLP, Chicago, IL, USA

Dual Retention Vane Arm

Kies, D. O.; Alexander, P. E.; Brumbaugh, J. D.; 4 Feb 04; 12 pp.; In English

Contract(s)/Grant(s): N00019-02-C-3003

Patent Info.: Filed Filed 4 Feb 04; US-Patent-Appl-SN-10-771 884

Report No.(s): PB2007-102960; No Copyright; Avail.: CASI: A03, Hardcopy

A variable vane arm is disclosed having dual retention capability to ensure vanes of a gas turbine engine remain connected to the vane arm even under surge loads or when fastener preload, or the entire fastener, is lost. The variable vane arm further provides a surge slot to facilitate rotation of the vane even when the vane is operating under surge or otherwise excessively high pressure conditions.

NTIS

Gas Turbine Engines; Surges; Vanes

20070008290 Bachman and Lapointe, P.C., New Haven, CT, USA

Micro-Circuit Platform

Cunha, F.; Santeler, K.; Teller, B.; 3 Feb 04; 6 pp.; In English

Contract(s)/Grant(s): AF-F33615-02C-2202

Patent Info.: Filed Filed 3 Feb 04; US-Patent-Appl-SN-10-771 485

Report No.(s): PB2007-102962; No Copyright; Avail.: CASI: A02, Hardcopy

A gas turbine engine component, such as a high pressure turbine blade, has an airfoil portion, a platform, and micro-circuits within the platform for cooling at least one of a platform edge adjacent the pressure side of the airfoil portion and the trailing edge of the platform. The micro-circuits include a first micro-circuit on a suction side of the airfoil and a second micro-circuit on a pressure side of the airfoil. The micro-circuits within the platform achieve high thermal convective efficiency, high film coverage, and high cooling effectiveness.

NTIS

Airfoils; Circuits; Cooling Systems; Turbine Blades

20070008291 United Technologies Corp., East Hartford, CT, USA

Cooled Rotor Blade with Vibration Damping Device

Surace, R. C.; Otero, E.; Gregg, S. J.; Propheter, T. A.; 4 Feb 04; 10 pp.; In English

Patent Info.: Filed Filed 4 Feb 04; US-Patent-Appl-SN-10-771 587

Report No.(s): PB2007-102963; No Copyright; Avail.: CASI: A02, Hardcopy

A rotor blade for a rotor assembly is provided that includes a root, an airfoil, and a damper. The airfoil has a length, a base, a tip, a first side wall, a second side wall, and at least one cavity. The length extends the base and the tip. The at least

one cavity is disposed between the side walls, and the channel is defined by a first wall portion and a second wall portion. The damper, which is selectively received within the channel, includes a first bearing surface, a second bearing surface, a forward surface, and an aft surface, all of which extend lengthwise. At least one of the surfaces is shaped to form a lengthwise extending passage within the channel. The passage has a flow direction oriented along the length of the at least one surface to permit cooling air travel along the at least one surface in a lengthwise direction. According to one aspect of the present invention, the damper has an arcuate lengthwise extending centerline.
NTIS
Cooling Systems; Vibration Damping; Rotor Blades (Turbomachinery)

20070008301 Conte (Francis L.), Swampscott, MA, USA
Converging Pin Cooled Airfoil
Lee, C. P.; Bunker, R. S.; Prakash, C.; 24 Oct 03; 8 pp.; In English
Contract(s)/Grant(s): AF-F33615-02-C-2212
Patent Info.: Filed Filed 24 Oct 03; US-Patent-Appl-SN-10-692 700
Report No.(s): PB2007-102961; No Copyright; Avail.: CASI: A02, Hardcopy

A turbine airfoil includes pressure and suction sidewalls extending in chord between leading and trailing edges and in span between a root and a tip. A septum is spaced between the sidewalls to define two cooling circuits on opposite sides of the septum which converge between the leading and trailing edges. An array of pins extends inwardly from the pressure sidewall at a discharge end of the circuits, and the pins decrease in length to conform with the converging circuit.
NTIS
Airfoils; Gas Turbine Engines; Pins

20070008654 Air Force Research Lab., Wright-Patterson AFB, OH USA
Experimental Evaluation of an Inlet Profile Generator for High Pressure Turbine Tests
Barringer, M D; Thole, K A; Polanka, M D; Jun 2006; 14 pp.; In English
Report No.(s): AD-A461291; AFRL-PR-WP-TP-2006-243; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461291

Improving the performance and durability of gas turbine aircraft engines depends highly on achieving a better understanding of the flow interactions between the combustor and turbine sections. The flow exiting the combustor is very complex, and it is characterized primarily by elevated turbulence and large variations in temperature and pressure. To better understand these effects, the goal of this work is to benchmark an adjustable turbine inlet profile generator for the Turbine Research Facility (TRF) at the Air Force Research Laboratory (AFRL). The research objective was to experimentally evaluate the performance of the non-reacting simulator that was designed to provide representative combustor exit profiles to the inlet of the TRF turbine test section. This paper discusses the verification testing that was completed to benchmark the performance of the generator. Results are presented in the form of temperature and pressure profiles as well as turbulence intensity and length scale. This study shows how one combustor geometry can produce significantly different flow and thermal field conditions entering the turbine.
DTIC
Engine Inlets; Gas Turbines; High Pressure; Jet Engines; Turbines

08
AIRCRAFT STABILITY AND CONTROL

Includes flight dynamics, aircraft handling qualities, piloting, flight controls, and autopilots. For related information see also 05 Aircraft Design, Testing and Performance; and 06 Avionics and Aircraft Instrumentation.

20070006853 NASA Langley Research Center, Hampton, VA, USA
Matlab Stability and Control Toolbox: Trim and Static Stability Module
Crespo, Luis G.; Kenny, Sean P.; November 2006; 20 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): WBS 23-090-50-70
Report No.(s): NASA/TM-2006-214536; L-19169; Copyright; Avail.: CASI: A03, Hardcopy

This paper presents the technical background of the Trim and Static module of the Matlab Stability and Control Toolbox. This module performs a low-fidelity stability and control assessment of an aircraft model for a set of flight critical conditions.

This is attained by determining if the control authority available for trim is sufficient and if the static stability characteristics are adequate. These conditions can be selected from a prescribed set or can be specified to meet particular requirements. The prescribed set of conditions includes horizontal flight, take-off rotation, landing flare, steady roll, steady turn and pull-up/push-over flight, for which several operating conditions can be specified. A mathematical model was developed allowing for six-dimensional trim, adjustable inertial properties, asymmetric vehicle layouts, arbitrary number of engines, multi-axial thrust vectoring, engine(s)-out conditions, crosswind and gyroscopic effects.
Author
Aerodynamic Stability; Aircraft Control; Static Stability; Takeoff; Flight Conditions; Aerodynamic Balance; Thrust Vector Control

20070007636 Civil Aeromedical Inst., Oklahoma City, OK USA
Comparison of a Typical Electronic Attitude-Direction Indicator with Terrain-Depicting Primary Flight Displays, for Performing Recoveries from Unknown Attitudes: Using Difference and Equivalence Tests
Beringer, Dennis B; Ball, Jerry D; Brennan, Kelly; Taite, Sitafa; Dec 2005; 12 pp.; In English
Report No.(s): AD-A460873; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460873

A study was conducted to determine if primary flight displays (PFDs) depicting terrain could be used with a level of safety equivalent to electronic attitude-direction indicators (EADIs) without terrain. Five groups of 8 pilots each flew scenarios in a flight simulator using one of three PFDs (EADI, full-color terrain, uniformly brown terrain) with or without guidance cues. Performances of recoveries from unknown attitudes using the EADI were measured first as a baseline, followed by trials with one of the experimental formats. Performance measures included initial response time, total recovery time, and both initial and secondary control reversals. Traditional 'difference' analyses found no significant performance differences between groups. Analyses using confidence intervals to assess equivalence of distributions showed that group performances were practically equivalent. Pilot preferences were examined and are reported. It was concluded that the specific terrain representations examined provided for performance at least equal to if not better than the conventional EADI. This comparative technique is recommended for situations in which one wishes to demonstrate that a proposed device or system is no worse than or roughly equivalent to something already in use.
DTIC
Attitude Indicators; Display Devices; Equivalence; Flight Simulators; Terrain

20070008207 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Flight Dynamics Analysis Branch End of Fiscal Year 2005 Report
August 2006; 92 pp.; In English; Original contains black and white illustrations
Report No.(s): NASA/TM-2006-214139; Rept-2006-00904-0; No Copyright; Avail.: CASI: A05, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070008207

This report summarizes the major activities and accomplishments carried out by the Flight Dynamics Analysis Branch (FDAB), Code 595, in support of flight projects and technology development initiatives in Fiscal Year (FY) 2005. The report is intended to serve as a summary of the type of support carried out by the FDAB, as well as a concise reference of key accomplishments and mission experience derived from the various mission support roles. The primary focus of the FDAB is to provide expertise in the disciplines of flight dynamics including spacecraft navigation (autonomous and ground based), spacecraft trajectory design and maneuver planning, attitude analysis, attitude determination and sensor calibration, and attitude control subsystem (ACS) analysis and design. The FDAB currently provides support for missions and technology development projects involving NASA, other government agencies, academia, and private industry.
Author
Dynamic Control; Flight Operations; Test Facilities; Control Systems Design; Observatories

20070008705 Civil Aeromedical Inst., Oklahoma City, OK USA
Color Analysis in Air Traffic Control Displays. Part 1: Radar Displays
Xing, Jing; Oct 2006; 21 pp.; In English
Report No.(s): AD-A461409; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461409

One of the current trends in air traffic control (ATC) display technology is a substantial increase in the use of color. Whereas the advantages of color may seem apparent, little attention has been devoted to potential disadvantages of color use

with respect to complex cognitive aspects of the ATC environment. Although controllers use several different displays simultaneously (designed and manufactured by different companies), the Federal Aviation Administration (FAA) has not yet adopted a standard for color use to ensure that the various color schemes are compatible. At present, there is no systematic documentation and analysis of color use in ATC displays. This lack of standardization and documentation presents a challenge for manufacturers to design compatible color schemes and for the FAA to evaluate the effectiveness of a display at acquisition. This report was designed to address the lack of such information. The study evaluates color-coding, color usage, task purposes and effectiveness of color use, potential shortcomings, and color complexity for three types of radar displays used by operational controllers. This systematic documentation allowed us to assess compatibility across displays. The study also revealed some visual factors that may affect the usefulness of a display. The results of these investigations will be beneficial for the development of design prototypes and for acquisition evaluation of new ATC display technologies.
DTIC
Air Traffic Control; Color; Display Devices; Radarscopes

09
RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, runways, hangars, and aircraft repair and overhaul facilities; wind tunnels, water tunnels, and shock tubes; flight simulators; and aircraft engine test stands. Also includes airport ground equipment and systems. For airport ground operations see *03 Air Transportation and Safety*. For astronautical facilities see *14 Ground Support Systems and Facilities (Space)*.

20070007416 Naval Postgraduate School, Monterey, CA USA
Cost Benefit Analysis of Performing a Pilot Project for Hydrogen-Powered Ground Support Equipment at Lemoore Naval Air Station
Etheridge, Jacqueline M; Maxwell, Brian W; Alton, G D; Dec 2006; 69 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460456; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460456

The primary purpose of this thesis is to provide a cost benefit analysis of a pilot program at NAS Lemoore for the use of hydrogen fuel cell powered aviation ground support equipment(GSE) and provide general background information on hydrogen power. The analysis is conducted to determine expected program cost and to determine what benefits the Navy could achieve by using hydrogen fuel cell powered tow tractors, electric carts and hydraulic carts. Analysis shows benefits in the following areas: reduced green house gas emissions and noise pollution, reduced HAZMAT generation due to reduced oil usage and spills/leaks, reduced maintenance labor costs for fuel cell over diesel engines, and reduced training time required after full fuel cell implementation.
DTIC
Cost Analysis; Cost Effectiveness; Fuel Cells; Ground Support Equipment; Hydrogen; Military Aviation

20070007640 Civil Aeromedical Inst., Oklahoma City, OK USA
Examining ATC Operational Errors Using the Human Factors Analysis and Classification System
Scarborough, Alfretia; Bailey, Larry; Pounds, Julia; Dec 2005; 36 pp.; In English
Contract(s)/Grant(s): Proj-AM-B-06-HRR-524
Report No.(s): AD-A460879; DOT-FAA-AM-05-25; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460879

In the literature of aviation accidents and incidents, human error has been recognized as the predominant factor contributing to aviation mishaps. Consequently, a number of human error models and taxonomies have been adapted to study the unique characteristics of flying an aircraft. However, relatively few attempts have been made to apply the same tools toward understanding the human factors causes of air traffic control (ATC) operational errors (OEs). An operational error is an occurrence attributable to an element of the air traffic system in which aircraft separation minima are not maintained. As a first attempt to systematically examine the underlying human causes of OEs, we report on the results of a study that consisted of three phases: (1) conducting a literature review to identify candidate error models and taxonomies, (2) selecting an appropriate error model or taxonomy for use in the ATC environment, and (3) applying the selected error model, or taxonomy, to a subset of the items identified by the FAA as OE causal factors. The results of our study revealed that, of the models and taxonomies examined, the Human Factors Analysis and Classification System (HFACS) was the taxonomy most readily adapted for use in an initial examination of ATC OEs. Causal factor items from 5,011 OE reports were classified using the HFACS taxonomy. Most items were classified as decision errors and skill-based errors. Additional research is needed to

develop a more comprehensive understanding of the factors that contribute to ATC decision errors and skill-based errors.
DTIC
Air Traffic Control; Air Traffic Controllers (Personnel); Classifications; Errors; Human Factors Engineering

20070008404 Illinois Univ. at Urbana-Champaign, Savoy, IL, USA
Effectiveness of a Personal Computer Aviation Training Device, a Flight Training Device, and an Airplane in Conducting Instrument Proficiency Checks. Volume 2. Objective Pilot Performance Measures
Rantanen, E.; Johnson, N. R.; Talleur, D. A.; Nov. 21, 2004; 56 pp.; In English
Contract(s)/Grant(s): DTFA-2001-G-037
Report No.(s): PB2007-105605; AHFD-04-16; No Copyright; Avail.: CASI: A04, Hardcopy

This research was prompted by the FAA Advisory Circular (AC) No. 61-126 (1997), which authorized the use of a Personal Computer Aviation Training Device (PCATD) to be used for 10 of the 15 hours authorized for an approved ground training device, but not for Instrument Proficiency Checks (IPCs). The research was supported under Federal Aviation Administration (FAA) cooperative agreement DFTA2001-G-037 with the Institute of Aviation, University of Illinois at Urbana-Champaign, during September 2001-November 2004. The study was sponsored by FAA Headquarters Flight Standards Service, General Aviation and Commercial Division. Dennis B. Beringer, Civil Aerospace Medical Institute (CAMI), served as the contracting officers technical representative. This report is Volume 2 of a two-volume final report. It is in the process of review and approval and is not at present an official FAA document. Consequently, the views expressed herein do not necessarily represent official FAA positions. Volume 1 covered results obtained from subjective pilot performance measures by certified flight instructors, instrument (CFII), who conducted the IPC flights for the study participants. This volume (Vol. 2) will describe objective pilot performance measures developed for the project and the results that they yielded. Published reports and presentations of the work on development of objective pilot performance measures are listed in this document.
NTIS
Abilities; Flight Training; Personal Computers; Pilot Performance; Training Devices

20070008405 Illinois Univ. at Urbana-Champaign, Savoy, IL, USA
Effectiveness of a Personal Computer Aviation Training Device, a Flight Training Device, and an Airplane in Conducting Instrument Proficiency Checks. Volume 1. Subjective Pilot Performance Evaluation
Taylor, H. L.; Talleur, D. A.; Rantanen, E. M.; Emanuel, T. W.; Nov. 21, 2004; 26 pp.; In English
Contract(s)/Grant(s): DTFA-2001-G-037
Report No.(s): PB2007-105606; AHFD-04-12; No Copyright; Avail.: CASI: A03, Hardcopy

This study was prompted by the FAA Advisory Circular (AC) No. 61-126 (1997), which authorized the use of a Personal Computer Aviation Training Device (PCATD) to be used for 10 of the 15 hours authorized for an approved ground training device. The advisory circular, however, did not authorize the use of PCATDs for Instrument Proficiency Checks (IPCs). The study was supported under Federal Aviation Administration (FAA) cooperative agreement DFTA2001-G-037 with the Institute of Aviation, University of Illinois at Urbana-Champaign, during September 2001-November 2004. The study was sponsored by FAA Headquarters Flight Standards Service, General Aviation and Commercial Division. Dennis B. Beringer, Civil Aerospace Medical Institute (CAMI), served as the contracting officers technical representative for FAA-CAMI. This report is Volume 1 of a two volume final report and is in the process of review and approval and is not at present an official FAA document. Consequently, the views expressed herein do not necessarily represent official FAA positions. Volume 2 will cover results obtained from objective pilot performance measures employed in the project. Semi-annual, annual, and published reports and presentations of the work including reports of the airborne flight data recorder (FDR) and development of objective pilot performance measures are listed in this document.
NTIS
Abilities; Evaluation; Flight Training; Performance Tests; Personal Computers; Pilot Performance; Training Devices

20070008689 Civil Aeromedical Inst., Oklahoma City, OK USA
The Outcome of ATC Message Complexity on Pilot Readback Performance
Prinzo, O V; Hendrix, Alfred M; Hendrix, Ruby; Nov 2006; 36 pp.; In English
Report No.(s): AD-A461355; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461355

Field data and laboratory studies conducted in the 1990s reported that the rate of pilot readback errors and communication

problems increased as controller transmissions became more complex. This resulted in the recommendation that controllers send shorter messages to reduce the memory load imposed on pilots by complex messages. More than 10 years have passed since a comprehensive analysis quantified the types and frequency of readback errors and communication problems that occur in the operational environment. Hence, a content analysis was performed on 50 hours of pilot and controller messages that were transmitted from 5 of the busiest terminal radar approach control facilities in the contiguous USA between October 2003 and February 2004. This report contains detailed and comprehensive descriptions of routine air traffic control (ATC) communication, pilot readback performance, call sign usage, miscommunications, and the effects of ATC message complexity and message length on pilot readback performance. Of importance was the finding that both the number of pilot requests and readback errors increased as the complexity and number of aviation topics in ATC messages increased - especially when pilots were performing approach tasks as compared with departure tasks. Also, nonstandard phraseology associated with a lack of English language proficiency and international communications were present in the data. In particular, pilot use of the word 'point' as part of a radio frequency was included in the read back of altitude ('three point five') and speed ('two point seven on the speed'). To limit the occurrence of communication problems and misunderstandings, controllers should be encouraged to transmit shorter and less complex messages. With increases in international travel, areas of concern related to English language proficiency and language production need to be addressed.
DTIC
Air Traffic Control; Air Traffic Controllers (Personnel); Errors; Messages; Pilot Performance; Pilots; Voice Communication

20070009292 Henningson, Durham and Richardson, Inc., Omaha, NE USA
Environmental Assessment, Demolition of Alpha Ramp Grand Forks Air Force Base, North Dakota
Goss, Brian; Jan 2007; 142 pp.; In English
Contract(s)/Grant(s): DACA45-03-D-0019
Report No.(s): AD-A462222; XC-319 CES/ND; No Copyright; Avail.: CASI: A07, Hardcopy

Grand Forks Air Force Base is proposing to demolish its Alpha Ramp (A-Ramp) and associated facilities and buildings (the Proposed Action). The purposes of the project are: to remove the A-Ramp facilities and infrastructure that are no longer needed; to remove excess buildings and utilities that represent sources of potential contamination; and to remove excess buildings and facilities (including walls) that are in the 7:1 flight envelope, clear zone, and 50:1 approach-departure clearance zone and require flight-line waivers. There are four alternatives for this Proposed Action: the No-Action Alternative, and three Implementation Alternatives for the Proposed Action. The Proposed Action will include mechanical demolition of all A-Ramp buildings, facilities including the security fence, and pavement; regrading of the area and revegetation of the area to suitable hay grass. After restoration, any future use of the A-Ramp area is as yet be determined, but the types of construction in the A-Ramp area may be limited because of existing flight-line restrictions. Three implementation alternatives for the Proposed Action were considered. All aspects of the Proposed Action would occur in, or under, the implementation alternatives except for minor variations. Two alternatives involve the reuse of the security wall rather than its demolition: reuse of the security walls on base, or sale of the walls for reuse off base. The third implementation alternative involves preserving the A-Ramp Perimeter Road; drainage ditches on either side of the Road would also not be modified except for some minor regrading that would occur northwest of A-Ramp. The No-Action Alternative would involve continued minimal use of some buildings and facilities; the unused ones would continue to deteriorate. Based on a review of the alternatives and their potential environmental impacts, the implementation alternative of preserving the A-Ramp Perimeter Road was selected as the preferred alternative.
DTIC
Environmental Surveys; Terminal Facilities

12
ASTRONAUTICS (GENERAL)

Includes general research topics related to space flight and manned and unmanned space vehicles, platforms or objects launched into, or assembled in, outer space; and related components and equipment. Also includes manufacturing and maintenance of such vehicles or platforms. For specific topics in astronautics see *categories 13 through 20*. For extraterrestrial exploration see *91 Lunar and Planetary Science and Exploration*.

20070006610 Federal Aviation Administration, Washington, DC USA
Federal Aviation Administration Fiscal Year 2007 Business Plan: Commercial Space Transportation
January 2007; 9 pp.; In English
Report No.(s): PB2007-106316; No Copyright; Avail.: CASI: A02, Hardcopy

The mission of the Federal Aviation Administration (FAA) Associate Administrator for Commercial Space Transportation (AST) is to ensure public safety for licensed U.S. launch activities, and to support the continued growth and expansion of the U.S. space transportation industry. Safety is AST's top priority. To meet its safety responsibilities, AST conducts a variety of core functions to ensure that uninvolved persons are protected from the dangers and potential hazards associated with commercial space launch operations. These functions include licensing, conducting safety inspections of licensed and permitted oerations, developing rulemaking products related to commercial launch activities, and conducting evalutions and making determinations regarding experimental permits. Also, AST is driven to ensure that it keeps pace with the evolving commercial space transportation industry. AST will lead agency efforts to develop the appropriate regulatory framework for human space flight and new experimental vehicle launches. AST will also continue to improve its internal tools and processes used to enable new laucnh vehicle technologies adn systems. Further, AST will leverage partnerships with other government organizations to enhance the safety of launches occurring from both federal and non-federal launch sites. In addition to ensuring public safety, AST enables industry through a variety of activities intended to encourage, promote, and facilitate the growth and expansion of U.S. commercial space transportation. AST's core business functions in this area include activities such as performing environmental projects, publishing reports on industry developments and trends, hosting stakeholder forums, and supporting development of policies that impact the U.S. commercial space launch industry. Further, AST takes great pride in delivering timely and reliable products that meet or exceed customer requirements. AST is committed to working with its stakeholders to identify approaches that will render even greater service and stakeholder satisfaction, as well as cost savings. Finally, AST's greatest resource is its dedicated staff. AST strives to ensure that all of its staff members are properly trained and prepared to perform at the highest levels.
NTIS
Aerospace Industry; Commerce; Commercial Spacecraft; Industries; Space Commercialization; Space Transportation; Spacecraft Launching

20070007473 Air Force Research Lab., Kirkland AFB, NM USA
X-Ray Irradiation Effects in Top Contact, Pentacene Based Field Effect Transistors for Space Related Applications
Devine, R A; Ling, Mang-Mang; Mallik, Abhijit B; Roberts, Mark; Bao, Zhenan; Jan 2006; 4 pp.; In English
Report No.(s): AD-A460567; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460567
Preliminary studies of the effect of x-ray irradiation, typically used to simulate radiation effects in space, on top contract, pentacene based field effect transistors have been carried out. Threshold voltage shifts in irradiated devices are consistent with positive charge trapping in the gate dielectric and a rebound effect is observed, independent of the sign of applied electric field during irradiation. Carrier mobility variations in positive electric field biased/irradiated devices are interpreted in terms of the effects of interface-state-like defects.
DTIC
Field Effect Transistors; Hydrocarbons; Irradiation; Radiation Effects; X Ray Irradiation; X Rays

20070007578 Air Force Research Lab., Kirkland AFB, NM USA
Advanced Space-Based Detector Research at the Air Force Research Laboratory (PREPRINT)
Alsing, P M; Cardimona, D A; Huang, D H; Apostolova, T; Glass, W R; Castillo, C D; Oct 2006; 7 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460772; AFRL-VS-PS-JA-2007-1003; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460772
At the Space Vehicles Directorate of the Air Force Research Laboratory we are interested in the use of detectors in space for surveillance and situational awareness missions. Our primary interests are in observations of objects both on earth and in space, each of which has very different background requirements. In addition, the space environment itself is especially demanding of any sensor system that will be expected to work continuously for long periods of time in such a challenging environment. In this talk we will describe some of the requirements for operation in space (low temperatures, long distances, high radiation. etc.), and some of the research we have been performing to address these special issues.
DTIC
Aerospace Environments; Detectors; Infrared Radiation; Military Technology; Photometers; Quantum Wells; Research and Development; Situational Awareness; Surveillance

20070008247 Stanford Linear Accelerator Center, CA, USA

Design and Application of an Electronic Logbook for Space System Integration and Test Operations

Kavelaars, A. T.; January 2006; 272 pp.; In English

Report No.(s): DE2006-893297; SLAC-R-816; No Copyright; Avail.: National Technical Information Service (NTIS)

In the highly technological aerospace world paper is still widely used to document space system integration and test (I&T) operations. E-Logbook is a new technology designed to substitute the most commonly used paper logbooks in space system I&T, such as the connector mate/demate logbook, the flight hardware and flight software component installation logbook, the material mix record logbook and the electronic ground support equipment validation logbook. It also includes new logbook concepts, such as the shift logbook, which optimizes management oversight and the shift hand-over process, and the configuration logbook, which instantly reports on the global I&T state of the space system before major test events or project reviews. The design of E-Logbook focuses not only on a reliable and efficient relational database, but also on an ergonomic human-computer interactive (HCI) system that can help reduce human error and improve I&T management and oversight overall. E-Logbook has been used for the I&T operation of the Gamma-ray Large Area Space Telescope (GLAST) Large Area Telescope (LAT) at the Stanford Linear Accelerator Center (SLAC). More than 41,000 records have been created for the different I&T logbooks, with no data having been corrupted or critically lost. 94% of the operators and 100% of the management exposed to E-Logbook prefer it to paper logbooks and recommend its use in the aerospace industry.

NTIS

Aerospace Industry; Systems Integration

20070008572 Army Research Development and Engineering Command, Warren, MI USA

A Survey and Comparison of Several Space Shuttle External Tank (ET) Ice/Frost Detection and Evaluation Systems

Meitzler, Thomas; Bankowski, Elena; Bednarz, David; Bienkowski, Mary; Bishop, Jennifer; Bryk, Darryl; Lane, Kimberly; Sohn, EJ; Vala, John; Jun 1, 2004; 46 pp.; In English

Report No.(s): AD-A461159; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461159

This working paper and progress report has been prepared as part of a National Aeronautics Space Agency (NASA)-Kennedy Space Center (KSC), Florida/U.S. Army Tank Automotive Research, Development & Engineering Center (TARDEC) Warren, Michigan Space Act Agreement (SAA) signed on 21 January 2004. This mutually-beneficial collaborative research investigation is being accomplished under the terms of a Statement of Work (SOW) entitled: 'Ice/Frost Detection and Evaluation' jointly signed in March 2004 by Ronald Phelps of NASA-KSC's Shuttle Processing Business Office, and Dr. Thomas Meitzler of TARDEC's Visual Perception Lab (VPL). Planning and implementation has involved collaboration between U.S. Army investigators and NASA-KSC's Ice/Debris Team. Acronyms and abbreviations used in this report are included in Appendix A.

DTIC

Detection; External Tanks; Frost; Ice; Ice Formation; Space Shuttles; Surveys

20070008794 United Technology Corp., Dayton, OH USA

Technical Operations Support (TOPS) II. Delivery Order 0011: Summary Status of MISSE-1 and MISSE-2 Experiments and Details of Estimated Environmental Exposures for MISSE-1 and MISSE-2

Pippin, Gary; Jul 2006; 51 pp.; In English

Contract(s)/Grant(s): F33615-01-D-5801-0011; Proj-4349

Report No.(s): AD-A461561; No Copyright; Avail.: CASI: A04, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461561

The purpose of this report is to provide a description of the exposure conditions experienced by the hardware and materials specimens from the MISSE-1 (Materials International Space Station Experiment) and MISSE-2 space flight experiments. Figure 1 shows an image of MISSE-1 and MISSE-2 deployed on ISS. The nominal ram-facing sides of each experiment are visible in this image. Quantitative values are provided when possible for selected environmental factors. There are still a number of measurements that need to be complete, details of background contamination levels to be determined, and perhaps additional consideration of the effects of secondary scattering of atomic oxygen, but it is not likely that the overall conclusions and observations in this report will change significantly.

DTIC

Estimating; Exposure; Images; International Space Station; Space Stations

20070008840 GCA Viron Div., Minneapolis, MN USA

The Application of Expandable Honeycomb to the Fabrication of Space Structures

Russell, Ivan W; Koons, Charles; Jan 1965; 25 pp.; In English

Report No.(s): AD-A461612; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461612

The exploration of space will undoubtedly require a wide variety of large structures. Several approaches to producing those large structures become immediately apparent. Small modules or components of the overall structure could be transported into the desired position and assembled into the overall structure. Another approach is to develop an expandable structure which has a small packaging volume and can be transported into the desired position in its fully assembled configuration. Of equal importance to the small packaging volume is the strength-to-weight ratio of the finished structure. Excess weight transported into the space environment means larger rockets and highly increased costs of launch. GCA Viron Division, in conjunction with several subcontractors, have developed a concept which produces a structure with a low packaging volume and provides high strength with a low weight penalty. This paper will discuss the development phases, materials research, fabrication techniques, experimental development, and actual model space structures which have been fabricated based on the expandable honeycomb concept.

DTIC

Aerospace Systems; Expandable Structures; Fabrication; Honeycomb Structures; Large Space Structures; Spacecraft Structures

13
ASTRODYNAMICS

Includes powered and free flight trajectories; orbital and launching dynamics.

20070008151 Naval Postgraduate School, Monterey, CA USA

High-Fidelity Real-Time Trajectory Optimization for Reusable Launch Vehicles

Bollino, Kevin P; Dec 2006; 445 pp.; In English; Original contains color illustrations

Report No.(s): AD-A460473; No Copyright; Avail.: CASI: A19, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460473

Creating simplicity out of complexity, this research abandons the traditional guidance and control architecture for aerospace vehicles and embraces a revolutionary concept based on the principles of nonlinear optimal control theory. Motivated by the emerging needs of the next generation of reusable space vehicles, an autonomous integrated guidance and control system is developed that provides a safe approach to the highly constrained and nonlinear reentry problem. A pseudospectral-based optimal guidance scheme is used to generate high-fidelity, vehicle-tailored solutions to reentry trajectory optimization and guidance problems. To provide an autonomous, onboard capability of satisfying final-approach requirements, a new method is developed that includes an automatic generation of landing constraints given any runway geometry. This unique and simple approach avoids significant complexities arising from previous ideas of trajectory segmentation, trimmed flight, and trajectory tracking schemes. When demonstrating the new ideas, it is shown that the proposed approach can easily compensate for large uncertainties and disturbances consisting of hurricane-force wind gusts. An investigation of these new principles for the complete, nonlinear six degree-of-freedom system dynamics indicates that while the results are quite promising, a substantial amount of new theoretical and computational problems remain open, particularly in the area of over-actuated dynamical systems.

DTIC

Control Theory; Launch Vehicles; Nonlinear Systems; Optimal Control; Optimization; Real Time Operation; Reusable Launch Vehicles; Trajectories; Trajectory Optimization

20070009215 Purdy Engineering, Inc., Poolesville, MD USA

Geolocation and Pointing Accuracy Analysis for the WindSat Sensor

Purdy, William E; Gaiser, Peter W; Poe, Gene A; Uliana, Enzo A; Meissner, Thomas; Wentz, Frank J; Mar 2006; 11 pp.; In English; Original contains color illustrations

Report No.(s): AD-A462109; No Copyright; Avail.: CASI: A03, Hardcopy

Geolocation and pointing accuracy analyses of the WindSat flight data are presented. The two topics were intertwined in the flight data analysis and will be addressed together. WindSat has no unusual geolocation requirements relative to other sensors, but its beam pointing knowledge accuracy is especially critical to support accurate polarimetric radiometry. Pointing

accuracy was improved and verified using geolocation analysis in conjunction with scan bias analysis. Two methods were needed to properly identify and differentiate between data time tagging and pointing knowledge errors. Matchups comparing coastlines indicated in imagery data with their known geographic locations were used to identify geolocation errors. These coastline matchups showed possible pointing errors with ambiguities as to the true source of the errors. Scan bias analysis of U, the third Stokes parameter, and of vertical and horizontal polarizations provided measurement of pointing offsets resolving ambiguities in the coastline matchup analysis. Several geolocation and pointing bias sources were incrementally eliminated resulting in pointing knowledge and geolocation accuracy that met all design requirements.
DTIC
Accuracy; Earth Orbits; Position (Location)

15
LAUNCH VEHICLES AND LAUNCH OPERATIONS

Includes all classes of launch vehicles, launch/space vehicle systems, and boosters; and launch operations. For related information see also *18 Spacecraft Design, Testing and Performance*; and *20 Spacecraft Propulsion and Power*.

20070007403 Naval Postgraduate School, Monterey, CA USA
Tactical Satellite (TacSat) Feasibility Study: A Scenario Driven Approach
Davis, Ryan; Gordon, Jennifer; Jose, Catherin; Kyser, Roy; May, Stephen; Anh, Nguyen; Olea, Maria; Perkins, Robert; Reyes, Jose; Scali, Fredric; Sep 2006; 223 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460421; No Copyright; Avail.: CASI: A10, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460421

project concentrates on implementing network centric military operations with specific threat engagement scenarios using legacy and future warfare systems based on open architecture concepts. These systems may be based at sea, on land or in the air, and provide fire control solutions that match sensed threats to available weapons throughout the battle space. Using a unique methodology, the project provides the following: 1) characterization of the battle space 2) description of the design principles applied and 3) a conceptual design. The conceptual design is then modeled using ARENA simulation software in an attempt to validate the proposed architecture. The project concentrates on implementing three very specific scenarios: Engage on Remote (EOR), Forward Pass (FP), and Remote Fire (RF). These concepts are applied to the FORCEnet Open Architecture Domain Model using legacy and future Naval systems such as AEGIS Cruisers and Destroyers, DD(x), CG(x), Littoral Combat Ship (LCS), and Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System (JLENS). As a part of the above scenarios, the presentation will address specifics on best shooter selection. The resulting functional architecture and data flows transform concepts into real engagement methods. These methods will match the Detect-Control-Engage (DCE) sequence with Observe-Orient-Decide and Act (OODA), and employ current methods of data fusion from various platforms to provide a true integrated fire control solution. Combat identified threats on the network can then be matched to any available weapons on the network, and the preferred shooter selected can efficiently engage the threat. Thus, the effective and efficient use of all sensors and weapons available in the battle space becomes possible.
DTIC
Architecture (Computers); Feasibility; Military Operations; Military Spacecraft; Satellite Communication; Space Missions

20070007535 Air Force Research Lab., Kirkland AFB, NM USA
Forced Air Convection Thermal Switch Concept for Responsive Space Missions
Williams, Andrew D; Palo, Scott E; Jan 2006; 12 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460684; AFRL-VS-PS-TP-2006-1044; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460684

There has been a growing need in the Department of Defense to make space more responsive and cost effective. Instead of taking years to design and deploy a new satellite, the goal is weeks or even days. To meet this challenge, the methodologies used to design, manufacture, test, launch, and deploy satellites must radically change. One of the most challenging aspects of this problem is the satellite's Thermal Control System (TCS). Traditionally, the TCS is vigorously designed, analyzed, and optimized for every satellite mission. The ideal TCS for responsive space would be robust and modular with an inherent plug-and-play capability. The focus of this work was to investigate the design of a thermal control system based on a forced air convection thermal switch (FACTS) concept. The concept consists of separating the individual satellite subsystems and enclosing them each in hermetically sealed enclosures. The temperature is then controlled by modulating the heat transfer

coefficient with a DC axial fan. Using FACTS, a conservative switching ratio of 69:1 was achieved.
DTIC
Air Currents; Artificial Satellites; Convection Currents; Forced Convection; Space Missions; Switches; Temperature Control

20070007611 Air Force Research Lab., Hanscom AFB, MA USA
A Critical Ionization Velocity Experiment on the ARGOS Satellite
Lai, Shu T; Haggstrom, Ingemar; Wannberg, Gudmund; Westman, Assar; McNeil, William J; Cooke, David; Wright, Lawrence; Groves, Keith; Pellinen-Wannberg, Asta; Jan 2007; 11 pp.; In English
Contract(s)/Grant(s): Proj-5021
Report No.(s): AD-A460814; AFRL-VS-HA-TR-2007-1004; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460814

We report on a xenon gas release experiment conducted on the Advanced Research and Global Observations (ARGOS) Satellite in the F-region ionosphere above the European Incoherent Scatter (EISCAT) radar at Tromso, Norway, Oct 20, 2000. In this experiment, xenon gas was released in the ram direction of the satellite. This was intended to induce ionization through the critical ionization velocity (CIV) process proposed by Alfven in his theory of the formation of the planets in the solar system. If the CIV process had been operational and efficient, ionization of the xenon cloud might have been observed. Radar observations by EISCAT showed no detectable enhancement of the ambient plasma in the velocity of the satellite. We present a simple model calculation which predicts that the overall yield of xenon ions in the release would be low, owing merely to the initially high density of the rapidly expanding xenon cloud.
DTIC
Artificial Satellites; Critical Velocity; Ionization

20070007662 Army Research Lab., Aberdeen Proving Ground, MD USA
Battlespace Terrain Ownership: A New Situation Awareness Tool
O'May, Janet F; Hansen, Charles E; Heilman, Eric G; Kaste, Richard C; Neiderer, Andrew M; Jun 2005; 30 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460917; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA460917

Information in the battlespace provides decisive power. It is imperative that critical information is brought to the forefront to enhance decision-making. An accurate model of a tactical operation will improve a commander s battlespace awareness. One vital piece of information is terrain control. The Battlespace Terrain Ownership (BTO) system embodies an algorithm that computes expected terrain control over time and space, based on combat power projection as a function of position, influence exerted by asset distribution, weapon system effectiveness, probabilities of hit and kill, and combat damage.
DTIC
Situational Awareness; Terrain

20070008462 NATO Consultation, Command, and Control Agency, The Hague, Netherlands
Experimentation Activities with Aerospace Ground Surveillance
Kreitmair, Thomas; Ross, Joe; Skaar, Trond; Jun 2005; 15 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460950; X5-NATO/C3/NL; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460950

The NATO Consultation, Command and Control Agency (NC3A) in The Hague, The Netherlands, was involved in 2004 in a set of laboratory and live experiments with Aerospace Ground Surveillance (AGS) sensor and exploitation systems. The experiments and some of the findings are described. Based on collected experience, recommendations are provided for usage of Standardisation Agreements (STANAG) and simulations of ground tracks.
DTIC
Aerospace Vehicles; Space Surveillance (Ground Based); Space Surveillance (Spaceborne); Surveillance

20070008666 Library of Congress, Washington, DC USA
Theft of Debris from the Space Shuttle Columbia: Criminal Penalties
Murnane, Andrew W; Eig, Larry; Jun 12, 2003; 4 pp.; In English
Report No.(s): AD-A461308; CRS-RS21417; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461308

The breakup of the Space Shuttle Columbia strewed debris over parts of the West and the South, and recovery of this debris was considered vital to the investigation into the Columbia's final moments of flight. Almost immediately after the breakup, however, press stories reported that members of the public were recovering pieces of Columbia's wreckage and converting them to their personal use. Even though the organized search for Columbia debris is winding down, prosecutions continue for stealing debris and new ones could possibly arise in the future. This report briefly describes possible criminal penalties for conversion of government property, and does not address issues related to the personal property of the Columbia's crew. This report will be updated as warranted.
DTIC
Debris; Space Debris; Space Shuttles

20070008752 Avco Corp., Wilmington, MA USA
Aluminum Foil Expandable Structures
Motta, S; Jan 1965; 33 pp.; In English
Report No.(s): AD-A461503; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461503
No abstract available
Aerospace Environments; Airfoils; Aluminum; Expandable Structures; Metal Foils

20070008820 Naval Research Lab., Washington, DC USA
Retromodulator for Optical Tagging for LEO Consumables
Gilbreath, G C; Meehan, Timothy J; Rabinovich, William S; Vilcheck, Michael J; Mahon, Rita; Ferraro, Mena; Vasquez, John A; Sokolsky, Ilene; Katzer, D S; Ikossi-Anastasiou, K; Jan 2007; 10 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461589; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461589
In this paper, we report the results of a recent demonstration in which a Multiple Quantum Well retromodulator array was used as a low power, lightweight means to provide optical tagging of a remotely located object. A laser diode integrated on a tracker/pointing system scanned without cueing for a modulated retroreflected beam. The retroreflected energy was received and the embedded code demodulated for tagging identification. Ranges were on the order of 40 meters using an array of 1/2 cm MQW devices. Data were transferred at a rate of one mega chip per second over the link. Device power requirements were on the order of several milliwatts.
DTIC
Consumables (Spacecraft); Earth Orbits; Low Earth Orbits; Marking; Modulators; Optical Tracking

20070008875 Texas Univ., Austin, TX USA
Reevaluating the Process: An Assessment of the Iran Nonproliferation Act and its Impact on the International Space Station Program
Rosenow, Mark F; Whiting, Richard; Apr 5, 2005; 50 pp.; In English
Report No.(s): AD-A461656; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461656
The Iran Nonproliferation Act (INA) was introduced on May 20, 1999 in the House International Relations Committee by Chairman Gilman, unanimously passed by Congress as HR-1883 and signed into law March 14, 2000. The Act was designed to be used as leverage in the USA' relationship with Russia on the International Space Station (ISS). The hope was to dissuade Russia from cooperating and assisting Iran with its nuclear program and what the U.S. thought were nuclear-weapon ambitions. The Act specifically restricts U.S. funding to Russia by limiting all purchases of goods and services for the ISS to those that were agreed upon before the Act's passing or those that are required in the event of an emergency that risks crew safety. NASA is supportive of the Iran Nonproliferation Act but is concerned about the agency's ability to carry out normal operations while fulfilling the original U.S./Russian ISS agreement following funding and policy changes since 1999. The combined effects of the 2002 deletion of the X-38 based Crew Rescue Vehicle from the Program, the 2003 Columbia tragedy and the introduction in 2004 of the Vision for Exploration that includes retiring the Space Shuttle by 2010 have dramatically increased the need to rely on the Russian Federal Space Agency (FSA or Roskosmos) for critical services. Absent an agreed non-legislative solution between the executive and legislative branches of the U.S. Government or a change

in policy, both the International Space Station and international exploration activities will be severely impacted and limited.
DTIC
Agreements; International Space Station; Iran; Space Stations

20070009121 Air Force Research Lab., Kirkland AFB, NM USA
Statistical Control Paradigm for Aerospace Structures Under Impulsive Disturbances
Pham, Khanh D; Robertson, Lawrence M; Aug 3, 2006; 18 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461966; AFRL-VS-PS-TP-2006-1047; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this paper, the newly developed statistical control theory is revisited to autonomously control the satellite attitude as well as to provide a means of actively attenuating impulsive disturbances caused by servicing dock and space debris. Simulations are performed using several docking and collision scenarios. The simulation results indicate that the existing attitude control system with an innovative and robust statistical controller design shows significant promise for use in attitude hold mode operation despite the presence of impulsive disturbances.
DTIC
Aerospace Environments; Aerospace Vehicles; Aircraft Structures; Control Theory; Stochastic Processes

20070009157 Air Force Research Lab., Wright-Patterson AFB, OH USA
A Rapid Assessment Tool for Space Access Vehicle Configurations in Guidance and Control Performance (Preprint)
Ngo, Anhtuan D; Oppenheimer, Michael W; Blake, William B; Moster, Gregory E; Aug 2006; 24 pp.; In English
Report No.(s): AD-A462014; No Copyright; Avail.: CASI: A03, Hardcopy

A guidance and control (G\&C) design tool to rapidly assess the necessary control effort of a conceptual space access vehicle to track its flight trajectory is described. This tool can be used as part of the preliminary design cycle in configuration, trajectory planning, structural analysis, aerodynamic modeling, and control surface sizing. Given a conceptual configuration for a space access vehicle and a desired trajectory for a reentry flight, this G\&C tool provides an inner-loop feedback control law and outer loop feedback guidance law to track the given trajectory. Assessment of the vehicle's tracking performance and associated aero-control usage can be made. This assessment can then be used to determine the appropriate control.
DTIC
Design Analysis; Feedback; Guidance (Motion); Laws; Maneuverable Reentry Bodies

20070009177 Air Force Research Lab., Kirkland AFB, NM USA
Autonomous Distant Visual Surveillance of Satellites (PREPRINT)
McInroy, John E; Robertson, Lawrence M; Erwin, R S; May 10, 2006; 11 pp.; In English; Original contains color illustrations
Report No.(s): AD-A462037; AFRL-VS-PS-JA-2006-1016; No Copyright; Avail.: CASI: A03, Hardcopy

This paper develops three new, interconnected techniques useful for the autonomous distant visual inspection of satellites. First, silhouetting of man made, erratically illuminated satellites is performed. Illumination cases include full sun from an arbitrary (often awkward) viewing angle and unilluminated (back-lit by the star field). New Statistical Straight Line Snakes (SSLS) prove efficient in finding the silhouette, even in the unilluminated case. The silhouette is composed of straight line segments, which are easy to calculate, fit the straight lines inherent in man made objects, and lend themselves to further processing (pose estimation, template matching, etc.). Once the silhouette has been used to find correspondence points, a second method for detecting a moving, nearby chaser vehicle is derived. The hard case is treated in which the chaser and satellite are so nearby that their images are blurred together. The algorithm finds the dimension of motion generated by the sequence of images. If the dimension is higher than that explained by a single rigid body, then this indicates a possible chaser. Independent relative motion between the satellite and chaser is required -- if the chaser is immobile with respect to the satellite, then a third technique must be used. This third method incorporates the satellite's solid model to estimate its pose from a noisy, diffraction limited image. The pose is then combined with the solid and optical model to create synthetic expected images. Inspection is performed by comparing these with the actual images. The new pose algorithm first estimates depth by a least upper bound technique. A fast method is derived of optimally estimating the rotation matrix by a sequence of analytical solutions (rather than a nonlinear numerical optimization!). Simulations illustrate the use of all three techniques on images obtained when viewing low Earth orbit satellites from the ground.
DTIC
Artificial Satellites; Autonomy; Image Processing; Natural Satellites; Pattern Recognition; Surveillance

20070009201 Naval Research Lab., Washington, DC USA

Strategies for Fault-Tolerant, Space-Based Computing: Lessons Learned from the ARGOS Testbed

Levellette, M N; Wood, K S; Wood, D L; Beall, J H; Shirvani, P P; Oh, N; McCluskey, E J; Jan 2002; 12 pp.; In English; Original contains color illustrations

Report No.(s): AD-A462089; No Copyright; Avail.: CASI: A03, Hardcopy

The Advanced Space Computing and Autonomy Testbed on the ARGOS Satellite provides the first direct, on orbit comparison of a modern radiation hardened 32 bit processor with a similar COTS processor. This investigation was motivated by the need for higher capability computers for space flight use than could be met with available radiation hardened components. The use of COTS devices for space applications has been suggested to accelerate the development cycle and produce cost effective systems. Software-implemented corrections of radiation-induced SEUs (SIHFT) can provide low-cost solutions for enhancing the reliability of these systems. We have flown two 32-bit single board computers (SBCs) onboard the ARGOS spacecraft. One is full COTS, while the other is RAD-hard. The COTS board has an order of magnitude higher computational throughput than the RAD-hard board, offseting the performance overhead of the SIHFT techniques used on the COTS board while consuming less power.

DTIC

Commercial Off-the-Shelf Products; Computer Systems Design; Fault Tolerance; Radiation Hardening; Satellite Observation

18
SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and spacecraft control and stability characteristics. For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance; 39 Structural Mechanics*; and *16 Space Transportation and\fSafety*.

20070006840 NASA Johnson Space Center, Houston, TX, USA

Natural and Induced Thermal Environments

Rickman, Steven L.; [2007]; 27 pp.; In English; Original contains black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070006840

Spacecraft in proximity to a planet (or moon) experience natural environmental heating from three sources: the sun, solar energy reflected from the planet, called albedo and infrared energy emitted from the planet, called planetary infrared or outgoing longwave radiation (OLR). These environmental heating sources, in concert with the orbit parameters, spacecraft design and attitude, determine the induced thermal environment and, hence, the spacecraft thermal response. This section provides the reader with an introduction to the natural and induced thermal environments for orbiting spacecraft. While the focus is, primarily, on Earth-orbiting spacecraft, extensions to the theory provided will permit an understanding of the thermal environments experienced while in proximity to other bodies. Planetary surface environments will also be discussed.

Author

Planetary Surfaces; Temperature Effects; Thermal Environments; Spacecraft Design; Infrared Radiation; Long Wave Radiation

20070007306 NASA, Washington, DC, USA

International Space Station Independent Safety Task Force

February 2007; 119 pp.; In English; Original contains color illustrations; Copyright; Avail.: CASI: A06, Hardcopy

The ISS Program is an international partnership comprised of the USA, Russia, Canada, the members of the European Space Agency, and Japan. Some 16 countries are in the partnership or involved via bilateral agreements with a Partner in building, operating, and using the ISS. This partnership will continue throughout the operational (post-assembly) phase of the Program, where NASA will continue to be responsible for the sustaining engineering, operation of NASA s elements, and integration of the Station. The vehicle is extremely large and complex with a current living volume of 15,000 cubic feet and a weight of 455,000 pounds. Planned assembly will expand it to 33,125 cubic feet and 855,000 pounds. Hardware and software are developed and tested all over the world and are assembled and operated on orbit at an altitude of approximately 215 nautical miles. Major systems including electrical power, cooling, data handling, and navigational control are distributed throughout the Station and are expanded as assembly progresses. Station assembly to date has gone exceptionally well and is a tribute to the ISS and Shuttle teams. Anomalies occur but are dealt with quickly and with outstanding results as

demonstrated recently by the solar wing retraction problem on ISS flight 12A.1/STS-116, where the spacewalking astronauts assisted in the retraction of the jammed solar array wing. These factors result in a complex and distributed program with a highly technical and distributed management system that must be staffed by highly skilled engineers and skilled, experienced managers. Maintaining critical technical and management skills in the ISS Program as the ISS matures and NASA's exploration program staffs up will be a challenge requiring proactive and continuing attention by NASA management. NASA depends heavily on U.S. contractors for technical support of Station integration and for vehicle operations. These contractors are the source of data and expertise that are critical in ensuring mission safety and success, and their timely participation is essential to meeting mission schedules. Due to the international nature of the ISS Program, this support requires mandatory interfaces with NASA s International Partners (IPs). A number of groups have advised NASA on various aspects of the ISS, particularly following the loss of the Space Shuttle Columbia. Their reviews have been timely and their contributions significant. The International Space Station (ISS) Safety Task Force was established to review a broad range of Station vulnerabilities and consequences.
Derived from text

International Space Station; Space Transportation System; Space Shuttles; Aerospace Safety; Solar Arrays; Astronauts; Space Stations

20070007324 NASA Johnson Space Center, Houston, TX, USA

The Characteristics and Consequences of the Break-up of the Fengyun-1C Spacecraft

Johnson, Nicholas L.; Stansbery, Gene; Liou, J.-C.; Stokeley, C.; Whitlock, D.; [2007]; 1 pp.; In English; 58th International Astronautical Congress, 24-28 Sep. 2007, Hyderabad, India; No Copyright; Avail.: Other Sources; Abstract Only

The intentional break-up of the Fengyun-1C spacecraft on 11 January 2007 via hypervelocity collision with a ballistic object created the most severe artificial debris cloud in Earth orbit since the beginning of space exploration. More than 900 debris on the order of 10 cm or greater in size have been identified by the U.S. Space Surveillance Network (SSN). The majority of these debris reside in long-lived orbits. The NASA Orbital Debris Program Office has conducted a thorough examination of the nature of the Fengyun-1C debris cloud, using SSN data for larger debris and special Haystack radar observations for smaller debris. These data have been compared with the NASA standard satellite break-up model for collisions, and the results are presented in this paper. The orbital longevity of the debris have also been evaluated for both small and large debris. The consequent long-term spatial density effects on the low Earth orbit (LEO) regime are then described. Finally, collision probabilities between the Fengyun-1C debris cloud and the resident space object population of 1 January 2007 have been calculated. The potential effect on the growth of the near-Earth satellite population is presented.
Author

Spacecraft Breakup; Space Debris; Probability Theory; Collisions; Low Earth Orbits

20070007333 NASA Glenn Research Center, Cleveland, OH, USA

A Micromechanics Finite Element Model for Studying the Mechanical Behavior of Spray-On Foam Insulation (SOFI)

Ghosen, Louis J.; Sullivan, Roy M.; Lerch, Bradley A.; [2006]; 36 pp.; In English; 43rd Annual Technical Meeting of the Society of Engineering Science, 13-16 Aug. 2006, PA, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 524238.08.02.03.04; Copyright; Avail.: CASI: A03, Hardcopy

A micromechanics model has been constructed to study the mechanical behavior of spray-on foam insulation (SOFI) for the external tank. The model was constructed using finite elements representing the fundamental repeating unit of the SOFI microstructure. The details of the micromechanics model were based on cell observations and measured average cell dimensions discerned from photomicrographs. The unit cell model is an elongated Kelvin model (fourteen-sided polyhedron with 8 hexagonal and six quadrilateral faces), which will pack to a 100% density. The cell faces and cell edges are modeled using three-dimensional 20-node brick elements. Only one-eighth of the cell is modeled due to symmetry. By exercising the model and correlating the results with the macro-mechanical foam behavior obtained through material characterization testing, the intrinsic stiffness and Poisson s Ratio of the polymeric cell walls and edges are determined as a function of temperature. The model is then exercised to study the unique and complex temperature-dependent mechanical behavior as well as the fracture initiation and propagation at the microscopic unit cell level.
Author

External Tanks; Foams; Insulation; Micromechanics; Microstructure; Finite Element Method; Photomicrographs; Temperature Dependence; Poisson Ratio; Mathematical Models

20070008105 NASA Glenn Research Center, Cleveland, OH, USA

An Overview of Spray-On Foam Insulation Applications on the Space Shuttle's External Tank: Foam Applications and Foam Shedding Mechanisms

Sullivan, Roy M.; Lerch, Bradley A.; Rogers, Patrick R.; Sparks, Scotty S.; August 14, 2006; 39 pp.; In English; 43rd Annual Technical Meeting of the Society of Engineering Science, 13-16 Aug. 2006, PA, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070008105

The Columbia Accident Investigation Board (CAIB) concluded that the cause of the tragic loss of the Space Shuttle Columbia and its crew was a breach in the thermal protection system on the leading edge of the left wing. The breach was initiated by a piece of insulating foam that separated from the left bipod ramp of the External Tank and struck the wing in the vicinity of the lower half of Reinforced Carbon-Carbon panel No. 8 at 81.9 seconds after launch. The CAIB conclusion has spawned numerous studies to identify the cause of and factors influencing foam shedding and foam debris liberation from the External Tank during ascent. The symposium on the Thermo-mechanics and Fracture of Space Shuttle External Tank Spray-On Foam Insulation is a collection of presentations that discuss the physics and mechanics of the ET SOFI with the objective of improving analytical and numerical methods for predicting foam thermo-mechanical and fracture behavior. This keynote presentation sets the stage for the presentations contained in this symposium by introducing the audience to the various types of SOFI applications on the Shuttle s External Tank and by discussing the various mechanisms that are believed to be the cause of foam shedding during the Shuttle s ascent to space

Author

Accident Investigation; Space Shuttles; Foams; External Tanks; Thermal Protection; Leading Edges; Fracture Mechanics; Insulation

20070008229 NASA Langley Research Center, Hampton, VA, USA

Design, Development, Testing, and Evaluation: Human Factors Engineering

Adelstein, Bernard; Hobbs, Alan; OHara, John; Null, Cynthia; December 2006; 52 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): WU 843515.02.01.07.03.01.04

Report No.(s): NASA/TM-2006-214535; L-19317; NESC-RP-06-108/05-173-E; No Copyright; Avail.: CASI: A04, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070008229

While human-system interaction occurs in all phases of system development and operation, this chapter on Human Factors in the DDT&E for Reliable Spacecraft Systems is restricted to the elements that involve 'direct contact' with spacecraft systems. Such interactions will encompass all phases of human activity during the design, fabrication, testing, operation, and maintenance phases of the spacecraft lifespan. This section will therefore consider practices that would accommodate and promote effective, safe, reliable, and robust human interaction with spacecraft systems. By restricting this chapter to what the team terms 'direct contact' with the spacecraft, 'remote' factors not directly involved in the development and operation of the vehicle, such as management and organizational issues, have been purposely excluded. However, the design of vehicle elements that enable and promote ground control activities such as monitoring, feedback, correction and reversal (override) of on-board human and automation process are considered as per NPR8705.2A, Section 3.3.

Author

Human Factors Engineering; Systems Engineering; Activity (Biology); Ground Based Control; Human Reactions

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SPACECRAFT INSTRUMENTATION AND ASTRIONICS

Includes the design, manufacture, or use of devices for the purpose of measuring, detecting, controlling, computing, recording, or processing data related to the operation of space vehicles or platforms. For related information see also *06 Avionics and Aircraft Instrumentation*; for spaceborne instruments not integral to the vehicle itself see *35 Instrumentation and Photography*; for spaceborne telescopes and other astronomical instruments see *89 Astronomy*.

20070008432 NASA Goddard Space Flight Center, Greenbelt, MD, USA

SpaceWire Architectures: Present and Future

Rakow, Glen Parker; September 25, 2006; 10 pp.; In English; 2006 MAPLD International Conference: SpaceWire 101 Seminar, 25 Sep. 2006, Washington, DC, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070008432

A viewgraph presentation on current and future spacewire architectures is shown. The topics include: 1) Current Spacewire Architectures: Swift Data Flow; 2) Current SpaceWire Architectures : LRO Data Flow; 3) Current Spacewire Architectures: JWST Data Flow; 4) Current SpaceWire Architectures; 5) Traditional Systems; 6) Future Systems; 7) Advantages; and 8) System Engineer Toolkit.
CASI
Architecture (Computers); Systems Engineering; Electric Wire; Aerospace Systems

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SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources. For related information see also *07 Aircraft Propulsion and Power, 28 Propellants and Fuels, 15 Launch Vehicles and Launch Operations*, and *44 Energy Production and Conversion*.

20070006743 NASA Johnson Space Center, Houston, TX, USA
An Assessment of the Role of Solid Rocket Motors in The Generation of Orbital Debris
Mulrooney, Mark; February 2007; 106 pp.; In English; Original contains color and black and white illustrations
Report No.(s): NASA/TP-2007-213738; S-996; Copyright; Avail.: CASI: A06, Hardcopy

Through an intensive collection and assimilation effort of SRM related data and resources, the author offers a resolution to the uncertainties surrounding SRM particulate generation, sufficiently so to enable a first-order incorporation of SRMs as a source term in space debris environment definition. The following five key conclusions are derived: 1) The emission of particles in the size regime of greatest concern from an orbital debris hazard perspective (D \g100 microns), and in significant quantities, occurs only during the Tail-off phase of SRM burn activity. 2) The velocity of these emissions is correspondingly small - between 0 and 100 m/s. 3) The total Tail-off emitted mass is between approximately 0.04 and 0.65% of the initial propellant mass. 4) The majority of Tail-off emissions occur during the 30 second period that begins as the chamber pressure declines below approximately 34.5 kPa (5 psia). 5) The size distribution for the emitted particles ranges from 100 microns \hD\h5cm.
Author
Solid Propellant Rocket Engines; Space Debris; Particulates; Hazards

20070006848 NASA Glenn Research Center, Cleveland, OH, USA
Gas Foil Bearing Technology Advancements for Closed Brayton Cycle Turbines
Howard, Samuel A.; Bruckner, Robert J.; DellaCorte, Christopher; Radil, Kevin C.; January 2007; 20 pp.; In English; Space Technology and Applications International Forum (STAIF-2007), 11-15 Feb. 2007, Albuquerque, NM, USA; Original contains black and white illustrations
Contract(s)/Grant(s): WBS 997180.10.03.01
Report No.(s): NASA/TM-2007-214470; ARL-TR-4036; E-15762; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070006848

Closed Brayton Cycle (CBC) turbine systems are under consideration for future space electric power generation. CBC turbines convert thermal energy from a nuclear reactor, or other heat source, to electrical power using a closed-loop cycle. The operating fluid in the closed-loop is commonly a high pressure inert gas mixture that cannot tolerate contamination. One source of potential contamination in a system such as this is the lubricant used in the turbomachine bearings. Gas Foil Bearings (GFB) represent a bearing technology that eliminates the possibility of contamination by using the working fluid as the lubricant. Thus, foil bearings are well suited to application in space power CBC turbine systems. NASA Glenn Research Center is actively researching GFB technology for use in these CBC power turbines. A power loss model has been developed, and the effects of a very high ambient pressure, start-up torque, and misalignment, have been observed and are reported here.
Author
Brayton Cycle; Foil Bearings; Electric Generators; Gas Bearings; Closed Cycles; Turbines

20070008232 NASA Marshall Space Flight Center, Huntsville, AL, USA
The State of Space Propulsion Research
Sackheim, R. L.; Cole, J. W.; Litchford, R. J.; August 2006; 24 pp.; In English; Original contains black and white illustrations
Report No.(s): NASA/TM-2006-214547; M-1167; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070008232

The current state of space propulsion research is assessed from both a historical perspective, spanning the decades since Apollo, and a forward-looking perspective, as defined by the enabling technologies required for a meaningful and sustainable human and robotic exploration program over the forthcoming decades. Previous research and technology investment approaches are examined and a course of action suggested for obtaining a more balanced portfolio of basic and applied research. The central recommendation is the establishment of a robust national Space Propulsion Research Initiative that would run parallel with systems development and include basic research activities. The basic framework and technical approach for this proposed initiative are defined and a potential implementation approach is recommended.
Author
Space Transportation; Propulsion; Research; Systems Engineering

20070008237 Lockheed Martin Space Operations, Bay Saint Louis, MS, USA, NASA Stennis Space Center, Stennis Space Center, MS, USA
Rocket Engine Plume Diagnostics at Stennis Space Center
Tejwani, Gopal D.; Langford, Lester A.; VanDyke, David B.; McVay, Gregory P.; Thurman, Charles C.; April 14, 2003; 12 pp.; In English; JANNAF 27th Exhaust Plume Technology Subcommittee, 5-9 May 2003, Stennis Space Center, MS, USA; Original contains black and white illustrations
Contract(s)/Grant(s): NAS13-650
Report No.(s): SE-2003-05-00029; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070008237

The Stennis Space Center has been at the forefront of development and application of exhaust plume spectroscopy to rocket engine health monitoring since 1989. Various spectroscopic techniques, such as emission, absorption, FTIR, LIF, and CARS, have been considered for application at the engine test stands. By far the most successful technology h a been exhaust plume emission spectroscopy. In particular, its application to the Space Shuttle Main Engine (SSME) ground test health monitoring has been invaluable in various engine testing and development activities at SSC since 1989. On several occasions, plume diagnostic methods have successfully detected a problem with one or more components of an engine long before any other sensor indicated a problem. More often, they provide corroboration for a failure mode, if any occurred during an engine test. This paper gives a brief overview of our instrumentation and computational systems for rocket engine plume diagnostics at SSC. Some examples of successful application of exhaust plume spectroscopy (emission as well as absorption) to the SSME testing are presented. Our on-going plume diagnostics technology development projects and future requirements are discussed.
Author
Space Shuttle Main Engine; Rocket Engines; Plumes; Emission Spectra; Exhaust Gases; Diagnosis

20070008858 Carlson, Caskey and Olds, P.C., Birmingham, MI, USA
Reduced Radar Cross Section Exhaust Nozzle Assembly
Arbona, J. A.; Allore, J.; Laporte, S.; Harris, M.; 28 Mar 05; 9 pp.; In English
Contract(s)/Grant(s): N000190-02-C-2003
Patent Info.: Filed Filed 28 Mar 05; US-Patent-Appl-SN-11-091-120
Report No.(s): PB2007-101422; No Copyright; Avail.: CASI: A02, Hardcopy

An exhaust nozzle assembly includes a plurality of interfitting flap assemblies that are moveable between a maximum area ratio and a minimum area ratio. Each of the pluralities of flap assemblies includes a slot and a wing. The wing fits within an adjacent slot of an adjacent flap assembly. Each of the flap assemblies includes a divergent element that provides a specific geometric shape forming the trailing edge surfaces. The flap element is attached to the divergent element and extends to a static structure. The flap element and the divergent element combine to form a continuous faceted outer surface of the exhaust nozzle assembly substantially void of gaps throughout the range of motion between the maximum and minimum area ratios.
NTIS
Exhaust Nozzles; Radar Cross Sections; Nozzle Design

23
CHEMISTRY AND MATERIALS (GENERAL)

Includes general research topics related to the composition, properties, structure, and use of chemical compounds and materials as they relate to aircraft, launch vehicles, and spacecraft. For specific topics in chemistry and materials see *categories 25 through 29*. For astrochemistry see category *90 Astrophysics*.

20070006590 Sandia National Labs., Albuquerque, NM USA
Improved InGaN Epitaxy Yield by Precise Temperature Measurement: Yearly Report 1
Creighton, J. R.; Koleske, D. D.; Russell, M. J.; Fischer, A. J.; Aug. 2006; 21 pp.; In English
Report No.(s): DE2006-891367; SAND2006-4359; No Copyright; Avail.: Department of Energy Information Bridge

This Report summarizes the first year progress (October 1, 2004 to September 30, 2005) made under a NETL funded project entitled ''Improved InGaN Epitaxy Yield by Precise Temperature Measurement''. This Project addresses the production of efficient green LEDs, which are currently the least efficient of the primary colors. The Project Goals are to advance IR and UV-violet pyrometry to include real time corrections for surface emissivity on multiwafer MOCVD reactors. Increasing wafer yield would dramatically reduce high brightness LED costs and accelerate the commercial manufacture of inexpensive white light LEDs with very high color quality. This work draws upon and extends our previous research (funded by DOE) that developed emissivity correcting pyrometers (ECP) based on the high-temperature GaN opacity near 400 nm (the ultraviolet-violet range, or UVV), and the sapphire opacity in the mid-IR (MIR) near 7.5 microns.
NTIS
Epitaxy; Gallium Nitrides; Indium; Nitrides

20070006612 Optomec Design Co., Albuquerque, NM, USA
Maskless Direct Write of Copper Using an Annular Aerosol Jet
Renn, M. J.; 27 Sep 04; 29 pp.; In English
Contract(s)/Grant(s): N00014-99-C-0243
Patent Info.: Filed Filed 27 Sep 04; US-Patent-Appl-SN-10-952 107
Report No.(s): PB2007-102761; No Copyright; Avail.: CASI: A03, Hardcopy

Methods and apparatus for the deposition of a source material (10) are disclosed. An atomizer (12) renders a supply of source material (10) into many discrete particles. A force applicator (14) propels the particles in continuous, parallel streams of discrete particles. A collimator (16) controls the direction of flight of the particles in the stream prior to their deposition on a substrate (18). In an alternative embodiment of the invention, the viscosity of the particles may be controlled to enable complex depositions of non-conformal or three-dimensional surfaces. The invention also includes a wide variety of substrate treatments which may occur before, during or after deposition. In yet another embodiment of the invention, a virtual or cascade impactor may be employed to remove selected particles from the deposition stream. Also a method and apparatus for maskless deposition of copper lines on a target, specifically relating to localized solution-based deposition of copper using an annular aerosol jet and subsequent material processing using conventional thermal techniques or laser processing.
NTIS
Aerosols; Copper; Deposition

20070006625 California Univ., Oakland, CA, USA
Tissue Preservation Media
Steinhardt, R. A.; 17 Dec 04; 9 pp.; In English
Contract(s)/Grant(s): NIH-AR44066; NIH-FY-13436
Patent Info.: Filed Filed 17 Dec 04; US-Patent-Appl-SN-11-015 180
Report No.(s): PB2007-102757; No Copyright; Avail.: CASI: A02, Hardcopy

Tissue preservation media comprising a polyoxyethylene/polyoxypropylene copolymer are used to preserve tissues and organs for storage and transplantation. In particular embodiments, the polyoxyethylene/polyoxypr- opylene copolymer is Pluronic F68 or FLOCOR (CRL-5861; purified poloxamer 188), and the medium is Steinhardt medium,polyoxyethylene/ polyoxypropylene copolymer-supplemented Optisol GS or polyoxyethylene/polyoxypropylene copolymer-supplemented ViaSpan.
NTIS
Culture Media; Preserving; Tissues (Biology)

20070006647 SRI International Corp., Menlo Park, CA, USA
Surface Deformation Electroactive Polymer Tranducers
Pelrine, R. E.; Kornbluh, R. D.; Prahlad, H.; 1 Sep 04; 27 pp.; In English
Contract(s)/Grant(s): DARPA-MDA972-02-C-0001
Patent Info.: Filed Filed 1 Sep 04; US-Patent-Appl-SN-10-933 113
Report No.(s): PB2007-102769; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention provides electroactive polymer transducers that produce out-of-plane deflections. The transducers form a set of surface features based on deflection of an electroactive polymer. The set of surface features may include elevated polymer surface features and/or depressed electrode surface features. Actuation of an active area may produce the polymer deflection that creates one or more surface features. A passive layer may operably connect to a polymer. The passive layer may comprise a thicker and softer material to amplify polymer thickness changes and increase surface feature visibility.
NTIS
Deformation; Electroactive Polymers; Transducers; Surface Geometry

20070006673 Southwest Texas State Univ., San Marcos, TX, USA
Support of the Ninth Boron in the Americas Workshop
Feakes, D. A.; January 2006; 101 pp.; In English
Report No.(s): DE2006-888961; No Copyright; Avail.: National Technical Information Service (NTIS)

The Scientific and Technical Information (STI) submitted includes the final report and a collection of abstracts for the Ninth Boron in the Americas Conference which was held May 19-22, 2004, in San Marcos, Texas. The topics covered in the abstracts include: Application in Medicine, Application in Organic Synthesis and Catalysis, Boranes and Carboranes, Materials and Polymers, Metallaboranes and Metallacarboranes, Organoboron Compounds, Synthesis and Catalysis, and Theoretical Studies. Attendees represented researchers from government, industry, and academia.
NTIS
Boron; Conferences

20070006802 Quarles and Brady, LLP, Milwaukee, WI, USA
Ultrasonic Elastrography Providing Axial, Orthogonal, and Shear Strain
Varghese, T.; Techavipoo, U.; Chen, Q.; Zagzebski, J. A.; 23 Feb 04; 9 pp.; In English
Contract(s)/Grant(s): NIH-CA86278
Patent Info.: Filed Filed 23 Feb 04; US-Patent-Appl-SN-10-784 526
Report No.(s): PB2007-102922; No Copyright; Avail.: CASI: A02, Hardcopy

Ultrasonic signals obtained at a range of angles are fit to a material independent model to derive both axial and lateral strain and thus parameters dependent on lateral strain including Poisson's ratio and shear strain.
NTIS
Axial Strain; Shear Properties; Shear Strain; Ultrasonic Tests

20070007486 EA Engineering Science and Technology, Inc., Sparks, MD USA
Site Specific Safety and Health Plan for Fort George G. Meade Base Closure Parcel Site Inspection Study
Edwards,; Apr 1990; 119 pp.; In English
Contract(s)/Grant(s): Proj-10559.05
Report No.(s): AD-A460590; No Copyright; Avail.: CASI: A06, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460590

Personnel involved in field investigations and remediation at sites where hazardous wastes may be present are potentially exposed to a variety of hazards, including: * Inhalation of toxic airborne contaminants. * Skin contact with contaminated soil and water. * Presence of flammable/combustible vapors. * Oxygen%deficient atmospheres. * Heat stress due to protective clothing and environmental conditions. Physical hazards inherent to field operations (e.g., working near heavy equipment or at remote locations). Adequate planning is needed prior to performing work at these sites to minimize the risk of employee injury or illness. Note that certain items included in this site safety and health plan have been deemed necessary over the course of the technical plan development; however, the current budget estimates do not reflect additional costs associated with these items. These additional items include: * Section 3.3.5 states that Unexploded Ordnance (UXO) clearance will be given to a depth of 5 feet prior to drilling, and to 20 ft once drilling operations begin. * A list of areas which must be cleared for UXO prior to the beginning of work operations is presented in Section 3.3.5 of the SSSHP. Any suspect UXO areas added

by a change in the scope of work will have to be added to this list and receive UXO clearance prior to work startup. * If the ecological survey includes surface water/sediment sampling, soil sampling, or electrofishing, then all suspect UXO areas where these operations occur must first be cleared for UXO. * A buffer zone of 100 yards surrounding suspect mustard areas, in which no invasive operations may occur, will be established by the EA SSHS.
DTIC
Combustion; Contamination; Flammability; Hazardous Materials; Health; Inspection; Safety; Soils; Toxicity; Vapors; Waste Disposal; Water

20070007513 EA Engineering Science and Technology, Inc., Sparks, MD USA
Management and Data Management Plan for Remedial Investigation at Fort George G. Meade Landfill and Preliminary Assessment/Site Investigation at the Former Gaithersburg NIKE Control and Launch Areas
Edwards, D; May 1989; 76 pp.; In English
Report No.(s): AD-A460644; No Copyright; Avail.: CASI: A05, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460644

Work assignments under this contract will include a Preliminary Assessment/Site Investigation at the former Gaithersburg NIKE Control and Launch Areas and a Remedial Investigation at the Fort Meade Landfill and other technical actions to establish the basis for development and evaluation of remedial alternatives. The program requires flexibility in organizing a team of technical personnel and technical resources to meet installation-specific needs, concurrent with employing preapproved field procedures, sampling techniques, and analytical methods to accomplish the assigned effort. At any given time during the period of performance, contamination assessments, sampling and analysis, geo- physical or aquifer testing, and preliminary risk assessments may be in various stages of progress. The effective program organization will accommodate these requirements for both flexibility and consistency while maintaining a manageable degree of control over all activities. Figure 1-1 illustrates the proposed organization for accomplishment of this effort. The core of the technical organization is the Project Manager and the assigned Project Team. Additional individuals can be made available if warranted. The Project Manager assigned to the project has current USATHAMA task management experience and will act as a direct line of technical communication to the COR with a secondary, backup line of communication through the Program Manager.
DTIC
Data Management; Hazardous Materials; Landfills; Launching; Management Planning; Organizations; Project Management; Sampling; Telecommunication; Toxicity

20070007521 Arnold Engineering Development Center, Arnold AFS, TN USA
Real-Time Processing of Pressure-Sensitive Paint Images
Ruyten, Wirn; Dec 2006; 95 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F40600-03-4-0001
Report No.(s): AD-A460653; AEDC-TR-06-6; No Copyright; Avail.: CASI: A05, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460653

The Arnold Engineering Development Center is one of the leading aerospace test centers to use pressure-sensitive paint (PSP) technology to measure full-field pressure distributions on the surfaces of test articles in a wind tunnel. This report addresses one of the principal challenges identified prior to the start of this reporting period: automated, on-line processing of the large amounts of image data that are acquired during a typical PSP test. This report shows that this image-processing challenge has been met successfully through innovations with regard to automatic image registration and parallel processing. This report also describes additional studies performed to guide the continued development of improved paints and data acquisition strategies for the application of lifetime-based PSP techniques.
DTIC
Image Processing; Paints; Pressure Distribution; Pressure Sensitive Paints; Real Time Operation

20070007634 Air Force Research Lab., Edwards AFB, CA USA
Plume Expansion and Ionization in a Micro Laser Plasma Thruster (Postprint)
Reilly, Michael P; Miley, George H; Hargus, Jr , William A; Jun 10, 2005; 14 pp.; In English
Contract(s)/Grant(s): Proj-2308
Report No.(s): AD-A460867; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460867

Ion density measurements have been performed on the plasma generated by an ablative diode laser thruster using a

negatively biased flatplate probe. The biased probe data was coupled with measurement of the ablation crater through use of a scanning electron microscope (SEM). The SEM was used to analyze the post-pulse ablation spots to determine the volume of fuel ablated. Themicro-laser plasma thruster (uLPT) discussed here ablates a target material through the back surface by focusing the laser through a transparent substrate in a process typically referred to as Transmissive mode (T-mode) ablation. The target materials investigated were polyvinyl chloride (PVC) and glycidyl azide polymer (GAP), while the substrates used were cellulose acetate and Kapton(R). Peak ion densities for a GAP (target)/acetate (substrate) were found to be 1.6x107cm-3, while for GAP/kapton and PVC/acetate the peak ion densities were 4.5x107cm-3 and7.9x109cm-3 respectively. Although these corresponded to low ionization fractions calculated from the observed mass loss, the results indicate there are ways to improve the ionization fraction and in turn increase the specific impulse.
DTIC
Ion Density (Concentration); Ionization; Laser Plasmas; Plumes; Semiconductor Lasers; Specific Impulse

20070008138 Academy of Sciences of the Georgian SSR, Tbilisi, Georgia
Mechanisms to Detoxify Selected Organic Contaminants in Higher Plants and Microbes, and Their Potential Use in Landscape Management
Kvesitadze, George; Khatisashvili, Gia; Sadunishvili, Tinatin; Oct 2004; 144 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): 62558-04-P-6107
Report No.(s): AD-A460732; No Copyright; Avail.: CASI: A07, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460732

In this report biochemical and physiological processes important for the phytoremediation of organic contaminants are discussed. Literature data on the uptake and potential of plants and microorganisms to detoxify organic contaminants are analyzed. Mechanisms of penetration and translocation of organic contaminants in plant leaves and roots are described. The principal transformation phases of organic contaminants once entered into a plant are: functionalization, conjugation and compartmentation. The following mechanisms to detoxify organic contaminants are discussed and the chemical reactions involved described: excretion, hydroxylation, reduction, hydrolysis, conjugate formation (glycosylation, peptide conjugation). The most important enzymes that participate in these processes, i.e., cytochrome P450-containing monooxygenase, peroxidase, phenoloxidase, nitroreductase, esterase, transferase, are characterized and known mechanisms of their actions discussed. Recently generated, so far unpublished, data on the uptake and transformation of TNT in plants and microorganisms are presented. Several effects on the plant cell ultrastructure are illustrated of organic contaminants with different chemical characteristics, as well as the changes cells undergo during the detoxification process. Two lists are presented of plant and microbial strains potentially utilizable for the remediation of organic contaminants. Further study of plants and microorganisms with a high potential for remediation of organic contaminants is recommended, and the subsequent application of the generated results is suggested.
DTIC
Contaminants; Land Use; Microorganisms; Organic Compounds; Terrain; Topography

20070008243 NASA Glenn Research Center, Cleveland, OH, USA
The Compressive Behavior of Isocyanate-crosslinked Silica Aerogel at High Strain Rates
Luo, H.; Lu, H.; Leventis, N.; Mech Time-Dependent Mater; August 28, 2006, pp. 83-111; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NNC04GB54G; NSF CMS-03-20968; Copyright; Avail.: Other Sources

Aerogels are low-density, highly nano-porous materials. Their engineering applications are limited due to their brittleness and hydrophilicity. Recently, a strong lightweight crosslinked silica aerogel has been developed by encapsulating the skeletal framework of amine-modified silica aerogels with polyureas derived by isocyanate. The mesoporous structure of the underlying silica framework is preserved through conformal polymer coating, and the thermal conductivity remains low. Characterization has been conducted on the thermal, physical properties and the mechanical properties under quasi-static loading conditions. In this paper, we present results on the dynamic compressive behavior of the crosslinked silica aerogel (CSA) using a split Hopkinson pressure bar (SHPB). A new tubing pulse shaper was employed to help reach the dynamic stress equilibrium and constant strain rate. The stress-strain relationship was determined at high strain rates within 114-4386/s. The effects of strain rate, density, specimen thickness and water absorption on the dynamic behavior of the CSA were investigated through a series of dynamic experiments. The Young's moduli (or 0.2% offset compressive yield strengths) at a strain rate approx.350/s were determined as 10.96/2.08, 159.5/6.75, 192.2/7.68, 304.6/11.46, 407.0/20.91 and 640.5/30.47 MPa for CSA with densities 0.205, 0.454, 0.492, 0.551,0.628 and 0.731 g/cu cm, respectively. The deformation and failure behaviors of a

native silica aerogel with density (0.472 g/cu cm), approximately the same as a typical CSA sample were observed with a high speed digital camera. Digital image correlation technique was used to determine the surface strains through a series of images acquired using high speed photography. The relative uniform axial deformation indicated that localized compaction did not occur at a compressive strain level of approx.17%, suggesting most likely failure mechanism at high strain rate to be different from that under quasi-static loading condition. The Poisson s ratio was determined to be 0.162 in nonlinear regime under high strain rates. CSA samples failed generally by splitting, but were much more ductile than native silica aerogels. Author

Aerogels; Stress-Strain Relationships; Strain Rate; Stress Analysis; Thermal Conductivity; Brittleness; Isocyanates; Crosslinking

20070008256 Sandia National Labs., Albuquerque, NM USA

Accelerated Aging of Solid Lubricants for the W76-1 TSL: Effects of Polymer Outgassing

Dugger, M. T.; Huffman, E. M.; Wallace, W. O.; Sep. 2006; 26 pp.; In English

Report No.(s): DE2006-892760; SAND2006-5419; No Copyright; Avail.: National Technical Information Service (NTIS)

The behavior of MoS(sub 2) lubricants intended for the W76-1 TSL was evaluated after 17 and 82 thermal cycles, each lasting seven days and including a low temperature of -35 C and a high temperature of 93 C, in a sealed container containing organic materials. The MoS(sub 2) was applied by tumbling with MoS(sub 2) powder and steel pins (harperized), or by spraying with a resin binder (AS Mix). Surface composition measurements indicated an uptake of carbon and silicon on the lubricant surfaces after aging. Oxidation of the MoS(sub 2) on harperized coupons, where enough MoS(sub 2) was present at the surface to result in significant Mo and S concentrations, was found to be minimal for the thermal cycles in an atmosphere of primarily nitrogen. Bare steel surfaces showed a reduction in friction for exposed coupons compared to control coupons stored in nitrogen, at least for the initial cycles of sliding until the adsorbed contaminants were worn away. Lubricated surfaces showed no more than a ten percent increase in steady-state friction coefficient after exposure. Initial coefficient of friction was up to 250 percent higher than steady-state for AS Mix films on H950 coupons after 82 thermal cycles. However, the friction coefficient exhibited by lubricated coupons was never greater than 0.25, and more often less than 0.15, even after the accelerated aging exposures.

NTIS

Accelerated Life Tests; Aging (Materials); Friction; Lubricants; Outgassing; Solid Lubricants

20070008260 Lawrence Livermore National Lab., Livermore, CA USA

Deformation of Nanocrystalline Materials at Ultrahigh Strain Rates

Wang, Y. M.; Bringa, E. M.; Victoria, M.; Caro, A.; McNaney, J. M.; Apr. 18, 2006; 8 pp.; In English

Report No.(s): DE2006-893573; UCRL-PROC-220628; No Copyright; Avail.: National Technical Information Service (NTIS)

Nanocrystalline materials with grain sizes smaller than 100 nm have attracted extensive research in the past decade. Due to their high strength, these materials are good candidates for high pressure shock loading experiments. In this paper, we investigated the microstructural evolutions of nanocrystalline nickel with grain sizes of 10-50 nm, shock-loaded in a range of pressures (20-70 GPa). A laser-driven isentropic compression process was applied to achieve high shock-pressures in a timescale of nanoseconds and thus the high-strain-rate deformation of nanocrystalline nickel. Postmortem transmission electron microscopy (TEM) examinations reveal that the nanocrystalline structures survive the shock deformation and that dislocation activity is the prevalent deformation mechanism when the grain sizes are larger than 30 nm, without any twinning activity at twice the stress threshold for twin formation in micrometer-sized polycrystals. However, deformation twinning becomes an important deformation mode for 10-20 nm grain-sized samples.

NTIS

Deformation; Grain Size; Strain Rate; Nanocrystals

20070008315 Lawrence Livermore National Lab., Livermore, CA USA

Science and Technology Review.July/August 2006. Understanding Shocked Materials

Radousky, H. B.; Aug. 30, 2006; 24 pp.; In English

Report No.(s): DE2006-893168; No Copyright; Avail.: National Technical Information Service (NTIS)

This month's issue has the following articles: (1) Experiments at the Scale of Simulations--Commentary by Tomas Diaz de la Rubia; (2) A New Realm of Materials Science--Livermore scientists are combining experiment, theory, and simulation to study the response of solids to extreme dynamic stresses at nanometer and subnanosecond scales; (3) Planets and Stars

under the Magnifying Glass--An international collaboration involving Laboratory scientists has discovered a planet made of rock or ice orbiting a dim star outside our solar system; and (4) Keeping an Eye on the Prize--A Livermore-IBM team uses a new code and the world's fastest computer to set a performance record for a science application.
NTIS
Research and Development; Technologies; Materials Science

20070008317 Sandia National Labs., Albuquerque, NM USA
Impact of Polymer Film Thickness and Cavity Size on Polymer Flow during Embossing: Towards Process Design Rules for Nanoimprint Lithography
Rowland, H. D.; King, W. P.; Sun, A. C.; Schunk, P. R.; Aug. 2006; 36 pp.; In English
Report No.(s): DE2006-893154; SAND2006-4864; No Copyright; Avail.: National Technical Information Service (NTIS)

This paper presents continuum simulations of polymer flow during nanoimprint lithography (NIL). The simulations capture the underlying physics of polymer flow from the nanometer to millimeter length scale and examine geometry and thermophysical process quantities affecting cavity filling. Variations in embossing tool geometry and polymer film thickness during viscous flow distinguish different flow driving mechanisms. Three parameters can predict polymer deformation mode: cavity width to polymer thickness ratio, polymer supply ratio, and Capillary number. The ratio of cavity width to initial polymer film thickness determines vertically or laterally dominant deformation. The ratio of indenter width to residual film thickness measures polymer supply beneath the indenter which determines Stokes or squeeze flow. The local geometry ratios can predict a fill time based on laminar flow between plates, Stokes flow, or squeeze flow. Characteristic NIL capillary number based on geometry-dependent fill time distinguishes between capillary or viscous driven flows. The three parameters predict filling modes observed in published studies of NIL deformation over nanometer to millimeter length scales. The work seeks to establish process design rules for NIL and to provide tools for the rational design of NIL master templates, resist polymers, and process parameters.
NTIS
Cavity Flow; Film Thickness; Lithography; Polymers

20070008638 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Branch Detonation of a Pulse Detonation Engine With Flash Vaporized JP-8
Slack, John D; Dec 2006; 99 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461265; AFIT/GAE/ENY/07-D04; No Copyright; Avail.: CASI: A05, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461265

Pulse Detonation Engines (PDE) operating on liquid hydrocarbon fuels are limited to operating frequencies of 35 Hz due to long ignition times from a low energy ignition sources. This study shows ignition time of JP-8 can be nearly eliminated by igniting a thrust tube using a secondary detonation. A counter flow heat exchanger attached to a thrust tube utilized waste heat from the detonation process to heat JP-8 to supercritical conditions. The fuel flash vaporized when injected into the air stream of the engine. A detonation was produced by a spark in a 5 cm diameter, 1.37 m long tube. The detonation was then propagated in a 1.9 cm diameter crossover tube into the head of second thrust tube where a pressure transducer and hydroxyl (OH) sensor measured the combustion event. Branch detonation was performed over a range of equivalence ratios ranging from 1.05 to 1.3. Branch ignited thrust tubes have shown 40% improvement in deflagration to detonation transition (DDT) time and a slight improvement in DDT distance.
DTIC
Deflagration; Detonation; Heat Exchangers; Ignition; JP-8 Jet Fuel; Pressure Sensors; Pulse Detonation Engines; Vaporizing

20070008793 University of Southern California, Los Angeles, CA USA
Preparation, Characterization, and Crystal Structures of the SO3NHF- and SO3NF2-Ions (POSTPRINT)
Haiges, Ralf; Wagner, Ross; Yousufuddin, Muhammed; Etzkorn, Markus; Prakash, G K; Christe, Karl O; Chapman, Robert D; Welker, Mark F; Kreutzberger, Charles B; Mar 16, 2006; 7 pp.; In English
Report No.(s): AD-A461560; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461560

Recently, a new class of high-energy-containing materials, gem-bis(difluoramino)-substituted heterocyclic nitramines, has gained attention as high-energy oxidizers: HNFX and TNFX have been successfully synthesized under strongly acidic conditions from their corresponding ketone derivatives using an excess of difluoramine. HNF2 is an unpredictably shock-sensitive and thermally unstable, gaseous compound which can be generated from different precursors, e.g.,

tetrafluorohydrazine, N,N-difluorourea, N,N-difluorocarbamates, or trityldifluoramine. Out of these precursors, only trityldifluoramine is a stable storable solid. However, it is not useful as a general reagent for the preparation of larger quantities of gem-bis(difluoramines) because its synthesis requires the use of expensive N2F4 which is commercially unavailable and must be prepared from difluoramine, and of equivalent amounts of mercury in an organic solvent. The use of mercury presents environmental problems, and working with N2F4 in an organic solvent can be hazardous. Therefore, it is highly desirable to develop a stable, solid, readily accessible difluoramine source. Obvious candidates for HNF2 sources were difluorosulfamate salts. Although the parent free acid, HOSO2NF2, had been known since 1961 and has been widely used as a difluoroaminating reagent, no reports could be found on the existence of its salts. In this paper, we report the results from two independent studies.
DTIC
Crystal Structure; Ions

20070008804 Air Force Research Lab., Wright-Patterson AFB, OH USA
Silver Diffusion and High-Temperature Lubrication Mechanisms of YSZ-Ag-Mo Based Nanocomposite Coatings (Preprint)
Hu, J J; Muratore, C; Voevodin, A A; May 2006; 43 pp.; In English
Contract(s)/Grant(s): F33615-01-D-5802; Proj-4349
Report No.(s): AD-A461572; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461572

Yttria-stabilized zirconia (YSZ) nanocomposite coatings consisting of silver and molybdenum were produced by a hybrid process of filtered vacuum arc, magnetron sputtering and pulsed laser depositions for tribological investigations at different high temperatures. The microstructure of the coatings was determined by X-ray diffraction and transmission electron microscopy. The friction coefficients were measured using a high-temperature ball-on-disk tribometer at 25 to 700C. The coatings with 24 at.% Ag and 10 at.% Mo contents showed a friction coefficient of 0.4 or less for all temperatures from 25 to 700C. The wear scar surfaces and coating cross sections were studied using scanning electron, transmission electron, scanning transmission electron and focused ion beam microscopes, which provided the information on chemical composition distributions of silver and molybdenum along with microstructure features. The silver diffusion and coalescence on surfaces played an important part in the high-temperature lubrication mechanism of the YSZ-Ag-Mo coatings. Silver was found to be an effective lubricant at temperatures below 500C and its coalescence on the surface isolated molybdenum inside coatings from ambient oxygen. Lubricious oxides of molybdenum were formed and lubricated at temperatures above 500C when the silver was worn off the contact surface. For silver containment inside the coating at high temperatures, a multilayer architecture was build by inserting a TiN diffusion barrier layer in the composite coatings. Microscopic observations showed that this barrier layer prevented silver exit to the coating surface. At the same time, this enabled a subsequent lateral lubricant supply toward a wear scar location where the diffusion barrier layer was worn through and/or for a next thermal cycle. The multilayer coating maint
DTIC
Coatings; Diffusion; High Temperature; Lubrication; Nanocomposites; Silver; Yttria-Stabilized Zirconia

20070008964 Air Force Research Lab., Wright-Patterson AFB, OH USA
Low Loss Striated YBa(2)Cu(3)O(7-d) Coated Conductor with Filamentary Current Sharing
Barnes, Paul N; Sumption, Michael D; Dec 2004; 9 pp.; In English
Contract(s)/Grant(s): Proj-3145
Report No.(s): AD-A461816; AFRL-PR-WP-TP-2006-214; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461816

A simple investigation into the properties of weakly linked filaments in striated YBa(2)Cu(3)O(7-d) (YBCO) coated conductors has been performed. Such weak-link connections may arise in two different contexts within the coated conductors, the one case being the occurrence of unintentional connections. However, it may be desirable to intentionally induce the weak-link connections in order to allow a current sharing between the filaments. This allows the localized degradation of a given filament to be circumvented at a small cost in terms of the added losses and magnetization. This problem has been treated mathematically with a comparison of the superconductor weak linking in contrast to the normal-metal-induced current sharing. The estimates for target values of filament coupling are deduced, and the results in terms of magnetization are then determined. The YBCO samples created, using the pulsed laser deposition, are described that have these properties. The

samples consist of one control and one striated sample. The magnetization response of these samples is then considered in terms of the expressions developed.
DTIC
Coatings; Conductors; Electric Conductors; YBCO Superconductors

20070009073 Air Force Research Lab., Wright-Patterson AFB, OH USA
AC Loss Reduction of YBCO Coated Conductors by Multifilamentary Structure
Amemiya, Naoyuki; Kasai, Satoshi; Yoda, Keiji; Jiang, Zhenan; Levin, George A; Barnes, Paul N; Oberly, Charles E; Apr 2006; 10 pp.; In English
Contract(s)/Grant(s): Proj-3145
Report No.(s): AD-A461815; AFRL-PR-WP-TP-2006-208; No Copyright; Avail.: CASI: A02, Hardcopy

Large cross-sectional aspect ratios of YBCO coated conductors leads to large magnetization loss in AC transverse magnetic field. In this work, the magnetization loss of multifilamentary YBCO coated conductors was studied experimentally. A 100 mm length of striated multifilamentary YBCO coated conductor was prepared with the conductor and filaments 10 mm wide and 0.4 mm wide, respectively. Laser ablation was used to make the sample's striations. Magnetization loss of the striated conductor and reference nonstriated conductor was measured in AC transverse magnetic fields normal to the conductor at various frequencies. Measured loss of the 100 mm striated conductor was \h9% of the measured loss of the nonstriated conductor at f=11.3 Hz and H/Hcc=8.8. Even though the coupling loss component increases the magnetization loss in the striated conductor, the AC loss reduction by striation is still clear at 171.0 Hz. Transverse resistance between filaments estimated by four-probe measurement was 38 for 1 m at 80 K. Estimated coupling length is much longer than the sample length at 171.0 Hz, suggesting that filaments in striated conductors are far from 'completely coupled.'
DTIC
Alternating Current; Coatings; Conductors; Electric Conductors; Losses; YBCO Superconductors

20070009144 Bari Univ., Italy
Assessing the Effects of Soil Humic and Fulvic Acids on Germination and Early Growth of Native and Introduced Grass Varieties
Nicola, Senesi; Dec 6, 2005; 32 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N62558-05-P-0179
Report No.(s): AD-A461993; No Copyright; Avail.: CASI: A03, Hardcopy

Experimental Five humic acid (HA) samples isolated from the two original (collected in the field) Wyoming soils in duplicate, Guernsey North (GN4+5 and GN6) and Guernsey South (GS4+5 and GS6), and one Utah soil, Dugway (D11+12+13+14), and seven HA samples isolated from the same soils but collected in duplicate or triplicate from control (no plants grown) greenhouse pots (GN-A and GN-B, GSA and GS-B, D-A, D-B and D-C), object of this research, were obtained from the USDA-St.Paul group. A solution 0.5 M NaOH was used to extract these HAs from soils. All HA samples were characterized for moisture and ash contents, elemental (C, H, N, S, O) and acidic functional group (total acidity, COOH, phenolic OH) composition, and by Fourier transform infrared (FTIR) spectroscopy, and fluorescence spectroscopy in the emission, excitation and synchronous scan modes. RESEARCH PLANS FOR the REMAINDER of THE CONTRACT PERIOD For the remainder of the contract period (14 months) research plans are the following: (a) Chemical and spectroscopic characterization of the HAs isolated in replicates from greenhouse pot soils where the two grass/four varieties were grown. (b) Germination and early growth experiments of the four grass varieties in combinations by two in the presence of the three soil HAs at two concentrations. (c) Possible follow-up experiments with HA concentrations optimal to promote the growth of the grass varieties of interest. (d) Correlation of the germination and seedling growth data with the chemical and spectroscopic parameters of the HAs examined, in order to possibly find out which HA parameters may influence germination and growth of the four grass varieties examined.
DTIC
Acids; Folic Acid; Germination; Grasses; Soils

20070009324 Utah Univ., Salt Lake City, UT USA
User Guide for Characterizing Particulate Matter. Evaluation of Several Real-Time Methods. Appendix 1
Kelly, K E; Sarofim, Adel F; Lightly, Joann S; Wagner, D A; Armott, W P; Rogers, C F; Zielinska, B; Prather, K A; Oct 1, 2003; 110 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-CP-1106
Report No.(s): AD-A462282; No Copyright; Avail.: CASI: A06, Hardcopy

This study developed and validated innovative techniques for characterizing the amount and composition of PM10, PM2.5, and smaller particles for four major classes of DoD emission sources: aircraft ground support vehicles, rocket motors, aircraft, and sandblasting operations. The techniques include the coupling of dilution samplers with advanced measurement techniques for composition and size that provide detailed analyses sufficient to complete a material balance. The size-classified analyses include measurement made with the cascade impactor and aerosol time-of-flight mass spectrometer (ATOFMS). A photoelectric aerosol sensor (PAS) was being evaluated for use in rapidly evaluating field emissions of particle-bound polycyclic aromatic hydrocarbons (PAH). In addition, a photoacoustic spectrometer was investigated for use in measuring soot particle concentrations. The objective was to calibrate and enhance these instruments for DOD use. To this end, the devices are being demonstrated at DoD facilities, and the methodologies developed will be transferred to personnel responsible for monitoring emissions at DoD facilities.
DTIC
Measuring Instruments; Particulates; Real Time Operation

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COMPOSITE MATERIALS

Includes physical, chemical, and mechanical properties of laminates and other composite materials.

20070006723 Roberts and Mercanti, Princeton, NJ, USA
Left Handed Materials Using Magnetic Composites
Chui, S. T.; Xiao, J. Q.; 27 Feb 03; 18 pp.; In English
Contract(s)/Grant(s): ONR-N-00014-97-1-0300; DAAD-19-01-2-0001
Patent Info.: Filed Filed 27 Feb 03; US-Patent-Appl-SN-10-504 358
Report No.(s): PB2007-102843; No Copyright; Avail.: CASI: A03, Hardcopy

A left-handed composite material which includes a mixture of a ferromagnetic material and a dielectric material. The direction of magnetization of the ferromagnetic material, and its volume fraction are controlled such that the composite material exhibits negative permeability in a frequency region near the ferromagnetic resonance frequency, and low eddy current losses. Furthermore, the handedness of the material may be locally tuned to be alternately converted into a right-handed material or a left-handed material by application of an external magnetic field, electric field, or mechanical stress. Such materials are easy to make and can be easily scaled up for industrial use.
NTIS
Composite Materials; Dielectric Properties; Magnetic Materials; Patent Applications

20070006729 Weingarten, Shurgin, Gagnebin and Lebovici, LLP, Boston, MA, USA
Modular Packaging System
DaSilva, R. A.; Fanucci, J. P.; 10 Jan 05; 29 pp.; In English
Contract(s)/Grant(s): N00014-03-M-0315; DAAE30-03-C-1041
Patent Info.: Filed Filed 10 Jan 05; US-Patent-Appl-SN-11-032 570
Report No.(s): PB2007-102841; No Copyright; Avail.: CASI: A03, Hardcopy

A modular packaging system of containers each having a generally tubular, hollow container body of a fiber-reinforced composite material with cooperative mating interlocking elements extending axially along its length. The interlocking elements allow the containers to be stacked and palletized in a stable manner. An interface between a closure mechanism and the container body provides a good seal and prevents fraying or brooming of the fiber-reinforced composite material at the end face of the body.
NTIS
Packaging; Patent Applications

20070006732 Shapiro and Dupont, LLP, Santa Monica, CA, CA, USA
Directionally Oriented Particle Composites
McKinght, G. P.; 21 Feb 03; 29 pp.; In English
Contract(s)/Grant(s): NSF-CMS-9815208
Patent Info.: Filed Filed 21 Feb 03; US-Patent-Appl-SN-10-504 308
Report No.(s): PB2007-102837; No Copyright; Avail.: CASI: A03, Hardcopy

Magnetostrictive particulate composites with a preferred crystal orientation of the particles and methods for their

manufacture are described. In a representative embodiment, a 25% volume Terfenol-D fraction polymer matrix composite was fabricated in a magnetic field using geometric anisotropy to orient needle shaped particles with long axis (112) orientation along the length of the composite. Results demonstrate that the magnetostriction of a (112) oriented particle composite saturates near 1600 ppm. This is a significant increase when compared to composites without preferential orientation (1200 ppm) and represents the largest reported magnetostriction for a particulate composite material.
NTIS
Magnetostriction; Particulates; Patent Applications

20070006801 Bruckner (John), P.C, Austin, TX, USA
Condensed Phase Conversion and Growth of Nanorods and Other Materials Instead of From Vapor
Geohegan, D. B.; Seals, R. D.; Puretzky, A. A.; Fan, X.; 18 Jan 05; 37 pp.; In English
Contract(s)/Grant(s): DE-AC05-96OR-22464; DE-AC05-84OR-21400
Patent Info.: Filed Filed 18 Jan 05; US-Patent-Appl-SN-11-037 725
Report No.(s): PB2007-102908; No Copyright; Avail.: CASI: A03, Hardcopy

Compositions, systems and methods are described for condensed phase conversion and growth of nanorods and other materials. A method includes providing a condensed phase matrix material; and activating the condensed phase matrix material to produce a plurality of nanorods by condensed phase conversion and growth from the condensed phase matrix material instead of from vapor. The compositions are very strong. The compositions and methods provide advantages because they allow (1) formation rates of nanostructures necessary for reasonable production rates, and (2) the near net shaped production of component structures.
NTIS
Composite Materials; Nanorods; Nanostructures (Devices); Vapor Phases; Vapors

20070007555 Defence Science and Technology Organisation, Victoria, Australia
Design Methodology for Scarf Repairs to Composite Structures
Wang, C H; Gunnion, A; Aug 2006; 41 pp.; In English
Report No.(s): AD-A460738; DSTO-RR-0317; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460738

Scarf repairs are the preferred method of repairing thick composite structures, especially when externally bonded patches can no longer meet the stiffness, strength, and flushness requirements. Present designs of scarf repairs are based on two-dimensional analyses of scarf joints, assuming a uniform stress distribution along the scarf. This report presents an improve design methodology for designing scarf repairs to composite laminates. With the aid of elastic-plastic analyses, a critical assessment of the current design methods has been carried out, with major emphasis being placed on the stress/ strain concentration along the bondline. It is proposed to replace the shear stress criterion with the maximum strain criterion. Comparison with experimental results confirmed that the new approach provides an improved first-order prediction of repair efficiency of scarf repairs.
DTIC
Composite Materials; Composite Structures; Scarf Joints; Stress-Strain Relationships

20070007591 Defence Science and Technology Organisation, Victoria, Australia
Literature Review: Materials with Negative Poisson's Ratios and Potential Applications to Aerospace and Defence
Liu, Q; Aug 2006; 47 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460791; DSTO-GD-0472; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460791

An auxetic material exhibits exceptional features, which are different from a conventional material. That is, the auxetic material gets fatter when it is stretched, or becomes smaller when it is compressed, because it has a negative Poisson's ratio. This report briefly reviews the latest advances in research work in auxetic materials, structural mechanisms, properties and application, particularly in aerospace and defense.
DTIC
Composite Materials; Mechanical Properties; Poisson Ratio; Surveys

20070007705 Delaware State Coll., Dover, DE USA
Left Handed Materials Based on Magnetic Nanocomposites
Xiao, John Q; Oct 18, 2006; 11 pp.; In English
Contract(s)/Grant(s): F49620-03-1-0351; Proj-2305
Report No.(s): AD-A461023; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461023

A new measurement technique has been proposed to determine the sign of the index of refraction in thin film samples. We have observed signature of negative index in NiFe-SiO2 magnetic granular materials and in NiFe/SiO2 multilayers. However, the signal is weak due to thin sample and is very much sample dependent, we could not consistently confirm the properties. We have theoretically established selection criteria for magnetic materials and their structures to achieve LHMs or NIMs. We have theoretically proposed several new structures that show negative index of refraction (NIMs). These structures include: 1) Double negative materials (DNMs) for LHMs: E/M multilayers consisting of alternating negative e and negative u layers. 2) Single negative materials (SNMs) for NIMs: Ferrite/(Semiconductor or Oxides) multilayer with negative u. We have developed a theory that unifies DNMs and SNMs as a function of two fundamental material parameters: quality factors for permittivity (Qe=e'/e') and permeability (Qu=u'u').
DTIC
Composite Materials; Ferrites; Magnetic Materials; Nanocomposites; Oxides; Refractivity

20070008199 NASA Glenn Research Center, Cleveland, OH, USA
Advanced Ceramics for NASA's Current and Future Needs
Jaskowiak, Martha H.; 2006; 24 pp.; In English; Advanced Ceramics for NASA's Current and Future Needs, 28 Sep. 2006, Technargilla, Rimini,, Italy; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 599489.02.07.03.06; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070008199

Ceramic composites and monolithics are widely recognized by NASA as enabling materials for a variety of aerospace applications. Compared to traditional materials, ceramic materials offer higher specific strength which can enable lighter weight vehicle and engine concepts, increased payloads, and increased operational margins. Additionally, the higher temperature capabilities of these materials allows for increased operating temperatures within the engine and on the vehicle surfaces which can lead to improved engine efficiency and vehicle performance. To meet the requirements of the next generation of both rocket and air-breathing engines, NASA is actively pursuing the development and maturation of a variety of ceramic materials. Anticipated applications for carbide, nitride and oxide-based ceramics will be presented. The current status of these materials and needs for future goals will be outlined. NASA also understands the importance of teaming with other government agencies and industry to optimize these materials and advance them to the level of maturation needed for eventual vehicle and engine demonstrations. A number of successful partnering efforts with NASA and industry will be highlighted.
Author
Aerospace Engineering; Ceramic Matrix Composites; Technology Utilization; Air Breathing Engines; NASA Space Programs

20070008204 NASA Glenn Research Center, Cleveland, OH, USA
Detecting Thermal Barrier Coating Delamination Using Visible and Near-Infrared Luminescence from Erbium-Doped Sublayers
Eldridge, J. I.; Bencic, T. J.; Martin, R. E.; Singh, J.; Wolfe, D. E.; [2007]; 17 pp.; In English; 31st International Cocoa Beach Conference and Exposition on Advanced Ceramics and Composites, 21-26 Jan. 2007, Daytona Beach, FL, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 5615810208.03.04.03; Copyright; Avail.: CASI: A03, Hardcopy

Nondestructive diagnostic tools are needed to monitor early stages of delamination progression in thermal barrier coatings (TBCs) because the risk of delamination induced coating failure will compromise engine performance and safety. Previous work has demonstrated that for TBCs composed of yttria-stabilized zirconia (YSZ), luminescence from a buried europium-doped sublayer can be utilized to identify the location of TBC delamination from the substantially higher luminescence intensity observed from the delaminated regions of the TBC. Luminescence measurements from buried europium-doped layers depend on sufficient transmittance of the 532 nm excitation and 606 nm emission wavelengths through the attenuating undoped YSZ overlayer to produce easily detected luminescence. In the present work, improved delamination indication is demonstrated using erbium-doped YSZ sublayers. For visible-wavelength luminescence, the erbium-doped sublayer offers the advantage of a very strong excitation peak at 517 nm that can be conveniently excited a 514 nm Ar ion

laser. More importantly, the erbium-doped sublayer also produces near-infrared luminescence at 1550 nm that is effectively excited by a 980 nm laser diode. Both the 980 nm excitation and the 1550 nm emission are transmitted through the TBC with much less attenuation than visible wavelengths and therefore show great promise for delamination monitoring through thicker or more highly scattering TBCs. The application of this approach for both electron beam physical vapor deposited (EB-PVD) and plasma-sprayed TBCs is discussed.
Author
Delaminating; Detection; Doped Crystals; Erbium; Luminescence; Substrates; Thermal Control Coatings

20070008436 NASA White Sands Test Facility, NM, USA
Experimental Investigation of the Shuttle Transportation System Composite Overwrapped Pressure Vessels for Stress Rupture Life
Greene, Nathanael; Saulsberry, Regor; Yoder, Tommy; Forsyth, Brad; Carillo, Marlene; Thesken, John; [2006]; 13 pp.; In English; American Society for Composites 20th Technical Conference, 17-19 Sep. 2006, Dearborn, MI, USA; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

A viewgraph presentation describing stress rupture testing on Composite Overwrapped Pressure Vessels (COPV) is shown. The topics include: 1) Purpose for Testing; 2) NASA WSTF COPV Test Program; 3) NASA WSTF Test Facilities; 4) COPV Impact Study; 5) Fluids Compatibility Testing; 6) Stress Rupture Testing; and 7) COPV Lifting.
CASI
Composite Wrapping; Pressure Vessels; Space Transportation System; Space Shuttles; Creep Rupture Strength; Life (Durability)

20070008620 Air Force Research Lab., Wright-Patterson AFB, OH USA
Textured Copper Metallic Substrates for 2nd Generation High Temperature Superconductor Applications
Yust, Nicholas; Nekkanti, Rama; Brunke, Lyle; Barnes, Paul; Jan 2003; 5 pp.; In English
Contract(s)/Grant(s): Proj-3145
Report No.(s): AD-A461234; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461234

Sharp cube textured Cu (100) tapes have been produced as a possible substrate for epitaxially grown conductive, intermediate metallic or ceramic buffer layers with subsequent deposition of high critical current density YBa2Cu307-x (YBCO) films. Cu substrates were fabricated from rods and foils by smooth cold rolling followed by recrystallization. Detailed x-ray diffraction (XRD) studies along with orientation imaging microscopy were performed to measure the inplane alignment, out-of-plane alignment and microtexture for different annealing temperatures. The best full width half-maximum (FWHM) values of 5.4 deg for in-plane alignment and 5.8 deg for out-of-plane alignment were obtained at 750 deg C annealing temperature. Microtexture results indicate more than 97.5% of grains have less than 10 deg misorientation.
DTIC
Copper; High Temperature Superconductors; Substrates

20070008658 Dayton Univ. Research Inst., OH USA
Composites Containing Barrier Layers for Reduced Permeability at Cryogenic Temperatures
Bechel, Vernon T; Donaldson, Steven L; Kim, Ran Y; Mar 2006; 13 pp.; In English
Contract(s)/Grant(s): FA8650-05-D-5052; Proj-4347
Report No.(s): AD-A461295; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461295

To help prevent leakage that may occur if cracks develop in a cryogenic composite pressure vessel due to thermo-mechanical fatigue, liners are occasionally implemented. However, liners can be difficult to fabricate and maintain, and mismatch of their CTE with the underlying composite can promote debonding of the liner. In this effort, two approaches to incorporating a barrier layer directly into a carbon/bismaleimide PMC (IM7/5250-4) were investigated for their effectiveness in preventing the development of through-thickness crack networks that can lead to leakage. In the first concept, a 'thin ply' of T800 carbon fiber/5250-4 bismaleimide composite much thinner than a standard 0.13 mm thick ply was placed adjacent to the surface plies or mid-plane ply group where cracks initiated first. This arrangement was chosen to help prevent crack growth beyond these early-cracking plies. Overall the thin plies were successful both in limiting 'stitch crack' propagation into the neighboring plies and in limiting the overall interior ply damage. In the second concept, an even thinner layer (\h0.25 mm thick) of electro-spun PAN fibers infused with 5250-4 was again placed next to the surface plies. The electro-spun fiber layer

did not prevent crack growth from the surface plies into the neighboring plies but did significantly limit the interior ply damage that formed.
DTIC
Barrier Layers; Composite Materials; Cryogenic Temperature; Cryogenics; Permeability; Pressure Vessels; Protective Coatings

20070009174 Air Force Research Lab., Wright-Patterson AFB, OH USA
Microstructural Characterization and Modeling of Discontinuously-Reinforced Aluminum Composites (Postprint)
Spowart, Jonathan E; Aug 2006; 15 pp.; In English
Contract(s)/Grant(s): F33615-01-C-5214; FA8650-04-D-5233; Proj-M02R
Report No.(s): AD-A462034; No Copyright; Avail.: CASI: A03, Hardcopy

Models for predicting the constitutive behavior of spatially-heterogeneous microstructures such as discontinuously-reinforced aluminum (DRA) and other metallic matrix composites based on unit cell approaches generally do not incorporate higher-order microstructural features such as degree of homogeneity and spatial anisotropy of the reinforcement phase. Moreover, more complex numerical models rarely encompass the volumes of material necessary to ensure statistical relevance. The present contribution offers an alternative approach for quantifying and then incorporating the microstructural homogeneity of these materials within an elastic-plastic finite element code. An attempt is made to model both the micromechanical length scale associated with the individual reinforcement particles and the microstructural length scale associated with their spatial distribution, at a greatly-reduced computational expense, by using a volume-averaged, discretized approach.
DTIC
Aluminum Alloys; Composite Materials; Finite Element Method; Metal Matrix Composites; Microstructure

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INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY

Includes the analysis, synthesis, and use of inorganic and organic compounds; combustion theory; electrochemistry; and photochemistry. For related information see category *34 Fluid Dynamics and Thermodynamics*. For astrochemistry see category *90\fAstrophysics*.

20070006629 DeWitt Ross and Stevens, S.C., Madison, WI, USA
Methods and Apparata for Precisely Dispensing Microvolumes of Fluids
Larson, B. J.; Lee, C. H.; Lal, A.; Lagally, M. G.; 22 Feb 05; 10 pp.; In English
Contract(s)/Grant(s): NSF-9725021
Patent Info.: Filed Filed 22 Feb 05; US-Patent-Appl-SN-11-064 226
Report No.(s): PB2007-102754; No Copyright; Avail.: CASI: A02, Hardcopy

Devices and methods for depositing fluids on substrates in patterns of spots, lines, or other features use a nozzle, which is preferably configured similarly to a micropipette, having a piezoelectric crystal or other ultrasonic actuator coupled to one of its sides. The nozzle may be charged via capillary action by dipping it into a well containing the fluid to be deposited, and may then be positioned over a desired area of a substrate, at which point activation of the ultrasonic actuator at ultrasonic frequencies will eject the fluid onto the substrate. The needle may subsequently be dipped into a well of rinsing fluid for cleaning. Spots or lines on the order of 5 micrometers width may be generated, making the invention particularly suitable for use in biological applications such as microarray production and in microelectronics applications such as the printing of organic circuitry.
NTIS
Dispensers; Substrates; Fluids

20070006634 National Inst. of Standards and Technology, Gaithersburg, MD USA
Progress in the Development of a Combustion Kinetics Database for Liquid Fuels
Tsang, W.; January 2005; 6 pp.; In English
Report No.(s): PB2007-105053; No Copyright; Avail.: CASI: A02, Hardcopy

We describe our progress in the development of chemical kinetics databases for liquid fuels. The intention is to create kinetics databases that can be used to simulate all aspects of combustion across a wide range of equivalence ratios. This paper will include some brief comments on existing databases, a summary of current work and a discussion of future directions.

Liquid fuels are complex mixtures containing hundreds of compounds. There are however a limited number of classes. There is general agreement that surrogate mixtures, with a limited number of compounds, can reproduce much of the combustion behavior of real fuels. The largest component in liquid hydrocarbon fuels are the linear alkanes and we have concentrated our work on this type of compound. The discussion will cover work on the development of a database for the cracking of heptane to form the small olefins and dienes that can be used as inputs to PAH/soot models. Primary emphasis has been on the unimolecular reactions that break the larger organic radicals to smaller components used in soot models. Rate constants on the isomerization and breakdown of all alkyl radicals from C4 to C7 and 1-olefinyl radicals from C4 to C6 have been determined. Recent work has dealt with the chemically activated decomposition of alkyl radicals from H addition to the olefins. These are competitive with the products from hydrogen abstract and will favor olefin as opposed to diolefin yields. The discrepancy between low and high temperature results on isomerization of alkyl radical has been assigned to tunneling effects. Work on the elementary reactions for butylbenzene decomposition was completed. Problems and extensions of this work to more general situation will be discussed.
NTIS
Combustion Physics; Data Bases; Liquid Fuels; Progress; Reaction Kinetics

20070006643 Palmer and Dodge, LLP, Boston, MA, USA
Crystal Structure of the 30s RIBOSOM and Its Use
Ramakrishnan, V.; Brodersen, D. E.; Wimberly, B. T.; Carter, A. P.; 17 Sep 01; 28 pp.; In English
Contract(s)/Grant(s): NIH-GM-44973
Patent Info.: Filed Filed 17 Sep 01; US-Patent-Appl-SN-09-953 807
Report No.(s): PB2007-102746; No Copyright; Avail.: CASI: A03, Hardcopy
The invention provides an X-ray crystal structure of the 30S ribosome, obtained from Thermus thermophilus 30S subunit, having a tetragonal space group P4(sub 12)(sub 12) with unit cell dimensions of a=401.4.+-.4.0 (ANG), b=401.4.+-.4.0 (ANG), c=175.9.+-.5.0 (ANG). An advantageous feature of the structure is that it diffracts beyond 3 (ANG) resolution. The invention also provides a crystal of 30S having the three dimensional atomic coordinates of the 30S ribosome, the coordinates being provided in this document. The data may be used for the rational design and modelling of inhibitors for the 30S ribosome, which have potential use as antibiotics.
NTIS
Crystal Structure; Ribosomes

20070006670 Rothwell, Figg, Ernst and Manbeck, P.C., Washington, DC, USA
Fluorescent Probes for Saccharrides
Lakowicz, J. R.; 10 Mar 05; 50 pp.; In English
Patent Info.: Filed Filed 10 Mar 05; US-Patent-Appl-SN-11-075 817
Report No.(s): PB2007-102772; No Copyright; Avail.: CASI: A03, Hardcopy
This invention relates generally the field of fluorescent probes. More specifically, the invention relates to electron-donor and electron acceptor pairs that posses a boronic acid group or boronic, arsenious, germanic and telluric acid derivatives and methods of use of such compounds as sensors for detecting the presence of sugars.
NTIS
Fluorescence; Patent Applications; Sugars; Probes

20070006728 Westinghouse Savannah River Co., Aiken, SC, USA, Savannah River National Lab., Aiken, SC, USA
Uranium and Plutonium Loading onto Monosodium Titanate (MST) in Tank 50H
Hobbs, D. T.; Aug. 2006; 8 pp.; In English
Report No.(s): DE2006-891662; WSRC-STI-2006-00003; No Copyright; Avail.: Department of Energy Information Bridge
A possible disposition pathway for the residue from the abandoned In-Tank Precipitation (ITP) sends the material from Tank 48H in increments to Saltstone via aggregation in Tank 50H. After entering Tank 50H, the amount of fissile material sorbed on MST may increase as a result of contacting waste solutions with dissolved uranium and plutonium. SRNL recommends that nuclear criticality safety evaluations use uranium and plutonium loadings onto MST of 14.0 (+-) 1.04 weight percent (wt %) for uranium and 2.79 (+-) 0.197 wt % for plutonium given the assumed streams defined in this report. These values derive from recently measured for conditions relevant to the Actinide Removal Process (ARP) and serve as

conservative upper bounds for uranium and plutonium loadings during the proposed transfers of MST from Tank 48H into Tank 50H.
NTIS
Actinide Series; Plutonium; Titanates; Uranium

20070006794 Lawrence Livermore National Lab., Livermore, CA USA
Integrated Crystal Mounting and Alignment System for High-Throughput Biological Crystallography
Nordmeyer, R. A.; Snell, G. P.; Cornell, E. W.; Kolbe, W.; Earnest, T. N.; 22 Feb 05; 29 pp.; In English
Contract(s)/Grant(s): DE-AC-03-76SF-00098
Patent Info.: Filed Filed 22 Feb 05; US-Patent-Appl-SN-11-064 357
Report No.(s): PB2007-102851; No Copyright; Avail.: CASI: A03, Hardcopy

A method and apparatus for the transportation, remote and unattended mounting, and visual alignment and monitoring of protein crystals for synchrotron generated x-ray diffraction analysis. The protein samples are maintained at liquid nitrogen temperatures at all times: during shipment, before mounting, mounting, alignment, data acquisition and following removal. The samples must additionally be stably aligned to within a few microns at a point in space. The ability to accurately perform these tasks remotely and automatically leads to a significant increase in sample throughput and reliability for high-volume protein characterization efforts. Since the protein samples are placed in a shipping-compatible layered stack of sample cassettes each holding many samples, a large number of samples can be shipped in a single cryogenic shipping container.
NTIS
Alignment; Crystallography; Crystals; Mounting; X Ray Diffraction

20070007271 Speciality Materialls, Inc., Lowell, MA, USA
Fabrication of Chemically Doped, High Upper Critical Field Magnesium Diboride Superconducting Wires
Marzik, J. V.; Oct. 2005; 53 pp.; In English
Report No.(s): DE2006-850578; No Copyright; Avail.: National Technical Information Service (NTIS)

Controlled chemical doping of magnesium diboride (MgB2) has been shown to substantially improve its superconducting properties to the levels required for high field magnets, but the doping is difficult to accomplish through the usual route of solid state reaction and diffusion. Further, superconducting cables of MgB2 are difficult to fabricate because of the friable nature of the material. In this Phase I STTR project, doped and undoped boron fibers were made by chemical vapor deposition (CVD). Several \g100m long batches of doped and undoped fiber were made by CVD codeposition of boron plus dopants. Bundles of these fibers infiltrated with liquid magnesium and subsequently converted to MgB2 to form Mg-MgB2 metal matrix composites. In a parallel path, doped boron nano-sized powder was produced by a plasma synthesis technique, reacted with magnesium to produce doped MgB2 superconducting ceramic bodies. The doped powder was also fabricated into superconducting wires several meters long. The doped boron fibers and powders made in this program were fabricated into fiber-metal composites and powder-metal composites by a liquid metal infiltration technique. The kinetics of the reaction between boron fiber and magnesium metal was investigated in fiber-metal composites. It was found that the presence of dopants had significantly slowed the reaction between magnesium and boron. The superconducting properties were measured for MgB2 fibers and MgB2 powders made by liquid metal infiltration. Properties of MgB2 products (Jc, Hc2) from Phase I are among the highest reported to date for MgB2 bulk superconductors. Chemically doped MgB2 superconducting magnets can perform at least as well as NbTi and NbSn3 in high magnetic fields and still offer an improvement over the latter two in terms of operating temperature. These characteristics make doped MgB2 an effective material for high magnetic field applications, such as magnetic confined fusion, and medical MRI devices. Developing fusion as an energy source will dramatically reduce energy costs, global warming, and radioactive waste. Cheaper and more efficient medical MRI devices could lower examination costs, find potential health problems earlier, and thus also benefit society as a whole. Other potential commercial applications for this material are devices for the generation and storage of electrical power, thus lowering the cost of delivered electricity.
NTIS
Additives; Borides; Doped Crystals; Fabrication; Magnesium; Superconductivity; Superconductors (Materials); Wire

20070007441 Semiconductor Solutions, LLC, Midland, MI USA

Q4 Known Goods Substrates Technical Report

Loboda, Mark; Carlson, Eric; Chung, Gilyong; Russell, Brian; Dec 2, 2006; 10 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-05-C-0324

Report No.(s): AD-A460496; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460496

The Known Good Substrates (KGS) program is on track technically and financially with program tasks. Q4 wafer fabrication will be completed on time, Q4 metrology and characterization was completed, and Q3 wafers were distributed to partners early in Q4. Many subcontractors are ramping down activities as their work nears completion. A full program review meeting was held in December 2006.

DTIC

Silicon Carbides; Substrates; Wafers

20070007539 Army Tank-Automotive Research and Development Command, Warren, MI USA

Thermal Runaway

Catherino, Henry A; Feb 21, 2005; 24 pp.; In English

Report No.(s): AD-A460694; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460694

During battery discharge, the heat generated is the sum of the Joule (resistive) and enthalpic (chemical) heating effects. Conversely, during battery charging, the heat generated is the Joule minus the enthalpic heating. If the conditions are carefully selected, one can observe a net battery cooling during charging. However, an interesting phenomenon takes place during overcharge. Those cells designed as sealed recombinant systems develop significant heating. Flooded designs do not exhibit this effect. The applied electric power generates energetic reaction products as a consequence of the electrochemical reactions. This is an energy absorbing process. The gasses are then vented into the environment. Since the sealed cells undergo a closed recombination cycle, i.e., no material is exchanged with the environment, the rate of heat generated is proportional to the power input to the cell. Essentially, the cell is behaving in the manner of a resistor. In this connection, the thermal runaway phenomenon that has been often observed in starved electrolyte cell designs raises a potential problem in battery applications. It is not efficient to design around the worst case scenario, i.e., anticipating the thermal runaway effect. It is wiser to detect its onset and shut down the charging process. An alternative approach is to develop an understanding of the Thermal Runaway process and, perhaps, develop a method for eliminating or effectively controlling it. A study was performed in attempt to model the thermal runaway effect. In short, the effect appears to be related to the electrolyte distribution in the separator. This suggests that modification of the AGM separator properties could provide a means for better controlling the thermal runaway failure mode.

DTIC

Chemical Reactions; Electrochemistry

20070007540 Pennsylvania State Univ., University Park, PA USA

Advanced Fuel Development and Fuel Combustion Delivery Order 0007: Abatement of Soot from Military Gas Turbine Engines via Fuel Additives

Litzinger, Thomas A; Aug 2006; 87 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F33615-98-D-2801-0007; Proj-3048

Report No.(s): AD-A460695; No Copyright; Avail.: CASI: A05, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460695

The technical objective of this program was to develop fundamental understanding of the complex interactions of additives with the processes that lead to PM emissions from military gas turbine engines and to use that fundamental understanding to select and investigate the most promising additives for reducing PM emissions. Because of the inherent complexity of the combustion processes within gas turbine combustors and great difficulty in making measurements inside combustors, it was not possible to achieve the technical objective of this program by making measurements in gas turbine combustors. Furthermore, due to the complexity of the combustion process in a gas turbine combustor, no single laboratory flame or reactor will suffice as a model for a combustor. Therefore, multiple laboratory devices were applied to study the effects of additives on soot formation processes. These devices included a shock tube, a well-stirred reactor, premixed flames, diffusion flames, a spray flame, and a high pressure turbulent reactor. Experiments were performed at Penn State in four of

these devices: a premixed flame, a co-flow diffusion flame, a spray flame and the high pressure turbulent reactor.
DTIC
Additives; Combustion; Combustion Chambers; Emission; Fuel Combustion; Gas Turbine Engines; Gas Turbines; Soot

20070007571 Science Applications International Corp., Abingdon, MD USA
Characterization and Neutralization of Recovered Lewisite Munitions
Morrissey, Kevin M; Cheicante, Richard L; Creasy, William R; Fouse, Janet C; Hulet, Melissa S; Ruth, Jill L; Schenning, Amanda M; Forrest, Lucille P; Weiss, Mary P; Durst, H D; O'Connor, Richard J; Berg, Frederic J; McMahon, Leslie R; Dec 2006; 130 pp.; In English
Contract(s)/Grant(s): DAAD13-03-D-0017
Report No.(s): AD-A460761; No Copyright; Avail.: CASI: A07, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460761

This report summarizes efforts to characterize the lewisite contained in recovered munitions and validate a neutralization chemistry for lewisite fill materiel. The selected neutralization reagent, aqueous 20 wt% sodium permanganate, was found to be effective in destroying the lewisite. In lab-scale and full-scale Explosive Destruction System testing, the aqueous permanganate consistently produced terminal neutralents that had residual lewisite levels well below the treatment goal of 50 mg/L (ppm). The reaction products included inorganic pentavalent arsenate and various pentavalent organo-arsenicals. Solid manganese dioxide was also produced during the reaction and was successfully managed in the full-scale Explosive Destruction System testing.
DTIC
Ammunition; Decontamination; Destruction; Emergencies

20070007593 State Univ. of New York, Binghamton, NY USA
Design, Packaging and Reliability of MEMS S&A Components and Systems
Park, S B; Sammakia, Baghat; Pitarresi, James; Dec 26, 2006; 133 pp.; In English
Contract(s)/Grant(s): N00014-05-0688
Report No.(s): AD-A460794; No Copyright; Avail.: CASI: A07, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460794

Technology refinements to the packaging process, as well as assuring the highest possible yield of serviceable F/S&A systems, are specifically addressed. The primary objective of this research project is to provide a basic physics based understanding of the behavior and performance of Safe and Arm (S & A) systems. The research covers a broad range of activities ranging from basic materials characterization to overall system level models. The research is conducted as a collaborative effort between Binghamton University, (BU), the Bennington Micro technology Center (BMC), and the Indian Head Division of the Naval Surface Warfare (IHDIV). BU focused on applied research related to the materials properties, the mechanical and thermal behavior of the system and the overall system performance and reliability under field conditions. BMC focused on process and manufacturing issues and help with the implementation of design changes and the exploration of additional applications.
DTIC
Indium; Microelectromechanical Systems; Packaging; Reliability

20070007595 Auburn Univ., AL USA
Contact Metallization and Packaging Technology Development for SiC Bipolar Junction Transistors, PiN Diodes, and Schottky Diodes Designed for Long-Term Operations at 350degreeC
Williams, J R; Johnson, R W; Mohney, S E; Ryu, S -H; May 2006; 111 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F33615-01-C-2188; Proj-3145
Report No.(s): AD-A460796; No Copyright; Avail.: CASI: A06, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460796

This report describes the development of composite ohmic contact and packaging technologies for the wideband gap semiconductor silicon carbide (SiC) with demonstrations of these technologies using 4H-SiC JFETs (junction field effect transistors). The goal of this effort is protection against oxidation / inter-diffusion and stable operation in air at 350 degrees C for up to 10,000 hr. Ta-Si and Ru-Ta barrier layers have been developed and tested for composite contacts that consist of the ohmic contact layer (e.g., Ni2Si), the barrier layer, an adhesion layer such as Pt and a gold cap layer that is suitable for wire bonding. Reliability and failure analysis studies have been conducted for chip metallizations for die attachment and for

large area wire bonding to substrate metals, die metals and die metals over SiO2. 1800V/5A 4H-SiC JEFETs have been designed and fabricated using the Ta-Si and Ru-Ta barrier layers in the composite ohmic contacts. The devices were characterized at 300 ?C and used in the design of a 2W, 270-28V dc-dc converter. With Vgate = -33V, the JFETs were able to block 600V with J \h 32microamps/sq cm at 300 degrees C.
DTIC
Bipolar Transistors; Field Effect Transistors; Junction Diodes; Junction Transistors; Metallizing; Packaging; P-I-N Junctions; Schottky Diodes; Silicon Carbides

20070007616 Dayton Univ. Research Inst., OH USA
Non-Chromated Coating Systems for Corrosion Protection of Aircraft Aluminum Alloys (Preprint)
Voevodin, N; Buhrmaster, D; Balbyshev, V; Khramov, A; Johnson, J; Mantz, R; Apr 2006; 14 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8650-05-D-5050; Proj-4347
Report No.(s): AD-A460825; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460825

The Air Force requires the development of an environmentally compliant chromate-free aircraft coating system that meets or exceeds current corrosion protection capabilities. A number of non-chromated pretreatments and primers have been independently developed over the past years. This report compares the corrosion resistance performance of selected fully non-chromate systems to the standard chromate containing coating system. The data identified two non-chromated systems that performed comparably to the standard chromated aircraft coating system.
DTIC
Aluminum Alloys; Chromates; Coating; Corrosion Prevention; Corrosion Resistance

20070007653 Army Environmental Center, Aberdeen Proving Ground, MD USA
Shallow Water UXO Technology Demonstration Site Scoring Record No. 3
Rowe, Gary; Jan 2007; 53 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-8-CO-160-UXO-016
Report No.(s): AD-A460902; ATC-9297; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460902

This report documents the efforts of IT Jewell, Inc. to detect and discriminate inert unexploded ordnance (UXO) using G882 and mm magnetometers. Testing was conducted at ATC, Standardized Shallow Water UXO Technology Demonstration Site. A description of the tested system and an estimate of survey costs along with the analysis of the system performance are provided.
DTIC
Ammunition; Ordnance; Scoring; Shallow Water

20070008249 Lawrence Livermore National Lab., Livermore, CA USA
Long-Term Corrosion Behavior of Alloy 22 in 5 M CaCl(2) AT 120(deg)C
Estill, J. C.; Hust, G. A.; Evans, K. J.; Stuart, M. L.; January 2006; 9 pp.; In English
Report No.(s): DE2006-893375; No Copyright; Avail.: Department of Energy Information Bridge

In conditions where tight crevices exist in hot chloride containing solutions Alloy 22 may suffer crevice corrosion. The occurrence (or not) of crevice corrosion in a given environment (e.g, salt concentration and temperature), is governed by the values of the critical potential (E(sub crit)) for crevice corrosion and the corrosion potential (E(sub corr)). This paper discusses the evolution of E(sub corr) and corrosion rate (CR) of creviced Alloy 22 specimens in 5 M calcium chloride (CaCl(sub 2)) at 120 C. Tested specimens included non-creviced rods and multiple creviced assemblies (MCA) both non-welded (wrought) and welded. Results show that Alloy 22 suffers crevice corrosion under the open circuit conditions in the aerated hot CaCl(sub 2) brine. However, after more than a year of immersion the propagation of crevice corrosion was not significant. The general corrosion rate decreased or remained unchanged as the immersion time increased. For rods and MCA specimens, the corrosion rate was lower than 100 nm/year after more than a year immersion time.
NTIS
Calcium Chlorides; Corrosion; Corrosion Resistance; Nickel Alloys

20070008283 Iowa State Univ. of Science and Technology, Ames, IA, USA

Comparison of Time-Of-Flight and Multicollector ICP Mass Spectrometers for Measuring Actinides in Small Samples Using Single Shot Laser Ablation

Houk, R. S.; Aeschliman, D. B.; Bajic, S. J.; Baldwin, D.; Nov. 01, 2005; 13 pp.; In English

Report No.(s): DE2006-892796; IS-5162; No Copyright; Avail.: National Technical Information Service (NTIS)

The objective of these experiments is to evaluate the performance of two types of ICP-MS device for measurement of actinide isotopes by laser ablation (LA) ICP-MS. The key advantage of ICP-MS compared to monitoring of radioactive decay is that the element need not decay during the measurement time. Hence ICP-MS is much faster for long-lived radionuclides. The LA process yields a transient signal. When spatially resolved analysis is required for small samples, the laser ablation sample pulse lasts only (approx)10 seconds. It is difficult to measure signals at several isotopes with analyzers that are scanned for such a short sample transient. In this work, a time-of-flight (TOF) ICP-MS device, the GBC Optimass 8000 (Figure 1) is one instrument used. Strictly speaking, ions at different m/z values are not measured simultaneously in TOF. However, they are measured in very rapid sequence with little or no compromise between the number of m/z values monitored and the performance. Ions can be measured throughout the m/z range in single sample transients by TOF. The other ICP-MS instrument used is a magnetic sector multicollector MS, the NU Plasma 1700 (Figure 2). Up to 8 adjacent m/z values can be monitored at one setting of the magnetic field and accelerating voltage. Three of these m/z values can be measured with an electron multiplier. This device is usually used for high precision isotope ratio measurements with the Faraday cup detectors. The electron multipliers have much higher sensitivity. In our experience with the scanning magnetic sector instrument in Ames, these devices have the highest sensitivity and lowest background of any ICP-MS device. The ability to monitor several ions simultaneously, or nearly so, should make these devices valuable for the intended application: measurement of actinide isotopes at low concentrations in very small samples for nonproliferation purposes. The primary sample analyzed was an urban dust pellet reference material, NIST 1648. The ability to provide good detection limits for single laser shots is critical.

NTIS

Ablation; Actinide Series; Laser Ablation; Mass Spectrometers; Time of Flight Spectrometers

20070008332 Iowa State Univ. of Science and Technology, Ames, IA USA

High Resolution Studies of the Origins of Polyatomic Ions in Inductively Coupled Plasam - Mass Spectrometry

Ferguson, J. W.; Aug. 09, 2006; 97 pp.; In English

Report No.(s): DE2006-892732; No Copyright; Avail.: Department of Energy Information Bridge

The inductively coupled plasma (ICP) is an atmospheric pressure ionization source. Traditionally, the plasma is sampled via a sampler cone. A supersonic jet develops behind the sampler, and this region is pumped down to a pressure of approximately one Torr. A skimmer cone is located inside this zone of silence to transmit ions into the mass spectrometer. The position of the sampler and skimmer cones relative to the initial radiation and normal analytical zones of the plasma is key to optimizing the useful analytical signal. The ICP both atomizes and ionizes the sample. Polyatomic ions form through ion-molecule interactions either in the ICP or during ion extraction. Common polyatomic ions that inhibit analysis include metal oxides (MO(sup +)), adducts with argon, the gas most commonly used to make up the plasma, and hydride species. While high resolution devices can separate many analytes from common interferences, this is done at great cost in ion transmission efficiency--a loss of 99% when using high versus low resolution on the same instrument. Simple quadrupole devices, which make up the bulk of ICP-MS instruments in existence, do not present this option. Therefore, if the source of polyatomic interferences can be determined and then manipulated, this could potentially improve the figures of merit on all ICP-MS devices, not just the high resolution devices often utilized to study polyatomic interferences.

NTIS

High Resolution; Ions; Mass Spectroscopy; Plasmas (Physics)

20070008551 California Univ., Santa Barbara, CA USA

Experimental Investigation of Thin Film InGaAsP Coolers

LaBounty, Chritopher J; SHakouri, Ali; Robinson, Gerry; Esparza, Luis; Abraham, Patrick; Bowers, John E; Jan 2000; 7 pp.; In English

Report No.(s): AD-A461124; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461124

Most optoelectronic devices for long haul optical communications are based on the InP/InGaAsP family of materials. Thin film coolers based on the same material system can be monolithically integrated with optoelectronic devices such as lasers, switches, and photodetectors to control precisely the device characteristics such as wavelength and optical power. Superlattice structures of InGaAs/InP and InGaAs/InGaAsP are used to optimize the thermionic emission resulting in a cooling behavior

beyond what is possible with only the Peltier effect. A careful experimental study of these coolers is undertaken. Mesa sizes, superlattice thickness, and ambient temperature are all varied to determine their effect on cooling performance. A three-dimensional, self-consistent thermal-electric simulation and an effective one-dimensional model are used to understand the experimental observations and to predict what will occur for other untested parameters. The packaging of the coolers is also determined to have consequences in the overall device performance. Cooling on the order of 1 to 2.3 degrees over 1-micron thick barriers is reported.
DTIC
Coolers; Cooling; Indium Gallium Arsenides; Indium Phosphides; Optical Communication; Optical Properties; Phosphorus; Superlattices; Thin Films

20070008554 Stollar (R. L.) and Associates, Inc., Denver, CO USA
Remedial Action Plan for Fort Douglas
Mar 1994; 10 pp.; In English
Contract(s)/Grant(s): DAAA15-90-D-0018-0005
Report No.(s): AD-A461127; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461127

This Remedial Action Plan (RAP), issued by the U.S. Army (Army), identifies the preferred alternatives for cleaning up electrical utility transformers and residential structures containing lead-based paint at Fort Douglas. These contaminated areas are within areas of Fort Douglas that have been transferred to the University of Utah. This transferred property is known as the excessed area. This document explains the rationale for choosing the preferred alternatives and summarizes other alternatives. The Army will select a final remedy for the site only after the information submitted during the public comment period has been reviewed and considered.
DTIC
Contamination; Polychlorinated Biphenyls; Risk

20070008559 California Univ., Santa Barbara, CA USA
N- and P-Type SiGe/Si Superlattice Coolers
Fan, Xiaofeng; Zeng, Gehong; Crokea, Edward; Robinson, Gerry; LaBounty, Chris; Shakourib, Ali; Bowers, John E; Jan 2000; 5 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461134; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461134

ABSTRACT SiGe is a good thermoelectric material for high temperature applications. In this paper the fabrication and characterization of single-element SiGe/Si superlattice coolers of both n- and p-type devices are described for room temperature applications. Superlattice structures were used to enhance the device performance by reducing the thermal conductivity between the hot and the cold junctions, and by providing selective removal of hot carriers through thermionic emission. The structure of the samples consisted of a 3 m thick symmetrically strained Si0.7Ge0.3/Si superlattice grown on a buffer layer designed so that the in-plane lattice constant is approximately that of relaxed Si0.9Ge0.1. Cooling by 1.7 K for n -type device and by 1.9 K for p-type device at room temperature was measured, corresponding to cooling power densities of hundreds of watts per square centimeter. The results show that the packaged devices of both n and p coolers can work together in similar optimal conditions. This paves the road to fabricate n- and p-type superlattice coolers in an array format electrically in series and thermally in parallel, similar to conventional thermoelectric devices, and thus achieve large cooling capacities with relatively small currents.
DTIC
Coolers; Cooling; Germanium; N-Type Semiconductors; Semiconductors (Materials); Silicon; Superlattices

20070008566 Ohio State Univ., Columbus, OH USA
Island Growth of Y2BaCuO5 Nanoparticles in (211~1.5 nm/123~10 nm)xN Composite Multilayer Structures to Enhance Flux Pinning of YBa2Cu3O7-Delta Films
Haugan, T; Barnes, P N; Maartense, I; Cobb, C B; Lee, E J; Sumption, M; Mar 2003; 8 pp.; In English
Contract(s)/Grant(s): Proj-3145
Report No.(s): AD-A461148; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461148

A controlled introduction of second-phase Y2BaCuO5 (211) nanoparticles into YBa2Cu3O7-8(123) thin films was

achieved for the first time for the purpose of increasing flux pinning. The island-growth mode of 211 on 123 was utilized to obtain an area particle density \g10(exp 11) sq cm of 211 thick-disk-shaped nanoparticles in individual layers. Composite layered structures of (211y nanoparticles/123z)xN were deposited by pulsed laser deposition on LaA1O3 substrates, with N bilayers = 24 to 100, y thickness = 1 to 2 nm, and z thickness = 6 to 15 nm (assuming continuous layer coverage). With 211 addition, the critical current densities at 77 K were higher at magnetic fields as low as 0.1 T and increased as much as approximately 300% at 1.5 T. The superconducting transition temperature was reduced by approximately 2 to 4 K for 211 volume fraction \h20%. Reinitiation of 123 growth after every 211 layer resulted in a smooth and flat surface finish on the films and also greatly reduced surface particulate formation especially in thicker films (~1 micrometer).
DTIC
Composite Structures; Flux Pinning; Laminates; Nanoparticles; YBCO Superconductors

20070008628 California Univ., Santa Barbara, CA USA
P-Type InGaAsP Coolers for Integrated Optic Devices
Vashaee, Daryoosh; LaBounty, Christopher; Fanb, Xiaofeng; Zeng, Gehong; Abraham, Patrick; Bowers, John E; Shakouri, Ali; Jan 2001; 7 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461248; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461248

Single stage heterostructure coolers based on thermoelectric and thermionic cooling in p- type InGaAsP superlattice structures have been fabricated and characterized. The effect of ambient temperature and the device size have been studied. Experimental results showed 0.5 degree centigrade cooling below the ambient temperature at 25C. This cooling over 1 mm thick superlattice barrier corresponds to cooling power densities on the order of 200 W/cm2. The device cools by a factor of two better at higher temperatures (70C). This is due to the reduction of the superlattice thermal conductivity and the broadening of the electronic distribution function at higher temperatures. 150x150 um2 devices provide largest cooling at room temperature while the optimum device size shrinks as the temperature increases. Simulations results that take into account finite thermal resistance of the InP substrate, the effect of the contact resistance, heat generation in the wire-bonds and metallic pads on top of the device predict accurately the optimum cooling of these micro refrigerators. By eliminating the major parasitic sources of heating (reducing the contact resistance to 5x10-7 ohm-cm2, and optimizing the metallic contacts on top of the devices), simulations show that one can achieve up to 15oC cooling (10 s of kW/cm2 cooling power) with single stage p-InGaAsP thin film coolers.
DTIC
Coolers; Cooling; Gallium Arsenides; Indium Gallium Arsenides; Indium Phosphides; Semiconductors (Materials)

20070008636 Naval Air Warfare Center, China Lake, CA USA
Development of Subscale Fast Cookoff Test (PREPRINT)
Atwood, Alice; Wilson, Kenneth; Laker, Travis; Washburn, Ephraim; Sep 21, 2006; 11 pp.; In English
Contract(s)/Grant(s): Proj-HHLL
Report No.(s): AD-A461263; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461263

This paper presents a report on the design and development of a controlled heat flux combustor in support of a larger task aimed at the development of a sub-scale alternate test protocol to the external fire test currently required for final hazards classification (HC) of an ordnance system. The specific goal of this part of the task was to design a thermal stimulus that could be controlled and still deliver the flux levels encountered in a liquid fuel fire of the type related to transportation and storage.
DTIC
Classifications; Combustion Chambers; Firing (Igniting); Fuels; Hazards; Heat Flux; Heat Transfer; Ordnance

20070008645 Army Aviation and Missile Command, Redstone Arsenal, AL USA
Flowfield and Radiation Analysis of Missile Exhaust Plumes Using a Turbulent-Chemistry Interaction Model
Calhoon, W H; Kenzakowski, D C; Jan 2000; 12 pp.; In English
Report No.(s): AD-A461273; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461273

The combustion or afterburning of fuel-rich rocket exhaust with the atmosphere may result in large infrared radiation emissions which can play a significant role in the design of missile base components and missile defense systems. Current engineering level models neglect turbulent-chemistry interactions and typically underpredict the intensity of plume

afterburning and afterburning burnout. To evaluate the impact of turbulent-chemistry interactions, an assumed PDF model was applied to missile plume simulations of a generic booster. Simulation results reveal turbulent-chemistry interactions to have a large impact on plume signatures as afterburning burnout was approached.
DTIC
Afterburning; Combustion; Exhaust Gases; Flow Distribution; Missiles; Plumes; Rocket Exhaust; Turbulence

20070008655 Air Force Research Lab., Wright-Patterson AFB, OH USA
Partial Melt Processing of Solid-Solution Bi2Sr2CaCu2O8+delta Thick-Film Conductors with Nanophase Al2O3 Additions
Haugan, T; Wong-Ng, W; Cook, L P; Vaudin, M D; Swartzendruber, L; Barnes, P N; Apr 2006; 15 pp.; In English
Contract(s)/Grant(s): Proj-3145
Report No.(s): AD-A461292; AFRL-PR-WP-TP-2006-230; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461292

Partial-melt processing of BiSrCaCuO thick-film conductors with additions of nanophase Al2O3 was studied to increase flux pinning and inhibit SrCaCuO phase defect formation. Nanophase Al2O3 was added to Bi:Sr:Ca:Cu:O powders with four different compositions: three with Bi:Cu approximately 2:2 and one closer to the ideal Bi-2223 composition. The effect of Al2O3 addition on film microstructural and superconducting properties was studied for a range of partial-melt temperatures. Results were compared to Al2O3-free films with compositions lying within the single-phase solid-solution 2212 region. Nanophase Al2O3 reacted with 2212-type precursors to form a composite of micron size or smaller particles of solid-solution (Sr,Ca)3Al2O6 in a solid-solution 2212 superconducting matrix. The Ca content of the (Sr,Ca)3Al2O6 in a solid-solution 2212 superconducting matrix. The Ca content of the (Sr,Ca)3Al2O6 particles formed was approximately like 2212 precursor. Addition of 6-25% volume fraction of (Sr,Ca)3Al2O6 to Bi-2212 only slightly reduced Tcs and c-axis texturing, but improved film quality by reducing Sr-Ca-Cu-O defect volume fraction by factors of 2 to 6 and significantly increased Jc by over one order of magnitude for 0 to 2 T applied fields at 20 to 30 K.
DTIC
Aluminum Oxides; Conductors; Electric Conductors; Flux Pinning; Solid Solutions; Thick Films

20070008727 Army Tank-Automotive and Armaments Command, Warren, MI USA
Analysis of the Effects of Exhaust Placement on the Thermal Signature of a Concept Vehicle
Polsen, Erik; Jan 2004; 51 pp.; In English
Report No.(s): AD-A461466; MECH-522; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461466

This chapter will present the initial necessary information needed to understand the following chapters. The text below provides an overall understanding of the problem topic first, and then includes pertinent information regarding the background of the posed problem. Next, the criteria and parameters imposed will be identified, followed by the methodology used in solving the problem. Finally, the primary purposes and a brief overview of the report will be discussed. Problem Topic Due to the high cost of modifying vehicles after production in order to reduce the thermal signature, this report evaluates the effects of the placement of the vehicle's exhaust outlet on the overall thermal signature during the conceptual phase. In the past, the lack of regard for the thermal signature during the design of a ground vehicle often led to millions of dollars spent to minimize the thermal signature post-production. Integrating thermal management into the design process at the concept level allows for a better overall system that combines the best of lethality, mobility, and survivability. By designing a better overall system the Tank-Automotive Research, Development, and Engineering Center (TARDEC) provides the soldier with superior war-fighting capabilities.
DTIC
Automobiles; Exhaust Emission; Signatures

20070008737 Brown Univ., Providence, RI USA
Mesoporous Carbons With Self-Assembled High-Activity Surfaces (PREPRINT)
Jian, Kengqing; Truong, Trun C; Hurt, Robert H; Hoffman, Wesley P; Jul 7, 2006; 23 pp.; In English
Contract(s)/Grant(s): Proj-2306
Report No.(s): AD-A461480; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461480

There is great interest in the development of improved mesoporous carbons as sorbents, catalyst supports, capacitors, and

electrodes. The optimization of mesoporous carbons typically focuses on the control of pore structure, surface area, and the number and type of surface functional groups. A porous carbon property that is often overlooked is the crystal structure of the carbon in the immediate vicinity of the internal surfaces. This interfacial structure provides the carbon 'platform' for subsequent surface treatment and can thus determine the number of potential active sites for functionalization and influence the final polarity, surface charge density, and/or chemisorptive activity of the carbon material.
DTIC
Carbon; Liquid Crystals; Porous Materials; Surface Properties

20070008742 New Mexico Univ., Albuquerque, NM USA
High Dielectric Constant Oxides for Advanced Micro-Electronic Applications
Devine, Roderick A; Nov 29, 2006; 22 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F29601-01-C-0241; Proj-4846
Report No.(s): AD-A461486; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461486

A series of mixed oxide compounds have been manufactured and studied with a view to assessing their suitability for applications in advanced microelectronics: ZrO2, Ta2O5, LaAlO3, Sm2O3, Pr2O3, Nd2O3, TiO2, Ti(x)Si(1-x)O2. Although each material has distinct advantages, particularly in terms of the magnitude of the dielectric constant, none of those studied can satisfy all of the requirements for thin films on Si. Consideration of the situation likely to arise under real technological conditions leads us to conclude that there are major issues still to be resolved, if indeed they can, if the goals outlined in the semiconductor roadmap for 2016 and beyond are to be attained.
DTIC
Dielectric Properties; Microelectronics; Oxides; Permittivity; Silicon Dioxide; Titanium Oxides; Zirconium Oxides

20070008745 Rice Univ., Houston, TX USA
A Study of the Formation, Purification, Ligand Substitution Chemistry, and Application as a SWNT Growth Catalyst of the Nanocluster (Preprint)
Anderson, Robin E; Colorado, Jr , Ramon; Crouse, Christopher; Ogrin, Douglas; Edwards, Christopher L; Whitsitt, Elizabeth; Moore, Valerie C; Koveal, Dorothy; Lupu, Corina; Stewart, Michael; Feb 2006; 55 pp.; In English
Report No.(s): AD-A461489; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461489

The synthetic conditions for the isolation of the iron-molybdenum nanoc1uster FeMoC, along with its application as a catalyst precursor for VLS growth of SWNTs have been studied. As prepared FeMoC is contaminated with the Keplerate cage without the Keggin template; however, extraction of pure FeMoC may be accomplished by Soxhlet extraction with EtOH. The resulting EtOH solvate is consistent with the replacement of the water ligands coordinated to Fe being substituted by EtOH. FeMoC-EtOH has been characterized by IR, UV-vis spectroscopy, MS, XPS and 31P NMR. The solid state 31P NMR spectrum for FeMoC-EtOH suggests little effect of the paramagnetic Fe3+ centers in the Keplerate cage on the Keggin ion?s phosphorous. The high chemical shift anisotropy, and calculated T1 and T2 values are consistent with a weak magnetic interaction between the Keggin ion?s phosphorus symmetrically located within the Keplerate cage. Increasing the FeCl2 concentration and decreasing the pH of the reaction mixture optimizes the yield of FeMoC. The solubility and stability of FeMoC in H2O and MeOH/H20 is investigated.
DTIC
Catalysts; Chemical Reactions; Ligands; Nanoclusters; Purification; Substitutes

20070008759 Air Force Research Lab., Edwards AFB, CA USA
Pulsed Laser Deposition of YBCO Coated Conductor Using Y(2)O(3) as the Seed and Cap Layer (Postprint)
Barnes, P N; Nekkanti, R M; Haugan, T J; Campbell, T A; Yust, N A; Evans, J M; Jun 4, 2004; 8 pp.; In English
Contract(s)/Grant(s): Proj-3145
Report No.(s): AD-A461512; AFRL-PR-WP-TP-2006-229; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461512

Although a variety of buffer layers have been routinely reported, a standard architecture commonly used for the YBa2Cu3O7-x (YBCO) coated conductor is YBCO/CeO2/YSZ/CeO2/substrate or YBCO/CeO2/YSZ/Y2O3/substrate where ceria is typically the cap layer. CeO2 is generally used as only a seed (or cap layer) since cracking within the film occurs in

thicker CeO2 layers due to the stress of lattice mismatching. Y2O3 has been proposed as a seed and as a cap layer but usually not for both in a given architecture, especially with all layers deposited in situ. Yttrium oxide films grown on nickel by electron beam evaporation processes were found to be dense and crack free with good epitaxy. In this report, pulsed laser deposition (PLD) of Y2O3 is given where Y2O3 serves as both the seed and cap layer in the YBCO architecture. A comparison to PLD CeO2 is provided. Deposited layers of the YBCO coated conductor are also grown by laser ablation. Initial deposition resulted in specimens on textured Ni substrates with current densities of more than 1 MA cm-2 at 77 K, self-field.
DTIC
Coatings; Conductors; Electric Conductors; Electron Beams; Laser Beams; Pulsed Laser Deposition; Pulsed Lasers; Seeds; YBCO Superconductors; Yttrium Oxides

20070008775 Naval Research Lab., Washington, DC USA
Propagation of Electromagnetic Waves Through Propellant Gases
Gager, F M; Nov 6, 1947; 13 pp.; In English
Report No.(s): AD-A461535; NRL-R-3197; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461535

This interim report contains a qualitative analysis of the subject problem (NRL Problem 36R25-03 'Propagation of Electromagnetic Waves through Propellent Gases') including some comments on nomenclature and instrumentation difficulties. It also sets forth the reported and unreported activities of the Naval Research Laboratory in various fields of approach to the problem by indicating what data have been collected and the status of its analysis. In addition, some salient aspects of future endeavor toward a conclusion of the study are indicated.
DTIC
Electromagnetic Radiation; Electromagnetic Wave Transmission; Flames; Propellants; Qualitative Analysis; Wave Propagation

20070008943 Edgerton, Germeshausen and Grier, Inc., Idaho Falls, ID USA
Characterization Report for U.S. Army Materials Technology Laboratory Research Reactor
Aug 1990; 70 pp.; In English
Contract(s)/Grant(s): DE-AC07-76IDO1570
Report No.(s): AD-A461781; EGG-WM-8978; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461781

This report describes the characterization for the decommissioning of the U.S. Army Materials Technology Laboratory (AMTL) Research Reactor, located at Watertown, Massachusetts. The characterization determined the radioactive and chemical contaminants present at the reactor facility to support the efforts to plan the decommissioning of this facility. The AMTL research reactor was constructed in the late 1950s and 1960. The reactor started operations in June 1960 and continued through June 1970, when the reactor was deactivated. The reactor was used by AMTL as well as other Army arsenals, research centers, and local institutions to conduct various solid-state physics research experiments and programs. Since the reactor deactivation in 1970, the reactor containment facility has been used to house various radiography experiments. Reactor operations reports for the period June 15, 1960, through March 27, 1970, and the facility safety reports indicate that there was no fuel breached during reactor operations or fuel transfers. The low levels of radioactivity and contamination found in the reactor vessel and on the reactor components during the surveys further substantiate these indications. It is not anticipated that any significant problems relating to the finding of unsuspected contamination will be encountered during the decommissioning of the reactor facility.
DTIC
Characterization; Contamination; Radioactivity; Toxicity

20070008995 California State Coll., Long Beach, CA USA
Mapping the Current Distribution in YBa(2)Cu(3)O(7-x) Thin Films with Striations
Wang, L B; Price, M B; Young, J L; Kwon, C; Levin, George A; Haugan, Timothy J; Barnes, Paul N; Jun 2004; 8 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0493; F49620-02-1-0439; Proj-3145
Report No.(s): AD-A461884; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461884

We have studied the transport current distributions in striated YBa2Cu3O(7-X) (YBCO) films and coated conductors

using variable temperature scanning laser microscopy (VTSLM). VTSLM images reveal the location of incomplete separation between filaments due to un-optimized sample processing parameters. When the current flows parallel to the completely separated striations, the current seems to flow within a strip without inter-mixing via the substrate. Initial resistivity measurements on metallic inter-filamentary connections (gold dots) exhibit a semiconducting behavior. VTSLM images clearly show that the current flows between filaments via the metallic inter-connect, indicating the semiconducting resistive behavior is due to the interface between YBCO and metallic layer. The results demonstrate the potential of VTSLM technique in investigating current sharing and normal metal inter-connect issues for the coated conductor development for ac applications.
DTIC
Current Distribution; High Temperature Superconductors; Striation; Thin Films

20070008997 Air Force Research Lab., Wright-Patterson AFB, OH USA
Correlation Between the XPS Peak Shapes of Y(1)Ba(2)Cu(3)O(7-x)and Film Quality (Postprint)
Barnes, Paul N; Mukhopadhyay, Sharmila M; Haugan, Timothy J; Krishnaswami, Swaminathan; Tolliver, Justin C; Maartense, Iman; Jun 2003; 6 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-3145
Report No.(s): AD-A461891; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461891

X-ray photoelectron spectroscopy (XPS) depth profiling was used to investigate the compositional and chemical profile of a typical YBCO coated conductor architecture. Results of the process revealed that the Y(3d) photoelectronic peak shape in these films is very different from bulk YBCO. To investigate this, several samples of Y1Ba2Cu3O7-x thin films were intentionally created of varying quality. The films were deposited on LaAlO3 by pulsed laser deposition with Jc values ranging from poorly conducting up to several MA/cm2. Initial results indicated a potential correlation between the Y(3d) XPS peak shape (full-width-half-maximum) of the YBCO and the film quality. A potential correlation may also exist with the Cu(2p) Ba(3d) ratio indicating an interrelationship to the FWHM of the Y(3d) peak. Film quality was determined by current transport, resistive Tc, and AC magnetic susceptibility measurements
DTIC
Photoelectron Spectroscopy; Shapes; Thin Films; X Ray Spectroscopy; YBCO Superconductors

20070009003 Air Force Research Lab., Wright-Patterson AFB, OH USA
Studies on Ba(2)YNbO(6) Buffer Layers for Subsequent YBa(2)Cu(3)O(7-x) Film Growth
Sathiraju, Srinivas; Barnes, Paul N; Varanasi, Chakrapani; Wheeler, Robert; Mar 2004; 6 pp.; In English
Contract(s)/Grant(s): Proj-3145
Report No.(s): AD-A461909; AFRL-PR-WP-TP-2006-220; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461909

In this paper, we are reporting a dielectric oxide buffer Ba(2)YNbO(6) (BYNO) and its performance on various substrates for a potential buffer layer for the growth of YBa(2)Cu(3)O(7-x) (YBCO) coated conductors. Ba(2)YNbO(6) is a moderate dielectric. Using pulsed laser deposition, epitaxial BYNO films were grown at 850 degrees C with an oxygen pressure of 200 mTorr on single crystal MgO (100) substrate and ion beam assisted sputter deposited MgO buffered hastelloy metal substrates. The surface morphology of the BYNO films reveals out growths even though the average surface roughness is only 2-8 nm. The texture of BYNO films is ~8 degrees and thickness of these layers 100 nm on metal substrates. Highly c-axis oriented YBCO films were deposited on BYNO buffered substrates. Critical transition temperatures (Tc0) determined from electrical transport measurements vary between 88-89 K and corresponding critical current densities (Jc) ranging from 0.5-1 MA/cm(squared) at 77 K.
DTIC
Barium Oxides; Niobium Oxides; YBCO Superconductors; Yttrium Oxides

20070009009 Earth Technology, Inc., Alexandria, VA USA
Final Public Involvement & Response Plan (PIRP)
Jul 1994; 78 pp.; In English
Contract(s)/Grant(s): DAAA15-91-D-0009-0001
Report No.(s): AD-A461920; No Copyright; Avail.: CASI: A05, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461920

his Public Involvement and Response Plan (PIRP) for Woodbridge Research Facility (WRF) presents a site-specific program to establish communication and information exchange among U.S. Army staff; the Army Research Laboratory (ARL), the U.S. Army Environmental Center (USAEC); various Federal, State of Virginia, Prince William County, Fairfax County, and community agencies; and the public. Effective communication and timely information exchange is essential for maintaining community understanding and support for WRF and for implementing a successful PIRP. This plan includes methods for facilitating communication between the U.S. Army and local citizens, business people, elected officials, and leaders from the surrounding community and civic associations. PIRP activities will be handled under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the Superfund Amendments and Reauthorization Act (SARA) of 1986, the Defense Authorization Amendments and Base Closure and Realignment Act (Public Law 100-526). The facility, which is located in Prince William County, Virginia, has been selected for closure after over 40 years of operation. The ARL, with the support of AEC, is now beginning efforts to characterize the nature and extent of contamination created by past activities at the facility. Environmental problems discovered will be remediated under the Base Realignment and Closure (BRAC) Environmental Restoration Program. The purpose of the PIRP is to establish an effective community relations program that informs the community of the BRAC Environmental Restoration Program at the site, and provides for early and continuous community involvement in the cleanup process. The Army is committed to communicating and exchanging information with neighboring communities, State and local agencies, and the Environmental Protection Agency (EPA).
DTIC
Closures; Contamination; Installing; Research Facilities; Restoration

20070009079 Air Force Research Lab., Wright-Patterson AFB, OH USA
AC Loss in Striped (Filamentary) YBCO Coated Conductors Leading to Designs for High Frequencies and Field-Sweep Amplitudes
Sumption, M D; Collings, E W; Barnes, P N; Jun 2004; 15 pp.; In English
Contract(s)/Grant(s): Proj-3145
Report No.(s): AD-A461853; AFRL-PR-WP-TP-2006-201; No Copyright; Avail.: CASI: A03, Hardcopy

AC losses of YBCO coated conductors are investigated by calculation and experiment for the higher frequency regime. Previous research using YBCO film deposited onto single-crystal substrates demonstrated the effectiveness of 'striping' or filamentary subdivision as a technique for AC loss reduction. As a result of these studies the idea of subdividing YBCO 'coated conductors' (YBCO, overlayer, and even underlayer) into such stripes suggested itself. The suggestion was implemented by burning grooves into samples of coated conductor using laser micromachining. Various machining parameters were investigated, and the striping and slicing characteristics are presented. Loss measurements were performed on unstriped as well as striped samples by the pick-up coil technique at frequencies from 50 to 200 Hz at field sweep amplitudes of up to 150 mT. The effect of soft ferromagnetic Fe shielding was also investigated. The results of the experiments form a starting point for a more general study of reduced-loss coated conductor design (including hysteretic, coupling, normal eddy current, and transport losses) projected into higher ranges of frequency and field-sweep amplitude with transformer and all-cryogenic-motor/generator applications in mind.
DTIC
Alternating Current; Coatings; Conductors; Electric Conductors; High Frequencies; High Temperature; Losses; Single Crystals; Superconductivity; Superconductors (Materials); YBCO Superconductors

20070009202 Ohio State Univ., Columbus, OH USA
Hysteretic Loss vs. Filament Width in Thin YBCO Films Near the Penetration Field (Postprint)
Cobb, Coleman B; Barnes, Paul N; Haugan, Timothy J; Tolliver, Justin; Oberly, Charles E; Sumption, M D; Lee, E; Collings, E W; Jun 2003; 6 pp.; In English
Contract(s)/Grant(s): Proj-3145
Report No.(s): AD-A462091; No Copyright; Avail.: CASI: A02, Hardcopy

Magnetization vs. applied field measurements (M-H loops) were taken on YBCO thin films with filaments patterned into them. The YBCO was deposited onto LaAlO3 substrates using PLD, and the filaments were formed by laser ablation. M-H loops were taken at 4.2 K in fields up to plus or minus 9 T using a vibrating sample magnetometer technique, the field applied perpendicular to the film width, d. The losses were seen to be greatly reduced by filament width reductions following the standard expression Qh/Hm alpha dJc/10. The penetration field was also well described by the standard 'high field' expression = Hp = (0.4Jct) ln(d/t + 1), where t is the film thickness. The regimes of applicability of the loss expression were investigated, in particular near Hm approximates Hp. A more general form of the loss equation was obtained and compared with the

high-field approximation. The result was that although Qh/Hm still increased in proportion to d, the rate of increase decreased as Hm approached Hp.
DTIC
Barium Oxides; Copper Oxides; Hysteresis; Losses; Near Fields; Penetration; Superconducting Films; Thin Films; YBCO Superconductors; Yttrium Oxides

20070009213 Taitech, Inc., Beavercreek, OH USA
Simulations of Cavity-Stabilized Flames in Supersonic Flow Using Reduced Chemical Kinetic Mechanisms (Postprint)
Liu, Jiwen; Tam, Chung-Jen; Lu, Tianfeng; Law, Chung K; Jan 2006; 17 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8650-05-M-2616; Proj-2308
Report No.(s): AD-A462104; No Copyright; Avail.: CASI: A03, Hardcopy

The VULCAN CFD code integrated with a reduced chemical kinetic mechanism was applied to simulate cavity-stabilized ethylene-air flames and to predict flame stability limits in supersonic flows based on an experimental study. A 15-step reduced kinetic mechanism for ethylene was systematically developed through skeletal reduction with a directed relation graph and time scale reduction based on quasi-steady state assumptions. The accuracy of the reduced kinetic mechanism and its implementation in the VULCAN code were demonstrated in an auto-ignition problem with a range of parameters. 3D simulations were then carried out for cavity-stabilized flames at different fuel flow rates and turbulent Schmidt numbers. For comparison with the performance of the present reduced mechanism, a 3- and a 10-step global kinetic model were applied to simulate the same cavity combustor, and the results show that the 15-step reduced model predicts experimental results much better than the 3- and 10-step models. The importance of including accurate chemical kinetics in CFD simulations is therefore demonstrated.
DTIC
Cavities; Combustion Chambers; Flames; Reaction Kinetics; Simulation; Supersonic Combustion Ramjet Engines; Supersonic Flow

20070009294 Hawaii Univ., Honolulu, HI USA
Hawaii Energy and Environmental Technologies (HEET) Initiative Phase 4
Rocheleau, Richard E; Aug 2006; 262 pp.; In English
Contract(s)/Grant(s): N00014-04-1-0682; Proj-05PR10625-00
Report No.(s): AD-A462227; No Copyright; Avail.: CASI: A12, Hardcopy

This report summarizes work conducted by the Hawaii Natural Energy Institute of the University of Hawaii under the Hawaii Energy and Environmental Technologies (HEET) Initiative funded through the Office of Naval Research. This initiative focused on critical technology needs associated with the exploration and utilization of seabed methane hydrates and the development and testing of advanced fuel cells and fuel cell systems. The efforts in methane hydrates comprised four primary components: laboratory and analytical investigations of hydrate destabilization phenomena, characterization of the microbial community in marine hydrate beds, engineering development of subsea power generation systems utilizing seafloor methane, and promotion of international R&D partnerships. In the fuel cell area, the major accomplishment was the addition of three new fuel cell test cells to the Hawaii Fuel Cell Test Facility to augment existing capabilities to include fuels purity studies and hardware-in-the-loop testing. In addition, simulation work encompassed evaluation of a fuel cell energy/power system for propulsion of an unmanned underwater vehicle.
DTIC
Energy Technology; Fuel Cells; Hydrates; Methane; Underwater Vehicles

20070009320 Army Tank-Automotive Research and Development Command, Warren, MI USA
A Methodology for Indirect Determination of Diesel Fuel Laminar Flame Speed
Schihl, Peter; Tasdemir, John; Dec 12, 2003; 9 pp.; In English
Contract(s)/Grant(s): DAAE07-98-2-0004
Report No.(s): AD-A462277; TARDEC-TR-13962; No Copyright; Avail.: CASI: A02, Hardcopy

A method for indirectly determining the laminar flame speed for diesel fuel was formulated and benchmarked against cylinder pressure data acquired for two direct-injection diesel engines. The approach was focused on fitting a series of experimentally generated heat release and mean cylinder pressure profiles with a zero-dimensional, physics-based combustion model. A correlation for laminar flame speed was generated based on the optimal fit of flame speed to this series of heat release profiles. This technique resulted in a correlation that had a reasonable RMS error and exhibited trends that have been observed

with lighter hydrocarbon fuels such as gasoline including pressure and air fuel ratio behavior.
DTIC
Combustion; Diesel Engines; Diesel Fuels; Flames; Laminar Flow

20070009599 Department of the Navy, Washington, DC USA
Bi-Liquid Phase Replenishment Electrolyte Management System
Dow, Eric, Inventor; Feb 6, 2006; 27 pp.; In English
Report No.(s): AD-D020275; No Copyright; Avail.: CASI: A03, Hardcopy

An electrochemical cell system and methods for controlling the system are provided that are operated to produce an amount of current based upon power draw. The cell utilizes a solution phase catholyte introduced into a cell containing a metallic anode and a catalytic surface. A cathodic species is introduced into the space between the anode and the surface as a liquid along with electrolyte and liquid caustic. The mixture of caustic, electrolyte and liquid catholyte is continuously recirculated through the space, and a portion of the recirculation stream is exhausted in order to control the concentration of reaction products in each cell. Controllable injection mechanisms are used to inject the liquids from storage sources based upon the monitored power draw. The control mechanism independently controls each injection mechanism to inject appropriate amounts of caustic, electrolyte and catholyte to achieve the desired concentrations.
DTIC
Binary Fluids; Electrochemistry; Electrolytes; Liquid Phases; Management Systems; Patent Applications; Replenishment

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METALS AND METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals and metallic materials; and metallurgy.

20070006650 Lawrence Livermore National Lab., Livermore, CA USA
Spinodal Ordering and Precipation in U-6 wt% Nb
Hsiung, L.; Zhou, J.; Dec. 22, 2005; 10 pp.; In English
Report No.(s): DE2006-891382; UCRL-CONF-217871; No Copyright; Avail.: Department of Energy Information Bridge

A combinative approach of microhardness testing, tensile testing, and TEM microstructural analysis was employed to study the microstructure and mechanical instability of a water-quenched U-6wt.% Nb (WQU6Nb) alloy subjected to different aging schedules including artificial aging at 200 C, 15-year natural aging at ambient temperatures, and 15-year natural aging followed by accelerative aging at 200 C. The changes in mechanical property during and after the aging processes were examined using microhardness and tensile-testing methods. During the early stages of artificial aging at 200 C, the microhardness of WQ-U6Nb alloy increased, i.e., age hardening, as a result of the development of nanoscale modulation caused by spinodal decomposition. Coarsening of the modulated structure occurred after a prolonged aging at 200 C for 16 hours, and it led to a decrease of microhardness, i.e., age softening. Phase instability was also found to occur in WQ-U6Nb alloy that was subjected to a 15-year natural aging at ambient temperatures. The formation of partially ordered domains resulting from a spinodal modulation with an atomic-scale wavelength rendered the appearance of swirl-shape antiphase domain boundaries (APBs) observed in TEM images. Although it did not cause a significant change in microhardness, 15-year natural aging has dramatically affected the aging mechanisms of the alloy isothermally aged at 200 C. Microhardness values of the NA alloy continuously increased after isothermal aging at 200 C for 96 hours as a result of the phase decomposition of partially ordered domains into Nb-depleted (alpha) phase and Nb-enriched U(sub 3)Nb ordered phase in the alloy. It is concluded that the long-term natural aging changes the transformation pathway of WQ-U6Nb, and it leads to order-disorder transformation and precipitation hardening of WQ-U6Nb alloy.
NTIS
Precipitation Hardening; Uranium Alloys

20070006651 Lawrence Livermore National Lab., Livermore, CA USA
Cleaning of Free Machining Brass
Shass, T.; Jan. 05, 2006; 6 pp.; In English
Report No.(s): DE2006-891391; UCRL-TR-217975; No Copyright; Avail.: Department of Energy Information Bridge

We have investigated four brightening treatments proposed by two cleaning vendors for cleaning free machining brass. The experimental results showed that none of the proposed brightening treatments passed the swipe test. Thus, we maintain

the recommendation of not using the brightening process in the cleaning of free machining brass for NIF application.
NTIS
Brasses; Cleaning; Machining

20070006731 Westinghouse Savannah River Co., Aiken, SC, USA, Savannah River National Lab., Aiken, SC, USA
Gaseous Hydrogen Effects on the Mechanical Properties of Carbon and Low Alloy Steels
Lam, P. S.; Jun. 2006; 36 pp.; In English
Report No.(s): DE2006-891665; WSRC-TR-2006-00119; No Copyright; Avail.: National Technical Information Service (NTIS)

This report is a compendium of sets of mechanical properties of carbon and low alloy steels following the short-term effects of hydrogen exposure. The property sets include the following: Yield Strength; Ultimate Tensile Strength; Uniform Elongation; Reduction of Area; Threshold Cracking, K(sub H) or K(sub th); Fracture Toughness (K(sub IC), J(sub IC), and/or J-R Curve); and Fatigue Crack Growth (da/dN). These properties are drawn from literature sources under a variety of test methods and conditions. However, the collection of literature data is by no means complete, but the diversity of data and dependency of results in test method is sufficient to warrant a design and implementation of a thorough test program. The program would be needed to enable a defensible demonstration of structural integrity of a pressurized hydrogen system. It is essential that the environmental variables be well-defined (e.g., the applicable hydrogen gas pressure range and the test strain rate) and the specimen preparation be realistically consistent (such as the techniques to charge hydrogen and to maintain the hydrogen concentration in the specimens).
NTIS
Carbon; Carbon Steels; Crack Propagation; Fracturing; High Strength Steels; Hydrogen; Mechanical Properties

20070006734 Westinghouse Savannah River Co., Aiken, SC, USA, Savannah River National Lab., Aiken, SC, USA
Tritium Effects on Weldment Fracture Toughness
Morgan, M. J.; Tosten, M. H.; West, S. L.; Jul. 17, 2006; 26 pp.; In English
Report No.(s): DE2006-891669; WSRC-STI-2006-00056; No Copyright; Avail.: Department of Energy Information Bridge

The effects of tritium on the fracture toughness properties of Type 304L stainless steel and its weldments were measured. Fracture toughness data are needed for assessing tritium reservoir structural integrity. This report provides data from J-Integral fracture toughness tests on unexposed and tritium-exposed weldments. The effect of tritium on weldment toughness has not been measured until now. The data include tests on tritium-exposed weldments after aging for up to three years to measure the effect of increasing decay helium concentration on toughness. The results indicate that Type 304L stainless steel weldments have high fracture toughness and are resistant to tritium aging effects on toughness. For unexposed alloys, weldment fracture toughness was higher than base metal toughness. Tritium-exposed-and-aged base metals and weldments had lower toughness values than unexposed ones but still retained good toughness properties. In both base metals and weldments there was an initial reduction in fracture toughness after tritium exposure but little change in fracture toughness values with increasing helium content in the range tested. Fracture modes occurred by the dimpled rupture process in unexposed and tritium-exposed steels and welds. This corroborates further the resistance of Type 304L steel to tritium embrittlement. This report fulfills the requirements for the FY06 Level 3 milestone, TSR15.3 'Issue summary report for tritium reservoir material aging studies' for the Enhanced Surveillance Campaign (ESC). The milestone was in support of ESC L2-1866 Milestone-'Complete an annual Enhanced Surveillance stockpile aging assessment report to support the annual assessment process'.
NTIS
Fracture Strength; Tritium; Welded Joints

20070006737 Westinghouse Savannah River Co., Aiken, SC, USA, Savannah River National Lab., Aiken, SC, USA
Extraction of Fracture-Mechanics and Transmission-Electron-Microscopy Samples from Tritium-Exposed Reservoirs Using Electric-Discharge Machining
Imrich, K. J.; Morgan, M. J.; Tosten, M. H.; 2006; 15 pp.; In English
Report No.(s): DE2006-891682; WSRC-STI-2006-00125; No Copyright; Avail.: Department of Energy Information Bridge

The Enhanced Surveillance Campaign is funding a program to investigate tritium aging effects on the structural properties of tritium reservoir steels. The program is designed to investigate how the structural properties of reservoir steels change during tritium service and to examine the role of microstructure and reservoir manufacturing on tritium compatibility. New surveillance tests are also being developed that can better gauge the long-term effects of tritium and its radioactive decay product, helium-3, on the properties of reservoir steels. In order to conduct these investigations, three types of samples are

needed from returned reservoirs: tensile, fracture mechanics, and transmission-electron microscopy (TEM). An earlier report demonstrated how the electric-discharge machining (EDM) technique can be used for cutting tensile samples from serial sections of a 3T reservoir and how yield strength, ultimate strength and elongation could be measured from those samples. In this report, EDM was used successfully to section sub-sized fracture-mechanics samples from the inner and outer walls of a 3T reservoir and TEM samples from serial sections of a 1M reservoir. This report fulfills the requirements for the FY06 Level 3 milestone, TSR 15.1 'Cut Fracture-Mechanics Samples from Tritium-Exposed Reservoir' and TSR 15.2 'Cut Transmission-electron-microscopy foils from Tritium-Exposed Reservoir' for the Enhance Surveillance Campaign (ESC). This was in support of ESC L2-1870 Milestone-'Provide aging and lifetime assessments of selected components and materials for multiple enduring stockpile systems'.
NTIS
Compatibility; Electric Discharges; Extraction; Fracture Mechanics; Machining; Reservoirs; Steels; Transmission Electron Microscopy; Tritium

20070006740 Lawrence Livermore National Lab., Livermore, CA USA
Corrosion Study of Amorphous Metal Ribbons
Lina, T.; Day, S. D.; Farmer, J. C.; Aug. 02, 2006; 9 pp.; In English
Report No.(s): DE2006-892070; UCRL-TR-223299; No Copyright; Avail.: National Technical Information Service (NTIS)
Corrosion costs the Department of Defense billions of dollars every year, with an immense quantity of material in various structures undergoing corrosion. For example, in addition to fluid and seawater piping, ballast tanks, and propulsions systems, approximately 345 million square feet of structure aboard naval ships and crafts require costly corrosion control measures. The use of advanced corrosion-resistant materials to prevent the continuous degradation of this massive surface area would be extremely beneficial. The potential advantages of amorphous metals have been recognized for some time (Latanison 1985). Iron-based corrosion-resistant, amorphous-metal coatings under development may prove important for maritime applications (Farmer et al. 2005). Such materials could also be used to coat the entire outer surface of containers for the transportation and long-term storage of spent nuclear fuel, or to protect welds and heat affected zones, thereby preventing exposure to environments that might cause stress corrosion cracking (Farmer et al. 1991, 2000a, 2000b). In the future, it may be possible to substitute such high-performance iron-based materials for more-expensive nickel-based alloys, thereby enabling cost savings in a wide variety of industrial applications. It should be noted that thermal-spray ceramic coatings have also been investigated for such applications (Haslam et al. 2005). This report focuses on the corrosion resistance of iron-based melt-spun amorphous metal ribbons. Melt-Spun ribbon is made by rapid solidification--a stream of molten metal is dropped onto a spinning copper wheel, a process that enables the manufacture of amorphous metals which are unable to be manufactured by conventional cold or hot rolling techniques. The study of melt-spun ribbon allows quick evaluation of amorphous metals corrosion resistance. The melt-spun ribbons included in this study are DAR40, SAM7, and SAM8, SAM1X series, and SAM2X series. The SAM1X series ribbons have Ni additions in increments of 1, 3, 5, and 7 atom percent, to DAR40. For example, 1X7 means a composition of 7-atom% Ni added to 93-atom% of DAR40. Similarly, The SAM1X series ribbons have Mo additions in increments of 1, 3, 5, and 7 atom percent, to DAR40. For example, 2X3 means a composition of 3-atom% Mo added to 97-atom% of DAR40. SAM7 ribbon is a Fe-Cr-Mo-Y-C-B metal glass, commonly called Alloy1651. SAM8 is SAM7 with an additional 3-atom% W. The nominal compositions of DAR40 and SAM7 are listed in Table 1. SAM7 ribbon is extremely brittle and hard to manufactured by melt-spinning, only limited number of SAM7 ribbons were tested.
NTIS
Amorphous Materials; Corrosion; Metals; Ribbons

20070006803 Soloway (Hayes), P.C., Tucson, AZ, USA
Thermal and Electrochemical Process for Metal Production
Withers, J. C.; Loutfy, R. O.; 21 Apr 04; 16 pp.; In English
Contract(s)/Grant(s): ARMY-W911QX-04-0009; DARPA-MDA972-03-C-0034
Patent Info.: Filed Filed 21 Apr 04; US-Patent-Appl-SN-10-828 641
Report No.(s): PB2007-102928; No Copyright; Avail.: CASI: A03, Hardcopy
A system for purification of high value metals comprises an electrolytic cell in which an anode formed of a composite of a metal oxide of the metal of interest with carbon is electrochemically reduced in a molten salt electrolyte.
NTIS
Electrochemistry; Metals; Thermodynamics

20070006837 NASA Glenn Research Center, Cleveland, OH, USA

Effects of Rhenium Addition on the Temporal Evolution of the Nanostructure and Chemistry of a Model Ni-Cr-Al Superalloy, 1, Experimental Observations

Yoon, Kevin E.; Noebe, Ronald D.; Seidman, David N.; [2006]; 13 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NSF DMR-02-41928; WBS 698671.01.03.17; Copyright; Avail.: Other Sources

The temporal evolution of the nanostructure and chemistry of a model Ni-8.5 at.% Cr-10 at. % Al alloy, with the addition of 2 at.% Re, aged at 1073 K from 0.25 to 264 h, was studied. Transmission electron microscopy and atom-probe tomography were used to measure the number density and mean radius of the gamma prime (L1(sub 2) structure)-precipitates and the chemistry of the gamma prime-precipitates and the gamma (face-centered cubic)-matrix, including the partitioning behavior of all alloying elements between the gamma- and gamma prime-phases and the segregation behavior at gamma/gamma prime interfaces. The precipitates remained spheroidal for an aging time of up to 264 h and, unlike commercial nickel-based superalloys containing Re, there was not confined (nonmonotonic) Re segregation at the gamma/gamma prime interfaces. Author

Aluminum Alloys; Heat Resistant Alloys; Nanostructure (Characteristics); Nickel Alloys; Chromium Alloys; Rhenium; Chemical Analysis; Mathematical Models

20070007326 NASA Johnson Space Center, Houston, TX, USA

Evaluation of Surface Residual Stresses in Friction Stir Welds Due to Laser and Shot Peening

Hatamleh, Omar; Rivero, Iris V.; Lyons, Jed; [2007]; 15 pp.; In English; Copyright; Avail.: CASI: A03, Hardcopy

The effects of laser, and shot peening on the residual stresses in Friction Stir Welds (FSW) has been investigated. The surface residual stresses were measured at five different locations across the weld in order to produce an adequate residual stress profile. The residual stresses before and after sectioning the coupon from the welded plate were also measured, and the effect of coupon size on the residual stress relaxation was determined and characterized. Measurements indicate that residual stresses were not uniform along the welded plate, and large variation in stress magnitude could be exhibited at various locations along the FSW plate. Sectioning resulted in significant residual stress relaxation in the longitudinal direction attributed to the large change in dimensions in this direction. Overall, Laser and shot peening resulted in a significant reduction in tensile residual stresses at the surface of the specimens. Author

Friction Stir Welding; Shot Peening; Lasers; Welded Joints; Tensile Stress; Metal Plates

20070007328 NASA Glenn Research Center, Cleveland, OH, USA

Phase Stability of a Powder Metallurgy Disk Superalloy

Gabb, Timothy P.; Gayda, John; Kantzos, P.; Telesman, Jack; Gang, Anita; Oct. 18, 2006; 16 pp.; In English; Materials Science and Technology Symposium, 16-19 Oct. 2006, Cincinnati, OH, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 698259.02.07.03; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070007328

Advanced powder metallurgy superalloy disks in aerospace turbine engines now entering service can be exposed to temperatures approaching 700 C, higher than those previously encountered. They also have higher levels of refractory elements, which can increase mechanical properties at these temperatures but can also encourage phase instabilities during service. Microstructural changes including precipitation of topological close pack phase precipitation and coarsening of existing gamma' precipitates can be slow at these temperatures, yet potentially significant for anticipated disk service times exceeding 1,000 h. The ability to quantify and predict such potential phase instabilities and degradation of capabilities is needed to insure structural integrity and air worthiness of propulsion systems over the full life cycle. A prototypical advanced disk superalloy was subjected to high temperature exposures, and then evaluated. Microstructural changes and corresponding changes in mechanical properties were quantified. The results will be compared to predictions of microstructure modeling software. Author

Heat Resistant Alloys; Powder Metallurgy; Metal Powder; Diffusion; Life (Durability); Stability; Structural Failure; Turbine Engines; Microstructure

20070007455 Air Force Research Lab., Wright-Patterson AFB, OH USA

High Temperature Properties and Aging-Stress Related Changes of FeCo Materials

Horwath, John; Turgut, Zafer; Fingers, Richard; Jul 2006; 130 pp.; In English

Contract(s)/Grant(s): Proj-3145

Report No.(s): AD-A460527; AFRL-PR-WP-TR-2006-2176; No Copyright; Avail.: CASI: A07, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460527

This publication focuses on high temperature magnetic, mechanical, and electrical properties of three Fe-Co alloys intended for use in high stress and high temperature environments. The specific alloys of interest are Hiperco(trade name) Alloy 27, Hiperco(trade name) Alloy 50 and Hiperco(trade name) Alloy 50 HS. Aging related changes in magnetic, mechanical, and electrical performance throughout the material's lifetime are documented. The effect of compressive and tensile stresses that may originate from product assembly and rotational forces during operation was also studied. Information contained in this publication is only specific to the alloys with given annealing conditions since magnetic and mechanical properties depend greatly on the annealing conditions performed after cold deformation. However, absence of any grain growth during 500 deg C aging up to 5,000 hours indicates that the observed trends should be representative for the same alloy compositions with different annealing histories.

DTIC

Aging (Materials); Cobalt Alloys; High Temperature; Iron Alloys

20070007607 Air Force Research Lab., Wright-Patterson AFB, OH USA

Qualifying Welders and Certifying Processes Produces Quality Products (Preprint)

Perkins, Larry; Jun 2006; 6 pp.; In English; Original contains color illustrations

Report No.(s): AD-A460809; AFRL-ML-WP-TP-2006-462; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460809

Two-week training session at Hobart Institute, Troy, Ohio. Discusses the growing need for qualified welders in the aircraft industry as there is move from fastened structures to welded joints.

DTIC

Certification; Welding

20070008255 Michigan Technological Univ., Houghton, MI, USA

Verification of Steelmaking Slags Iron Content Final Technical Progress Report. May 1, 2001 through April 30, 2006

Hwang, J. Y.; Sep. 30, 2006; 78 pp.; In English

Report No.(s): DE2006-892748; No Copyright; Avail.: National Technical Information Service (NTIS)

The steel industry in the USA generates about 30 million tons of by-products each year, including 6 million tons of desulfurization and BOF/BOP slag. The recycling of BF (blast furnace) slag has made significant progress in past years with much of the material being utilized as construction aggregate and in cementitious applications. However, the recycling of desulfurization and BOF/BOP slags still faces many technical, economic, and environmental challenges. Previous efforts have focused on in-plant recycling of the by-products, achieving only limited success. As a result, large amounts of by-products of various qualities have been stockpiled at steel mills or disposed into landfills. After more than 50 years of stockpiling and landfilling, available mill site space has diminished and environmental constraints have increased. The prospect of conventionally landfilling of the material is a high cost option, a waste of true national resources, and an eternal material liability issue. The research effort has demonstrated that major inroads have been made in establishing the viability of recycling and reuse of the steelmaking slags. The research identified key components in the slags, developed technologies to separate the iron units and produce marketable products from the separation processes. Three products are generated from the technology developed in this research, including a high grade iron product containing about 90%Fe, a medium grade iron product containing about 60% Fe, and a low grade iron product containing less than 10% Fe. The high grade iron product contains primarily metallic iron and can be marketed as a replacement of pig iron or DRI (Direct Reduced Iron) for steel mills. The medium grade iron product contains both iron oxide and metallic iron and can be utilized as a substitute for the iron ore in the blast furnace. The low grade iron product is rich in calcium, magnesium and iron oxides and silicates. It has a sufficient lime value and can be utilized for acid mine drainage treatment. Economic analysis from this research demonstrates that the results are favorable. The strong demand and the increase of price of the DRI and pig iron in recent years are particularly beneficial to the economics. The favorable economics has brought commercial interests. ICAN Global has obtained license agreement on the technology from Michigan Tech. This right was later transferred to the Westwood Land, Inc. A demonstration pilot plant is under construction to evaluate the technology. Steel industry will benefit from the new supply of the iron units once the commercial plants are constructed. Environmental benefits to the public and the steel industry will be tremendous.

Not only the old piles of the slag will be removed, but also the federal responsible abandoned mines from the old mining activities can be remediated with the favorable product generated from the process. Cost can be reduced and there will be no lime required, which can avoid the release of carbon dioxide from lime production process.
NTIS
Industries; Iron; Slags; Steels; Waste Utilization

20070008262 Lawrence Livermore National Lab., Livermore, CA USA
Dynamic Response of Single Crystalline Copper Subjected to Quasi-isentropic Lasser and Gas Gun Driving Loading
Meyers, M.; Jarmakani, H.; McNaney, J.; Schneider, M.; Nguyen, J.; May 25, 2006; 8 pp.; In English
Report No.(s): DE2006-893566; UCRL-CONG-221628; No Copyright; Avail.: National Technical Information Service (NTIS)

Single crystalline copper was subjected to quasi-isentropic compression via gas-gun and laser loading at pressures between 18 GPa and 59 GPa. The deformation substructure was analyzed via transmission electron microscopy (TEM). Twins and laths were evident at the highest pressures, and stacking faults and dislocation cells in the intermediate and lowest pressures, respectively. The Preston-Tonks-Wallace (PTW) constitutive description was used to model the slip-twinning process in both cases.
NTIS
Copper; Dynamic Response; Gas Guns; Single Crystals; Transmission Electron Microscopy

20070008263 Lawrence Livermore National Lab., Livermore, CA USA
Alloy 22 Localized Corrosion Susceptibility in Aqueous Solutions of Chloride and Nitrate Salts of Sodium and Potassium at 110-150 (deg) C. FY05 Summary Report
Felker, S.; Hailey, P. D.; Lian, T.; Staggs, K. J.; Gdowski, G.; Sep. 2006; 37 pp.; In English
Report No.(s): DE2006-893568; UCRL-TR-218195; No Copyright; Avail.: National Technical Information Service (NTIS)

Alloy 22 (a nickel-chromium- molybdenum-tungsten alloy) is being investigated for use as the outer barrier of waste containers for a high-level nuclear waste repository in the thick unsaturated zone at Yucca Mountain, Nevada. Experiments were conducted to assess crevice corrosion of Alloy 22 in de-aerated aqueous solutions of chloride and nitrate salts of potassium and sodium in the temperature range 110-150 C(some limited testing was also conducted at 90 C). Electrochemical testswere run in neutral salt solutions without acid addition and others wererun in salt solutions with an initial hydrogen ion concentration of 10(sup -4) molal. The Alloy 22 specimens were weld prism specimens and de-aeration was performed with nitrogen gas. No evidence of crevice corrosion was observed in the range 125-150 C. In the 120 to 160 C temperature range, the anionic concentration of stable aqueous solutionsis dominated by nitrate relative to chloride. At nominally 120 C, the minimum nitrate to chloride ratio is about 4.5, and it increases to about 22 at nominally 155 C. The absence of localized corrosion susceptibility in these solutions is attributed to the known inhibiting effect of the nitrate anion. At 110 C, aqueous solutions can have dissolved chloride in excess of nitrate. Localized corrosion was observed at nitrate to chloride ratios up to 1.0, the highest ratio tested. The extent of localized corrosion was confined to the crevice region of the samples, and was limited for nitrate to chloride ratios greater than or equal to 0.3. Aqueous solution chemistry studies indicate that nitrate to chloride ratios of less than 0.5 are possible for temperatures up to nominally 116 C. However, the exact upper temperature limit is unknown and no electrochemical testing was done at these temperatures. Limited comparison between 8 m Cl aqueous solutions of Na + K on the one hand and Ca on the other indicated similar electrochemical E(sub crit) values and similar morphology of attack, again limited to the crevice region. However, the 24 hr E(sub corr) value was higher for the Ca based solution; this is probably due to the higher acidity of this solution (Ca(sup 2+) is slightly hydrolyzing). Intermediate-term corrosion potential (E(sub corr)) measurements indicate that moderately acidic conditions are required to achieve elevated E(sub corr) values.
NTIS
Aqueous Solutions; Chlorides; Corrosion; Nitrates; Potassium; Radioactive Wastes; Sodium

20070008435 Stanford Linear Accelerator Center, CA, USA, Cornell Univ., Ithaca, NY, USA
Determining Micromechanical Strain in Nitinol
Strasberg, M.; Aug. 18, 2006; 26 pp.; In English
Report No.(s): DE2006-892605; SLAC-TN-06-030; No Copyright; Avail.: National Technical Information Service (NTIS)

Nitinol is a superelastic alloy made of equal parts nickel and titanium. Due to its unique shape memory properties, nitinol is used to make medical stents, lifesaving devices used to allow blood flow in occluded arteries. Micromechanical models and

even nitinol-specific finite element analysis (FEA) software are insufficient for unerringly predicting fatigue and resultant failure. Due to the sensitive nature of its application, a better understanding of nitinol on a granular scale is being pursued through X-ray diffraction techniques at the Stanford Synchrotron Radiation Laboratory (SSRL) at the Stanford Linear Accelerator Center (SLAC). Through analysis of powder diffraction patterns of nitinol under increasing tensile loads, localized strain can be calculated. We compare these results with micromechanical predictions in order to advance nitinol-relevant FEA tools. From this we hope to gain a greater understanding of how nitinol fatigues under multi-axial loads.
NTIS
Micromechanics; Nitinol Alloys

20070008643 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
An Exploration of Several Structural Measurement Techniques for Usage with Functionally Graded Materials
Reuter, Robert; Dec 2006; 72 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461271; AFIT/GAE/ENY/07-D03; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461271

Titanium / titanium boride functionally graded 6‘x 1‘x1’ beams were subjected to a four-point beam test in order to critique the value of several measurement techniques. Also, finite element analysis results were compared with experimental values and general observations about the experiment were recorded. Uniform 85% TiB /15% Ti and uniform commercially pure titanium specimens were also subjected to the same loading conditions as a control. Techniques used include digital image correlation, fiber optic strain gauging, strain gauging, and differential infrared thermography techniques. The strain data results were compared with one another and to linear finite element models. It was found that several of the techniques had distinct advantages and disadvantages for usage in a layered functionally graded system. Furthermore, the finite element showed good agreement with results when overlaid with several of the measurement techniques.
DTIC
Functionally Gradient Materials; Titanium; Titanium Borides

20070008739 Air Force Research Lab., Wright-Patterson AFB, OH USA
A Comparison of Optical and SEM BSE Imaging Techniques for Quantifying Alpha-Beta Titanium Alloy Microstructures (Preprint)
Miller, Jonathan; May 2006; 9 pp.; In English
Report No.(s): AD-A461482; AFRL-ML-WP-TP-2006-432; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461482

Quantitative metallography is often used to confirm the proper processing of aerospace metallic materials. A microstructural feature of great importance for titanium alloys processed in the alpha-beta phase field is the volume fraction of primary alpha. Standard methods of measuring delineated featured within a microstructure have been established previous, such as ASTM E-112 for grain size and ASTM E-562 for fraction of secondary phase. An accepted standard, however, for imaging technique has not been established to determine the quantity of primary alpha in alpha-beta titanium alloys, and metallurgists in industry and academia often favor different imaging techniques. In the present work, the volume fraction of primary alpha was measured using both optical microscopy and SEM backscatter electron (BSE) techniques. A comparison of measurements from images from both techniques indicated that the volume fraction of primary alpha was essentially equivalent.
DTIC
Imaging Techniques; Metallography; Microstructure; Titanium Alloys

20070008915 Air Force Research Lab., Wright-Patterson AFB, OH USA
Development of a Dovetail Fretting Fatigue Fixture for Turbine Engine Materials (Preprint)
Golden, Patrick J; Mar 2006; 11 pp.; In English
Contract(s)/Grant(s): Proj-4347
Report No.(s): AD-A461732; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461732

A unique dovetail fretting fatigue fixture was designed and evaluated for testing turbine engine materials at room or elevated temperatures. Materials from the cold section and hot sections of military turbojet engines were chosen for testing. The new fixture was improved over the previously used dovetail fretting fatigue fixture by including direct measurement of contact forces, alignment control, and elevated temperature capability. Measurement of the shear component of the contact

force was validated through an alternative instrumentation method. Initial tests reveal interesting variability in the behavior of the nickel based superalloy specimens.
DTIC
Engine Parts; Fixtures; Fretting; Heat Resistant Alloys; Turbine Engines; Turbojet Engines

20070009150 Missouri Water Resources Research Center, Rolla, MO USA
Effect of Initial Temper on the Mechanical Properties of Friction Stir Welded Al-2024 Alloy (Preprint)
Dixit, V; Mishra, R S; Lederich, R J; Talwar, R; Sep 2006; 19 pp.; In English
Contract(s)/Grant(s): FA8650-04-C-5704; Proj-2865
Report No.(s): AD-A462005; No Copyright; Avail.: CASI: A03, Hardcopy

The microstructural evolution and resultant mechanical properties during friction stir welding (FSW) of precipitation strengthened aluminum alloys depend on initial temper as well as FSW process parameters. Al-2024 alloy under two different initial tempers, T3 and T8, was used in this study. FSW bead-on-plate runs were performed at different values of process parameters (tool rotation rate and tool traverse speed). Microstructure and mechanical properties of the nugget region and heat affected zone (HAZ) were evaluated. Differential scanning calorimetry (DSC) revealed that in the nugget region, presence of GPB zone results from the partial dissolution of Al2CuMg phase. The microstructure and tensile properties were found to be independent of the initial temper of the material in the nugget region. In the HAZ region, tensile properties increased at higher heat-index values for T3 condition, and decreased monotonically for T8 condition.
DTIC
Aluminum Alloys; Friction Stir Welding; Mechanical Properties

20070009172 Air Force Research Lab., Wright-Patterson AFB, OH USA
Alpha/Beta Heat Treatment of a Titanium Alloy with a Non-Uniform Microstructure (Preprint)
Semiatin, S L; Lehner, T M; Miller, J D; Doherty, R D; Furrer, D U; Aug 2006; 42 pp.; In English
Contract(s)/Grant(s): Proj-M02R
Report No.(s): AD-A462032; No Copyright; Avail.: CASI: A03, Hardcopy

The effect of alpha/beta solution temperature and cooling rate on the evolution of microstructure during the heat treatment of Ti-6Al-2Sn-4Zr-2Mo-0.1Si (Ti6242Si) with a partially-spheroidized starting microstructure of equiaxed + remnant lamellar alpha was established. Experiments comprising induction heating to a peak temperature of 971 or 982 degrees C followed by cooling at a rate of 11 or 42 degrees C/min revealed that the volume fraction of the equiaxed alpha grew much more rapidly than the lamellar constituent. These results were explained semi-quantitatively using simple diffusion analyses of the growth of either spherical or elliptical particles, taking into account the soft-impingement of the concentration fields. Despite the much lower diffusivity of molybdenum, which appears to control the growth of primary alpha in Ti6242Si, the similarity of the overall kinetics compared to those measured previously for Ti-6Al-4V was explained on the basis of the higher supersaturations developed during cooldown in the present alloy.
DTIC
Heat Treatment; Microstructure; Nonuniformity; Titanium Alloys

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NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials. For composite materials see *24 Composite Materials*.

20070006653 SRI International Corp., Menlo Park, CA, USA
Diffusion Coatings for Corrosion-Resistant Components in Coal Gasification Systems
Krishnan, G. N.; Malhotra, R.; Alvarez, E.; Sep. 07, 2006; 14 pp.; In English
Report No.(s): DE2006-891455; No Copyright; Avail.: Department of Energy Information Bridge

Heat-exchangers, particle filters, turbines, and other components in integrated coal gasification combined cycle system must withstand the highly sulfiding conditions of the high-temperature coal gas over an extended period of time. The performance of components degrades significantly with time unless expensive high alloy materials are used. Deposition of a suitable coating on a low-cost alloy may improve its resistance to such sulfidation attack, and decrease capital and operating costs. The alloys used in the gasifier service include austenitic and ferritic stainless steels, nickel-chromium-iron alloys, and expensive nickel-cobalt alloys. During this period, we analyzed several coated and exposed samples of 409 steel by scanning

electron microscopy (SEM) and energy-dispersive X-ray (EDX). We report here on findings of this analysis: 1. A SS409 coupon that was coated with multilayered combined nitrides of Ti, Al, and Si showed adherent coatings on the surface; 2. A similarly coated coupon, after exposure to simulated coal gas at 900DGC for 300 h, revealed that the coating has cracked during the exposure; 3. An SS409 coupon that was coated with nitrides of Ti and Si with a barrier layer of tungsten in between to improve the adhesion of the coating and to prevent outward diffusion of iron to the surface. 4. A porous coupon was coated with nitrides of Ti and Al and examination of the coupon revealed deposition of Ti at the interior surfaces. A similarly prepared coupon was exposed to simulated coal gas at 370DGC for 300 h, and it showed no corrosion.
NTIS
Coal Gasification; Corrosion Resistance; Diffusion

20070006710 Westinghouse Savannah River Co., Aiken, SC, USA, Savannah River National Lab., Aiken, SC, USA
Effects of Tritium Exposure on UHMW-PE, PTFE, and Vespel (TRADE NAME)
Clakr, E. A.; Shanahan, K. L.; May 31, 2006; 53 pp.; In English
Report No.(s): DE2006-891658; WSRC-STI-2006-00049; No Copyright; Avail.: Department of Energy Information Bridge

Samples of three polymers, Ultra-High Molecular Weight Polyethylene (UHMW-PE), polytetrafluoroethylene (PTFE, also known as Teflon(reg-sign)), and Vespel(reg-sign) polyimide were exposed to 1 atmosphere of tritium gas at ambient temperature for varying times up to 2.3 years in closed containers. Sample mass and size measurements (to calculate density), spectra-colorimetry, dynamic mechanical analysis (DMA), and Fourier-transform infrared spectroscopy (FT-IR) were employed to characterize the effects of tritium exposure on these samples. Changes of the tritium exposure gas itself were characterized at the end of exposure by measuring total pressure and by mass spectroscopic analysis of the gas composition. None of the polymers exhibited significant changes of density. The color of initially white UHMW-PE and PTFE dramatically darkened to the eye and the color also significantly changed as measured by colorimetry. The bulk of UHMW-PE darkened just like the external surfaces, however the fracture surface of PTFE appeared white compared to the PTFE external surfaces. The white interior could have been formed while the sample was breaking or could reflect the extra tritium dose at the surface directly from the gas. The dynamic mechanical response of UHMW-PE was typical of radiation effects on polymers- an initial stiffening (increased storage modulus) and reduction of viscous behavior after three months exposure, followed by lowering of the storage modulus after one year exposure and longer. The storage modulus of PTFE increased through about nine months tritium exposure, then the samples became too weak to handle or test using DMA. Characterization of Vespel(reg-sign) using DMA was problematic--sample-to-sample variations were significant and no systematic change with tritium exposure could be discerned. Isotopic exchange and incorporation of tritium into UHMW-PE (exchanging for protium) and into PTFE (exchanging for fluorine) was observed by FT-IR using an attenuated total reflectance method. No significant change in the Vespel(reg-sign) infrared spectrum was observed after three months exposure. Protium significantly pressurized the UHMW-PE containers during exposure to about nine atmospheres (the initial pressure was one atmosphere of tritium). This is consistent with the well-known production of hydrogen by irradiation of polyethylene by ionizing radiation. The total pressure in the PTFE containers decreased, and a mass balance reveals that the observed decrease is consistent with the formation of small amounts of (sup 3)HF, which is condensed at ambient temperature. No significant change of pressure occurred in the Vespel(reg-sign) containers; however the composition of the gas became about 50% protium, showing that Vespel(reg-sign) interacted with the tritium gas atmosphere to some degree. The relative resistance to degradation from tritium exposure is least for PTFE, more for UHMW-PE, and the most for Vespel(reg-sign), which is consistent with the known relative resistance of these polymers to gamma irradiation. This qualitatively agrees with the concept of equivalent effects for equivalent absorbed doses of radiation damage of polymers. Some of the changes of different polymers are qualitatively similar; however each polymer exhibited unique property changes when exposed to tritium.
NTIS
Absorption Spectroscopy; Ambient Temperature; Exposure; Polytetrafluoroethylene; Tritium

20070006733 Carnegie Institution of Washington, Washington, DC, USA
Apparatus and Method for Diamond Production
Hemley, R. J.; Mao, H. K.; Yan, C. S.; Vohra, Y. K.; 27 Jan 05; 18 pp.; In English
Contract(s)/Grant(s): NSF-EAR-8929239; NSF-DMR-9972750
Patent Info.: Filed Filed 27 Jan 05; US-Patent-Appl-SN-11-043 062
Report No.(s): PB2007-102835; No Copyright; Avail.: CASI: A03, Hardcopy

An apparatus for producing diamond in a deposition chamber including a heat-sinking holder for holding a diamond and for making thermal contact with a side surface of the diamond adjacent to an edge of a growth surface of the diamond, a noncontact temperature measurement device positioned to measure temperature of the diamond across the growth surface of

the diamond and a main process controller for receiving a temperature measurement from the noncontact temperature measurement device and controlling temperature of the growth surface such that all temperature gradients across the growth surface are less than 20.degree. C. The method for producing diamond includes positioning diamond in a holder such that a thermal contact is made with a side surface of the diamond adjacent to an edge of a growth surface of the diamond, measuring temperature of the growth surface of the diamond to generate temperature measurements, controlling temperature of the growth surface based upon the temperature measurements, and growing single-crystal diamond by microwave plasma chemical vapor deposition on the growth surface, wherein a growth rate of the diamond is greater than 1 micrometer per hour.
NTIS
Deposition; Diamonds; Patent Applications

20070006742 Chicago Univ., Chicago, IL USA
Permafrost Ceramicrete
Wagh, A. S.; Fisher, B.; Natarajan, R.; 14 Sep 04; 8 pp.; In English
Contract(s)/Grant(s): DE-W-31-109-ENG-38
Patent Info.: Filed Filed 14 Sep 04; US-Patent-Appl-SN-10-941 592
Report No.(s): PB2007-102833; No Copyright; Avail.: CASI: A02, Hardcopy

A dry mix of a calcined oxide of Ca and/or Mg and an acid phosphate and fly ash with or without insulating extenders useful in permafrost conditions. Calcined oxide is present at about 12% to about 40% by weight and the acid phosphate is present at about 35% to about 45% by weight. The fly ash is present at about 10% to about 50% by weight with the fly ash being between about 50% to about 100% class F with the remainder class C. Insulating extenders are present in the range from 0% to about 15% by weight of the combined calcined oxide and acid phosphate and fly ash. 0.1% to about 0.5% boric acid and/or borate by weight of the dry mix is present.
NTIS
Cements; Ceramics; Chemical Bonds; Patent Applications; Permafrost; Phosphates

20070006786 Oklahoma State Univ., Stillwater, OK, USA
Guidelines for Using Prime and Tack Coats
Cross, S. A.; Shrestha, P. P.; Jul. 2005; 111 pp.; In English
Contract(s)/Grant(s): DTFH68-02-P-00271
Report No.(s): PB2007-105406; No Copyright; Avail.: National Technical Information Service (NTIS)

Prime and tack coats have a purpose in the pavement construction process, yet many times they are misused or eliminated during the project. While most of the time no harm appears to occur to the roadway, technical guidance is warranted to assure appropriate usage. The objective of this study was to produce a prime and tack coat guide publication developed for project development and field personnel to provide decision-making guidance on how to use, when to keep, and when to eliminate prime and tack coats. A literature search, which focused on handbooks and technical reports, was conducted to determine the applicability and benefits of prime and tack coat, prime and tack coat effectiveness, materials used and when and where they are used. CFLHDs current construction specifications were compared with best practices determined from the literature and phone surveys of current practice of state DOTs from the CFLHD region. Finally, a review of the potential harmful and positive environmental effects of the prime and tack coat process, including the various bituminous products used, was undertaken. Based on the information collected, a guideline for CFLHD project development and field personnel was developed. The guideline provides decision-making guidance on how to use, when to keep, and when to eliminate prime and tack coats.
NTIS
Asphalt; Construction; Primers (Coatings)

20070006796 Battelle Memorial Inst., Richland, WA, USA
Polymer Surface with Increased Hydrophilicity and Method of Making
Rieke, P. C.; 22 Jan 04; 9 pp.; In English
Contract(s)/Grant(s): DE-AC0676RL01830
Patent Info.: Filed Filed 22 Jan 04; US-Patent-Appl-SN-10-764 223
Report No.(s): PB2007-102867; No Copyright; Avail.: CASI: A02, Hardcopy

A polymer having a surface with increased hydrophilicity comprises a functionalized surface with a modified water contact angle less than the contact angle characteristic of an as-received, non-functionalized polymer surface. A method for

making the hydrophilic polymer having the functionalized surface comprises exposing the non-functionalized surface to a plasma and a reactive gas.
NTIS
Polymers; Surface Properties

20070006797 BBWI, Idaho Falls, ID, USA
Metallic Coatings on Silicon Substrates, and Methods of forming Metallic Coatings on Silicon Substrates
Branagan, D. J.; Hyde, T. A.; Fincke, J. R.; 13 Aug 04; 10 pp.; In English
Contract(s)/Grant(s): DE-AC07-99ID13727
Patent Info.: Filed Filed 13 Aug 04; US-Patent-Appl-SN-10-918 287
Report No.(s): PB2007-102868; No Copyright; Avail.: CASI: A02, Hardcopy

The invention includes methods of forming a metallic coating on a substrate which contains silicon. A metallic glass layer is formed over a silicon surface of the substrate. The invention includes methods of protecting a silicon substrate. The substrate is provided within a deposition chamber along with a deposition target. Material from the deposition target is deposited over at least a portion of the silicon substrate to form a protective layer or structure which contains metallic glass. The metallic glass comprises iron and one or more of B, Si, P and C. The invention includes structures which have a substrate containing silicon and a metallic layer over the substrate. The metallic layer contains less than or equal to about 2 weight % carbon and has a hardness of at least 9.2 GPa. The metallic layer can have an amorphous microstructure or can be devitrified to have a nanocrystalline microstructure.
NTIS
Metal Coatings; Metallic Glasses; Silicon; Substrates

20070006817 National Renewable Energy Lab., Golden, CO USA
Application of Single Wall Carbon Nanotubes as Transparent Electrodes in Cu(In,Ga)Se(sup 2)-Based Solar Cells
Contreras, M.; Barnes, T.; vande Lagemaat, J.; Rumbles, G.; Coutts, T. J.; May 2006; 6 pp.; In English
Report No.(s): DE2006-891545; NREL/CP-520-39914; No Copyright; Avail.: Department of Energy Information Bridge

We present a new thin-film solar cell structure in which the traditional transparent conductive oxide electrode (ZnO) is replaced by a transparent conductive coating consisting of a network of bundled single-wall carbon nanotubes. Optical transmission properties of these coatings are presented in relation to their electrical properties (sheet resistance), along with preliminary solar cell results from devices made using CuIn1-xGaxSe2 thin-film absorber materials. Achieving an energy conversion efficiency of \g12% and a quantum efficiency of (approx)80% demonstrate the feasibility of the concept. A discussion of the device structures will be presented considering the physical properties of the new electrodes comparing current-voltage results from the new solar cell structure and those from standard ZnO/CdS/Cu(In,Ga)Se2/Mo solar cells.
NTIS
Carbon; Carbon Nanotubes; Electrodes; Solar Cells; Transparence; Walls

20070007332 NASA Glenn Research Center, Cleveland, OH, USA
Thin Film Ceramic Strain Sensor Development for Harsh Environments: Identification of Candidate Thin Film Ceramics to Test for Viability for Static Strain Sensor Development
Wrbanek, John D.; Fralick, Gustave C.; Hunter, Gary W.; October 25, 2006; 24 pp.; In English; Air Force Research Lab. meeting, 25 Oct. 2006, Wright-Patterson AFB, OH, USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

The need to consider ceramic sensing elements is brought about by the temperature limits of metal thin film sensors in propulsion system applications. In order to have a more passive method of negating changes of resistance due to temperature, an effort is underway at NASA GRC to develop high temperature thin film ceramic static strain gauges for application in turbine engines, specifically in the fan and compressor modules on blades. Other applications include on aircraft hot section structures and on thermal protection systems. The near-term interim goal of this research effort was to identify candidate thin film ceramic sensor materials to test for viability and provide a list of possible thin film ceramic sensor materials and corresponding properties to test for viability. This goal was achieved by a thorough literature search for ceramics that have the potential for application as high temperature thin film strain gauges, reviewing potential candidate materials for chemical & physical compatibility with NASA GRC's microfabrication procedures and substrates.
Author
Ceramics; Thin Films; Strain Gages; High Temperature; Turbine Engines; Thermal Protection; Chemical Compatibility; Compressor Blades; Propulsion

20070007438 California Univ., Santa Barbara, CA USA
Plastic/Brittle Behavior of Consolidated Bodies: Role of Particle Pair Potential
Lange, F F; Jan 2005; 15 pp.; In English
Contract(s)/Grant(s): DAAD19-02-1-0380
Report No.(s): AD-A460490; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460490

Colloidal powder processing can improve the reliability and strength of ceramics by reducing the size of strength degrading heterogeneities through filtering the powder prior to consolidation. Removing heterogeneities greater than a given size is equivalent to a proof test, namely, truncating the strength distribution. Although significant property improvements can be made with the colloidal approach, new forming methods-consistent with the removal of flaws, are still under development. This development requires knowledge relating the mechanical properties of saturated powder compacts to the forces between particles, similar to relating properties of crystalline materials to interatomic forces. The background to this program resides with the discovery that short-range repulsive potentials can be developed that, when combined with the pervasive attractive van der Waals potential, produce an interparticle pair potential characterized by a potential well. This development has lead to new shape forming methods that are discussed at the end of this review.
DTIC
Brittleness; Ceramics; Colloids; Powder (Particles); Powder Metallurgy; Shapes

20070007577 Air Force Research Lab., Wright-Patterson AFB, OH USA
Permeability of Polymer Composites for Cryogenic Applications (Preprint)
Bechel, Vernon T; Arnold, Fred; Mar 2006; 13 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460771; AFRL-ML-WP-TP-2006-437; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460771

Previous cryogenic cycling research has focused on improving our understanding of the mechanisms that lead to a leakage-producing network of cracks in carbon/epoxy and carbon/bismaleimide composites and to evaluate a number of materials for use in cryogenic pressure vessels. However, the large fuel tanks and other cryogenic components of future reusable launch vehicles may benefit from the use of even higher temperature composite materials through the reduction in the weight of the thermal protection system needed to protect the composite components inside the vehicle. Hence, the current effort investigated two carbon/polymer composites (T650/AFR-PE-4 and T650/BIM-15) with service temperatures considerable greater than for most carbon/epoxy and carbon/bismaelimide composites. Additionally, to determine the effect of a more destructive thermal cycle, T650/AFR-PE-4 samples were also subjected to thermal cycling that included an elevated hold of 315 ?C.
DTIC
Carbon-Carbon Composites; Composite Materials; Cryogenics; Epoxy Compounds; Permeability; Polymers

20070008095 NASA White Sands Test Facility, NM, USA
ASTM Committee D20 on Plastics Liaison Report
Waller, J. M.; October 16, 2006; 17 pp.; In English; 11th International Symposium on Flammability and Sensitivity of Materials in Oxygen and Oxygen-Enriched Atmospheres, 18-20 Oct. 2007, Washington, DC, USA; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070008095

A viewgraph presentation describing plastic activities from committee D-20 is shown.
CASI
Plastics; Mechanical Properties; Thermoplasticity; Standards

20070008201 NASA Glenn Research Center, Cleveland, OH, USA
Thermal Expansion of Polyurethane Foam
Lerch, Bradley A.; Sullivan, Roy M.; August 14, 2006; 23 pp.; In English; SES 2006 43rd Annual Technical Meeting of the Society of Engineering Science: Thermo-Structural Mechanics and Fracture of Closed-cell Rigid Polymeric Foams, 13-16 Aug. 2006, University Park, PA, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 524238.08.02.03.04; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070008201

Closed cell foams are often used for thermal insulation. In the case of the Space Shuttle, the External Tank uses several

thermal protection systems to maintain the temperature of the cryogenic fuels. A few of these systems are polyurethane, closed cell foams. In an attempt to better understand the foam behavior on the tank, we are in the process of developing and improving thermal-mechanical models for the foams. These models will start at the microstructural level and progress to the overall structural behavior of the foams on the tank. One of the key properties for model characterization and verification is thermal expansion. Since the foam is not a material, but a structure, the modeling of the expansion is complex. It is also exacerbated by the anisoptropy of the material. During the spraying and foaming process, the cells become elongated in the rise direction and this imparts different properties in the rise direction than in the transverse directions. Our approach is to treat the foam as a two part structure consisting of the polymeric cell structure and the gas inside the cells. The polymeric skeleton has a thermal expansion of its own which is derived from the basic polymer chemistry. However, a major contributor to the thermal expansion is the volume change associated with the gas inside of the closed cells. As this gas expands it exerts pressure on the cell walls and changes the shape and size of the cells. The amount that this occurs depends on the elastic and viscoplastic properties of the polymer skeleton. The more compliant the polymeric skeleton, the more influence the gas pressure has on the expansion. An additional influence on the expansion process is that the polymeric skeleton begins to breakdown at elevated temperatures and releases additional gas species into the cell interiors, adding to the gas pressure. The fact that this is such a complex process makes thermal expansion ideal for testing the models. This report focuses on the thermal expansion tests and the response of the microstructure. A novel optical method is described which is appropriate for measuring thermal expansion at high temperatures without influencing the thermal expansion measurement. Detailed microstructural investigations will also be described which show cell expansion as a function of temperature. Finally, a phenomenological model on thermal expansion will be described.
Author
Polyurethane Foam; Thermal Expansion; Thermal Insulation; Mechanical Properties

20070008244 Iowa State Univ. of Science and Technology, Ames, IA USA
Resorption Rate Tunable Bioceramic: Si, Zn-Modified Tricalcium Phosphate
Wei, X.; Aug. 09, 2006; 148 pp.; In English
Report No.(s): DE2006-892738; No Copyright; Avail.: Department of Energy Information Bridge
This dissertation is organized in an alternate format. Several manuscripts which have already been published or are to be submitted for publication have been included as separate chapters. Chapter 1 is a general introduction which describes the dissertation organization and introduces the human bone and ceramic materials as bone substitute. Chapter 2 is the background and literature review on dissolution behavior of calcium phosphate, and discussion of motivation for this research. Chapter 3 is a manuscript entitled 'Si,Zn-modified tricalcium phosphate: a phase composition and crystal structure study', which was published in 'Key Engineering Materials'. Chapter 4 gives more crystal structure details by neutron powder diffraction, which identifies the position for Si and Zn substitution and explains the stabilization mechanism of the structure. A manuscript entitled 'Crystal structure analysis of Si, Zn-modified Tricalcium phosphate by Neutron Powder Diffraction' will be submitted to Biomaterials. Chapter 5 is a manuscript, entitled 'Dissolution behavior and cytotoxicity test of Si, Zn-modified tricalcium phosphate', which is to be submitted to Biomaterials . This paper discusses the additives effect on the dissolution behavior of TCP, and cytotoxicity test result is also included. Chapter 6 is the study of hydrolysis process of (alpha)-tricalcium phosphate in the simulated body fluid, and the phase development during drying process is discussed. A manuscript entitled 'Hydrolysis of (alpha)-tricalcium phosphate in simulated body fluid and phase transformation during drying process' is to be submitted to Biomaterials. Ozan Ugurlu is included as co-authors in these two papers due to his TEM contributions. Appendix A is the general introduction of the materials synthesis, crystal structure and preliminary dissolution result. A manuscript entitled 'Resorption rate tunable bioceramic: Si and Zn-modified tricalcium phosphate' was published in Ceramic Engineering and Science Proceedings (the 29th International Conference on Advanced Ceramics and Composites - Advances in Bioceramics and Biocomposites).
NTIS
Calcium Phosphates; Ceramics; Phosphates

20070008295 UT-Battelle, LLC, Oak Ridge, TN, USA
Robust Carbon Monolith Having Hierarchical Porosity
Dai, S.; Gulochon, G. A.; Liang, C.; 3 Feb 04; 18 pp.; In English
Contract(s)/Grant(s): DE-AC05-00BR22725
Patent Info.: Filed Filed 3 Feb 04; US-Patent-Appl-SN-10-770 734
Report No.(s): PB2007-102966; No Copyright; Avail.: CASI: A03, Hardcopy

A carbon monolith includes a robust carbon monolith characterized by a skeleton size of at least 100 nm, and a hierarchical pore structure having macropores and mesopores.
NTIS
Carbon; Liquid Chromatography; Porosity

20070008364 Iowa State Univ. of Science and Technology, Ames, IA USA
Biomimetic Nanocomposites of Calcium Phosphate and Self-Assembling Triblock and Pentablock Copolymers
Enlow, D. L.; Aug. 09, 2006; 61 pp.; In English
Report No.(s): DE2006-892726; No Copyright; Avail.: Department of Energy Information Bridge

In an effort to mimic the growth of natural bone, self-assembling, micelle and gel-forming copolymers were used as a template for calcium phosphate precipitation. Because of the cationic characteristics imparted by PDEAEM end group additions to commercially available Pluronic(reg-sign) Fl27, a direct ionic attraction mechanism was utilized and a polymer-brushite nanocomposite spheres were produced. Brushite coated spherical micelles with diameters of (approx)40 nm, and agglomerates of these particles (on the order of 0.5 (mu)m) were obtained. Thickness and durability of the calcium phosphate coating, and the extent of agglomeration were studied. The coating has been shown to be robust enough to retain its integrity even below polymer critical micelle concentration and/or temperature. Calcium phosphate-polymer gel nanocomposites were also prepared. Gel samples appeared as a single phase network of agglomerated spherical micelles, and had a final calcium phosphate concentration of up to 15 wt%. Analysis with x-ray diffraction and NMR indicated a disordered brushite phase with the phosphate groups linking inorganic phase to the polymer.
NTIS
Biomimetics; Calcium Phosphates; Copolymers; Nanocomposites

20070008434 NASA Johnson Space Center, Houston, TX, USA
Proposed G114-06 Amendment Standard Practices for Evaluating the Age Resistance of Polymeric Materials Used in Oxygen Service
Maes, Miguel; Waller, Jess; October 17, 2006; 17 pp.; In English; ASTM 11th International Symposium, 18-20 Oct. 2006, West Conshohocken, PA, USA; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070008434

A viewgraph presentation on proposed G114-06 amendments and G04.02 subcommittee balloting results for the effects of Oxygen degradation on polymers is shown.
CASI
Oxygen; Polymers; Mechanical Properties; Aging (Materials); Resistance

20070008585 Army Tank-Automotive Research and Development Command, Warren, MI USA
Evaluation of Purging Solutions for Military Fuel Tanks
Rhee, In-Sik; May 2003; 23 pp.; In English
Report No.(s): AD-A461177; TARDEC-TR-13840; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461177

Citrikleen is a terpene based solvent and its component is derived from d-limonene or pine tree. It is also a biodegradable water based solvent. Because of this property, US Army has used this environmentally friendly solvent as a purging solution in all military fuel tanks including Heavy Expanded Mobility Truck (HEMTT) for the last eight years. Recently, TACOM Logistic Assistance Representative (LAR) reported that Citrikleen solvent damages rubber seal equipped in Tank and Pump Units (TPUs), HEMTTs, and 5000 gallons of fuel delivery trucks. To clarity this problem, a seal compatibility test was conducted with Citrikleen solvents according to the ASTM D 471 test method for Rubber Property-Effect of Liquids. To draw a baseline for this evaluation, two fuel samples (i.e., JP-8 and DF-2) were tested along with Citrikleen. In addition, three more solvent were also tested to make a comparison against Citrikleen solvent Based on the seal compatibility test results, this paper summarizes test results and findings, and redefines Citrikleen solvent as a purging solution for military fuel tanks.
DTIC
Compatibility; Fuel Tanks; Purging; Solvents; Terpenes

20070008642 Missouri Water Resources Research Center, Rolla, MO USA
Freeform Extrusion of High Solids Loading Ceramic Slurries. Part 2. Extrusion Process Control (Preprint)
Mason, Michael S; Huang, Tieshu; Landers, Robert G; Leu, Ming C; Hilmas, Gregory E; Jul 2006; 13 pp.; In English
Contract(s)/Grant(s): FA8650-04-C-5704; Proj-2510
Report No.(s): AD-A461270; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461270

Part I of this paper provided a detailed description of a novel fabrication machine for high solids loading ceramic slurry extrusion processes and presented an empirical model of the ceramic extrusion process, viewing ram velocity as the input and extrusion force as the output. A constant extrusion force is desirable as it correlates with a constant material deposition rate and, thus, good part quality. The experimental results used to construct the model demonstrated that a constant ram velocity will not necessarily produce a constant extrusion force. In some instances the extrusion force increased until ram motor skipping occurred, and process disturbances, such as air bubble release and nozzle clogging, were often present. In this paper a feedback controller for the ceramic extrusion process is designed and experimentally implemented. The controller intelligently adjusts the ram motor velocity to maintain a constant extrusion force. Since there is tremendous variability in the extrusion process model, an on-off controller is utilized in these studies. Comparisons are made between parts fabricated with and without feedback control. It is demonstrated that the use of intelligent feedback control reduces the effect of process disturbances (i.e., air bubble release and nozzle clogging) and dramatically improves part quality.
DTIC
Ceramics; Extruding; Feedback; Ogives; Slurries; Solids

20070008656 Missouri Water Resources Research Center, Rolla, MO USA
Freeform Extrusion of High Solids Loading Ceramic Slurries. Part 1: Extrusion Process Modeling
Mason, Michael S; Huang, Tieshu; Landers, Robert G; Leu, Ming C; Hilmas, Gregory E; Jul 2006; 16 pp.; In English
Contract(s)/Grant(s): FA8650-04-C-5704; Proj-2510
Report No.(s): AD-A461293; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461293

A novel, solid freeform fabrication method has been developed for the manufacture of ceramic-based components in an environmentally friendly fashion. The method is based on the extrusion of ceramic slurries using water as the binding media. Aluminum oxide (Al2O3) is currently being used as the part material and solids loading as high as 60 vol. % has been achieved. This paper describes a novel manufacturing machine that has been developed for the extrusion of high solids loading ceramic slurries. A critical component of the machine is the deposition system, which consists of a syringe, a plunger, a ram actuated by a motor that forces the plunger down to extrude material, and a load cell to measure the extrusion force. An empirical, dynamic model of the ceramic extrusion process, where the input is the commanded ram velocity and the output is the extrusion force, is developed. Several experiments are conducted and curve fitting techniques are utilized to construct the dynamic model. The results demonstrate that the ceramic extrusion process has a very slow dynamic response, as compared to other non-compressible fluids such as water. A substantial amount of variation exists in the ceramic extrusion process, most notably in the transient dynamics, and a constant ram velocity may either produce a relatively constant steady-state extrusion force or it may cause the extrusion force to steadily increase until the ram motor skips. The ceramic extrusion process is also subjected to significant disturbances such as air bubble release, which causes a dramatic decrease in the extrusion force, and nozzle clogging, which causes the extrusion force to slowly increase until the clog is released or the ram motor skips.
DTIC
Ceramics; Extruding; Fabrication; Freezing; Slurries; Solids

20070008657 Missouri Water Resources Research Center, Rolla, MO USA
Freeze-Form Extrusion Fabrication of Alumina Components Using Aqueous Paste
Huang, Tieshu; Mason, Michael S; Hilmas, Gregory E; Leu, Ming C; Jul 2006; 22 pp.; In English
Contract(s)/Grant(s): FA8650-04-C-5704; Proj-2510
Report No.(s): AD-A461294; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461294

Freeze-form Extrusion Fabrication (FEF) is an environmentally friendly solid freeform fabrication method that uses aqueous pastes to fabricate ceramic-based components. The process uses only small quantities (2 to 4 vol.%) of organic binder. Using the FEF process, 3-D ceramic components have been fabricated from aluminum oxide (Al2O3) by extrusion deposition of Al2O3 paste in a layer-by-layer manner utilizing a 3-D gantry controlled by a computer using Labview software. Sintered

samples have achieved 98% of their theoretical density, demonstrating the feasibility of the FEF process.
DTIC
Aluminum Oxides; Aqueous Solutions; Ceramics; Extruding; Fabrication; Freezing; Pastes

20070008667 Ceramic Composites, Inc., Millersville, MD USA
Strength Enhancement and Application Development of Carbon Foam for Thermal Protection Systems
Duston, Christopher; Seghi, Steve; Watts, Roland; Sep 2004; 6 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F33615-03-M-5039
Report No.(s): AD-A461309; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461309

Carbon foam is recognized as having great potential as a component within hybrid (rainbow) Thermal Protection Systems for low angle re-entry vehicles. In this concept, the carbon foam supports a ceramic matrix composite surface by providing selectable insulating or thermally conductive dual-use properties. An initial barrier to implementation was the inherent weakness and friability of the carbon foams. Under a MDA funded SBIR program, Ceramic Composites Inc. has demonstrated the ability to increase the compressive modulus by 2 1/2 times through the treatment of the carbon foam ligaments with a uniform silicon carbide coating, serving to enhance strength and reduce friability, with minimal influence upon the thermal properties. The process is scalable to leading edge sizes using commercially available equipment. An overview of the technical approach will be presented, along with the envelope of enhanced material properties achieved under the program.
DTIC
Augmentation; Carbon; Foams; Silicon Carbides; Thermal Conductivity; Thermal Protection

20070008678 Missouri Univ., Rolla, MO USA
Freeze-Spray Processing of Layered Ceramic Composites (Preprint)
Jongprateep, O; Fu, Q; Abbott, A\g; Dogan, F; Apr 2006; 26 pp.; In English
Contract(s)/Grant(s): FA8650-04-C-5704; Proj-2865
Report No.(s): AD-A461326; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461326

Thermal gradients and associated stresses are critical in designing with ceramic composites having low thermal conductivity. In order to reduce the stresses from thermal gradients, compositional gradients are employed in designing of composite structures. This study addresses development of freeze-spray process to fabricate layered ceramic structures with controlled layer thickness and microstructural development. The composites were processed by spraying of ceramic slurries with low binder content and relatively high solids loadings (up to 40 vol%) on a cooled substrate. The frozen parts were freeze-dried and sintered at elevated temperatures. The relationship between microstructural development and thermal expansion behavior of Al2O3 and Y2O3-stabilized ZrO2 functionally graded ceramic composites is discussed.
DTIC
Ceramic Matrix Composites; Freezing; Sprayers

20070008787 Senterfitt (Akerman), West Palm Beach, FL, USA
Carbon Nanotube Films for Hydrogen Sensing
Rinzler, A. G.; Sippel-Oakley, J. A.; Kang, B. S.; Wang, H. T.; Ren, F.; January 1, 2007; 10 pp.; In English
Contract(s)/Grant(s): F49620-03-1-0370; DMR-04-00416
Report No.(s): PB2007-101425; PAT-APP-11-089-311; No Copyright; Avail.: CASI: A02, Hardcopy

A multi-layer H.sub.2 sensor includes a carbon nanotube layer, and a ultra-thin metal or metal alloy layer in contact with the nanotube layer. The ultra-thin metal or metal alloy layer is preferably from 10 to 50 angstroms thick. An electrical resistance of the layered sensor increases upon exposure to H.sub.2 and can provide detection of hydrogen gas (H.sub.2) down to at least 10 ppm. The metal or metal alloy layer is preferably selected from the group consisting of Ni, Pd and Pt, or mixtures thereof. Multi-layered sensors and can be conveniently operated at room temperature.
NTIS
Carbon Nanotubes; Detection; Hydrogen

20070008848 Universal Energy Systems, Inc., Dayton, OH USA

Lubrication Performance of Ionic Liquids Under Low Load Applications: Small Scale Interfaces (Preprint)

Nainaparampil, Jose L; Eapen, Kalathil C; Voevodin, Andrey; Zabinski, Jeffrey S; Sanders, Jeffrey H; May 2006; 11 pp.; In English

Report No.(s): AD-A461620; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461620

Ionic liquids (ILs) have myriad potential uses as low vapor pressure solvents, catalysts and conducting liquids. Approximately one trillion room temperature ILs are possible if we include all mixtures. Due to this large number, the selection of a particular IL for a specific application is very difficult. Certain ILs with long alkyl chains have been shown to exhibit lubricious characteristics under macro testing conditions. A method is described here that compares the performance of ILs as lubricants for low load conditions for both micro and nano level contacts. An atomic force microscope with micro-sphere attached tip in a fluid cell is used to compare the lubricity of ILs with distinct molecular architectures. Overall lubrication performance of ionic liquid studied here at low load conditions seems to be an interplay of boundary regime and hydrodynamic regime and H-silicon showed much lower friction than on neat silicon.

DTIC

Liquids; Loads (Forces); Lubricants; Lubrication; Nanotechnology; Tribology

20070009296 Naval Undersea Warfare Center, Newport, RI USA

Technology & Mechanics Overview of Air-Inflated Fabric Structures

Cavallaro, Paul V; Dec 4, 2006; 13 pp.; In English; Original contains color illustrations

Report No.(s): AD-A462232; NUWC-NPT-RR-11784; No Copyright; Avail.: CASI: A03, Hardcopy

Air-inflated fabric structures are categorized as pre-tensioned structures and are uniquely capable of many advantages not available with traditional structures. These include lighter weight designs, rapid and self-erecting deployments, enhanced mobility, large deployed-to- packaged volume ratios, fail-safe collapse and optional rigidification. Research and development in pursuit of air-inflated structures can be traced to space, military, commercial and marine applications. Examples include air ships, weather balloons, inflatable radomes, shelters, pneumatic muscles, inflatable boats, bridging, and energy absorbers such as automotive air bags and landing cushions for space vehicles. Recent advances in high performance fibers and improved textile manufacturing methods have fostered emerging interests in air-inflated fabric structures which are increasingly designed as reliable alternatives to conventional structures.

DTIC

Fabrics; Inflatable Structures; Textiles

20070009598 Naval Undersea Warfare Center, Newport, RI USA

Controlled Skin Formation for Foamed Extrudate

Beauregard, Donald V, Inventor; Nov 9, 2006; 11 pp.; In English

Report No.(s): AD-D020273; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention is directed to the extrusion of plastics, and more specifically to a method for achieving a very smooth extrudate surface using thermoplastic syntactic foam materials. It is a general purpose and object of the present invention to disclose a method and apparatus to control the skin formation of a foamed extrudate. It is a further object to employ an insulating plate to shield and control cooling of the die used to extrude the foam such that a low density extrudate with a solid skin and inner foamed core is achieved.

DTIC

Dies; Extruding; Foams; Patent Applications

28
PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; their storage and handling procedures; and aircraft fuels. For nuclear fuels see *73 Nuclear Physics*. For related information see also *07 Aircraft Propulsion and Power; 20 Spacecraft Propulsion and Power*; and *44 Energy Production and Conversion*.

20070007551 Library of Congress, Washington, DC USA

Natural Gas Markets in 2006

Pirog, Robert; Dec 12, 2006; 15 pp.; In English; Original contains color illustrations

Report No.(s): AD-A460726; CRS-RL33714; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460726

The Energy Information Administration (EIA) in its Short Term Energy and Winter Fuels Outlook (STEWFO) provided good news for residential natural gas consumers. EIA projected that natural gas winter home heating costs might decline by as much as 13% from last year's record-setting levels, even though consumption is expected to increase this winter. The STEWFO sees prices for natural gas lower than last year as a result of weak market fundamentals. Analyses of natural gas market demand and supply conditions seem to be consistent with the EIA STEWFO. Aggregate consumption of natural gas over the first seven months of 2006 has declined compared to 2005. U.S. production, as well as imports, have also declined over the same time period, likely in response to the decrease in consumption. On a sectoral level, the decline in consumption has included all consumer groups except electric power generators, whose consumption rose. Storage of natural gas, the factor that balances yearly demand and supply, is at an all time record high level, and is approaching the maximum physical capacity of the system. There does not appear to be any fundamental imbalance between demand and supply in the 2006 natural gas market, making a stable, or even declining, price level likely.
DTIC
Market Research; Natural Gas

20070008048 Library of Congress, Washington, DC USA
Russian Natural Gas: Regional Dependence
Gelb, Bernard A; Jan 5, 2007; 5 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460847; CRS-RS22562; No Copyright; Avail.: CASI: A01, Hardcopy

Russia is the dominant natural gas supplier to Europe and neighboring former Soviet states, as well as a major provider of oil. Some countries are entirely or largely dependent upon Russian energy supplies, particularly other Soviet successor states. As such, Russia has some ability to dictate natural gas prices. Russia cut off the gas supply to Ukraine and Moldova in January 2006 and threatened to cut off gas supplies to Belarus and Georgia during late 2006 price negotiations. These and other actions in the interim damaged Russia's reputation as a reliable energy supplier, spurred importing countries to seek other sources, and provoked criticism that it is using energy as a political tool.
DTIC
Natural Gas; Russian Federation

20070008157 Air Force Research Lab., Eglin AFB, FL USA
A Hydrocarbon Fuel Flash Vaporization System for a Pulsed Detonation Engine
Tucker, K C; King, Paul I; Schauer, Frederick R; Dec 2006; 29 pp.; In English
Report No.(s): AD-A460539; AFRL-MN-EG-TP-2006-7420; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460539

Practical operation of pulsed detonation propulsion requires operation on kerosene-based jet fuels. These low vapor pressure fuels remain in liquid form at typical pulsed detonation inlet conditions and residence times, and the subsequent presence of fuel droplets significantly hinders performance. A fuel flash vaporization system (FVS) was designed and built to reduce evaporation time and provide gaseous fuel to the PDE. Four fuels that vary in volatility and octane number were tested: n-heptane, iso-octane, aviation gasoline, and JP-8. Results showed the FVS quickly provides a detonable mixture for all of the fuels tested without cooking the fuel lines. A significant result was the detonation of flash vaporized JP-8 in air without a pre-detonator.
DTIC
Detonation; Fuel Systems; Hydrocarbon Fuels; Hydrocarbons; Jet Engine Fuels; Pulse Detonation Engines; Vaporizing

20070008507 Army Tank-Automotive and Armaments Command, Warren, MI USA
Microbiological Contamination in JP-8 Fuel
Rhee, In-Sik; Jun 1, 2004; 7 pp.; In English
Report No.(s): AD-A461051; 14103; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461051

No abstract available
Aircraft Fuels; Biological Effects; Contamination; JP-8 Jet Fuel; Microbiology; Microorganisms

20070008510 Army Tank-Automotive Research and Development Command, Warren, MI USA
Predicting the Liquid Lengths of Heavy Hydrogen Fuels
Hoogterp, Laura L; Aug 30, 2003; 13 pp.; In English
Report No.(s): AD-A461056; TARDEC-13918; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461056

The purpose of this paper is to outline the procedure used in determining the liquid lengths in diesel fuels. Using models formulated by previous researchers as well as the thermodynamic properties for three fuel surrogates the liquid length can be determined for diesel fuel, JP8 as well as provide a model for fuels between these ranges. This information is to later be used to develop a computer program to perform these calculations on engines running in a test cell.
DTIC
Diesel Fuels; Hydrogen Fuels; Liquid Hydrogen; Predictions

20070008722 Naval Research Advisory Committee, Arlington, VA USA
Future Fuels
Andrews, A M; Bryzik, W; Carlin, R; Feigley, J M; Harrison, III, W E; Katz, D J; Rodriguez, J Y; Snead, R L; Sommerer, J C; Tozzi, J T; Apr 2006; 80 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461456; NRAC-06-1; No Copyright; Avail.: CASI: A05, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461456

The challenge 'Unleash us from the tether of fuel,' came from Lt. Gen. James Mattis, USMC, Commanding General of Marine Corps Combat Development Command (MCCDC), and his Operation Iraqi Freedom (OIF) experience as CG of First Marine Division. As a near-term response, the Panel determined that the fuel tether remains, but found a way to lengthen it (Hybrid Electric Vehicle technology) and untangle it (dynamic fuel management). The Marine Corps must commit to the development of the hybrid electric architecture for tactical wheeled vehicles and the development of sensor and communications systems to enable operational commanders to manage fuel allocation and re-supply in real-time during combat operations. The Panel recommends that DOD commit now to procuring manufactured liquid hydrocarbons for the long term at lower than current market price, to encourage commercial financing, push technology and help motivate the building of the necessary manufacturing and distribution infrastructure.
DTIC
Electric Motor Vehicles; Fuel Consumption; Fuels; Hydrocarbon Fuels; Propulsion System Configurations; Propulsion System Performance

20070008749 Fish and Richarson P.C., Minnesapolis, MN, USA
High Propulsion Mass Fraction Hybrid Propellant System
Sarigul-Klijn, M.; Sarigul-Klijn, N.; Benson, J.; Macklin, F.; 28 Oct 05; 15 pp.; In English
Contract(s)/Grant(s): F29601-03-M-0176
Patent Info.: Filed Filed 28 Oct 05; US-Patent-Appl-SN-11-261-433
Report No.(s): PB2007-101421; No Copyright; Avail.: CASI: A03, Hardcopy

Disclosed is a propulsion system having a structural configuration that provides easy and convenient access to the interior regions of a liquid fuel tank and a hybrid rocket motor case. The system operates with a high oxidizer-to-fuel ratio and a high bulk density propellant combination that has a near uniform specific impulse over a large oxidizer-to-fuel ratio range. The system has an increased propellant mass fraction and reduced propellant residuals. This improves the performance of the hybrid propulsion system.
NTIS
Hybrid Propellants; Propulsion; Propulsion System Configurations; Propulsion System Performance; Rocket Propellants

20070009322 Army Tank-Automotive Research and Development Command, Warren, MI USA
Evaluation of Ball on Three Disks as Lubricity Evaluator for CI/LI in Synthetic JP-5
Stavinoha, Leo; McKay, Brian; Villahermosa, Luis; Muzzell, Pat; Apr 2004; 43 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAE07-02-C-LO70
Report No.(s): AD-A462280; No Copyright; Avail.: CASI: A03, Hardcopy

Synthetic fuel, like other poor lubricity fuels, will require lubricity-improving additives in order to prevent excessive engine fuel pump and injector wear. Lubricity improver additive, at minimum and maximum treat concentrations, were blended with a synthetic JP-5 hydrocarbon fuel containing no sulfur or aromatic species. The blends were then tested using the Ball on Three Disks (BOTD) bench-top test to determine their respective wear scars. Wear was determined to decrease in a non-linear fashion as the lubricity additive concentration increased. The BOTD has been shown to have correlative utilization over other diesel fuel lubricity bench-top tests including the Scuffing Load Ball on Cylinder Lubricity Evaluator (SLBOCLE) and High Frequency Reciprocating Rig (HFRR). The BOTD compares favorably with the lubricity additive

qualification bench-top test (Ball on Cylinder Lubricity Evaluator [BOCLE]) because of its lubricity additive sensitivity; however, published data indicates that it can more adequately represent conditions found in fuel pumps.
DTIC
Diesel Fuels; Engine Parts; Fuel Systems; JP-5 Jet Fuel; Performance Tests; Synthetic Fuels; Wear

31
ENGINEERING (GENERAL)

Includes general research topics related to engineering and applied physics, and particular areas of vacuum technology, industrial engineering, cryogenics, and fire prevention. For specific topics in engineering see *categories 32 through 39*.

20070007376 Army Tank-Automotive and Armaments Command, Warren, MI USA
Standards Representative Handbook
Molitoris, Heather J; Jun 2003; 12 pp.; In English
Report No.(s): AD-A460263; TACOM-13904; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460263

The National Technology Transfer Act of 1995 (Public Law 104-113) states, 'Federal Participation in the Development and Use of Voluntary Standards, that are transitioning the Executive branch of the Federal Government from a developer of internal standards to a customer of external standards. Specifically, section 12 'Standards Conformity' states, '...all Federal agencies and departments shall use technical standards that are developed and adopted by voluntary consensus standards bodies, using such technical standards as a means to carry out policy objectives or activities determined by the agencies and departments. Federal Agencies and departments shall consult with voluntary, private sector, consensus standards bodies, and shall.. participate with such bodies in the development of technical standards.' [1] NAC participates in standards work to serve our customers better by providing military acceptable commercially available products at lower costs. DoD purchase of commercially available products will be enhanced when NGS are available which define the needs of the DoD in terms of the commercial marketplace. However, one must note the difference between New Technology Standards and reforming Old MIL SPEC Standards. New Technology Standards focus on emerging technologies that are being developed in industry and the government, while Old MIL SPEC conversion takes existing standards focused more on component parts and attempts to add the necessary military requirements. They are equally important; however, with emerging technologies, the government has the opportunity at their inception to put the necessary language into the standard to make them more compatible with military applications.
DTIC
Handbooks; Organizations; Personnel

20070007508 Universal Technology Corp., Dayton, OH USA
Nondestructive Evaluation Technology Initiatives Program II (NTIP II). Delivery Order 10, Task 010-015: In Search of Excellence - An Historical Review
Forney, Donald; May 2006; 193 pp.; In English
Contract(s)/Grant(s): F33615-03-D-5204-0010; Proj-4349
Report No.(s): AD-A460631; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA460631

This report provides a brief historical account of the organization evolution, the research and development activities, and the important technology contributions made by the Nondestructive Evaluation Branch of the Air Force Research Laboratory?s (AFRL) Materials and Manufacturing Directorate (ML) and predecessor organizations. Its purpose is to bring attention to and document a remarkable legacy of people, vision and accomplishment. It tells the story of the early beginnings in 1919 at McCook Field in Dayton, Ohio along with many of the subsequent advances in Nondestructive Evaluation (NDE) science and engineering made by the men and women of the ML NDE Research and Development Program spanning over 8 decades of service. This report covers the NDE organization evolution; timeline of the people who served; notable events that influenced the national awareness and the growth of the NDE Program; the more significant NDE developments that impacted the AF; key NDE Program partnerships; and other important NDE topics. This brief history is important to the understanding of the significance of past developments and the dedication of many inventive Air Force technologists who helped pave the way to today's innovations and their positive impact on the safety and reliability of both aeronautical and space assets.
DTIC
Evaluation; Histories; Inspection; Nondestructive Tests; System Effectiveness

20070007641 Civil Aeromedical Inst., Oklahoma City, OK USA
Identification of Sildenafil (Viagra) and Its Metabolite (UK 103,320) in Six Aviation Fatalities
Johnson, Robert D; Lewis, Russell J; Feb 2006; 14 pp.; In English
Contract(s)/Grant(s): Proj-AM-B-05-TOX-204
Report No.(s): AD-A460880; DOT-FAA-AM-06-03; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460880

During the investigation of aviation accidents, postmortem samples from victims are submitted to the Federal Aviation Administration's Civil Aerospace Medical Institute for toxicological analysis. This report presents a rapid and reliable method for the identification and quantitation of sildenafil (Viagra) and its active metabolite, UK-103,320. This procedure utilizes sildenafil-d8 as an internal standard for more accurate and reliable quantitation. The method incorporates solid-phase extraction and LC/MS/MS and MS/MS/MS utilizing an atmospheric pressure chemical ionization ion trap mass spectrometer in the positive chemical ionization mode. Solid-phase extraction provided an efficient sample extraction yielding recoveries ranging from 79 - 88%. The limit of detection for sildenafil and UK-103,320 was 0.39 and 0.19 ng/mL, respectively. The linear dynamic range for both compounds was 0.78 - 800 ng/mL. The method was employed for the determination of sildenafil and UK-103,320 in postmortem fluid and tissue specimens collected from 6 fatal aviation accident victims. The current method proved to be simple, accurate, and robust for the identification and quantitation of sildenafil and UK-103,320 in postmortem fluids and tissues.
DTIC
Autopsies; Metabolites; Toxicology

20070008464 Aptima, Inc., Woburn, MA USA
Test Environment for FORCEnet Concepts
See, Katrina; Weil, Shawn A; Entin, Elliot E; Moore, Ronald A; Pattipati, Krishna; Meirina, Candra; Kleinman, David; Downes-Martin, Stephen; Hovanec, R S; Bailey, Adam; Mar 15, 2005; 29 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-02-C-0233
Report No.(s): AD-A460971; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460971

The USA Navy is undergoing a rapid transformation in the operations it conducts - the types of enemies it faces, the resources it has to draw upon, the capabilities it can deliver, the manner in which it coordinates with other branches of the armed services, and the organizational structures it uses to bring those new resources and capabilities to bear against a new generation of enemies. To accommodate this rapid transformation, a revolution has been occurring that began with the development of the concept of 'network-centric warfare' (NCW). NCW promises to deliver unprecedented operational tempo and situational awareness through networked connectivity. For the Navy, the NCW concept has evolved into the definition of FORCEnet as a future organizing principle. Given this rapid transformation, several questions emerge regarding how best to realize the FORCEnet vision. These questions involve issues such as organizational design, information flow, information filtering, and display technologies. Accordingly, in this report, we describe an effort to develop an integrated testbed to explore FORCEnet concepts and technologies. The testbed is unique in that it serves to unite research on novel FORCEnet architectures with research designed to develop innovative information displays to support network-centric operations. Our intent in this report is to briefly describe this testbed, which will enable future experimentation and validation of emerging concepts.
DTIC
Computerized Simulation; Organizations

20070008677 Air Force Research Lab., Kirkland AFB, NM USA
Noise Analysis for Complex Field Estimation Using a Self-Referencing Interferometer Wave Front Sensor (Postprint)
Rhoadarmer, Troy; Barchers, Jeffery D; Jan 2002; 15 pp.; In English
Contract(s)/Grant(s): DF299962; Proj-JT00
Report No.(s): AD-A461325; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461325

A noise analysis tor complex field reconstruction from a self-referencing interferometer wave front sensor with an amplified reference is evaluated. The wave front sensor is constructed from a phase-shifting, point diffraction interferometer where the reference field is created by coupling a focal plane image of the input optical filed into an optical amplifier. The noise characteristics of the wave front sensor are examined in terms of the field estimations Strehl. The effects of several

systems parameters are examined shot noise, read noise, quantization noise, the relative intensities of the signal and reference fields, spontaneous emission from the amplifier, and phase shift errors
DTIC
Interferometers; Optical Properties; Scintillation; Wave Fronts

20070008706 Army Engineer Research and Development Center, Vicksburg, MS USA
Operating the Portable Seismic Pavement Analyzer
Bell, Haley P; Dec 2006; 25 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461413; ERDC/GSL-SR-06-9; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461413

The portable seismic pavement analyzer (PSPA) is a non-destructive testing device that measures the seismic modulus of concrete pavements. This report provides guidance on how to operate the PSPA including (a) general use and recommendations of the PSPA, (b) processing data measured from the PSPA, (c) step-by-step instructions for replacing the batteries in the PS PA, (d) step-by-step instructions for removing and replacing the rubber pads on the bottom of the receivers and the source of the PSPA, and (e) troubleshooting.
DTIC
Analyzers; Maintenance; Nondestructive Tests; Pavements

20070008715 George Mason Univ., Fairfax, VA USA
The Use of Simulation Models in Model Driven Experimentation
Handley, Holly A; Zaidi, Zainab R; Levis, Alexander H; Jan 1999; 28 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-93-1-0912
Report No.(s): AD-A461444; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461444

In model driven or model based experimentation, the model of the experiment is a key component of the closed loop model of the process. The model is created through interaction with the team designing the experimental organizations as well as the team creating the experimental environment. Starting with preliminary descriptions, the model evolves as more specific details are available and influences the final experimental design. The methodology used to design the model reflects both the types of design information available and the underlying hypothesis of the experiment. Experiments validating fixed types of structures or processes lead to a model designed with a Structured Analysis Design Technique which leads to an explicit but rigid model design. Experiments investigating adaptation require a more flexible model which can be created using an Object Oriented design approach. This leads to a more flexible, object view of the experimental design. Either approach leads to an appropriate set of models from which an executable model can be derived. The executable model is used to carry out simulations In order to analyze the dynamic behavior of the model, an input scenario must be created based on the actual inputs that will be used in the experimental setting. When the model is stimulated with the scenario, its behavior can be observed and its performance measured on different criteria. Because it is a computer simulation, input parameters can be varied, constraints can be relaxed, and other variables (possibly) affecting the hypotheses can be explored to see their effect on the model and by inference the experiment. These results can then be made available to the design teams to influence further iterations of the design. Indeed, the model allows the consideration of many excursions, a situation that is not possible when the experiments include teams of humans.
DTIC
Simulation

20070008844 Naval Research Lab., Washington, DC USA
Chamber Tests with Human Subjects XVIII. Tests with HN Vapors
Heinen, J H; Taylor, W H; Stolp, B N; Conner, Jr , J C; Clausen, N M; Jan 9, 1946; 47 pp.; In English
Report No.(s): AD-A461616; NRL-P-2734; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461616

The calibration and operation of the NRL chamber for the exposure of human subjects to nitrogen mustard vapors is described in detail in the first part of this report. Concentration of HN vapors are established by mean of special design saturators and by a 'flash distillation' system. Analysis of the HN vapor is carried out by a colorimetric method based on the reaction with DB-3. Operation of the chamber has been standardized for HN-1 vapor exposures ranging from 200 to 2000 CT (60 min.) and for HN-3 vapor exposures ranging from 100 to 900 CT (60 min.). The precision of the operation is such that

a CT within 5% of the desired value is obtained with T factors of 50 to 70 minutes. In the second part of this report, a series of tests is described in which human volunteers were exposed to HN-1 or HN-3 at various CTS at 90 degrees Fahrenheit, 65% R. H., wearing masks and either ordinary or protective clothing. The most vulnerable body regions were the neck and the scrotum. Severe reactions on unprotected necks under summer conditions were observed following exposure to HN-1 at CT 300 and HN-3 at CT 150. The scrotal lesions resulting from exposure to the vapors of these agents were similar in time of onset, duration, and appearance to those from H vapor. CC-2 impregnated clothing offered poor protection against HN-1. Scrotal lesions were produced in men wearing both protective suits and shorts at CT 400 under summer conditions. On the other hand, good protection was afforded by this clothing against HN-3 up to the highest CT at which tests were conducted. No changes in the leukocyte counts were observed in any of the test subjects.
DTIC
Human Beings; Nitrogen; Vapors

20070008846 Naval Research Lab., Washington, DC USA
Chamber Tests with Human Subjects XX. Hypersensitivity to H as Demonstrated by Patch Tests Before and After Chamber Exposure to H Vapor
Heinen, J H; Carhart, H W; Taylor, W H; Stolp, B N; Connor, Jr , J C; Clausen, N M; May 15, 1946; 53 pp.; In English
Report No.(s): AD-A461618; NRL-P-2760; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461618

A series of sensitivity tests on men before and after exposure to H vapor is described in this report. Doses of 1, 1/2, 1/4, and 1/8 micrograms of H in mineral oil, worn as closed patches on the forearm for four hours, represented a satisfactory subvesicant level for determining altered sensitivity. The intensity of reaction to patch tests by previously unexposed men showed a marked variation directly proportional to the outside effective temperature at the time the patches were worn. In addition to erythema, edema and/or folliculitis were observed in only 2 of 230 men tests prior to exposure to H vapor. After exposure, 26% of 169 men manifested edema and/or folliculitis to patch tests. These men were arbitrarily considered ‘sensitized"/ This sensitized group also showed a more intense erythema for each does and a lower threshold dose for perceptible erythema than the non-sensitized group. Cases of abnormal generalized skin reaction following exposure to H vapor in the man-chamber are discussed. Eight kodachrome prints, illustrating pertinent features, are included.
DTIC
Exposure; Human Beings; Patch Tests; Vapors

20070009071 Brown Univ., Providence, RI USA
The Stochastic Piston Problem
Lin, G; Su, C -H; Karniadakis, G E; Aug 9, 2004; 11 pp.; In English
Report No.(s): AD-A461810; No Copyright; Avail.: CASI: A03, Hardcopy

We obtain analytical solutions for the perturbed shock paths induced by time-varying random motions of a piston moving inside an adiabatic tube of constant area. The variance of the shock location grows quadratically with time for early times and switches to linear growth for longer times. The analytical results are confirmed by stochastic numerical simulations, and deviations for large random piston motions are established.
DTIC
Pistons; Stochastic Processes

20070009218 Naval Research Lab., Washington, DC USA
WindSat Radio-Frequency Interference Signature and Its Identification Over Land and Ocean
Li, L; Gaiser, Peter W; Bettenhausen, Michael H; Johnston, William; Mar 2006; 11 pp.; In English; Original contains color illustrations
Report No.(s): AD-A462112; No Copyright; Avail.: CASI: A03, Hardcopy

Radio-frequency interference (RFI) in the spaceborne multichannel radiometer data of WindSat and the Advanced Microwave Scanning Radiometer EOS is currently being detected using a spectral difference technique. Such a technique does not explicitly utilize multichannel correlations of radiometer data, which are key information in separating RFI from natural radiations. Furthermore, it is not optimal for radiometer data observed over ocean regions due to the inherent large natural variability of spectral difference over ocean. In this paper, we first analyzed multivariate WindSat and Scanning Multichannel Microwave Radiometer (SMMR) data in terms of channel correlation, information content, and principal components of WindSat and SMMR data. Then two methods based on channel correlation were developed for RFI detection over land and

ocean. Over land, we extended the spectral difference technique using principal component analysis (PCA) of RFI indices, which integrates statistics of target emission/scattering characteristics (through RFI indices) and multivariate correlation of radiometer data into a single statistical framework of PCA. Over ocean, channel regression of X-band can account for nearly all of the natural variations in the WindSat data. Therefore, we use a channel regression-based model difference technique to directly predict RFI-free brightness temperature, and therefore RFI intensity. Although model difference technique is most desirable, it is more difficult to apply over land due to heterogeneity of land surfaces. Both methods improve our knowledge of RFI signatures in terms of channel correlations and explore potential RFI mitigation, and thus provide risk reductions for future satellite passive microwave missions such as the NPOESS Conical Scanning Microwave Imager/Sounder. The new RFI algorithms are effective in detecting RFI in the C- and X-band Windsat radiometer channels over land and ocean.
DTIC
Oceans; Radio Frequency Interference; Radiometers; Signatures

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COMMUNICATIONS AND RADAR

Includes radar; radio, wire, and optical communications; land and global communications; communications theory. For related information see also 04 Aircraft Communications and Navigation; and *17 Space Communications, Spacecraft Communications, Command and Tracking*; for search and rescue, see *03 Air Transportation and Safety*; and *16 Space Transportation and Safety*.

20070006588 California Univ., Berkeley, CA, USA, California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Optimizing Bandwidth Limited Problems Using One-Sided Communications and Overlap
Bell, C.; Bonachea, D.; Nishtala, R.; Yelick, K.; January 2005; 17 pp.; In English
Report No.(s): DE2006-891353; No Copyright; Avail.: Department of Energy Information Bridge

Partitioned Global Address Space languages like Unified Parallel C (UPC) are typically valued for their expressiveness, especially for computations with fine-grained random accesses. In this paper we show that the one-sided communication model used in these languages also has a significant performance advantage for bandwidth-limited applications. We demonstrate this benefit through communication microbenchmarks and a case-study that compares UPC and MPI implementations of the NAS Fourier Transform (FT) benchmark. Our optimizations rely on aggressively overlapping communication with computation but spreading communication events throughout the course of the local computation. This alleviates the potential communication bottleneck that occurs when the communication is packed into a single phase (e.g., the large all-to-all in a multidimensional FFT). Even though the new algorithms require more messages for the same total volume of data, the resulting overlap leads to speedups of over 1.75x and 1.9x for the two-sided and one-sided implementations, respectively, when compared to the default NAS Fortran/MPI release. Our best one-sided implementations show an average improvement of 15 percent over our best two-sided implementations. We attribute this difference to the lower software overhead of one-sided communication, which is partly fundamental to the semantic difference between one-sided and two-sided communication. Our UPC results use the Berkeley UPC compiler with the GASNet communication system, and demonstrate the portability and scalability of that language and implementation, with performance approaching 0.5TFlop/s on the FT benchmark running on 512 processors.
NTIS
Bandwidth; Telecommunication

20070006618 Baker Botts, LLP, Dallas, TX, USA
Data Handling in a Distributed Communication Network
Barnhart, R. C.; Schnaidt, D. V.; Talcott, S. W.; Kloosterman, C. S.; Miliani, M. C.; 18 Mar 05; 16 pp.; In English
Contract(s)/Grant(s): 69582CDE9H
Patent Info.: Filed Filed 18 Mar 05; US-Patent-Appl-SN-11-083-379
Report No.(s): PB2007-101344; No Copyright; Avail.: CASI: A03, Hardcopy

In one embodiment, a system for data handling in a distributed communication network includes one or more data-handling nodes (DHNs) each residing at one or more centrals that are each operable to receive a stream of first data units from a routing system. The stream of first data units includes both stored mission data (SMD) and telemetry data having originated at one or more remote units. Each DHN is operable, in near real time, to remove redundant instances of first data units from the stream of first data units, properly order first data units in the stream of first data units received at the central out of order, remove misconfigured first data units from the stream of first data units, extract the SMD from the stream of first

data units, generate second data units from the extracted SMD, and communicate a stream of the second data units to one or more interface data processors (IDPs).
NTIS
Communication Networks; Data Transmission; Telecommunication

20070006622 Senterfitt (Akerman), West Palm Beach, FL, USA
Coordinated Directional Medium Access Control in a Wireless Network
Fang, Y. M.; Wang, J.; Wu, D. O.; 15 Mar 05; 14 pp.; In English
Contract(s)/Grant(s): N000140210464
Patent Info.: Filed Filed 15 Mar 05; US-Patent-Appl-SN-11-080-041
Report No.(s): PB2007-101346; No Copyright; Avail.: CASI: A03, Hardcopy

A method of simultaneously transmitting and receiving multiple data packets over wireless channels among the nodes of a wireless network is provided. The method includes automatically selecting a master sending node and corresponding master receiving node in response to an omni-directionally transmitted request to send during a contention period. The method also includes selecting a slave sending node and corresponding slave receiving node if a spatial reuse ratio correspond to the master-node pair is less than a predetermined threshold and if directional data transmissions between the slave sending node and corresponding slave receiving node avoid interfering with directional data transmissions between the master nodes and other pairs of slave nodes. The method further includes causing the master sending node and slave sending node to directionally transmit data packets during a coordination period.
NTIS
Access Control; Computer Networks; Directional Control; Numerical Control; Wireless Communication

20070006624 Day (Jones), Pittsburgh, PA, USA
Device and Method for Programmable Wideband Network Emulation
Steenkiste, P. A.; Judd, G.; 15 Nov 05; 28 pp.; In English
Contract(s)/Grant(s): CCR-0205266
Patent Info.: Filed Filed 15 Nov 05; US-Patent-Appl-SN-11-274-530
Report No.(s): PB2007-101347; No Copyright; Avail.: CASI: A03, Hardcopy

An emulator for emulating a wireless network comprised of a plurality of RF nodes is comprised of a programmable controller for emulating the movements of the plurality of RF nodes within an emulated space. The controller provides both information and control signals based on the emulated movements. A programmable logic core receives a plurality of signals from the plurality of RF nodes and emulates signal propagation based on the information from the controller. A plurality of signal generation and conversion cards are interposed between the programmable logic core and the RF nodes. The signal generation and conversion cards are responsive to the control signals. Because of the rules governing abstracts, this abstract should not be used to construe the claims.
NTIS
Broadband; Mechanical Devices; Wireless Communication; Communication Networks

20070006772 National Inst. of Standards and Technology, Boulder, CO, USA
Propagation and Detection of Radio Signals Before, During and After the Implosion of a Large Convention Center
Holloway, C. L.; Koepke, G.; Camell, D.; Remley, K. A.; Schima, S. A.; Jun. 2006; 123 pp.; In English
Report No.(s): PB2007-106650; NIST/TN-1542; No Copyright; Avail.: National Technical Information Service (NTIS)

This is the third in a series of NIST technical notes (TN) on propagation and detection of radio signals in large buildings before, during, and after implosion. The first and second NIST Tech Notes (NIST TN 1540 and NIST TN 1541) described similar experiments carried out on a 13- story apartment building in New Orleans, LA, and on a large sports stadium (Veterans Stadium in Philadelphia, PA), respectively. These data will give first responders a better understanding of what to expect from the radio-propagation environment in disaster situations. The goals of this work are twofold: (1) to create a large, public-domain data set describing the attenuation in various building types of radio signals in public safety and cellular telephone bands, and (2) to investigate various schemes for detecting signals from first responders with radios or from civilians with cell phones who are trapped in voids in a totally or partially collapsed building. With the above goals in mind, measurements were carried out on a large convention center (the Washington DC Convention Center) in Washington, DC. Frequencies near public safety and cell phone bands (approximately 50 MHz, 150 MHz, 225 MHz, 450 MHz, 900 MHz, and 1.8 GHz) were chosen for these experiments. Radio transmitters similar to those used by first responders were used. An

automated system to measure signal strength was developed. Three different types of signal-strength experiments were performed. First, we carried out a radio-mapping experiment that provided data on how well radio signals at the different frequencies coupled into the convention center. From this we determined the field strength variability throughout the convention center. This experiment involved carrying a set of transmitters tuned to the various frequencies throughout the convention center, while recording the received signal at a fixed receive site located outside the large structure. Transmitters were also carried around the perimeter of the structure with a fixed receiving site on the outside. These measurements were carried out a few days before the convention center was imploded.
NTIS
Conventions; Implosions; Radio Signals; Signal Detection

20070006773 Transportation Research Center, Inc., East Liberty, OH, USA, Iowa Univ., Iowa City, IA, USA
Examiniation of the Distraction Effects of Wireless Phone Interfaces Using the National Advanced Driving Simulator-Final Report on a Freeway Study
Ranney, T.; Watson, G. S.; Mazzae, E. N.; Papelis, Y. E.; Ahmad, O.; Jun. 2005; 144 pp.; In English
Report No.(s): PB2007-106568; NHTSA/NVS-312; No Copyright; Avail.: National Technical Information Service (NTIS)

The report describes research to investigate the effects of wireless phone use on driving performance and behavior. The main objectives were to assess: (1) the distraction potential of wireless phone use while driving, and (2) the difference in distraction caused by the use of a Hands-Free wireless phone interface versus that associated with use of a Hand-Held interface. This research was conducted by NHTSA using the National Advanced Driving Simulator (NADS) in collaboration with NADS staff. Driving performance was examined in four events, including: (1) car-following, (2) lead-vehicle braking, (3) lead-vehicle cut in, and (4) merging. Phone conversation impaired performance most consistently during car following, resulting in an increase of approximately 0.3 to 0.4 seconds in drivers delay in responding to lead-vehicle speed changes, relative to performance without phone conversation. Steering entropy (error) also increased during phone conversation in car-following events, reflecting an increase in high-frequency steering corrections. Increased steering reversal rates indicated increased workload during phone conversation. There was little evidence of performance impairment due to phone conversation for the other three events. Neither the lead-vehicle braking nor lead-vehicle cut-in events exhibited the predicted slowing in accelerator release and brake response times. The merge event also did not provide consistent evidence of degraded performance due to phone use generally, with the notable exception based on analysis of eye glance data, that while engaged in phone conversation, drivers devoted less visual attention to planning for an upcoming merge event. Older and younger drivers did not exhibit consistently degraded driving performance due to phone conversation than middle-aged drivers. There were modest differences among interface conditions. Specifically: (1) Hand-Held phone use interfered with steering and lane control more than the Voice Digit Dialing with Speaker Kit Hands-Free interface, and (2) the Voice Digit Dialing with Speaker Kit Hands-Free interface was associated with faster travel speeds than the Hand-Held interface. Differences between interface conditions were stronger for dialing and answering than for conversation. The Hand-Held interface was associated with fastest dialing times and fewest dialing errors while voice dialing was associated with fastest answering and hang-up times. No differences among interface conditions in phone conversation task performance were found. Post-drive questionnaire results showed that in most cases participants overestimated the ease of use afforded by Hands-Free phone interfaces. In general, participants considered the Hand-Held interface to be most difficult to use, followed by the Headset Hands-Free and Voice Digit Dialing with Speaker Kit Hands-Free interfaces, respectively.
NTIS
Highways; Simulators; Wireless Communication; Telephones

20070006792 Senterfitt (Akerman), West Palm Beach, FL, USA, Florida Univ., Gainesville, FL, USA
System and Methods for Packet Filtering
Sahni, S. K.; Lu, H.; 30 Dec 04; 18 pp.; In English
Contract(s)/Grant(s): NSF-CC4-991-2395
Patent Info.: Filed Filed 30 Dec 04; US-Patent-Appl-SN-11-027 164
Report No.(s): PB2007-102849; No Copyright; Avail.: CASI: A03, Hardcopy

A system for classifying data packets transmitted over a data communications network based upon a set of predetermined prefixes associated with destination addresses of the data packets is provided. The includes a data structure stored in an electronic memory. The data structure is a prefix-in-B-tree (PIBT) data structure and/or a range-in-B-tree (RIBT) data structure, the at least one data structure comprising a plurality of nodes based upon the set of predetermined prefixes. The

system also includes a determination module for determining a match between one or more of the plurality of nodes and a destination address of a particular data packet.
NTIS
Classifications; Filtration; Packets (Communication)

20070007353 Mitre Corp., Bedford, MA USA
Capturing Behavioral Influences in Synthetic C2: What We've Learned So Far and Where We Need to Go
Bowen, Charles D; Couture, Ronald G; Flournoy, R D; Forbell, Eric M; Means, C D; Jan 2002; 7 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460209; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460209

The MITRE Corporation in Bedford, MA is executing a small research project entitled 'Capturing Behavioral Influences in Synthetic C2.' This project is being sponsored by the Air Force Electronic Systems Center (ESC) and began in November of 2001. At the previous SIW we presented the project plan. This paper presents initial findings from the project based on preliminary prototyping efforts and a review of related work in the community. We originally set out to 'start simple' by modeling a single C2 operator in the Joint Surveillance and Target Attack Radar System (JSTARS) mission area; however, we found it both undesirable and infeasible to single out a single operator since C2 at its core is collaborative teamwork. C2 modeling efforts need to focus on team or unit-level models. To make better use of limited available behavior data, C2 behavior modeling efforts must expand on existing information processing models and address specific taxonomies of C2 user tasks. Hybrid models may be necessary to bring the best of multiple modeling approaches to bear on the complex nature of C2 team/unit modeling. Guidelines are needed to (1) better define appropriate levels of detail/investment, and (2) provide validation approaches for behavior modeling across the different C2 application areas. Finally, in efforts to interface interactive human behavior models with battle simulations, it is necessary to understand and refine the hooks that enable the behavior models to appropriately impact the simulated battle.
DTIC
Command and Control; Human Behavior

20070007364 Carnegie-Mellon Univ., Pittsburgh, PA USA
Recent Progress in Robust Vocabulary-Independent Speech Recognition
Hon, Hsiao-Wuen; Lee, Kai-Fu; Jan 1991; 7 pp.; In English
Contract(s)/Grant(s): N00039-85-C-0163; ARPA ORDER-5167
Report No.(s): AD-A460230; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460230

This paper reports recent efforts to improve the performance of CMU's robust vocabulary-independent (VI) speech recognition systems on the DARPA speaker-independent resource management task. The improvements are evaluated on 320 sentences that randomly selected from the DARPA June 88, February 89 and October 89 test sets. Our first improvement involves more detailed acoustic modeling. We incorporated more dynamic features computed from the LPC cepstra and reduced error by 15% over the baseline system. Our second improvement comes from a larger training database. With more training data, our third improvement comes from a more detailed subword modeling. We incorporated the word boundary context into our VI subword modeling and it resulted in a 30% error reduction. Finally, we used decision-tree allophone clustering to find more suitable models for the subword units not covered in the training set and further reduced error by 17%. All the techniques combined reduced the VI error rate on the resource management task from 11.1% to 5.4% (and from 15.4% to 7.4% when training and testing were under different recording environment). This vocabulary-independent performance has exceeded our vocabulary-dependent performance. first order differenced cepstra and power. Here, we add second order differenced cepstra and power. We also incorporateboth 40 msec and 80 msec differenced cepstraa. These new features yielded a 15% error rate reduction, about the same as was achieved on vocabulary-dependent tasks [7]. Our second improvement involves the collection of more general English data, from which we can model more phonetic variabilities, such as the word boundary context. Our experiment shows that adding 5,000 sentences to an original 15,000 sentence training set gives only a 3% error reduction.
DTIC
Progress; Speech Recognition

20070007391 Naval Postgraduate School, Monterey, CA USA

Application of a Network Perspective to DoD Weapon System Acquisition: An Exploratory Study

Mantz, Ryan D; Dec 2006; 109 pp.; In English; Original contains color illustrations

Report No.(s): AD-A460399; No Copyright; Avail.: CASI: A06, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460399

One of the foundations of military command and control is that authority must match responsibility. Yet in weapon system acquisition, a program manager is responsible to deliver capabilities to the warfighter without full control of the resources he needs to carry out this task. Successful program managers recognize their dependencies upon other actors and execute their programs using a network with a common goal of enhancing a specific warfighting capability. A hierarchical chain of command still exists, but the network enables the actors to carry out their objectives in an efficient and effective manner. This report describes how acquisition process purportedly works in hierarchical terms. It also introduces a process model to describe the set of activities actually used and the actors who are required to collaborate to deliver capabilities to the warfighter. The analysis of those activities between actors reveals that weapon system acquisition behaves like a network. Describing acquisition in network terms allows those involved in weapon system acquisition oversight, policy, and practice to have a new insights and measurement tools to understand how to improve the weapon systems acquisition process.

DTIC

Acquisition; Networks; System Effectiveness; Weapon Systems

20070007392 Lockheed Martin Advanced Technology Labs., Cherry Hill, NJ USA

An Open Environment for Rapid Embedded Planning of On-The-Move Communications Networks Using Multi-Level Abstraction

Ukrainsky, Orest; Zebrowitz, Harris; Hein, Carl; Cortese, Andrew; Rubin, Aron; Poon, Cindy; Bard, Arnold; Reyes, Hector; Oct 2005; 7 pp.; In English; Original contains color illustrations

Report No.(s): AD-A460401; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460401

The rapid pace of future Net Centric Warfare requires that communication plans for mission specific demands be reduced from weeks/days to hours/minutes. The demands of the mobile networks change constantly as warfighters move their network infrastructure in response to battlefield dynamics, terrain, and logistics. There is a critical need for new technology to help automate the planning process for wireless on-the-move (OTM) networks. The Army's Communications Planner for Operational and Simulation Effects with Realism (COMPOSER) project is developing an open Framework with pluggable tools for assessing and planning OTM network operations that will give warfighters the ability to predict network performance required for mission success. Once on a mission, COMPOSER allows the warfighter to check plans against actual environmental and communications conditions and replan as necessary. At the heart of the COMPOSER architecture is the Communications Effects Simulator (CES), which can model dynamic OTM network, networks at multiple abstraction levels for user selectable efficiency and accuracy. This paper will describe the technical details of the COMPOSER architecture. Additional details of the COMPOSER CES, including examples of simulation abstraction techniques, will be presented. The paper also discusses the current project status and the current transition plan into ARMY operations.

DTIC

Communication Networks; Embedding; Telecommunication

20070007448 SRI International Corp., Menlo Park, CA USA

Techniques to Achieve an Accurate Real-Time Large-Vocabulary Speech Recognition System

Murveit, Hy; Monaco, Peter; Digalakis, Vassilios; Butzberger, John; Jan 1994; 7 pp.; In English

Contract(s)/Grant(s): N00014-92-C-0154

Report No.(s): AD-A460505; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460505

In addressing the problem of achieving high-accuracy real-time speech recognition systems, we focus on recognizing speech from ARPA's 20,000-word Wall Street Journal (WSJ) task, using current UNIX workstations. We have found that our standard approach-using a narrow beam width in a viterbi search for simple discrete-density hidden Markov models (HMMs)-works in real time with only very low accuracy. Our most accurate algorithms recognize speech many times slower than real time. Our (yet unattained) goal is to recognize speech in real time at or near full accuracy.

DTIC

Real Time Operation; Speech Recognition

20070007453 Air Force Research Lab., Rome, NY USA

Decision-Support Infosphere Services for Collaborative Operations and Virtual Environment Requirements (DISCOVER)

Milligan, James; Jun 14, 2005; 34 pp.; In English; Original contains color illustrations

Report No.(s): AD-A460521; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460521

PRELIMINARY FINDINGS -- IMPROVING EFFICIENCY: (1) Augmenting legacy systems with fuselet technology; (2) Distributed collaboration for distributed operations and improved communications; (3) Through controlled experimentation we can demonstrate how fuselets improve the warfighter's ability to make better, more optimized decisions.

DTIC

Decision Support Systems; Support Systems; Virtual Reality

20070007461 Naval Postgraduate School, Monterey, CA USA

Hypothesis Testing of Edge Organizations: Simulating Performance Under Industrial Era and 21st Century Conditions

Orr, Ryan J; Nissen, Mark E; Jan 2006; 24 pp.; In English

Report No.(s): AD-A460537; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460537

The Edge represents a fresh approach to organizational design. It appears to be particularly appropriate in the context of modern military warfare, but also raises issues regarding comparative performance of alternate organizational designs. Building upon prior C2 research, we seek to understand the comparative performance of the Edge and all organizational forms, across 21st Century and all mission-environmental conditions, and hence characterize the entire organization design space systematically. Leveraging recent advances in computational organization theory, we extend our campaign of experimentation to specify six, diverse, archetypal organizational forms from theory, and to evaluate their comparative performance empirically. Results confirm that no single organizational form is best for all circumstances; highlight contingent circumstances for which the Edge and other kinds of organizations perform relatively better than one another; and elucidate seven specific performance measures that provide multidimensional insight into different aspects of organizational performance. This research grounds the Edge organization firmly in well-established organization theory, and provides empirical support for and against claims regarding this novel organizational form, particularly in terms of agility. We discuss the model, experimental setup and results in considerable detail, which offer theoretical implications for the organization scholar and actionable guidance for the C2 practitioner.

DTIC

Command and Control; Edges; Hypotheses; Organizations; Simulation

20070007465 Aptima, Inc., Woburn, MA USA

Supporting Organizational Change in Command and Control: Approaches and Metrics

Weil, Shawn A; Levchuk, Georgiy; Downes-Martin, Stephen; Diedrich, Frederick J; Entin, Elliot E; See, Katrina E; Serfaty, Daniel; Jun 2005; 20 pp.; In English; Original contains color illustrations

Report No.(s): AD-A460545; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460545

Network-centered Command and Control (C2) has great potential to increase military effectiveness, in some measure due to enhanced information sharing and dissemination techniques. However, for these technologies to be maximally effective, C2 organizations need to have the flexibility to tailor their organizational structures in response to changing mission conditions. In the experiment reported here, a model-based approach to supporting organizational adaptation was assessed. The purpose of this experiment was to explore ways in which obstacles to adaptation could be overcome. Teams of Naval Officers participated in three simulations of a joint forces mission on the Distributed Dynamic Decision-making (DDD) simulator (Serfaty & Kleinman, 1985; Kleinman & Serfaty, 1989). The match between organizational structure and mission task requirements was manipulated within participants, resulting in differences in coordination requirements. Between the second and third simulated missions, participant teams were given the opportunity to select an organizational structure from a list of model-based, predefined organizational designs, to better accommodate the changing mission requirements. To support organizational change, model-based prospective information was provided to the teams. This support led to the adoption of better matched congruent organizations in each of the participant teams. Several measurement techniques were designed to evaluate both the degree of adaptation and its effect on mission performance.

DTIC

Command and Control; Organizations

20070007471 Massachusetts Inst. of Tech., Cambridge, MA USA
Modelling Context Dependency in Acoustic-Phonetic and Lexical Representations
Phillips, Michael; Glass, James; Zue, Victor; Jan 1991; 7 pp.; In English
Contract(s)/Grant(s): N00014-89-J-1332
Report No.(s): AD-A460564; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460564

In 1989, our group first reported on the development of SUMMIT, a segment-based speaker-independent continuous-speech recognition system [13] . The initial version of SUMMIT made use of fairly simple context-independent models for the lexical labels. Recently, we have begun to incorporate more complex models of lexical labels that take into account a variety of contextual factors. These changes, along with an improved corrective training procedure for adapting pronunciation arc weights and a larger set of training data, have resulted in the reduction of error rate by almost a factor of two on the Resource Management task.
DTIC
Phonetics; Speech Recognition

20070007550 Congressional Budget Office, Washington, DC USA
Alternatives for Connecting Remote Department of Defense Facilities to the Global Information Grid
Trunkey, R D; Sep 15, 2006; 24 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460714; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460714

The Global Information Grid is the communications network that connects Department of Defense (DoD) facilities worldwide. Although it is in daily use, its content continues to evolve. The Defense Information Systems Agency (DISA) is implementing an initiative called the Global Information Grid Bandwidth Expansion (GIG-BE) to increase the bandwidth available to DoD users. The initiative is also intended to move DoD from a network backbone owned by a contractor to one owned by the government (the GIG-BE). In addition, the contract that had connected many remote DoD facilities those not on the backbone to the network expired in February, and DISA is in the process of replacing it and other, similar contracts with the Defense Information System Network Access Transport Services (or DATS) contract, which will connect remote defense installations in the continental USA to the GIG-BE. Under the DATS contract, DISA envisions using short-term leases (of three years, followed by seven one-year options) to obtain the circuits necessary to connect remote sites to the network. Alternatively, DISA could acquire those circuits by using indefeasible rights of use (IRUs). Leases require periodic payments for the right to use circuits that are provided by private companies. IRUs, by contrast, involve a one-time payment at the beginning of the term for unlimited use of a circuit. The most common term for IRUs is 20 years; because that is also the expected useful life of a circuit, IRUs are considered purchases. Members of Congress have expressed concern about DISA's approach to acquiring network access for remote DoD facilities through the DATS contract. The Congress directed the Congressional Budget Office (CBO) to review DISA's analysis of alternatives and its underlying assumptions.
DTIC
Alternatives; Circuits; Connectors; Cost Analysis; Defense Program; Telecommunication

20070007559 BBN Systems and Technologies Corp., Cambridge, MA USA
Improved HMM Models for High Performance Speech Recognition
Austin, Steve; Barry, Chris; Chow, Yen-Lu; Derr, Alan; Kimball, Owen; Kubala, Francis; Makhoul, John; Placeway, Paul; Russell, William; Schwartz, Richard; Yu, George; Jan 1989; 8 pp.; In English
Contract(s)/Grant(s): N00014-85-C-0279; N00014-89-C-0008
Report No.(s): AD-A460743; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460743

In this paper we report on the various techniques that we implemented in order to improve the basic speech recognition performance of the BYBLOS system. Some of these methods are new, while others are not. We present methods that improved performance as well as those that did not. The methods include Linear Discriminant Analysis, Supervised Vector Quantization, Shared Mixture VQ. Deleted Estimation of Context Weights, MMI Estimation Using 'N-Best' Alternatives, Cross-Word Triphone Models. While we have not yet combined all of the methods in one system, the overall word recognition error rate on the May 1988 test set using the Word-Pair grammar has decreased from 3.4% to 1.7%.
DTIC
Markov Processes; Speech Recognition

20070007626 University of South Australia, Mawson Lakes, Australia
Towards a Science of Command and Control (C2)
Cropley, David H; Jun 2005; 38 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460855; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460855

This paper addresses the question 'what is the Science of Command and Control (C2)?' by first defining three key perspectives that cover that which comprises C2: Command Arrangements, Command and Command Support Systems. The paper examines the system-level properties of these three perspectives in combination, drawing the important conclusion that Command and Control cannot be understood by attempting to decompose the field into individual components. The paper then analyses the concept of a science of C2 by extracting the core components of a science: an organised body of knowledge and the processes of acquiring and applying that body of knowledge. In addition to these, the paper recognises the role that the application of the science plays in advancing the state of understanding of C2. The paper then uses the definition of the science of C2 to formulate a general matrix for understanding C2 research programs. The paper closes by studying examples of extant research placed in this matrix. The result is a comprehensive definition of the science of C2 and a tool for understanding C2 research.
DTIC
Command and Control; Heuristic Methods

20070007652 Army Research Lab., Adelphi, MD USA
Command and Control in Complex and Urban Terrain: Human Performance Modeling
Yerace, Gary; Bowman, Elizabeth; Jun 2005; 27 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460901; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460901

Current Command and Control (C2) systems don't provide commanders/leaders/soldiers with the information collection capabilities and decision aids needed to collectively plan the battle; to see first, understand first, act first, and finish decisively during close combat in complex and urban terrain. Specific barriers to decision superiority include the following: inadequate collaborative decision aids to visualize, describe, and control mixed assets (sensors, robots, and Soldiers); algorithms for decision-making with partial or incomplete information, inadequate algorithms for tailored, dynamic information push/pull to support the integration of mixed assets in close combat, and inadequate algorithms for situational awareness and focus in complex/urban terrain.
DTIC
Command and Control; Human Performance; Models; Urban Research; Warfare

20070007658 Defence Science and Technology Organisation, Edinburgh, Australia
A Dialectic for Network Centric Warfare
Lambert, Dale A; Scholz, Jason B; Jun 2005; 80 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460913; No Copyright; Avail.: CASI: A05, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460913

The US variant of NCW has been refined into the following form: The tenets of NCW are: 1. A robustly networked force improves information sharing. 2. Information sharing and collaboration enhance the quality of information and shared situational awareness. 3. Shared situational awareness enables self-synchronization. 4. These, in turn, dramatically increase mission effectiveness. In Australia, NCW has been defined with five tenets: 1. Professional mastery is essential to NCW. 2. Mission command will remain an effective command philosophy into the future. 3. Information and intelligence will be shared if a network is built by connecting engagement systems, sensor systems and command and control systems. 4. Robust networks will allow the ADF and supporting agencies to collaborate more effectively and achieve shared situational awareness. 5. Shared situational awareness will enable self-synchronisation, which helps warfighters to adapt to changing circumstances and allows them to apply multidimensional manoeuvre. The first two tenets have no equivalent representation in US NCW and are unique to Australian NCW. These two tenets provide some recognition of human aspects of NCW. Tenet 3 maps to US tenet 1, tenet 4 maps to US tenet 2, tenet 5 maps to US tenets 3 and 4. Throughout the following, we will retain a focus on the four US tenets, augmented by the human aspects of the Australian tenets.
DTIC
Command and Control; Communication Networks; Speech; Warfare

20070007681 Lockheed Martin Corp., Camden, NJ USA
The Pragmatics of Taking a Spoken Language System Out of the Laboratory
Daniels, Jody J; Hastie, Helen W; Jan 2003; 4 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N66001-01-D-6011
Report No.(s): AD-A460942; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460942

Lockheed Martin's Advanced Technology Laboratories has been designing developing testing and evaluating spoken language understanding systems in several unique operational environments over the past five years. Through these experiences we have encountered numerous challenges in making each system become an integral part of a user's operations. In this paper we discuss these challenges and report how we overcame them with respect to a number a of domains.
DTIC
Speech; Speech Recognition; Voice Communication

20070007683 USA Joint Forces Command, Norfolk, VA USA
Trust and Influence in the Information Age: Operational Requirements for Network Centric Warfare
Blatt, Nicole; Jun 2005; 15 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460945; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460945

HOW CAN LEADERS PREPARE FOR the INFORMATION AGE RMA? (1) The Information Age Drives a Revolution in Military Affairs (RMA): (a) Information technology (IT) increases access, amount, and speed of information and information flow; (b) This leads to changes in how we live, work, play, and fight. (2) The Information Age is Also Empowering Our Enemies: (a) Conflicts come in all levels from enforcing sanctions and capturing terrorists, to full-scale theater operations and nuclear war; (b) The Military requires agile and adaptable command and control structures to deal with the uncertainties of new threats; (3) What to Expect from the Information RNA: (a) Decision makers will be younger; (b) Organizational standing becomes less relevant; (c) Lower ranking people will have more power; (d) Innovative projects will surface without certification. ARE LEADERS PREPARED FOR the NEW CAPABILITIES?
DTIC
Communication Networks; Information; User Requirements; Warfare

20070007687 Lockheed Martin Corp., Bethesda, MD USA
Command and Control at the Edge
Chen, Clement C; Jun 15, 2005; 25 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460953; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460953

Command and control in a net centric sense involves the dynamic allocation of resources to opportunity in the pursuit of mission accomplishment. It is an intramural competition for means and privilege. Edge organizations are best positioned to engage in this competition in a manner that is most beneficial to the networked whole. However, personhood at the nodes complicates this process because the egocentric nature of human interaction works against the emergence of edge organizations and edge like behavior. Ironically, a more efficient and democratic means of performing this allocation process is possible in the world of machines. This paper is a sweeping thought piece that will explore the dynamics of edge interaction when humans are the primary actors at the nodes and how current notions of command and control may change dramatically as the edge becomes increasingly populated by machines. Because man and machine are fundamentally different, alternate modes of command and control will likely be necessary to lord over the interaction within and across the boundaries of these two distinct entities in the future. The notion of an edge organization itself may very well become subsumed by the larger changes that these new modes will engender.
DTIC
Command and Control; Communication Networks; Organizations; Warfare

20070008033 Air Force Experimentation Office, Langley AFB, VA USA
USAF Joint Expeditionary Force Experiments Experiment Management Lessons Learned
Euker, William T; Jun 2005; 19 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460487; No Copyright; Avail.: CASI: A03, Hardcopy

This paper presents observations and insights from experiment senior mentors, warfighters, and experiment management

personnel from five Joint Expeditionary Force Experiments (JEFX). The design, planning, execution, and assessment of a large-scale command and control experiment are addressed. In addition, experiment management changes for JEFX 06 are presented.
DTIC
Command and Control; Military Operations

20070008109 NASA Johnson Space Center, Houston, TX, USA
Potential Space Applications for Body-Centric Wireless and E-Textile Antennas
Kennedy, Timothy F.; Fink, Patrick W.; Chu, Andrew W.; Studor, George F.; [2007]; 1 pp.; In English; Seminar on Antenna and Propagation for Body-Centric, 24 Apr. 2007, London, UK; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070008109

Space environment benefits of body-centric wireless communications are numerous, particularly in the context of long duration Lunar and Martian outposts that are in planning stages at several space agencies around the world. Since crew time for such missions is a scarce commodity, seamless integration of body-centric wireless from various sources is paramount. Sources include traditional data, such as audio, video, tracking, and biotelemetry. Newer data sources include positioning, orientation, and status of handheld tools and devices, as well as management and status of on-body inventories. In addition to offering lighter weight and flexibility, performance benefits of e-textile antennas are anticipated due to advantageous use of the body s surface area. In creating e-textile antennas and RF devices, researchers are faced with the challenge of transferring conventional and novel designs to textiles. Lack of impedance control, limited conductivity, and the inability to automatically create intricate designs are examples of limitations frequently attributed to e-textiles. Reliable interfaces between e-textiles and conventional hardware also represent significant challenges. Addressing these limitations is critical to the continued development and acceptance of fabric-based circuits for body-centric wireless applications. Here we present several examples of e-textile antennas and RF devices, created using a NASA-developed process, that overcome several of these limitations. The design and performance of an equiangular spiral, miniaturized spiral-loaded slot antenna, and a hybrid coupler are considered, with the e-textile devices showing comparable performance to like designs using conventional materials.
Author
Biotelemetry; Wireless Communication; Slot Antennas; Textiles; Miniaturization; Spiral Antennas; Aerospace Environments

20070008132 Naval Postgraduate School, Monterey, CA USA
Implication of FORCEnet on Coalition Forces
Romero, Eric; Gorsch, Jeffrey; Nantasenamat, Arkapol; Sanchez, Mario; Nguyen, Michelle; Metaferia, Tewodros; Timm, Joel; Barron, Clara; Jung, Vincent; Nguyen, Michael; Tan, David; Sep 2006; 163 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460906; NPS-SE-06-003; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA460906

13. ABSTRACT (maximum 200 words) The coalition navies of Australia, Canada, New Zealand, UK and the USA (AUSCANNZUKUS) are in a period of transformation. They are stepping out of the Industrial Age of warfare and into the Informational Age of warfare. Network Centric Warfare (NCW) is the emerging theory to accomplish this undertaking. NCW describes the combination of strategies, emerging tactics, techniques, and procedures, and organizations that a fully or even partially networked force can employ to create a decisive war fighting advantage. 1 This theory is turned into a concept through Network Centric Operations (NCO) and implemented through the FORCEnet operational construct and architectural framework. The coalition navies are moving in a direction to develop and leverage information more effectively and efficiently. This will lead to an informational advantage that can be used as a combat multiplier to shape and control the environment, so as to dissuade, deter, and decisively defeat any enemy. This analysis was comprised of defining three TTCP AG-6 provided vignettes into ARENA model that captured Coalition ESG configurations at various FORCEnet levels. The results of the analysis demonstrated that enhanced FORCEnet capabilities such as FORCEnet Levels 2 and 4 would satisfy the capability gap for a needed network-centric ESG force that can effectively counter insurgency operations in Maritime warfare. Furthermore, the participating allied navies in the Coalition ESG should pursue acquisition strategies to upgrade their ship platforms in accordance with our recommendation which indicates that FORCEnet Level 2 is the best value.
DTIC
Communication Networks; Military Operations; Warfare

20070008134 Naval Postgraduate School, Monterey, CA USA

Coalition FORCEnet Implementation Analysis

Berger, Ted; Choate, Paul; Gonzales, Michael; Liou, Christine; Nguyen, Brian; Park, Eugene; Perkins, Gary; Peterson, Duncan; Russell, Tony; Shebatka, Eric; Tahimic, Rick; Whalin, Greg; Sep 2006; 209 pp.; In English; Original contains color illustrations

Report No.(s): AD-A460903; NPS-SE-06-005; No Copyright; Avail.: CASI: A10, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460903

In January 2006, the San Diego Naval Postgraduate Cohort was tasked to evaluate a FORCEnet scenario which involved a Humanitarian Support Mission which escalated into an Expeditionary Warfare Mission in and around the Philippine Islands, employing AUSCANNZUKUS Coalition forces. The task was to study the impact of Coalition forces participating in the USA Navy FORCEnet (Fn) program. The goal of this study is to provide options, perspective, technical and tactical insight to each nation in identifying opportunities to participate in FORCEnet and the operational benefits that result. The San Diego Naval Postgraduate Cohort developed an architecture and modeled it in an effort to demonstrate enhanced collaboration capability between U.S. and Coalition partners with an improved ability to collect, process and share information for joint decision making and joint tactical employment of resources between U.S. and Coalition countries, and to fully integrate Coalition operations. The modeling approach focused on integrating a Sensor grid, C2 grid, and Engagement grid. As a result, enabled Network-Centric warfare for Coalition Forces shows a significant increase in capabilities. Joint employment of FORCEnet demonstrated Coalition enhancements by providing a scalable and composable Joint force structure.

DTIC

Communication Networks; Military Operations

20070008141 Naval Postgraduate School, Monterey, CA USA

Network-Centric Maritime Radiation Awareness and Interdiction Experiments

Bordetsky, Alex; Dougan, Arden D; Nekoogar, Faranak; Jan 2006; 21 pp.; In English; Original contains color illustrations

Report No.(s): AD-A460538; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460538

The paper addresses technological and operational challenges of developing a global plug-and-play Maritime Domain Security testbed for the Global War on Terrorism mission. This joint NPS-LLNL project is based on the NPS Tactical Network Topology (TNT) comprised of long-haul OFDM networks combined with self-forming wireless mesh links to air, surface, ground, and underwater unmanned vehicles. This long-haul network is combined with ultra-wideband (UWB) communications systems for wireless communications in harsh radio propagation channels. LLNL s UWB communication prototypes are designed to overcome shortcomings of the present narrowband communications systems in heavy metallic and constricted corridors inside ships. In the center of our discussion are networking solutions for the Maritime Interdiction Operation (MIO) Experiments in which geographically distributed command centers and subject matter experts collaborate with the Boarding Party in real time to facilitate situational understanding and course of action selection. The most recent experiment conducted via the testbed extension to the Alameda Island exercised several key technologies aimed at improving MIO. These technologies included UWB communications from within the ship to Boarding Party leader sending data files and pictures, advanced radiation detection equipment for search and identification, biometric equipment to record and send fingerprint files to facilitate rapid positive identification of crew members, and the latest updates of the NPS Tactical Network Topology facilitating reachback to LLNL, Biometric Fusion Center, USCG, and DTRA experts.

DTIC

Communication Networks; Radio Transmission; Telecommunication; Terrorism; Topology

20070008155 International Computer Science Inst., Berkeley, CA USA

The Meeting Project at ICSI

Morgan, Nelson; Baron, Don; Edwards, Jane; Ellis, Dan; Gelbart, David; Janin, Adam; Pfau, Thilo; Shriberg, Elizabeth; Stolcke, Andreas; Jan 2001; 8 pp.; In English

Report No.(s): AD-A460587; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA460587

In collaboration with colleagues at UW, OGI, IBM, and SRI, we are developing technology to process spoken language from informal meetings. The work includes a substantial data collection and transcription effort, and has required a nontrivial degree of infrastructure development. We are undertaking this because the new task area provides a significant challenge to current HLT capabilities, while offering the promise of a wide range of potential applications. In this paper, we give our vision

of the task, the challenges it represents, and the current state of our development, with particular attention to automatic transcription.
DTIC
Speech Recognition; Conferences; Natural Language (Computers)

20070008156 Massachusetts Inst. of Tech., Lexington, MA USA
Tied Mixtures in the Lincoln Robust CSR
Paul, Douglas B; Jan 1989; 11 pp.; In English
Report No.(s): AD-A460569; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460569

HMM recognizers using either a single Gaussian or a Gaussian mixture per state have been shown to work fairly well for 1000-word vocabulary continuous speech recognition. However, the large number of Gaussians required to cover the entire English language makes these systems unwieldy for large vocabulary tasks. Tied mixtures offer a more compact way of representing the observation PDF's. We have converted our independent mixture systems to tied mixtures and have obtained mixed results: a 13% improvement in speaker-dependent recognition without cross-word triphone models, but no improvement in our speaker-dependent system with cross-word boundary triphone models or in our speaker-independent system. There is also a reduction in CPU requirements during recognition--but this is counter-balanced by an increase during training. This paper also includes a comment on the validity of the DARPA program's evaluation test system comparisons.
DTIC
Speech Recognition; Statistical Analysis; Mathematical Models

20070008158 Mitre Corp., Bedford, MA USA
Global Communications Grid Architecture Tutorial
White, Brian E; Oct 2002; 82 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F19628-99-C-0001
Report No.(s): AD-A460251; No Copyright; Avail.: CASI: A05, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460251

OUTLINE: * Introduction * Global Grid * Layered architecture * Getting connected * The Internet Protocol (IP) * Wrap-up
DTIC
Architecture (Computers); Communication Networks

20070008159 Mitre Corp., Bedford, MA USA
Candidate Designs for an Additional Civil Signal in GPS Spectral Bands
Betz, John W; Goldstein, David B; Jan 2002; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F19628-00-C-0001
Report No.(s): AD-A460213; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460213

As modernization of radio-navigation satellite systems (RNSS) proceeds, there is increasing interest in new signals for civilian use. New signals must coexist with current and already planned signals on the GPS L1 and L2 frequencies, offer more robustness, higher performance, and greater capacity. There are significant motivations, as well as significant challenges, to placing new civil signals within the existing GPS bands at L1 and L2. RF compatibility with existing and planned signals is a particular challenge. This paper motivates and describes designs suitable for an additional civil signal that fits within the existing spectrum allocations at L1 and L2. It discusses the benefits of sharing the existing spectrum, and outlines the constraints that must be satisfied for successful sharing. It then provides insight into the needed spectral characteristics, identifies a class of modulations that provides these characteristics, and shows advantages of these designs over others that have been considered. It also discusses aspects of the signal's spreading code and data message.
DTIC
Global Positioning System; Radio Navigation; Radio Signals; Spectral Bands

20070008162 Lockheed Martin Corp., Camden, NJ USA
A Three-Tiered Evaluation Approach for Interactive Spoken Dialogue Systems
Stibler, Kathleen; Denny, James; Jan 2001; 6 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N66001-98-D-8507; N47406-99-C-7033
Report No.(s): AD-A460931; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460931

We describe a three-tiered approach for evaluation of spoken dialogue systems. The three tiers measure user satisfaction, system support of mission success and component performance. We describe our use of this approach in numerous fielded user studies conducted with the U.S. military.

DTIC
Speech; Component Reliability

20070008253 Sandia National Labs., Albuquerque, NM USA
SAR Processing with Stepped Chirps and Phased Array Antennas
Doerry, A. W.; Sep. 2006; 30 pp.; In English
Report No.(s): DE2006-893561; SAND2006-5855; No Copyright; Avail.: Department of Energy Information Bridge

Wideband radar signals are problematic for phased array antennas. Wideband radar signals can be generated from series or groups of narrow-band signals centered at different frequencies. An equivalent wideband LFM chirp can be assembled from lesser-bandwidth chirp segments in the data processing. The chirp segments can be transmitted as separate narrow-band pulses, each with their own steering phase operation. This overcomes the problematic dilemma of steering wideband chirps with phase shifters alone, that is, without true time-delay elements.

NTIS
Antenna Arrays; Phased Arrays

20070008284 Army Aviation and Missile Command, Redstone Arsenal, AL, USA
Apparatus and Method for Multi-Channel Equalization
Levasseur, J. K.; Worley, B. A.; 28 Feb 04; 6 pp.; In English
Patent Info.: Filed Filed 28 Feb 04; US-Patent-Appl-SN-10-774 647
Report No.(s): PB2007-102958; No Copyright; Avail.: CASI: A02, Hardcopy

A communication system with a multi-channel array antenna utilizes a receiver matching process that adapts the pass band frequency response of each channel to a selected reference channel. This process is implemented digitally by inserting a tapped delay line filter in each channel, selecting one of the channels as a reference, and adapting the others to match the reference in both phase and amplitude. The process is performed for each system calibration cycle, which occurs just before receive data is captured and processed. The improvements include an apparatus and an algorithm that select a reference channel in the adaptive process during each system calibration cycle, producing optimal, or near optimal, channel matching.

NTIS
Beamforming; Algorithms; Antenna Arrays; Multichannel Communication

20070008289 Tendler (Robert K.), Boston, MA, USA
Collapsible Wide Band Width Discone Antenna
Apostolos, J. T.; 25 Feb 05; 12 pp.; In English
Patent Info.: Filed Filed 25 Feb 05; US-Patent-Appl-SN-11-067 417
Report No.(s): PB2007-102951; No Copyright; Avail.: CASI: A03, Hardcopy

A collapsible discone antenna is provided with an ultra wide band width by providing a collapsible conical skeleton cone, with the rods of the skeleton being provided with meander lines so as to effectively reduce the overall dimensions of the antenna by a factor of 2, with the antenna rods being electrically interconnected at their distal ends so as to eliminate performance degradation due to varying ground conductivities. A specialized feed configuration is used in one embodiment to feed multiple antennas stacked above a low band disc through the utilization of one or more coaxial lines which are wrapped around a ferrite toroid so that they may be passed up through the low-band disc without detuning the low band discone antenna. The use of the toroid inductor between the low-band cone and the low-band disc further reduces the low frequency cutoff of the antenna by markedly decreasing the VSWR at frequencies as low as 20 megahertz.

NTIS
Antenna Design; Broadband; Collapse; Design Analysis; Expandable Structures

20070008477 AT and T Labs Research, Florham Park, NJ USA

DATE: A Dialogue Act Tagging Scheme for Evaluation of Spoken Dialogue Systems

Walker, Marilyn; Passonneau, Rebecca; Jan 2001; 9 pp.; In English

Contract(s)/Grant(s): MDA-972-99-3-0003

Report No.(s): AD-A460992; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460992

This paper describes a dialogue act tagging scheme developed for the purpose of providing finer-grained quantitative dialogue metrics for comparing and evaluating DARPA COMMUNICATOR spoken dialogue systems. We show that these dialogue act metrics can be used to quantify the amount of effort spent in a dialogue maintaining the channel of communication or, establishing the frame for communication, as opposed to actually carrying out the travel planning task that the system is designed to support. We show that the use of these results in a 7% improvement in the fit in models of user satisfaction. We suggest that dialogue act metrics can ultimately support more focused qualitative analysis of the role of various dialogue strategy parameters, e.g., initiative, across dialogue systems, thus clarifying what development paths might be feasible for enhancing user satisfaction in future versions of these systems.

DTIC

Marking; Speech; Voice Communication

20070008492 Army Research Lab., Aberdeen Proving Ground, MD USA

OneSAF Killer/Victim Scoreboard Capability for C2 Experimentation. Track: C2 Experimentation

O'May, Janet; Heilman, Eric; Bodt, Barry; Forester, Joan; Jan 2002; 12 pp.; In English; Original contains color illustrations

Report No.(s): AD-A461020; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461020

Command and Control (C2) is a commander's guidance of his/her forces (command) to accomplish a goal or mission while monitoring the directed movements (control). The U.S. Army Research Laboratory's (ARL) Battlespace Decision Support Team (BDST) is exploring methods of evaluating the effectiveness of a commander's plan or course of action (COA). Part of our research involves the task of identifying metrics to rate a COA. We have modified the One Semi-Automated Forces (OneSAF) simulation to track direct fire hits and vehicle damage throughout simulated battles. One completed experiment ran a OneSAF scenario over 200 iterations and captured data. BDST will analyze the collected data to determine its utility in measuring COA effectiveness. Future applications of tools and techniques developed through this and other experiments will assist the commander as real-world battles unfold.

DTIC

Command and Control; Military Operations; Planning

20070008509 Pacific Science and Engineering Group, Inc., San Diego, CA USA

Identifying and Addressing User Needs: A Preliminary Report on the Command and Control Requirements for CJTF Staff

Moore, Ronald A; Averett, M G; Jan 1999; 19 pp.; In English; Original contains color illustrations

Report No.(s): AD-A461055; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461055

As part of the Navy's Decision Centered Design (DCD) program, preliminary Cognitive Task Analyses (CTA) were performed on Joint Operations Center (JOC) personnel serving aboard command and control ships under the command of a Joint Task Force Commander (CJTF). The initial focus of these efforts was on the Battle Watch Captain (BWC). Members of the DCD project team conducted interviews and observed exercises and actual underway operations onboard USS Coronado (AGF 11) and USS Mount Whitney (LCC 20) as part of the CTA effort. As data from these exercises and interviews were compiled, experienced cognitive task analysts examined the data to determine decision requirements, information flow patterns, training and organizational requirements, and common operational problems. The initial observations, analyses, and interviews quickly revealed that the CJTF, Battle Watch Captain, and the supporting personnel are not well served by current JOC information systems and workspaces. Independently, C2F and C3F are continuing to experiment with JOC layouts, displays, organizations, and decision support systems as they evolve toward an adequate configuration. Clearly, help for CJTF is urgently needed. Expected products from the DCD program include improved information management and display systems, and recommendations for changes to JOC policies and procedures.

DTIC

Command and Control; Decision Making; Identifying

20070008511 Space and Naval Warfare Systems Command, San Diego, CA USA
Human Factors of 3-D Perspective Displays for Command and Control
Smallman, Harvey S; St John, mark; Cowen, Michael B; Jan 2002; 14 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461058; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461058

Effective Command and Control (C2) requires the rapid comprehension of the identity and other attributes of tracks and other objects in three-dimensional (3-D) space. Advances in computing speed and power are enabling display designers to create real-time prototype 3-D displays for this purpose. By 3-D display, we mean a display that shows a perspective projection of all three dimensions of physical space onto a flat CRT. One example of a 3-D prototype C2 display is the Area Air Defense Commander (AADC) prototype display (Dennehy, Nesbitt & Sumey, 1994). These new 3-D prototypes are extremely compelling. They offer a radical increase in realism of the scenes they depict over existing 3-D C2 displays. Their naturalistic look and easy feel make them attractive to users who consistently express a strong preference for them. But just because users are clamoring for these 3-D displays and because we can now give them to them does this mean that we should advocate their ubiquitous adoption for C2? The experimental literature comparing 2-D and 3-D displays is large, complicated and contradictory, often showing mixed advantages for 3-D displays, at best. The Navy's Perspective Display Technology (PVT) project has been conducting human factors research addressing these issues. In this talk, an array of PVT's experimental studies is reviewed that offer a consistent - and often counter-intuitive - set of results and guidelines to the where, what and how of 3-D perspective display use for C2 tasks.
DTIC
Command and Control; Display Devices; Human Factors Engineering

20070008514 Space and Naval Warfare Systems Command, San Diego, CA USA
A 'Trust But Verify' Design for Course of Action Displays
St John, Mark; Manes, Daniel I; Osga, Glenn A; Jan 2002; 15 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461061; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461061

Automation, particularly of complex cognitive tasks, is bound to be incomplete, simplistic, or otherwise less than completely reliable. Recently, we have begun developing Trust but Verify techniques for increasing the effectiveness of even unreliable automation. The user's trust should be conditioned on known situational factors that affect the reliability of the automation, and users should be able to verify the automation results and operation to various qualitative degrees as the level of trust dictates. Here, we describe our preliminary work on these concepts in the domain of Course of Action (COA) selection for an Intruder Interception Task. This task involves deciding which of several available aircraft should be chosen to perform an interception of an unknown aircraft intruding into the air space. Based on repeated interviews with four subject matter experts, we identified and then distilled a set of factors essential to evaluating the optimal COA. We then designed a set of alternative displays to illustrate the factors based on the Trust but Verify concept and general human factors display guidance. Here we analyze the benefits and costs of two major design decisions: whether to display the COA factors using a tabular or graphic organization, and whether or how to integrate the COAs with the map or with each other in a common table.
DTIC
Command and Control; Display Devices; Human Factors Engineering

20070008604 Evidence Based Research, Inc., Vienna, VA USA
High Leverage Command and Control Functions with Critical Human Roles
Noble, David; Jan 1999; 14 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461212; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461212

The Command and Control systems of the future must support high quality decisions even when the pace of battle is very fast, the situation is uncertain, and organizations are complex and geographically distributed. This analysis identifies the set of Command and Control functions whose improvement would contribute most to achieving this goal. It identifies three sets of functions: a first set whose improvement will most improve C2 decision making; a second set that would benefit most from improvements in human performance; and a third set where improving human performance will produce the greatest payoff to C2 and operational effectiveness. Five of these functions in this final set support situation assessment, with emphasis on identifying needed information, on situation projection, and on sharing the common picture. The other five functions support

planning and execution. These emphasize developing the strategic concept, expressing intent and plan logic, and supporting adaptive control.
DTIC
Command and Control; Decision Making

20070008625 Michigan Univ., Ann Arbor, MI USA
Lightweight Failure Detection in Secure Group Communication
Jan 2000; 14 pp.; In English
Contract(s)/Grant(s): F30602-00-2-0508; ATM-9873025
Report No.(s): AD-A461243; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461243

The secure and efficient detection of process failures is an essential requirement of many distributed systems. In this paper, were present the design and analysis of a mechanism used for the detection of member failures in secure groups. Based on one-time passwords, our solution does not obviate the need for periodic statements from group members, but significantly reduces the cost of their generation and validation. A study comparing the costs of traditional mechanisms with our proposed approach is presented. Results of the study indicate the average case performance of the proposed scheme is 1/10th of traditional failure detection in trusted groups, and negligible in the untrusted groups. A discussion of security and performance tradeoffs made through mechanism policy is provided.
DTIC
Detection; Failure

20070008626 Carnegie-Mellon Univ., Pittsburgh, PA USA
Task and Domain Specific Modelling in the Carnegie Mellon Communicator System
Rudnicky, Alexander I; Bennett, Christina; Black, Alan W; Chotomongcol, Ananlada; Lenzo, Kevin; Oh, Alice; Singh, Rita; Jan 2000; 5 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N66001-99-1-8905
Report No.(s): AD-A461244; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461244

The Carnegie Mellon Communicator is a telephone-based dialog system that supports planning in a travel domain. The implementation of such a system requires two complimentary components, an architecture capable of managing interaction and the task, as well as a knowledge base that captures the speech, language and task characteristics specific to the domain. Given a suitable architecture, the principal effort in development is taken up in the acquisition and processing of a domain knowledge base. This paper describes a variety of techniques we have applied to modeling in acoustic, language, task, generation and synthesis components of the system.
DTIC
Models; Telephones

20070008627 Carnegie-Mellon Univ., Pittsburgh, PA USA
Towards a Universal Speech Interface
Rosenfeld, Roni; Zhu, Xiaojin; Toth, Arthur; Shriver, Stefanie; Lenzo, Kevin; Black, Alan W; Jan 2000; 9 pp.; In English
Contract(s)/Grant(s): N66001-99-1-8905
Report No.(s): AD-A461245; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461245

We discuss our ongoing attempt to design and evaluate universal human-machine speech-based interfaces. We describe one such initial design suitable for database retrieval applications, and discuss its implementation in a movie information application prototype. Initial user studies provided encouraging results regarding the usability of the design, as well as suggest some questions for further investigation.
DTIC
Human-Computer Interface; Man Machine Systems; Speech Recognition

20070008669 Naval Postgraduate School, Monterey, CA USA
Analysis of Team Communications in 'Human-in-the-Loop' Experiments in Joint Command and Control
Hutchins, Susan G; Hocevar, Susan P; Kemple, William G; Jan 1999; 11 pp.; In English
Report No.(s): AD-A461311; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461311

Successful mission accomplishment depends on more than individual skills and knowledge. Communication is essential to high team performance in complex tasks. Interaction processes that occur via team communications are critical for the appropriate use of individual resources, especially when situations call for sharing resources and coordinating responses. This paper reports on the results of an analysis of team communications to document the extent to which specific communication behaviors can be identified as indicative of high performance in teams who participated in Experiment Four under the Adaptive Architectures for Command and Control (A2C2) research program. Recently emerging findings on teamwork skills that characterize high performing teams were used as an organizing framework to examine team communications. Team communications can represent several important aspects of team performance, such as shared situational awareness and coordination. High- and low-performing teams were identified using composite performance scores. Transcripts of videotaped scenario play were coded by two independent raters. The goal was to examine the degree to which A2C2 participant teams exhibited cognitive behaviors reported to characterize highly successful teams, and to determine the relationship of these behaviors to mission performance.
DTIC
Command and Control; Coordination; Decision Making; Military Operations

20070008730 Office of the Under Secretary of Defense (Acquisitions and Technology), Washington, DC USA
Enabling Information Superiority through C4ISR Interoperability
Quinlan, Robin; Tillery, Gordon; Jan 2000; 11 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461473; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461473

Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance Systems Interoperability is the number one problem in the Defense Department today in joint force operations. Deployed operational forces are joint a meld of multiple Services and coalition partners, each independently efficient and smoothly operating. The resulting mix of unique systems, operating procedures, protocols and standards, tactics, and languages produces an interoperability quagmire and complicates the full realization of information superiority. Further, new systems and system upgrades are increasingly complex in sophistication of information technology and communications interfaces, and the problems compound. Because of practical limitations on assembling joint forces short of actual operational deployment, modeling and simulation (M&S) is a key to understanding and resolving interoperability problems. M&S plays a critical role in system and force evaluation; the Joint Distributed Engineering Plant (JDEP) will provide a test bed for systems to be exercised in a representative joint operational environment. A collaborative engineering environment underpins JDEP, utilizing concepts of Simulation Based Acquisition (SBA). Individual systems must be 'born joint.' In addition to optimizing a systems design, in terms of independent performance, the design must include the capability to interoperate with a myriad of other systems. This is in the context of a systems architecture drawn from a joint operational architecture which portrays the users (theater warfighting Commander-in-Chief) requirements to prosecute operations. M&S used in system development must provide reuse and interoperability of models and data across service and program lines. This is essential to building system-of-systems interoperability.
DTIC
Command and Control; Interoperability; Military Operations; Simulation

20070008732 Singapore Armed Forces Center for Military Experimentation, Singapore
Command Post Anywhere Experiment - Exploiting the use of TeamSight for Ops Concepts
Cheah, Mervyn; Chew, Lock P; Fong, Gwenda; Teh, Cheryl A; Toh, Elsie; Jun 2005; 36 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461475; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461475

The concept of Command Post Anywhere is to be able to disperse the Brigade Command Post (CP) footprint to the forces so that command is everywhere and the Command Post is no longer a place for the enemy to detect and destroy. Every functional cell of the Brigade CP operates physically apart from each other over wide distances in an area of operation, but is still connected wirelessly with one another via TeamSight - a collaborative environment consisting of a team operating picture and a suite of communication tools. This idea was fielded in an experiment in conjunction with an Armoured Brigade CP exercise conducted from 21-23 Oct 2004. In evaluating the feasibility of CPA, several aspects were considered: sensemaking ability, situation awareness, operational tempo and survivability. The findings from this experiment, as determined by three measures (communication activity, situation awareness assessments and contextual inquiry) successfully

demonstrated that CPA supported by TeamSight is indeed a viable concept.
DTIC
Organizations; Telecommunication

20070008751 AB Technologies, Inc., Alexandria, VA USA
Using Army Force-on-Force Simulations to Stimulate C4I Systems for Testing and Experimentation
Hieb, Michael R; Timian, Donald H; Jan 1999; 28 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461500; XA-ODISC4; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461500

Simulation interfaces to Command, Control, Communications, Computers, and Intelligence (C4I) systems are essential for testing and experimentation. It is impractical to carry out large-scale tests in the field due to constrained resources and reduced availability of support units and equipment. Model and Simulation (M&S) systems have standardized on certain protocols and architectures for interoperability, such as the High Level Architecture (HLA). The C4I community is also moving to standardize on the Joint Technical Architecture (JTA) and the Defense Information Infrastructure Common Operating Environment (DII COE). These interoperability efforts can facilitate interfacing to C4I systems, if interface standards that align these two domains are developed. It is currently extremely difficult to interface Army C4I systems to standard Army simulations due to fundamental differences in their architectures and systems. The interfaces that have been constructed are limited in reusability. Historically this is due to the lack of common data models in the Army C4I systems, making each interface unique. A major objective of the Army Model and Simulation Office (AMSO) is to develop the technical infrastructure, architecture, and standards to allow simulations to interoperate with live C4I systems. In this paper, we outline a new approach that focuses on common data and software components as opposed to building black box interfaces.
DTIC
Command and Control; Computers; Intelligence; Simulation

20070008784 Silkroad, Inc., McLean, VA USA
The New Global Information Economy: Implications and Recommendations for Service-Oriented Architectures (SOAs)
Bass, Tim; Donahue, William; Jun 2005; 21 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461546; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461546

EMERGING CONCEPTS: (1) Information networks are complex systems and the complexity is accelerating; (2) The dynamics of complex internets are dominated by the notion of self-organization and emergent behavior at the 'edge;' (3) Net-centric concepts are rapidly evolving to information-centric, peer-to-peer, digital information sharing and digital rights management; (4) Information-centric means a transformation from industrial-age economics to information-age economics.
DTIC
Digital Systems; Networks

20070008786 Washington Univ., Seattle, WA USA
Energy-Aware Secure Multicast Communication in Ad-Hoc Networks Using Geographic Location Information
Lazos, Loukas; Poovendran, Radha; Jan 2003; 5 pp.; In English
Contract(s)/Grant(s): DAAD19-02-1-0242
Report No.(s): AD-A461548; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461548

The problem of securing multicast communications in an energy-constrained ad-hoc network requires the efficient management of cryptographic quantities. We show that existing efficient key distribution techniques for wired networks that rely on logical hierarchies are extremely energy inefficient. We also show that the consideration of the physical location of the members is critical for developing energy-efficient key distribution schemes. By exploiting the spatial correlation between the members of the multicast group, we construct an energy-aware key distribution scheme. We present simulation results to illustrate the improvements achieved by our proposed algorithm.
DTIC
Communication Networks; Position (Location)

20070008789 Space and Naval Warfare Systems Command, Charleston, SC USA
The Grand Challenges of Command and Control Policy
Lenahan, Jack; Charles, Phil; Jun 2006; 45 pp.; In English
Report No.(s): AD-A461552; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461552

We are interested in defining and investigating the grand challenges facing the command and control (C2) community in a network centric, transformational environment. The purpose of these investigations is to provide a rigorous basis for assessing the state of the art and the state of the practice of command and control in modern warfare. In 1900, David Hilbert proposed a list of 23 outstanding problems in mathematics, a number of which have now been solved, some of which remain open but have guided mathematics analysis for the last 100 years. In a similar vein, it is the intent of this paper is to attempt to define the challenges facing modern defense organizations such that formal requirements and solutions to these problems may begin to evolve. Thus, once the grand challenges are defined and accepted, C2 art and practice may be analyzed and measured against these grand objectives on the basis of a continuum of progress. That continuum is suggested as containing the following elements: formal definitions of the grand issues; agreement of both the issues and their definition by the warfighting community; and formal metrics definitions for each issue such that progress is easily identified, measured, and recognized as progress.
DTIC
Command and Control; Grammars; Policies

20070008790 ASRC Communication Ltd., Kirtland AFB, NM USA
Tactical Digital Information Link - Test Report and Analysis on the Integration and Lexicon of Simulators (TADIL-TRAILS)
Sorroche, Joe; Jun 2005; 11 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461554; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461554

Link 16 is a Communications, Navigation and Identification (CNI) system, intended to exchange surveillance and Command and Control (C2) information among various C2 and weapons platforms, which enhance the missions of each service. Link 16 is the primary NATO standard for the tactical datalink. NATO STANAG 5516/MIL-STD-6016C describes the TADIL J message formats and Link 16 network instructions. A protocol for simulating Link 16 in Distributive Interactive Simulation (DIS) and High Level Architecture (HLA) is in process of becoming a Simulation Interoperability Standards Organization (SISO) standard: SISO-STD-002-V2.9.6. The standard is scheduled to begin formal balloting in April 2005. The Air Force Distributed Mission Operations Center of Excellence (DMOC) located at Kirtland AFB, New Mexico, has implemented the Distributed Interactive Simulation (DIS) portion of SISO-STD-002- V2.8. In addition, Northrop Grumman has implemented the Draft Link 16 Simulation Standard protocol on its Common Connection Device (CCD), and one such device is at the DMOC. The software followed the draft standard and modified the DIS Transmitter and Signal Protocol Data Units (PDUs) for Fidelity Levels 0 - 3. During the DIS standard implementation, valuable lessons on the design were provided to the SISO Standards Group, as well as recommended changes to the standard. Two tests and one experiment, which incorporated the changes to the Link 16 standard, were conducted at the DMOC. The tests and experiment objectives were to verify and validate the DIS portion of the standard. The first test was conducted the week of 9 Dec 2002, the second the week of 24 Feb 2003. The experiment was conducted during the JEFX 04 SPIRAL 3 Test, 17 26 May 2004. This paper presents the test results, experiment results, and lexicon of the Link 16 standard, in an effort to increase interoperability among C2 systems.
DTIC
Data Links; Digital Data; Information; Pulse Communication; Simulators

20070008791 ASRC Communication Ltd., Kirtland AFB, NM USA
Tactical Digital Information Link - Technical Advice and Lexicon for Enabling Simulation (TADIL-TALES)
Sorroche, Joe; Jun 2005; 22 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461555; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461555

Link 16 is a Communications, Navigation, and Identification (CNI) system, intended to exchange surveillance and Command and Control (C2) information among various C2 and weapons platforms, which enhance the missions of each service. NATO STANAG 5516/MIL-STD-6016 describes the TADIL J message formats and Link 16 network instructions. Several protocols have evolved to satisfy specific needs. The NATO STANAG 5602 SIMPLE Link 16 Standard is one such

protocol. The standard is designed to be complementary to the SIMPLE Standard. Recently, the Simulation Interoperability Standards Organization (SISO) has developed a Link 16 Simulation Standard. The objective of the simulation standard is to establish a single format to exchange TADIL J messages, and emulate a Link 16 radio frequency network that supports Distributed Missions Operations (DMO) training for the warfighter. In developing a standard for simulating Link 16 in Distributive Interactive Simulation (DIS) and High Level Architecture (HLA), it is recognized that there are widely varying requirements for achieving fidelity among different users. The IEEE 1278.1a-1998 Standard describes established DIS Transmitter and Signal Protocol Data Units (PDUs), but they are not specifically defined for Link 16 simulation. The SISO Link 16 Standard does not change the IEEE 1278.1a-1998 Standard fields for the Transmitter or Signal PDUs, but exploits the fact that both PDUs are variable length. For Transmitter PDUs, the standard defines how the variable length modulation parameter fields must be populated. For Signal PDUs, Link 16 specific information is relegated to the variable length data fields. This paper presents the Link 16 DIS Transmitter and Signal PDU structures, HLA HLA BOM Object Model Templates (OMTs), general requirements, and implementation guidelines that provide interoperability among C2 systems.
DTIC
Data Links; Digital Data; Information; Pulse Communication; Simulation

20070008816 NATO Consultation, Command, and Control Agency, The Hague, Netherlands
A State-Space Formulation for Effects-Based Operations
Thuve, Hakon; Jun 2006; 42 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461585; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461585
No abstract available
Military Operations; Planning; System Effectiveness

20070008817 Solers, Inc., Arlington, VA USA
Reading the Mind of the Enemy: Predictive Analysis and Command Effectiveness
Ownby, Michael; Kott, Alexander; Jun 2006; 16 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461586; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461586
The Defense Advanced Research Projects Agency (DARPA) Real-time Adversarial Intelligence and Decision-making (RAID) program is investigating the feasibility of reading the mind of the enemy to estimate and anticipate, in real-time, the enemy's likely goals, deceptions, actions, movements and positions. This program focuses specifically on urban battles at echelons of battalion and below. The RAID program leverages approximate game-theoretic and deception-sensitive algorithms to provide real-time enemy estimates to a tactical commander. A key hypothesis of the program is that these predictions and recommendations will make the commander more effective, i.e. he should be able to achieve his operational goals safer, faster, and more efficiently. Realistic experimentation and evaluation drive the development process using human-in-the-loop wargames to compare humans and the RAID system. Two experiments were conducted in 2005 as part of Phase I to determine if the RAID software could make predictions and recommendations as effectively and accurately as a 4-person experienced staff. This report discusses the intriguing and encouraging results of these first two experiments conducted by the RAID program. It also provides details about the experiment environment and methodology that were used to demonstrate and prove the research goals.
DTIC
Decision Making; Enemy Personnel; Prediction Analysis Techniques; Predictions; Reading; Real Time Operation; Warfare

20070008818 Research Inst. for Communication, Information Processing and Ergonomics, Wachtberg-Werthhoven, Germany
Content Analysis of HUMINT Reports
Hecking, Matthias; Jun 2006; 40 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461587; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461587
The new deployments of the German Federal Armed Forces cause the necessity to analyze large quantities of Human Intelligence (HUMINT) reports. These reports are characterized by a large topical and linguistic variety. Therefore, they are good candidates for applying techniques from computational linguistics. In this paper, the ZENON project is described, in which an information extraction approach is used for the (partial) content analysis of English HUMINT reports from the

KFOR (Kosovo Force) deployment of the Bundeswehr. The overall objective of this research is to realize a graphically navigatable Entity-Action-Network. The information about the actions and named entities are identified from each sentence and the content of the sentences are formally represented in typed feature structures. These structures can be combined and presented in a navigatable network. After a short introduction, the information extraction approach is explained. The ZENON project is described in detail. English HUMINT reports from the KFOR deployment form the basis for the development of the experimental ZENON system. These reports are used to build a specialized text micro-corpus with semantic annotations. This KFOR text corpus is described as well.
DTIC
Linguistics; Natural Language Processing

20070008826 California Univ., Santa Cruz, CA USA
Wireless Internet Gateways (WINGS)
Garcia-Luna-Aceves, J J; Fullmer, Chane L; Madruga, Ewerton; Beyer, David; Frivold, Thane; Jan 1997; 7 pp.; In English
Contract(s)/Grant(s): DAAB07-95-C-D157
Report No.(s): AD-A461596; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461596

Today's internetwork technology has been extremely successful in linking huge numbers of computers and users. However, to date, this technology has been oriented to computer interconnection in relatively stable operational environments, and thus cannot adequately support many of the emerging civilian and military uses that require a more adaptive and more easily deployed technology. In particular, multihop packet radio networks are ideal for establishing instant communication infrastructures in disaster areas resulting from flood, earthquake, hurricane, or fires, supporting U.S. military doctrine for reliable, secure infrastructures for communication among all tiers down to the soldiers on-the-move, and extending the global communication infrastructure to the wireless, mobile environment. The Defense Advanced Research Projects Agency (DARPA) is sponsoring the development of wireless internet gateways (WINGs) as part of the DARPA Global Mobile (GloMo) Information Systems program. WINGs are wireless IP routers that enable the seamless marriage of distributed, dynamic, selforganizing, multihop wireless networks with the emerging multimedia Internet. This paper describes the WING architecture and novel communication protocols for channel access and routing, as well as the hardware and software development environment used to prototype and demonstrate wireless mobile internetworking.
DTIC
Communication Networks; Internets; Wings

20070008827 California Univ., Santa Cruz, CA USA
Poll-before-Data Multiple Access
Tzamaloukas, Asimakis; Garcia-Luna-Aceves, J J; Jan 1999; 6 pp.; In English
Contract(s)/Grant(s): F30602-97-2-0338
Report No.(s): AD-A461597; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461597

No abstract available
Communication Networks; Multiple Access; Wireless Communication

20070008855 Wright State Univ., Dayton, OH USA
Cultural Barriers to Multinational C2 Decision Making
Altman Klein, Helen; Pongonis, Anna; Klein, Gary; Jan 2000; 17 pp.; In English
Contract(s)/Grant(s): DAAH01-00-C-R094
Report No.(s): AD-A461631; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461631

National cultural differences present barriers to successful coalition command and control. The challenge is compounded by distributed decision making that characterizes many operations. If U.S. military personnel are to work effectively in coalition operations, they have to understand the complexities presented by national cultural differences. This paper reviews cultural differences that can disrupt situational awareness, decision making, coordination, and communication in multinational coalitions. These differences are in power distance, dialectical reasoning, counterfactual thinking, risk assessment, uncertainty management, and activity orientation. The authors propose a Cultural Lens concept that captures cultural differences in reasoning, judgment, and authority structure. A Cultural Lens is a metaphor to allow those involved in C2 operations to see

their world as if through the eyes of other participants. They will understand how options are conceptualized and evaluated. This ability to decenter supports anticipation of actions, accurate judgments, and effective negotiation of differences. A Cultural Lens will strengthen common ground and the coordination of action. It aims at enhancing understanding, grounding training, and optimizing the design of decision support systems. As multinational coalitions account for more of military operations and Operations Other Than War (OOTW), national culture differences will need to be managed.
DTIC
Command and Control; Decision Making; Military Operations; Warfare

20070008863 Strategic Consulting, Inc., Fairfax Station, VA USA
Rethinking Command & Control (Briefing Charts)
Curts, Raymond J; Campbell, Douglas E; Jun 2006; 48 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461641; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461641

Established characteristics bounding the conduct of Command and Control going back to the days of Sun Tzu specifically describe the intended implementation of C2 operations. These can still be seen aboard a variety of warfighting assets and in training facilities both at home and deployed. Military posturing has changed with the advent of information systems and Moore's Law. This has naturally led to the need for 'information superiority' which in turn highlights the necessity for new policies, processes, procedures, strategies and tactics. At issue is that the term 'Command & Control' may need to be redefined, or that it is no longer applicable in this new age of agile organizations. The consequences of recent warfighting actions have led some to believe that the role of C2 is being eroded by the advent of huge databases and ubiquitous services. In short, traditional Command & Control works well in a military that is trained in a limited communications environment, experienced and semi-autonomous. Moving as we are, to a military that is becoming dependent upon automation will require it to replace training, experience, and autonomy with a more centralized control, and dependence upon automation. Otherwise, the authors suggest that 'Command and Control' is a relic in today's modern warfare environment.
DTIC
Charts; Command and Control

20070008885 California Univ., Santa Cruz, CA USA
A Comparison of On-Demand and Table Driven Routing for Ad-Hoc Wireless Networks
Raju, Jyoti; Garcia-Luna-Aceves, J J; Jan 2000; 6 pp.; In English
Contract(s)/Grant(s): F30602-97-2-0338
Report No.(s): AD-A461673; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461673

We introduce WRP-Lite, which is a table-driven routing protocol that uses non-optimal routes, and compare its performance with the performance of the dynamic source routing (DSR) protocol, which is an on-demand routing protocol for wireless ad-hoc networks. We evaluate the performance of WRP-Lite and DSR for varying degree of mobility and traffic in a 20-node network. The performance parameters are end-to-end delay, control overhead, percentage of packets delivered, and hop distribution. We show that WRP-Lite has much better delay and hop performance while having comparable overhead to DSR.
DTIC
Mobility; Protocol (Computers)

20070008890 California Univ., Santa Cruz, CA USA
Collision Avoidance and Resolution Multiple Access for Multichannel Wireless Networks
Garces, Rodrigo; Garcia-Luna-Aceves, J J; Jan 2000; 9 pp.; In English
Contract(s)/Grant(s): DAAB07-95-C-D157
Report No.(s): AD-A461687; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461687

We introduce and analyze CARMA-MC (for Collision Avoidance and Resolution Multiple Access MultiChannel), a new stable channel access protocol for multihop wireless networks with multiple channels. CARMA-MC relies on the assignment of a unique channel and a unique identifier to each node to support correct deterministic collision resolution in the presence of hidden terminals. CARMA-MC dynamically divides the channel of each node into cycles of variable length; each cycle consists of one or more receiving periods and a transmission period. During the receiving period, stations with one or more

packets to send compete for the right to acquire the floor of a particular receiver's channel using a deterministic tree-splitting algorithm. Each receiving period consists of collision resolution steps. A single round of collision resolution (i.e., a success, and idle or a collision of control packets) is allowed in each contention step. The receiving period is initiated by the receiver and takes place in the channel assigned to the receiver station. The channel utilization and packet delays are studied analytically and by simulation.
DTIC
Collision Avoidance; Communication Networks; Multichannel Communication; Multiple Access; Wireless Communication

20070008953 Space and Naval Warfare Systems Center, San Diego, CA USA
Achieving Information Dominance: Seven Imperatives for Success
Kaye, Tom; Galdorisi, George; Jun 2002; 22 pp.; In English
Report No.(s): AD-A461794; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461794

The importance of C4ISR (command, control, communications, computers, intelligence, surveillance, and reconnaissance) as a key enabler for warfighting success has long been recognized. What has been less clear is a means for U.S.-led joint and coalition forces to achieve C4ISR dominance. Understanding not just the operational needs and the technical requirements - but also the functional capabilities required to achieve this goal - can hasten the day when C4ISR dominance for USA military forces is more than a futuristic goal. We address a critical issue - how does the technical community achieve this goal? The overarching thesis of this paper is that in order to achieve C4ISR dominance, the technical community should neither chase means to overcome extant enemy operational capabilities nor attempt to push systems to the operational forces based solely on available technology. Rather, it should build to a discrete set of functional capabilities to achieve this C4ISR dominance. This paper identifies seven functional imperatives to achieve this C4ISR dominance over an adversary. We conclude that what has remained timeless from the days of Sun Tzu to today's conflicts are the universal needs of warfighters to have the right information, at the right place, at the right time.
DTIC
Command and Control; Dominance; Military Operations

20070008957 Ministry of Defence (Army), London, UK
The Development of a Coalition Operational Architecture: A British and US Army Approach
Galvin, K E; Madigan, J C; Jan 2000; 28 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461799; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461799

In January 1999, after discussions between staff from the UK's Command Support Branch, Directorate General of Development and Doctrine (DGD&D), and the US Army's TRADOC Program Integration Office Army Battle Command Systems (TPIO-ABCS) at Fort Leavenworth, it was agreed that the possibility of developing a Coalition Operational Architecture (COA) to support a US Corps operating as a Combined Joint Task Force (CJTF) Headquarters with up to a UK Division as an integral part of its ORBAT would be investigated by staff from both countries' Army Operational Architecture (AOA) teams. The initial work was completed by August 1999. The paper sets out how the work was progressed using both the model that was built using the UK's Soft Systems Methodology and the utilization of US Army IDEFO models. Key issues that should be addressed in coalition operations are highlighted and it recommends how this work should be taken forward to support the issue of C2 interoperability in coalition operations of the future. The initial results were presented to the US-UK Staff Talks in September 1999. An agreement in principle to further develop the COA was agreed but resource priorities have meant that the next phase of work is yet to begin.
DTIC
Command and Control; Interoperability; Military Operations; United Kingdom

20070008959 Naval Research Lab., Washington, DC USA
Common Operational Picture (COP) and Common Tactical Picture (CTP) Management via a Consistent Networked Information Stream (CNIS)
Mittu, Ranjeev; Segaria, Frank; Jan 2000; 13 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461803; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461803

The US Navy and Marine Corps have been developing technologies for the Common Operational Picture (COP) and

Consistent Tactical Picture (CTP). The COP consists of data with long life spans serving war-fighters, who think in terms of minutes, hours, days or months. The CTP is generally envisioned to consist of data with short life spans serving operators and weapons that think in term of seconds or microseconds. Applications and war-fighters are stove-piped to receive the information relevant to their needs, thus, are unable to properly share data in a fashion in which everyone operating throughout the entire battle space can construct a systematic, consistent view of the battle space. The Naval vision is to provide one common, consistent data stream serving every Naval information consumer. Considering the wide breadth and depth of the Naval information community, this will be a challenging task. Therefore, it is extremely important that the Naval research community identifies and addresses the issues inherent to achieving this vision. The objective of the Consistent Networked Information Stream (CNIS) project is to develop a next generation information manager which can provide such a consistent stream of COP/CTP data.
DTIC
Data Management; Data Processing; Data Systems; Images; Information Management; Management Systems; Network Analysis

20070008967 Space and Naval Warfare Systems Center, San Diego, CA USA
Composeable FORCEnet Command and Control
Galdorisi, George; Sep 2004; 25 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461829; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461829
FORCEnet is the operational construct and architectural framework for Naval warfare in the Information Age which integrates warriors, sensors, networks, command and control, platforms and weapons into a networked, distributed combat force, scalable across the spectrum of conflict from seabed to space and sea to land. Ultimately, the naval and Joint warfighter and not the engineers will use the capabilities needed for the immediate operational and tactical problem. Warfighters operating in a Composeable FORCEnet-enabled environment will soon be able to compose the C4ISR components developed by the engineering community to ensure superior decision-making. This capability has the potential to enable the Joint Force Commander to achieve the maximum degree of operational effectiveness across the spectrum of warfighting and to do it faster than ever before.
DTIC
Command and Control; Systems Integration

20070009060 North Carolina State Univ., Raleigh, NC USA
Control of Mobile Communication Systems With Time-Varying Channels via Stability Methods
Buche, Robert; Kushner, Harold J; Aug 2003; 18 pp.; In English
Contract(s)/Grant(s): DAAD19-02-1-0425; ECS-9979250
Report No.(s): AD-A461517; No Copyright; Avail.: CASI: A03, Hardcopy
No abstract available
Mobile Communication Systems; Stability; Telecommunication; Time; Variations

20070009100 Air Force Research Lab., Brooks AFB, TX USA
Investigation of Complex C3 Decisionmaking under Sustained Operations: Issues and Analyses
Elliott, Linda R; Miller, James C; Barnes, Christopher; Dalrymple, Mathieu; Brown, Leroy; Whitmore, Jeff; Fischer, Joe; Cardenas, Rebecca; Jan 2002; 14 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461940; No Copyright; Avail.: CASI: A03, Hardcopy
In this paper we describe plans and initial progress in baseline investigations of fatigue on team performance in complex and operationally relevant task environments. Preliminary data collection used a PC-based analogue of command and control simulations. The platform was developed based on cognitive and functional analysis of C3 mission, tactics, team-member roles, and role interdependencies. Tactical scenarios were developed to capture core team coordination, decision-making and problem-solving task demands. Issues regarding measures and scenario development are identified and discussed. Preliminary findings, indicating increased resistance to fatigue effects over time, are presented. Lessons learned are noted, along with plans for subsequent research.
DTIC
Command and Control; Decision Making

20070009110 Army Communications-Electronics Command, Fort Monmouth, NJ USA
Intelligent Nodes in Knowledge Centric Warfare
Dawidowicz, Edward; Rodriguez, Albert; Langston, John; Jun 2002; 10 pp.; In English
Report No.(s): AD-A461953; No Copyright; Avail.: CASI: A02, Hardcopy

With the continuous increase in complexity and tempo on the modern battlefield, new demands are placed on information dissemination. The volume of information available to the user becomes larger while the time necessary to correctly interpret and understand this information becomes prohibitively smaller. Cognitive processing of information at the user nodes is proposed as a potential solution to this information overflow problem. These nodes we will call Intelligent Nodes [Dawidowicz, 2001]. This paper will introduce the architecture of an Intelligent Node and will demonstrate its hierarchical scalability across all echelons and Battlefield Functional Areas. This technology is directly applicable to the Objective Force and Future Combat Systems.
DTIC
Command and Control; Information Management; Networks; Warfare

20070009116 Defense Information Systems Agency, Falls Church, VA USA
Estimating Situational Awareness Parameters for Net Centric Warfare from Experiments
Hiniker, Paul J; Jan 2005; 10 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461961; No Copyright; Avail.: CASI: A02, Hardcopy

During the past decade the doctrine of Net Centric Warfare has emerged and grown. NCW has been defined as an information superiority-enabled concept of operations that generates increased combat power by networking sensors, decision makers, and shooters to achieve shared awareness, increased speed of command, higher tempo of operations, greater lethality, increased survivability, and degree of self -synchronization. (Alberts, Garstka, and Stein (2000)). Situational Awareness and its sharing by linked warfighters is thus deemed to be a major causative factor in increasing combat power. How do we create and measure situational awareness and relate it to combat? What are some of its determinants? We shall see in the results of the controlled warfighting experiment examined below that there are at least two major determinants of increased Situational Awareness for a warfighting team, viz. use of a relatively complete Common Operational Picture of the battlespace and time spent collaborating with this COP as a team.
DTIC
Command and Control; Estimating; Situational Awareness; Warfare

20070009122 Defense Advanced Research Projects Agency, Arlington, VA USA
Bringing Control Theory to C2: An Update on the DARPA JFACC Program
McCorry, Daniel C; Morse, H S; Jan 2000; 14 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461968; No Copyright; Avail.: CASI: A03, Hardcopy

The current emphasis of the JFACC program is on the applicability of control theory, broadly conceived, to selected problems in military command and control. The program is organized around the conduct of a special type of experiment, in which a control technology is matched against an externally given plant. We discuss the approach and initial experimental results of a number of the research teams, as well as the work of the system architect. A final section reviews current challenges as well as anticipated future results and developments.
DTIC
Command and Control; Control Theory

20070009125 Science Applications International Corp., McLean, VA USA
Architecture Modeling Approach for Net-Centric Enterprise Services
Lau, Yun-Tung; Okon, Walter J; Kye, David; King, Michelle; Jan 2005; 17 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461972; No Copyright; Avail.: CASI: A03, Hardcopy

This paper presents an architecture modeling approach for service-oriented architectures such as the Net-Centric Enterprise Services (NCES). The approach is driven by operational mission threads. It uses Unified Modeling Language and the Department of Defense Architecture Framework to capture, analyze, and present the architecture products. Steps in this approach include: 1. Formulating activity models for a mission thread. 2. Mapping the activities to NCES and existing systems. 3. Developing logical deployment architecture with NCES included. 4. Developing logical data models. 5. Constructing executable architecture models. This architecture development approach has been applied to NCES mission

threads, which cover a wide range of activities in the Warfighting, Intelligence, and Business domains. It provides a direct trace from NCES capabilities to operational requirements and shows how NCES will support various communities of interest. We illustrate the approach using mission threads that are closely related to Command and Control. Examples include Time-Sensitive Targeting, Joint Close Air Support, and Global Strike.
DTIC
Command and Control; Data Management; Warfare

20070009149 Ohio State Univ., Columbus, OH USA
Design of a High Speed Data Capture Device for a Coherent Radar Application
Frankford, Mark; Carr, Michael A; Nov 2006; 85 pp.; In English
Contract(s)/Grant(s): N00173-04-2-C005
Report No.(s): AD-A462004; 746389-1; No Copyright; Avail.: CASI: A05, Hardcopy

Anti-ship missiles (ASM) have long presented a serious threat to the safety and security of America's naval forces. Over the past 30 years, significant efforts have been made to develop reliable countermeasures to protect the fleet against a wide variety of ASM weaponry. Due to cost, weight, and size limitations, conventional radar-guided ASMs (RGASM) have employed non-coherent radar techniques, and thus countermeasures developed to date have been designed specifically to defeat non-coherent threats. Recently advances in miniaturization have enabled the design of coherent RGASMs, demanding the creation of a new breed of countermeasures. To enable the design of countermeasures to protect against coherent RGASMs, a variety of tools must first be constructed. Amount these is a coherent RGASM test bed to be used for monitoring the behavior of missiles as they are deployed against simulated targets in a laboratory environment. One component of this test bed consists of a high speed data capture device (HSCD) for capturing and recording real-time data as it moves through a RGASM's digital processing in order to analyze how the RGASM's decision making is affected by each countermeasure's behavior. This thesis outlines the design of an HSCD for interfacing directly to a RGASM to aid in accomplishing this task.
DTIC
Antiship Missiles; Coherent Radar; High Speed; Simulation; Test Stands

20070009195 Naval Research Lab., Washington, DC USA
Packet Testing in Free-Space Optical Communication Links Over Water
Suite, M R; Burris, H R; Moore, C I; Stell, M F; Wasiczko, L; Freeman, W; Rabinovich, W S; Gilbreath, G C; Scharpf, W J; Jan 2006; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-05-WR-20216
Report No.(s): AD-A462078; No Copyright; Avail.: CASI: A03, Hardcopy

NRL's Chesapeake Bay lasercom test facility (LCTF) offers a variety of ranges for researching free-space optical laser communication (FSO lasercom) links in a maritime environment. This paper discusses link performance over the 16 km one-way range at the LCTF. There are several methods to determine the link quality in FSO lasercom. Bit-error-rate (BER) testing and packet testing are two possible methods. Since errors generally tend to occur in bursts in FSO channels, packet testing may offer a better indication of the quality of service (QoS) rather than BER testing. Link performance measured via packet testing is being investigated in a variety of atmospheric conditions. Results of these experiments will be presented.
DTIC
Bit Error Rate; Communication Networks; Free-Space Optical Communication; Lasers; Masers; Optical Communication; Test Facilities; Water

20070009200 Naval Research Lab., Washington, DC USA
Quantitative Prediction of NACK-Oriented Reliable Multicast (NORM) Feedback
Adamson, R B; Macker, Joseph P; Jan 2002; 7 pp.; In English; Original contains color illustrations
Report No.(s): AD-A462088; No Copyright; Avail.: CASI: A02, Hardcopy

We have applied the concept of truncated exponential timers for efficient reliable multicast feedback suppression for cases of both multicast and unicast feedback channels. Unicast feedback operation for multicast transport is becoming a more prevalent concern with the advent of source specific multicast routing and asymmetric networks offering forward-based multicast (e.g., satellite distribution network). We discuss our approach to the design and its integration with a working reliable multicast protocol. We then present simulation results demonstrating that observed implementation performance matches the

analytically predicted performance. Finally, we formulate a quantitative predictor of reliable multicast protocol feedback traffic levels.
DTIC
Communication Networks; Feedback; Prediction Analysis Techniques

20070009260 University of Southern California, Marina del Rey, CA USA
Dramatic Expression in Opera, and Its Implications for Conversational Agents
Johnson, W L; Jan 2003; 9 pp.; In English
Report No.(s): AD-A462170; No Copyright; Avail.: CASI: A02, Hardcopy

It is commonly agreed among embodied conversational agent (ECA) researchers that ECA behavior should be based upon principles of human face-to-face communication (Cassell et al., 2000; Traum & Rickel, 2002). It is less commonly acknowledged that principles of human acting can inform the design of ECA behavior, particularly in making behavior engaging and understandable. Character animators, in contrast, understand clearly the relationship between character behavior and acting (Porter, 1997), and have articulated principles such as exaggeration and staging that are based in part on observations of actors (Thomas & Johnston, 1981; Lasseter, 1987; Maestri, 1999). However, we cannot expect to capture principles of dramatic portrayal in ECAs simply by copying the techniques of animators. ECAs are being developed for a applications with a variety of media characteristics; we therefore need to draw lessons from a range of dramatic media, including those involving live action. Some ECA developers try to incorporate dramatic aspects by collecting motion capture data from actors (Churchill et al., 2000). This approach relies upon the actor's expressive skills to achieve the desired dramatic effect. Unfortunately there is no assurance that motion capture data will appear equally expressive and appropriate when transferred to different media and different dramatic contexts.
DTIC
Human Relations; Voice Communication

20070009306 Aptima, Inc., Woburn, MA USA
From Laboratory to Field - Testing A2C2 Concepts during Global Warfare Exercises
Hess, Stephen M; Kemple, William G; Entin, Elliot E; Hess, Kathleen P; Hocevar, Susan P; Serfaty, Daniel; Jan 2000; 6 pp.; In English
Report No.(s): AD-A462249; No Copyright; Avail.: CASI: A02, Hardcopy

Global Wargame '99 offered the A2C2 team a unique opportunity to witness a large-scale exploration of Network Centric Warfare (NCW) concepts in the context of an extended operational exercise. The team became involved in Global '99 three months prior to the game through their interaction with a team of warfighters with whom they conducted a training exercise at the Naval Postgraduate School entitled 'Bridge to Global '99.' During that training exercise, the A2C2 modeling team introduced a model-based organizational structure designed to optimally support the demands of the Global scenario. CCG1 and a staff of roughly 30 officers played the organization in a laboratory at the Naval Postgraduate School while the A2C2 assessment team observed, collected a range of performance measures, provided detailed feedback about the impacts of Information Technology (IT) tools, assessed the function of the organization relative to model predictions, and captured team processes that evolved and improved as the game progressed. The positive outcome of this experience led CCG1 to recommend a variation on the A2C2 architecture for the Global Wargame itself. This presented the A2C2 team with an unprecedented opportunity to follow a model-based architecture from the laboratory to the field. Although Global '99 was not an experiment in the classical sense, the exercise did manipulate three central components of NCW: model-driven innovations in organizational design, new C2 processes to match changes in command organization, and the availability of advanced information technologies and collaboration tools. This paper describes Global Wargame '99 from the A2C2 perspective, including the methods they used there to capture data and the lessons they learned from the experience.
DTIC
Command and Control; Field Tests; Military Operations; Synchronism; War Games; Warfare

20070009311 Space and Naval Warfare Systems Command, San Diego, CA USA
Improving Collaboration in Command and Control Environments: Creating and Exchanging Iconic Tags of Key Information
Cowen, Michael B; Fleming, Robert A; Jan 2005; 34 pp.; In English; Original contains color illustrations
Report No.(s): AD-A462258; No Copyright; Avail.: CASI: A03, Hardcopy

DCODE (Decision Making Constructs in a Distributed Environment) objectives are to: improve the ability of both

individuals and distributed group decision makers to evaluate, share, and integrate decision-relevant information items and to improve decision time by reducing the time and effort devoted to conflict resolution and consensus building in reaching an overall group decision. Decision making application areas are: information fusion, analysis and situation assessment, option generation/selection, course of action (COA) recommendations and consensus building.
DTIC
Command and Control; Decision Making

20070009312 Naval Postgraduate School, Monterey, CA USA
Hypothesis Testing of Edge Organizations: Specifying Computational C2 Models for Experimentation
Nissen, Mark E; Jan 2005; 34 pp.; In English; Original contains color illustrations
Report No.(s): AD-A462259; No Copyright; Avail.: CASI: A03, Hardcopy

The Edge represents a fresh approach to organizational design, moving knowledge and power to the edges of organizations. But this raises issues in terms of comparative performance with respect to alternate organizational designs (esp. military C2). The research described in this article represents the first stage of a multi-disciplinary, multi-year investigation into the design and efficacy of Edge organizations for current and future, military, mission-environmental contexts. Specifically, we employ methods and tools of computational experimentation to compare empirically the performance of current and competing organizational forms. This first study begins by specifying computational models of Hierarchy and Edge organizations in the C2 domain. Rooted firmly in Organization Theory, yet cognizant of military operations, in this article we report the bases and results of such specification in considerable detail. We also design an experiment to compare explicitly the performance of both Hierarchy and Edge organizations across two, contrasting, mission-environmental contexts: Industrial Age and 21st Century. Preliminary, experimental results reveal insightful dynamic patterns and differential performance capabilities of Hierarchy and Edge C2 organizations. This work suggests immediate results amenable to practical application in the Military. And it suggests also an exciting agenda for continued research along the lines of this investigation.
DTIC
Command and Control; Hypotheses; Mathematical Models; Military Operations

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ELECTRONICS AND ELECTRICAL ENGINEERING

Includes development, performance, and maintainability of electrical/electronic devices and components; related test equipment; and microelectronics and integrated circuitry. for related information see also *60 Computer Operations and Hardware*; and *76 Solid-State Physics*. For communications equipment and devices see *32 Communications and Radar*.

20070006615 Tope-McKay and Associates, Malibu, CA, USA
Adaptive, Intelligent Transform-Based Analog to Information Converter Method and System
Petre, P.; Kadambo, S.; Jensen, J. F.; 12 May 04; 39 pp.; In English
Contract(s)/Grant(s): DARPA-N66001-01-C-8042
Patent Info.: Filed Filed 12 May 04; US-Patent-Appl-SN-10-845 487
Report No.(s): PB2007-102760; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention provides an adaptive, intelligent transform based Analog to Information Converter (AIC) for wideband signals by directly converting an analog signal to information (e.g., features, decisions). This direct conversion is achieved by (1) capturing most of the information of a wideband signal via hardware/software implemented mathematical transformations, (2) effectively removing unwanted signals such as jammer and interfere from the input signal, and (3) using novel algorithms for highly accurate decision making and feature extraction (e.g., high probability of detection with low probability of false alarm). The jump in the improvement over today's state-of-the-art is in terms of effective and optimum signal information extraction at high-speed.
NTIS
Analog Data; Analog to Digital Converters; Information Systems

20070006617 Battelle Memorial Inst., Richland, WA, USA
Multi-mode Radio Frequency Device
Gilbert, R. W.; Carrender, C. L.; Anderson, G. A.; Steele, K. D.; 21 Jan 04; 8 pp.; In English
Contract(s)/Grant(s): DE-AC06-76RL01830

Patent Info.: Filed Filed 21 Jan 04; US-Patent-Appl-SN-10-762 585
Report No.(s): PB2007-102759; No Copyright; Avail.: CASI: A02, Hardcopy

A transponder device having multiple modes of operation, such as an active mode and a passive mode, wherein the modes of operation are selected in response to the strength of a received radio frequency signal. A communication system is also provided having a transceiver configured to transmit a radio frequency signal and to receive a responsive signal, and a transponder configured to operate in a plurality of modes and to activate modes of operation in response to the radio frequency signal. Ideally, each mode of operation is activated and deactivated independent of the other modes, although two or more modes may be concurrently operational.

NTIS

Electronic Equipment; Radio Frequencies; Telecommunication

20070006620 Fieldmetrics, Inc., Seminole, FL, USA

Current Sensor

Yakymyshyn, C. P.; Brubaker, M. A.; Yakymyshyn, P. J.; 7 Jan 05; 26 pp.; In English
Contract(s)/Grant(s): DE-FG03-01-ER83228
Patent Info.: Filed Filed 7 Jan 05; US-Patent-Appl-SN-10-905 509
Report No.(s): PB2007-102758; No Copyright; Avail.: CASI: A03, Hardcopy

A current sensor is described that uses a plurality of magnetic field sensors positioned around a current carrying conductor. The sensor can be hinged to allow clamping to a conductor. The current sensor provides high measurement accuracy for both DC and AC currents, and is substantially immune to the effects of temperature, conductor position, nearby current carrying conductors and aging.

NTIS

Electric Current; Sensors; Magnetic Fields

20070006627 Wells Saint John, P.S, Spokane, WA, USA

Thin Film Transistors and Methods of Forming Thin Film Transistors

Manning, M.; 18 Jan 05; 12 pp.; In English
Contract(s)/Grant(s): ARPA-MDA972-92-C-0054
Patent Info.: Filed Filed 18 Jan 05; US-Patent-Appl-SN-11-038 601
Report No.(s): PB2007-102756; No Copyright; Avail.: CASI: A03, Hardcopy

A method of forming a thin film transistor over a substrate is provided whereby at least one of the source region or the drain region is conductively doped while preventing conductivity doping of the channel region without any masking of the channel region occurring by any separate masking layer. A method includes, a) providing a substrate having a node to which electrical connection is to be made; b) providing a first electrically insulative dielectric layer over the substrate; c) providing an electrically conductive gate layer over the first dielectric layer; d) providing a second electrically insulative dielectric layer over the electrically conductive gate layer; e) providing a contact opening through the second dielectric layer, the electrically conductive gate layer and the first dielectric layer; the contact opening defining projecting sidewalls; f) providing a gate dielectric layer within the contact opening laterally inward of the projecting sidewalls; g) providing a layer of semiconductive material over the second dielectric layer and within the contact opening against the gate dielectric layer and in electrical communication with the node; the semiconductive material within the contact opening defining an elongated and outwardly extending channel region the electrical conductance of which can be modulated by means of the adjacent electrically conductive gate and gate dielectric layers; and h) conductively doping the semiconductive material layer lying outwardly of the contact opening to form one of a source region or a drain region of a thin film transistor.

NTIS

Thin Films; Transistors; Dielectrics

20070006628 Myers Bigel Sibley and Sajovec, Raleigh, NC, USA

Optoelectronic Devices Having Arrays of Quantum-DOT Compound Semiconductor Superlattices Therein

Zhang, Z.; Misra, V.; Bedair, M. A.; Ozturk, M.; 24 Feb 05; 15 pp.; In English
Contract(s)/Grant(s): DARPA-N66001-01-1-8977
Patent Info.: Filed Filed 24 Feb 05; US-Patent-Appl-SN-11-065 085
Report No.(s): PB2007-102755; No Copyright; Avail.: CASI: A03, Hardcopy

Methods of forming a nano-scale electronic and optoelectronic devices include forming a substrate having a

semiconductor layer therein and a substrate insulating layer on the semiconductor layer. An etching template having a first array of non-photolithographically defined nano-channels extending therethrough, is formed on the substrate insulating layer. This etching template may comprise an anodized metal oxide, such as an anodized aluminum oxide (AAO) thin film. The substrate insulating layer is then selectively etched to define a second array of nano-channels therein. This selective etching step preferably uses the etching template as an etching mask to transfer the first array of nano-channels to the underlying substrate insulating layer, which may be thinner than the etching template. An array of semiconductor nano-pillars is then formed in the second array of nano-channels. The semiconductor nano-pillars in the array may have an average diameter in a range between about 8 nm and about 50 nm. The semiconductor nano-pillars are also preferably homoepitaxial or heteroepitaxial with the semiconductor layer.
NTIS
Optoelectronic Devices; Quantum Dots; Semiconductors (Materials); Superlattices

20070006630 Thomas Kayden, Horstemeyer and Risley, LLP, Atlanta, GA, USA
Method and Apparatus to Create Electrical Junctions for Information Routing in Textile Structures
Jayaraman, S.; Park, S.; 15 Jan 04; 14 pp.; In English
Contract(s)/Grant(s): DARPA-F30602-00-2-0564
Patent Info.: Filed Filed 15 Jan 04; US-Patent-Appl-SN-10-759 691
Report No.(s): PB2007-102753; No Copyright; Avail.: CASI: A03, Hardcopy

Disclosed are systems or apparatuses and methods for forming a junction between conductive fibers that are incorporated into a fabric. Briefly, one method includes the steps of removing insulation from two intersecting individually insulated conductive fibers to expose the individually conductive fibers, bringing the exposed individually conductive fibers into contact with each other at a junction point, and forming a molecular bond between the conductive fibers at the junction point. Also disclosed are systems for forming a junction between conductive fibers that are incorporated into a fabric. In this regard, one embodiment of such a system can include a first apparatus that removes insulation from two intersecting individually insulated conductive fibers to expose the individually conductive fibers, a second apparatus that brings the exposed individually conductive fibers into contact with each other at a junction point, and a third apparatus that aids in formation of a molecular bond between the conductive fibers at the junction point.
NTIS
Data Structures; Semiconductor Junctions; Textiles

20070006644 Brinks Hofer Gilson and Lione, Chicago, IL, USA
Doped Metal Oxide Nanoparticles and Methods for Making and Using Same
Burda, C.; 16 Mar 05; 54 pp.; In English
Contract(s)/Grant(s): CHE-0239688
Patent Info.: Filed Filed 16 Mar 05; US-Patent-Appl-SN-11-081-862
Report No.(s): PB2007-101361; No Copyright; Avail.: CASI: A04, Hardcopy

Metal oxide nanoparticles are described that contain a non-metallic dopant selected from the group consisting of boron, carbon, silicon, germanium, nitrogen, phosphorous, arsenic, sulfur, selenium, tellurium, fluorine, chlorine, bromide, iodine, and combinations thereof. Methods of making and using these doped metal oxide nanoparticles are also described.
NTIS
Additives; Metal Oxides; Nanoparticles; Methodology

20070006659 Fish and Richarson P.C., Minnesapolis, MN, USA
Aperture Coded Camera for Three Dimensional Imaging
Pereira, F.; Modaaress, D.; Gharib, M.; Dabiri, D.; Jeon, D.; 28 Feb 06; 20 pp.; In English
Contract(s)/Grant(s): N00014-97-1-0303
Patent Info.: Filed Filed 28 Feb 06; US-Patent-Appl-SN-11-365-970
Report No.(s): PB2007-101340; No Copyright; Avail.: CASI: A03, Hardcopy

A system and method for determining instantaneously the three-dimensional coordinates of large sets of points in space is disclosed. This system uses two or more CCD cameras (or any other type of camera), each with its own lens and pinhole. The CCD's are all arranged so that the pixel arrays are within the same plane. The CCD's are also arranged in a predefined pattern. The combination of the multiple images acquired from the CCD's onto one single image forms a pattern, which is dictated by the predefined arrangement of the CCD's. The size and centroid on the combined image are a direct measure of

the depth location Z and in-plane position (X,Y), respectively. The use of a predefined pattern enables high speed computation through simple algorithmic procedures. Moreover, the use of CCD cameras allows for the recording of such datasets at the corresponding image frame rate, thus opening the use of the invention to the mapping of dynamical systems.
NTIS
Apertures; Cameras; Coding; Imaging Techniques; Patent Applications

20070006668 Fieldmetrics, Inc., Seminole, FL, USA
Vented Capacitor
Brubaker, M. A.; Hosking, T. A.; 29 Dec 04; 6 pp.; In English
Contract(s)/Grant(s): DE-FG03-01-ER83228
Patent Info.: Filed Filed 29 Dec 04; US-Patent-Appl-SN-10-905 352
Report No.(s): PB2007-102766; No Copyright; Avail.: CASI: A02, Hardcopy

A means of increasing the corona inception voltage (CIV), and thereby increasing the operating voltage, of film/foil capacitors is described. Intentional venting of the capacitor encapsulation improves the corona inception voltage by allowing internal voids to equilibrate with the ambient environment.
NTIS
Capacitors; Patent Applications

20070006719 OBanion and Ritchey, LLP, Sacramento, CA, USA
Methods of Fabricating Nanostructures and Nonowires and Devices Fabricated Therefrom
Majumdar, A.; Shakouri, A.; Sands, T. D.; Yang, P.; Mao, S. S.; 20 Jan 05; 44 pp.; In English
Contract(s)/Grant(s): DE-AC03-76SF00098; NSF-DMR-0092086
Patent Info.: Filed Filed 20 Jan 05; US-Patent-Appl-SN-11-040 664
Report No.(s): PB2007-102844; No Copyright; Avail.: CASI: A03, Hardcopy

One-dimensional nanostructures having uniform diameters of less than approximately 200 nm. These inventive nanostructures, which we refer to as nanowires, include single-crystalline homostructures as well as heterostructures of at least two single-crystalline materials having different chemical compositions. Because single-crystalline materials are used to form the heterostructure, the resultant heterostructure will be single-crystalline as well. The nanowire heterostructures are generally based on a semiconducting wire wherein the doping and composition are controlled in either the longitudinal or radial directions, or in both directions, to yield a wire that comprises different materials. Examples of resulting nanowire heterostructures include a longitudinal heterostructure nanowire (LOHN) and a coaxial heterostructure nanowire (COHN).
NTIS
Nanostructures (Devices); Nanowires; Patent Applications; Semiconductor Devices; Single Crystals

20070006726 Pittsburgh Univ., PA, USA
Metallic Nano-Optic Lenses and Beam Shaping Devices
Kim, H. K.; Sun, Z.; Capelli, C. C.; 2 Dec 04; 43 pp.; In English
Contract(s)/Grant(s): ONR-00014-99-0663
Patent Info.: Filed Filed 2 Dec 04; US-Patent-Appl-SN-11-001 054
Report No.(s): PB2007-102842; No Copyright; Avail.: CASI: A03, Hardcopy

A nano-optic device comprises a plurality of subwavelength apertures in a metal film or between metal islands. The device is adapted to shape a radiation beam transmitted there through. For example, beam shaping includes at least one of beam focusing, beam bending and beam collimating.
NTIS
Collimation; Lenses; Optical Equipment; Patent Applications

20070006751 Jenkins, Wilson, Taylor and Hunt, P.A., Durham, NC, USA, Duke Univ., Durham, NC, USA
Miniaturized High-Density Multichannel Electrode Array for Long-Term Neuronal Recordings
Nicolelis, M. A. L.; Lehew, G. C.; Krupa, D. J.; 18 Oct 05; 25 pp.; In English
Contract(s)/Grant(s): ND0014-98-0676
Patent Info.: Filed Filed 18 Oct 05; US-Patent-Appl-SN-11-252-953
Report No.(s): PB2007-101312; No Copyright; Avail.: CASI: A03, Hardcopy

A high-density multichannel microwire electrode array is disclosed. The array can comprise a variable number of

electrodes. A method of assembling the array is further disclosed. Additionally, a plurality of devices employing the array are disclosed, including an intelligent brain pacemaker and a closed loop brain machine interface.
NTIS
Electrodes; Miniaturization; Neurophysiology; Patent Applications

20070006768 North Carolina State Univ., Raleigh, NC USA
Methods of Fabricating Gallium Nitride Semiconductor Layers on Substrates Including Non-Gallium Nitride Posts, and Gallium Nitride Semiconductor Structures Fabricated Thereby
Linthicum, K. J.; Gehrke, T.; Davis, R. F.; 8 Mar 05; 8 pp.; In English
Contract(s)/Grant(s): ONR-N00014-96-1-0765; ONR-N00014-98-1-0384
Patent Info.: Filed Filed 8 Mar 05; US-Patent-Appl-SN-11-074 485
Report No.(s): PB2007-102845; No Copyright; Avail.: CASI: A02, Hardcopy

A substrate includes non-gallium nitride posts that define trenches there between, wherein the non-gallium nitride posts include non-gallium nitride sidewalls and non-gallium nitride tops and the trenches include non-gallium floors. Gallium nitride is grown on the non-gallium nitride posts, including on the non-gallium nitride tops. Preferably, gallium nitride pyramids are grown on the non-gallium nitride tops and gallium nitride then is grown on the gallium nitride pyramids. The gallium nitride pyramids preferably are grown at a first temperature and the gallium nitride preferably is grown on the pyramids at a second temperature that is higher than the first temperature. The first temperature preferably is about 1000.degree. C. or less and the second temperature preferably is about 1100 degrees C. or more. However, other than temperature, the same processing conditions preferably are used for both growth steps. The grown gallium nitride on the pyramids preferably coalesces to form a continuous gallium nitride layer. Accordingly, gallium nitride may be grown without the need to form masks during the gallium nitride growth process. Moreover, the gallium nitride growth may be performed using the same processing conditions other than temperatures changes. Accordingly, uninterrupted gallium nitride growth may be performed.
NTIS
Gallium Nitrides; Patent Applications; Semiconductor Devices; Semiconductors (Materials)

20070006784 Bureau of Industry and Security, Washington, DC, USA
Defense Industrial Base Assessment: U.S. Imaging and Sensors Industry
Oct. 2006; 188 pp.; In English
Report No.(s): PB2007-105418; No Copyright; Avail.: CASI: A09, Hardcopy

The U.S. imaging and sensors industry is an important and growing part of the U.S. high technology defense and civilian industrial base. The technology and products developed by the U.S. imaging and sensors industry play an important role in maintaining the military advantage the U.S. enjoys today. Imaging and sensors products are used in defense-related applications, such as target imaging, homing, detecting, and tracking. At the same time, the commercial market for such products has grown dramatically over the last five years. Imaging and sensors products have substantial and growing commercial (e.g., surveillance, quality control, process control, and construction and other inspection) and other civil (e.g., astronomy, fire fighting, medical imaging, hunting, and wildlife observation) applications. Imaging and sensors technology and products are continuing to evolve at a rapid rate in both defense and commercial markets. U.S. firms continue to dominate the defense portion of the industry. However, this is less true for commercial products. Manufacturers in China, France, Germany, Israel, Japan, Russia, and the UK are increasingly serving the commercial product markets where there is growing global demand. Increasing global competition, combined with less restrictive export licensing procedures in most overseas markets for both defense and commercial products, has raised some concerns among U.S. industry leaders about their long-term competitive position and ability to maintain technological leadership. To better understand the validity of these issues and their potential implications for current and future U.S. defense production capabilities, the U.S. Army Research, Development and Engineering Command supported the U.S. Department of Commerce, Bureau of Industry and Securitys (BIS) concept to initiate an assessment of the U.S. imaging and sensors industry. This assessment reviews the health and competitiveness of the imaging and sensors industry. The industry, as defined for this assessment, includes manufacturers, integrators, service providers, distributors, retailers, brokers, resellers, and federal and private research laboratories. Industry-specific surveys sent to these groups were used to collect essential employment, financial, product, research and development, and other data from 2001 through 2005. Survey data was augmented with site visits, attendance at technical conferences, interviews and reviews of other studies of this industry.
NTIS
Commerce; Defense Industry; Economic Analysis; Imaging Techniques; Industries

20070006790 Pearne and Gordon, LLP, Cleveland, OH, USA

Liquid Crystal Display

Doane, J. W.; Khan, A. A.; Shiyanovskaya, I.; Green, A.; 7 Dec 04; 28 pp.; In English

Contract(s)/Grant(s): DAAB07-03-C-J406

Patent Info.: Filed Filed 7 Dec 04; US-Patent-Appl-SN-11-006 100

Report No.(s): PB2007-102847; No Copyright; Avail.: CASI: A03, Hardcopy

A flexible liquid crystal display is provided wherein an addressable liquid crystal layer is disposed on a single flexible substrate so that the display itself will exhibit flexibility. The substrate is preferably a flexible non-transparent material and more preferably a drapable material such as fabric.

NTIS

Liquid Crystals; Substrates

20070006791 Los Alamos National Lab., NM USA

Durable Electrooptic Devices Comprising Ionic Liquids

Warner, B. P.; McCleskey, T. M.; Burrell, A. K.; 20 Jan 05; 41 pp.; In English

Contract(s)/Grant(s): DE-W-7405-ENG-36

Patent Info.: Filed Filed 20 Jan 05; US-Patent-Appl-SN-11-041 069

Report No.(s): PB2007-102848; No Copyright; Avail.: CASI: A03, Hardcopy

Electrolyte solutions for electrochromic devices such as rear view mirrors and displays with low leakage currents are prepared using inexpensive, low conductivity conductors. Preferred electrolytes includebifunctional redox dyes and molten salt solvents with enhanced stabilitytoward ultraviolet radiation. The solvents include lithium or quaternaryammonium cations, and perfluorinated sulfonylimide anions selected from trifluoromethylsulfonate (CF.sub.3SO.sub.3.sup.-), bis(trifluoromethyl-sulfonyl)imide ((CF.sub.3SO.sub.2).sub.2N.sup.-), bis(perfluoroethylsulfonyl)imide ((CF.sub.3CF.sub.2SO.sub.2).sub.2N.sup.--) and tris(trifluoromethy lsulfonyl)methide ((CF.sub.3SO.sub.2).sub.3C.sup.- -). Electroluminescent, electrochromic and photoelectrochromic devices with nanostructured electrodes include ionic liquids with bifunctional redox dyes.

NTIS

Conductors; Durability; Liquids; Low Conductivity; Optoelectronic Devices

20070006798 Harvard Coll. Observatory, Cambridge, MA, USA

Doped Elongated Semiconductors, Growing Such Semiconductors, Devices Including Such Semiconductors and Fabricating Such Devices

Lieber, C. M.; Cui, Y.; Duan, X.; Huang, Y.; 17 Mar 05; 81 pp.; In English

Contract(s)/Grant(s): ONR-N00014-98-1-0499; NSF-981226

Patent Info.: Filed Filed 17 Mar 05; US-Patent-Appl-SN-11-082 372

Report No.(s): PB2007-102906; No Copyright; Avail.: CASI: A05, Hardcopy

A bulk-doped semiconductor that is at least one of the following: a single crystal, an elongated and bulk-doped semiconductor that, at any point along its longitudinal axis, has a largest cross-sectional dimension less than 500 nanometers, and a free-standing and bulk-doped semiconductor with at least one portion having a smallest width of less than 500 nanometers. Such a semiconductor may comprise an interior core comprising a first semiconductor; and an exterior shell comprising a different material than the first semiconductor. Such a semiconductor may be elongated and my have, at any point along a longitudinal section of such a semiconductor, a ratio of the length of the section to a longest width is greater than 4:1, or greater than 10:1, or greater than 100:1, or even greater than 1000:1. At least one portion of such a semiconductor may a smallest width of less than 200 nanometers, or less than 150 nanometers, or less than 100 nanometers, or less than 80 nanometers, or less than 70 nanometers, or less than 60 nanometers, or less than 40 nanometers, or less than 20 nanometers, or less than 10 nanometers, or even less than 5 nanometers. Such a semiconductor may be a single crystal and may be free-standing. Such a semiconductor may be either lightly n-doped, heavily n-doped, lightly p-doped or heavily p-doped. Such a semiconductor may be doped during growth. Such a semiconductor may be part of a device, which may include any of a variety of devices and combinations thereof, and, and a variety of assembling techniques may be used to fabricate devices from such a semiconductor. Two or more of such a semiconductors, including an array of such semiconductors, may be combined to form devices, for example, to form a crossed p-n junction of a device. Such devices at certain sizes may exhibit quantum confinement and other quantum phenomena, and the wavelength of light emitted from one or more of such semiconductors may be controlled by selecting a width of such semiconductors.

NTIS

Doped Crystals; Fabrication; Semiconductors (Materials)

20070006799 Knobbe Martens Olson and Bear, LLP, Irvine, CA, USA
Field Emission Display with Smooth Aluminum Film
Raina, K. K.; 1 Sep 04; 8 pp.; In English
Contract(s)/Grant(s): ARPA-DABT63-97-0001
Patent Info.: Filed Filed 1 Sep 04; US-Patent-Appl-SN-10-931 314
Report No.(s): PB2007-102905; No Copyright; Avail.: CASI: A02, Hardcopy

This invention provides a conductive aluminum film and method of forming the same, wherein a non-conductive impurity is incorporated into the aluminum film. In one embodiment, the introduction of nitrogen creates an aluminum nitride subphase which pins down hillocks in the aluminum film to maintain a substantially smooth surface. The film remains substantially hillock-free even after subsequent thermal processing. The aluminum nitride subphase causes only a nominal increase in resistivity (resistivities remain below about 12 (mu)(OMEGA-cm)), thereby making the film suitable as an electrically conductive layer for integrated circuit or display devices.
NTIS
Aluminum; Display Devices; Field Emission; Integrated Circuits; Metal Films; Thin Films

20070007373 Virginia Polytechnic Inst. and State Univ., Blacksburg, VA USA
Energy-Efficient, Utility Accrual Scheduling under Resource Constraints for Mobile Embedded Systems
Wu, Haisang; Ravindran, Binoy; Jensen, E D; Li, Peng; Jan 2004; 21 pp.; In English
Contract(s)/Grant(s): N00014-00-1-0549
Report No.(s): AD-A460255; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460255

We present an energy-efficient, utility accrual, real-time scheduling algorithm called the Resource-constrained Energy-Efficient Utility Accrual Algorithm (or ReUA). ReUA considers an application model where activities are subject to time/utility function (TUF) time constraints, resource dependencies including mutual exclusion constraints, and statistical performance requirements including activity (timeliness) utility bounds that are probabilistically satisfied. Further, ReUA targets mobile embedded systems where system-level energy consumption is also a major concern. For such a model, we consider the scheduling objectives of (1) satisfying the statistical performance requirements; and (2) maximizing the system-level energy efficiency. At the same time, resource dependencies must be respected. Since the problem is NP-hard, ReUA makes resource allocations using statistical properties of application cycle demands and heuristically computes schedules with a polynomial-time cost. We analytically establish several timeliness and non-timeliness properties of the algorithm. Further, our simulation experiments illustrate the algorithm's effectiveness.
DTIC
Energy Consumption; Scheduling

20070007415 Naval Postgraduate School, Monterey, CA USA
Direct Electric Field Visualization in Semiconductor Planar Structures
Andrikopoulos, Pavlos; Dec 2006; 145 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460455; No Copyright; Avail.: CASI: A07, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460455

A new technique for imaging the 2D transport of free charge in semiconductor structures is used to directly map electric field distributions in operating devices. Direct transport imaging is demonstrated in a scanning electron microscope, using an optical microscope and a high sensitivity charge coupled device. Transport behavior under the combined influence of both diffusion and drift is predicted by modeling the drift and diffusion in 2D following generation at a point source. This is the first demonstration of a technique that allows the mapping of the electric field by determining not only the direction but especially the magnitude of the electric field with high resolution. The measured results show excellent agreement with theoretical predictions simulated with COMSOL software. The transport imaging technique also allows measurement of the contact resistance in a new way that is nondestructive and based on a two-point contact only. The technique illustrates the device's characteristics by determining the exact activation point of the diode and the deviations from an ideal I-V behavior. The method is extremely useful since the complexity and miniaturization of current devices do not allow for multiple wiring that standard four point measurement demands. Finally, a suggestion for further research of the effects of electromigration by using the direct transport imaging technique is offered. The latter is a subject of high importance in electronic device reliability.
DTIC
Electric Fields; Imaging Techniques; Planar Structures; Scanning Electron Microscopy; Semiconductor Devices; Semiconductors (Materials)

20070007470 BBN Systems and Technologies Corp., Cambridge, MA USA

Comparative Experiments on Large Vocabulary Speech Recognition

Schwartz, Richard; Anastasakos, Tasos; Kubala, Francis; Makhoul, John; Nguyen, Long; Zavaliagkos, George; Jan 1993; 7 pp.; In English

Contract(s)/Grant(s): N00014-91-C-0115; N00014-92-C-0035

Report No.(s): AD-A460561; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460561

This paper describes several key experiments in large vocabulary speech recognition. We demonstrate that, counter to our intuitions, given a fixed amount of training speech, the number of training speakers has little effect on the accuracy. We show how much speech is needed for speaker-independent (SI) recognition in order to achieve the same performance as speaker-dependent (SD) recognition. We demonstrate that, though the N-Best Paradigm works quite well up to vocabularies of 5,000 words, it begins to break down with 20,000 words and long sentences. We compare the performance of two feature preprocessing algorithms for microphone independence and we describe a new microphone adaptation algorithm based on selection among several codebook transformations.

DTIC

Microphones; Speech; Speech Recognition

20070007498 Office of the Under Secretary of Defense (Acquisitions), Washington, DC USA

Special Technology Area Review on Mixed-Signal Components

Apr 2000; 45 pp.; In English

Report No.(s): AD-A460612; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460612

Periodically, the Advisory Group on Electron Devices (AGED) conducts Special Technology Area Reviews (STARs) to evaluate the status of an electron device technology or defense application. This STAR report documents the findings from the reviews and assessments of the Mixed-Signal Components STAR, (originally titled The Future of Silicon-Based Analog Integrated Circuit Components STAR) that was held in two sessions, on 17 September 1997 and 11 December 1997, by AGED Working Group B (Microelectronics) at Palisades Institute for Research Services, Inc., Arlington, VA. The goal of the STAR was to assess the future military needs for mixed-signal components, the availability and capability of current and emerging mixed-signal components, and to provide recommendations concerning technical directions and investment strategies necessary to ensure that the Department of Defense's (DoD's) future needs are met. Current state of the art digital processing capabilities do not support operation at radio frequencies. Therefore, the ADC must down-convert signals from radio frequencies to speeds at which the signals can be digitally processed. Present efforts to improve ADCs are centered on ways to reduce the number of links in the chain of analog down-conversions.

DTIC

Analog to Digital Converters; Integrated Circuits

20070007502 Army Tank-Automotive Research and Development Command, Warren, MI USA

Thermal Imagine Applications Toward Design Optimization and Operational Troubleshooting of Lightweight Robotic Vehicles

Mason, James; Jones, Jack; Polsen, Erik; Mar 29, 2006; 15 pp.; In English; Original contains color illustrations

Report No.(s): AD-A460616; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460616

The Army is interested in using thermal imaging devices to identify potential mechanical/electrical failure modes and to validate system design of unmanned ground vehicles. Such a method would allow the improved reliablity and durability of unmanned ground vehicles, would improve system design by identifying overworked components and identify failing components during proventive maintenance. The presentation illustrates the use of forward looking infrared (FLIR) technology in detecting hot spots created by overworked components in a robot designed by a high school team. FLIR imagery is used within the Army and industry for thermal management of various systems to include circuit design and thermal management of heat producing elements.

DTIC

Design Optimization; Flir Detectors; Infrared Instruments; Maintenance; Robotics

20070007509 SRI International Corp., Menlo Park, CA USA
Communication and Interaction in Multi-Agent Planning
Georgeff, Michael; Dec 9, 1984; 18 pp.; In English
Contract(s)/Grant(s): N00014-80-C-0296; F49620-79-C-0018
Report No.(s): AD-A460634; TR 313; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460634

A method for synthesizing multi-agent plans from simpler single-agent plans is described. The idea is to insert communication acts into the single agent plans so that agents can synchronize activities and avoid harmful interactions. Unlike most previous planning systems, actions are represented by sequences of states, rather than as simple state change operators. This allows the expression of more complex kinds of interaction than would otherwise be possible. An efficient method of interaction and safety analysis is then developed and used to identify critical regions in the plans. An essential feature of the method is that the analysis is performed without generating all possible interleavings of the plans, thus avoiding a combinatorial explosion. Finally, communication primitives are inserted into the plans and a supervisor process created to handle synchronization.
DTIC
Combinatorial Analysis; Planning

20070007606 Utah Univ., Salt Lake City, UT USA
Selection Criteria of Test Signals for Correlation-Based Wire Fault Analysis (Preprint)
Telasula, Venkata; Furse, Cynthia; Lo, Chet; May 2006; 10 pp.; In English
Contract(s)/Grant(s): FA8650-04-C-5228; Proj-4130
Report No.(s): AD-A460807; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460807

This paper compares reflectometry signals for location of intermittent faults on live electrical cables. STDR, SSTDR, linear chirp, quadratic chirp, concave-up chirp, convex-down chirp and all frequency randomized phase noise signals were tested. The SSTDR was observed to be the most effective signal for live wire testing, because of its minimal interference with the existing signals and narrow correlation signature. This paper provides a methodology for systematically evaluating signal performance and design criteria for live wire test systems.
DTIC
Power Lines; Wire

20070007635 Army Aeromedical Research Lab., Fort Rucker, AL USA
A Unified Taxonomic Approach to the Laboratory Assessment of Visionic Devices
Pinkus, Alan R; Rash, Clarence E; Sep 2006; 15 pp.; In English
Contract(s)/Grant(s): Proj-879
Report No.(s): AD-A460871; USAARL-2006-14; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460871

The increased usage of visionic devices necessitates the development of a unified approach to testing and evaluation of such devices. A NATO working group was established to achieve this goal. This presentation describes a taxonomy to classify a given visionic device (based on optical design and display type) and to recommend specific test parameters that should be measured to ensure planned operational performance is delivered in the final product.
DTIC
Helmet Mounted Displays; Taxonomy

20070007691 Army Research Lab., Aberdeen Proving Ground, MD USA
Effects of Visual, Auditory, and Tactile Cues on Army Platoon Leader Decision Making
Krausman, Andrea S; Elliott, Linda R; Redden, Elizabeth S; Petrov, Plamen; Jun 2005; 34 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460958; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460958

Future U.S. infantry capabilities, coupled with network-centric warfare concepts, will enable huge advancements in information distribution and display, and will provide a combat advantage. However, the distribution of large amounts of information, especially to the visual channel may result in information bottlenecks and cognitive overload. Utilizing other

human senses such as audition and touch to convey information may help soldiers manage information, thereby enhancing their performance on the battlefield. In this paper, we describe our theory-based analytical approach that will identify techniques that aid information management and enhance situational awareness and decision making for operators of future Army Combat systems, specifically, the platoon leader in the infantry command and control vehicle.
DTIC
Command and Control; Decision Making; Display Devices; Human-Computer Interface; Visual Stimuli

20070007700 Arizona State Univ., Tempe, AZ USA
Time-Resolved IR Electroluminescence Spectroscopy System
Zhang, Yong-Hang; May 2006; 18 pp.; In English
Contract(s)/Grant(s): FA9550-05-1-0434; Proj-2301
Report No.(s): AD-A461015; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461015

A time-resolved PL and EL system has been built to study optical and thermal properties of optoelectronic devices. The system offers very flexible capabilities for time-resolved PL and EL measurements with a temporal resolution of 1 ns over a wave-length range from 400 nm to 12 micrometers. The system is also seamlessly integrated with our existing Fourier transform infrared spectrometer for quasi-CW PL and EL measurements up to 25 micrometers. The use of a temperature variable cryostat and probe station allows all experiments to be carried out at any given temperature between 10-450K. This versatile system enables many experiments, which will benefit DoD funded research, including two MURI programs entitled 'Semiconductor Optical Upconversion Refrigeration' and 'Si Based Lasers', which are funded through AFOSR. An immediate application of this unique system is to use low temperature time-resolved EL spectroscopy to study electroluminescence refrigeration in LEDs.
DTIC
Electroluminescence; Infrared Spectroscopy; Photoluminescence

20070007703 Wisconsin Univ., Madison, WI USA
Superconducting Magnet System for a Low Temperature Laser Scanning Microscope
Larbalestier, David C; Sep 22, 2006; 5 pp.; In English
Contract(s)/Grant(s): FA9550-05-1-0425
Report No.(s): AD-A461018; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461018

The dominant current-limiting mechanism in YBCO CC tapes still occurs at grain boundaries over a wide range of magnetic fields, even when the FWHM of the texture distribution is only 4-5 deg. The LTLSM is one of very few instruments that can directly observe this limitation. Our initial studies with the LTLSM bought with this equipment grant show that the intragrain critical current density crosses over with the intergrain critical current density at fields of about 2T near liquid nitrogen temperature. The local transport current distribution and the E(x,y) distribution depend quite strongly on magnetic field. The LTLSM provides a unique capability for studying this subject because it can operate in any magnetic field. Our aim here was to incorporate a 5T superconducting magnet/cryostat into our LTLSM system and to be able to measure the magnetic field dependencies of the voltage change response distributions. The system was installed and worked very well, providing direct data on the influence of grain boundaries and other local sources of dissipation.
DTIC
Laser Applications; Low Temperature; Magnetic Fields; Scanners; Scanning; Scanning Electron Microscopy; Superconducting Magnets

20070008035 Dayton Univ. Research Inst., OH USA
Power and Thermal Technologies for Air and Space. Delivery Order 0001: Single Ionic Conducting Solid-State Electrolyte
Turner, Allen; Nov 2005; 22 pp.; In English
Contract(s)/Grant(s): FA8650-04-D-2403-0001; Proj-3145
Report No.(s): AD-A460518; UDR-TR-2005-00246; No Copyright; Avail.: CASI: A03, Hardcopy

This report focuses on the development of a lithium-ion conducting channel as a solid-state electrolyte for rechargeable lithium batteries through the use of thin films of dilithium phthalocyanine (Li2Pc) which have been solvent cast onto manganese dioxide cathodes. Experimental procedures have been developed which have resulted in the successful deposition

of Li2Pc with low ionic resistance. AC impedance measurements and analysis of the equivalent circuit has shown that specific ionic conductivities of 1.9 x 10-4 S/cm at room temperature are achievable. However, it has also been shown that Li2Pc in its current configuration is also an electronic conductor. Development of a thin film insulator based on lithium nitride in conjunction with Li2Pc is now in progress.
DTIC
Electrolytes; Solid State; Storage Batteries

20070008050 Air Force Research Lab., Eglin AFB, FL USA
An Investigation of a Dynamic Sensor Motion Strategy
Yerrick, Nathan P; Jeffcoat, David E; Tiwari, Abhishek; Dec 2006; 15 pp.; In English
Contract(s)/Grant(s): Proj-2304
Report No.(s): AD-A460850; No Copyright; Avail.: CASI: A03, Hardcopy

This paper considers a dynamic sensor coverage problem in which a single mobile sensor attempts to monitor multiple sites. Sensor motion is modeled using a discrete time, discrete state Markov process. State dynamics at each site are modeled as a linear system. A stochastic simulation is used to demonstrate previously derived theoretical conditions under which a single sensor is or is not sufficient to maintain a bounded estimate of the state of every site. Observations are made about the relationship of sensor motion to system dynamics. A strategy is presented to find a good sensor motion model based upon the system dynamics and to determine the convexity of the solution set.
DTIC
Detectors; Motion

20070008051 Air Force Research Lab., Hanscom AFB, MA USA
Bias Induced Strain in AlGaN/GaN Heterojunction Field Effect Transistors and its Implications
Anwar, A F; Webster, Richard T; Smith, Kurt V; May 26, 2006; 4 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-2305
Report No.(s): AD-A460851; AFRL-SN-HS-JA-2005-0016; No Copyright; Avail.: CASI: A01, Hardcopy

We report gate bias dependence of the charge due to piezoelectric polarization obtained by using a fully coupled formulation based upon the piezoelectric constitutive equations for stress and electric displacement. This formulation is significant because it fully accounts for electromechanical coupling under the constraint of global charge control. The coupled formulation results in lower charge due to piezoelectric polarization as compared to the uncoupled formulation for a given Al mole fraction. With increasing two dimensional electron gas concentration, that is, for gate biases greater than threshold, the compressive strain along the c axis in the barrier AlGaN layer increases with a concomitant increase of in-plane stress. Current collapse is correlated to the increase in source and drain resistances through their dependence upon surface charge. An alternate explanation of current collapse using local charge neutrality is also presented.
DTIC
Bias; Field Effect Transistors; Heterojunctions; Piezoelectricity

20070008149 Office of Inspector General, Arlington, VA USA
Management of the Iraqi Interim Government Fund
Oct 27, 2006; 26 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460508; SIGIR-06-031; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460508

In 2004, the Iraqi Interim Government established the Iraqi Interim Government Fund (IIGF), providing $136 million from the Development Fund for Iraq1 for U.S. military commanders to respond to the urgent humanitarian relief and reconstruction requirements in their areas of responsibility. The Multi-National Force-Iraq (MNF-I) is responsible for overseeing and reporting monthly to the Iraqi government on the status of IIGF projects and financial information; MNF-I's subordinate command, the Multi-National Corps-Iraq (MNC-I), is responsible for management of the IIGF projects. IIGF projects involve the repair or reconstruction of hospitals and clinics, the provision of electrical equipment (such as generators), and civic cleanup. One of its purposes is to employ as many Iraqis as possible. As of July 31, 2006, MNC-I reported that it had disbursed $114.9 million for 683 IIGF projects, of which 628 were complete. Objectives The objectives of this audit are to determine if MNF-I can properly account for the funds provided by the Iraqi Interim Government and has used the funds for their intended purposes.
DTIC
Electric Equipment; Finance; International Relations

20070008281 Sandia National Labs., Albuquerque, NM USA
Novel Electron Gun with an Independently Addressable Cathode Array
Reed, K.; Pena, G.; Schneider, L.; Rudys, J.; Aug. 2006; 7 pp.; In English
Report No.(s): DE2006-892771; SAND2006-4988; No Copyright; Avail.: National Technical Information Service (NTIS)

The design of a novel electron gun with an array of independently addressable cathode elements is presented. Issues relating to operation in a 6.5 Tesla axial magnetic field are discussed. Simulations with the TriComp (1) electromagnetic field code that were used to determine the space charge limited tube characteristic and to model focusing of the electron beam in the magnetic field are reviewed. Foil heating and stress calculations are discussed. The results of CYLTRAN (2) simulations yielding the energy spectrum of the electron beam and the current transmitted through the foil window are presented.
NTIS
Cathodes; Electron Beams; Magnetic Fields

20070008296 General Electric Co., Houston, TX, USA
Switching Circuitry for Reconfigurable Arrays of Sensor Elements
Thomenius, K. E.; Fisher, R. A.; Wodnicki, R. G.; Hazard, C. R.; Smith, L. S.; 29 Oct 04; 26 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0181
Patent Info.: Filed Filed 29 Oct 04; US-Patent-Appl-SN-10-978 196
Report No.(s): PB2007-102955; No Copyright; Avail.: CASI: A03, Hardcopy

A device comprising an array of sensors that are reconfigurable by means of a switching network. The sensors may be optical, thermal or pressure sensors or ultrasonic transducers. More specifically, the device comprises: a multiplicity of sensor elements; a plurality of bus lines; a set of access switches for selectively connecting a set of the sensor elements in a row to a bus line, one of the access switches being connected to a first sensor element; a multiplicity of sets of matrix switches, each of the sets of matrix switches selectively connecting a respective sensor element of the multiplicity of sensor elements to a respective set of adjacent sensor elements, one of the matrix switches being connected to the first sensor element and to a second sensor element that is not a member of the set of sensor elements; and control circuitry that controls the access switches and the matrix switches in accordance with a selected switching configuration such that the first sensor element is connected to the bus line via said one access switch, while at the same time the second sensor element is connected to said one access switch via said one matrix switch.
NTIS
Circuits; Diagnosis; Micromachining; Switching; Ultrasonic Radiation; Ultrasonic Wave Transducers; Pressure Sensors

20070008312 Lawrence Livermore National Lab., Livermore, CA USA
Yttrium Calcium Oxyborate for High Average Power Frequency Doubling and OPCPA
Liao, Z. M.; Jovanovic, I.; Ebbers, C. A.; Bayramian, A.; Schaffers, K.; Jun. 26, 2006; 4 pp.; In English
Report No.(s): DE2006-893170; UCRL-PROC-222417; No Copyright; Avail.: National Technical Information Service (NTIS)

Significant progress has been achieved recently in the growth of Yttrium Calcium Oxyborate (YCOB) crystals. Boules have been grown capable of producing large aperture nonlinear crystal plates suitable for high average power frequency conversion or optical parametric chirped pulse amplification (OPCPA). With a large aperture (5.5 cm x 8.5 cm) YCOB crystal we have demonstrated a record 227 W of 523.5nm light (22.7 J/pulse, 10 Hz, 14 ns). We have also demonstrated the applicability of YCOB for 1053 nm OPCPA.
NTIS
Amplification; Calcium; High Frequencies; Yttrium

20070008316 Iowa State Univ. of Science and Technology, Ames, IA USA
Transient Eddy Current Response Due to a Subsurface Crack in a Conductive Plate
Fu, F.; Aug. 09, 2006; 169 pp.; In English
Report No.(s): DE2006-892733; IS-T 2303; No Copyright; Avail.: National Technical Information Service (NTIS)

Eddy current nondestructive evaluation (NDE) is usually carried out by exciting a time harmonic field using an inductive probe. However, a viable alternative is to use transient eddy current NDE in which a current pulse in a driver coil produces a transient .eld in a conductor that decays at a rate dependent on the conductivity and the permeability of the material and the coil configuration. By using transient eddy current, it is possible to estimate the properties of the conductive medium and to locate and size potential .aws from the measured probe response. The fundamental study described in this dissertation seeks

to establish a theoretical understanding of the transient eddy current NDE. Compared with the Fourier transform method, the derived analytical formulations are more convenient when the transient eddy current response within a narrow time range is evaluated. The theoretical analysis provides a valuable tool to study the effect of layer thickness, location of defect, crack opening as well as the optimization of probe design. Analytical expressions have been developed to evaluate the transient response due to eddy currents in a conductive plate based on two asymptotic series. One series converges rapidly for a short time regime and the other for a long time regime and both of them agree with the results calculated by fast Fourier transform over all the times considered. The idea of asymptotic expansion is further applied to determine the induced electromotive force (EMF) in a pick-up coil due to eddy currents in a cylindrical rod. Starting from frequency domain representation, a quasi-static time domain dyadic Green's function for an electric source in a conductive plate has been derived. The resulting expression has three parts; a free space term, multiple image terms and partial reflection terms. The dyadic Green's function serves as the kernel of an electric field integral equation which defines the interaction of an ideal crack with the transient eddy currents in a conductive plate. The crack response is found using the reciprocity theorem. Good agreement is observed between the predictions of the magnetic field due to the crack and experimental measurements.
NTIS
Cracks; Eddy Currents; Transient Response; Nondestructive Tests

20070008344 Iowa State Univ. of Science and Technology, Ames, IA USA
Spontaneous Generation of Voltage in Single-Crystal Gd5Si2Ge2 During Magnetostructural Phase Transformations
Xou, M.; Tang, H.; Schlagel, D. L.; Lograsso, T. A.; Gschneidner, K. A.; Apr. 19, 2006; 3 pp.; In English
Report No.(s): DE2006-893094; No Copyright; Avail.: National Technical Information Service (NTIS)
The spontaneous generation of voltage (SGV) in single-crystal and polycrystalline Gd(sub 5)Si(sub 2)Ge(sub 2) during the coupled magnetostructural transformation has been examined. Our experiments show reversible, measurable, and repeatable SGV responses of the materials to the temperature and magnetic field. The parameters of the response and the magnitude of the signal are anisotropic and rate dependent. The magnitude of the SGV signal and the critical temperatures and critical magnetic fields at which the SGV occurs vary with the rate of temperature and magnetic-field changes.
NTIS
Electric Potential; Magnetic Materials; Phase Transformations; Single Crystals

20070008348 Sandia National Labs., Albuquerque, NM USA
Design and Performance of a 30KV Electron Gun with Ten Independent Cathodes and a Magnetic Lens
Reed, K.; Rudys, J.; Aug. 2006; 7 pp.; In English
Report No.(s): DE2006-893124; SAND2006-4989; No Copyright; Avail.: National Technical Information Service (NTIS)
Measurements on a 30 kV electron gun with ten independent cathodes, operating in a 6.5 Tesla (T) magnetic field are presented. An earlier paper covered the design of this electron gun (1). Experimental results are compared to model predictions. Beam current is compared to theoretical space charge limited flow.
NTIS
Cathodes; Electron Guns; Magnetic Fields; Magnetic Lenses

20070008452 Beyer Weaver and Thomas, LLP, Oakland, CA, USA, California Inst. of Tech., Pasadena, CA USA
Reshuffled Communications Processes in Pipelined Asynchronous Circuits
Lines, A. M.; Martin, A. J.; Mummings, U.; 11 May 06; 21 pp.; In English
Contract(s)/Grant(s): DAAH-04-94-G-0274
Patent Info.: Filed Filed 11 May 06; US-Patent-Appl-SN-11-433-203
Report No.(s): PB2007-101413; No Copyright; Avail.: CASI: A03, Hardcopy
An asynchronous logic family of circuits which communicate on delay-insensitive flow-controlled channels with 4-phase handshakes and 1 of N encoding, compute output data directly from input data using domino logic, and use the state-holding ability of the domino logic to implement pipelining without additional latches.
NTIS
Circuits; Synchronism; Pipelining (Computers)

20070008538 California Univ., Santa Barbara, CA USA
SiGe/Si Superlattice Coolers
Fan, Xiaofeng; Zeng, Gehong; Croke, Edward; Robinson, Gerry; LaBounty, Chris; Shakouri, Ali; Jan 2000; 15 pp.; In English
Report No.(s): AD-A461105; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461105

The fabrication and characterization of SiGe/Si superlattice coolers are described. Superlattice structures were used to enhance the device performance by reducing the thermal conductivity between the hot and the cold junctions, and by providing selective removal of hot carriers through thermionic emission. Cooling of 2.2 K and 2.5 K were measured on n-type and p-type 75 * 75 micronmeter2 devices, corresponding to cooling power densities of hundreds of watts per square centimeter. Cooling up to 7.2 K was obtained at 150 C for p-type 50 * 50 micronmeter2 devices. The results show that n-type and p-type coolers can work together in similar optimal conditions. This paves the road to fabricate n-type and p-type superlattice coolers in an array format electrically in series and thermally in parallel, similar to conventional thermoelectric devices, and thus achieve large cooling capacities with relatively small currents.
DTIC
Coolers; Cooling; Germanium; Integrated Circuits; Superlattices; Thermal Conductivity; Thermoelectricity

20070008552 California Univ., Santa Barbara, CA USA
P-type SiGe/Si Superlattice Cooler
Fan, Xiaofeng; Zeng, Gehong; Croke, Edward; Robinson, Gerry; LaBounty, Chris; Ahn, Channing C; Shakouri, Ali; Bowers, John E; Jan 2000; 6 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461125; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461125

The fabrication and characterization of single element p-type SiGe/Si superlattice coolers are described. Superlattice structures were used to enhance the device performance by reducing the thermal conductivity between the hot and the cold junctions, and by providing selective emission of hot carriers through thermionic emission. The structure of the samples consisted of a 3 m thick symmetrically strained Si0.7Ge0.3/Si superlattice grown on a buffer layer designed so that the in-plane lattice constant is approximately that of relaxed Si0.9Ge0.1. Cooling up to 2.7 K at 25 C and 7.2 K at 150 C were measured. These p-type coolers can be combined with n-type devices that were demonstrated in our previous work. This is similar to conventional multi element thermoelectric devices, and it will enable us to achieve large cooling capacities with relatively small currents.
DTIC
Coolers; Cooling; Electron States; Semiconductors (Materials); Superlattices; Thermal Conductivity; Thermoelectricity

20070008553 Carnegie-Mellon Univ., Pittsburgh, PA USA
Efficient Consistency for Erasure-Coded Data via Versioning Servers
Goodson, Garth R; Wylie, Jay J; Ganger, Gregory R; Reiter, Micahel K; Mar 2003; 25 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0433; F30602-99-2-0539
Report No.(s): AD-A461126; CMU-CS-03-127; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461126

This paper describes the design, implementation and performance of a family of protocols for survivable, decentralized data storage. These protocols exploit storage-node versioning to efficiently achieve strong consistency semantics. These protocols allow erasure-codes to be used that achieve network and storage efficiency (and optionally data confidentiality in the face of server compromise). The protocol family is general in that its parameters accommodate a wide range of fault and timing assumptions, up to asynchrony and Byzantine faults of both storage-nodes and clients, with no changes to server implementation or client-server interface. Measurements of a prototype storage system using these protocols show that the protocol performs well under various system model assumptions, numbers of failures tolerated, and degrees of reader-writer concurrency.
DTIC
Client Server Systems; Coding; Computer Storage Devices; Consistency; Data Storage; Protocol (Computers); Synchronism

20070008555 Air Force Research Lab., Wright-Patterson AFB, OH USA
Tb and Ce Doped Y123 Films Processed by Pulsed Laser Deposition
Kell, Joseph W; Haugan, Timothy J; Locke, Mary Frances; Barnes, Paul N; May 2004; 6 pp.; In English
Contract(s)/Grant(s): Proj-3145
Report No.(s): AD-A461129; AFRL-PR-WP-TP-2006-221; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461129

To evaluate possible flux pinning enhancement in YBa2Cu3O7(7-x)(Y123) films due to partial rare-earth ion substitutions, Ce and Tb doping are studied. Bulk ceramic targets of varying compositions (Y(1-x)RE(x)Ba2Cu3O7(7-x) were

made with several doping levels (x = 0.001 to 0.1, RE = Ce or Tb) by using regular solid-state reaction and sintering procedures. These targets were used to deposit Ce and Tb doped YBCO films onto SrTiO3 single crystal substrates by pulsed laser ablation. Doped YBCO films were characterized for Tc, magnetic field dependence of Jc (at 77 K), microstructure, and other properties. The results are compared to undoped YBCO films processed in similar manner.
DTIC
Deposition; Doped Crystals; Magnetic Fields; Pulsed Laser Deposition; Pulsed Lasers; Superconductors (Materials)

20070008556 California Univ., Santa Barbara, CA USA
Monolithic Integration of Solid State Thermionic Coolers with Semiconductor Lasers
LaBounty, Christopher; Oberl, David; Piprek, Joachim; Abraham, Patrick; Shakouri, Ali; Bowers, John E; Jan 2000; 4 pp.; In English
Report No.(s): AD-A461130; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461130

We examine the cooling requirements and temperature stabilization needs of semiconductor lasers. Monolithic integration of thin film solid state thermionic coolers for laser applications is proposed and experimental results on an integrated structure are discussed. Many types of semiconductor lasers such as vertical cavity surface emitting lasers (VCSEL s) or distributed feedback (DFB) lasers can generate large heat power densities on the order of kW/cm2 over areas as small as 100mm2 [1]. Under these conditions, the active region can reach temperatures greater than 70 C above the heat sink temperature. It is desirable in many applications to control the operating temperature in order to tune the operating characteristics such as emission wavelength or to enhance the performance such as increasing the output power. Conventionally, thermoelectric (TE) coolers are used to manage temperature, however since they are not easily integrated with semiconductor devices [2], the packaging can be costly. Moreover, the TE device usually determines the reliability and lifetime of a packaged laser module [3]. An alternative to traditional TE coolers is heterostructure integrated thermionic coolers. These thin film coolers use the selective emission of hot electrons over a heterostructure barrier layer from emitter to collector resulting in an evaporative cooling of the electron gas beyond what is possible with the Peltier effect [4]. Thermionic coolers fabricated in the InGaAsP material system have demonstrated cooling on the order of several degrees over one-to two micron thick barriers (see fig.1) and cooling power densities of over 100 W/cm2 [5,6]. This cooling power density is approximately an order of magnitude greater than what is possible with TE coolers. The InGaAsP material system is important for long wavelength semiconductor lasers used in long haul and other high-speed optical communication systems.
DTIC
Coolers; Cooling; Laser Cavities; Semiconductor Lasers; Solid State; Surface Emitting Lasers

20070008577 Carnegie-Mellon Univ., Pittsburgh, PA USA
What Makes a Good Molecular-Scale Computer Device?
Goldstein, Seth C; Rosewater, Dan; Sep 26, 2002; 16 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N000140110659
Report No.(s): AD-A461166; CMU-CS-02-181; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461166

The lithographically-produced CMOS transistor has been the key technology that has enabled the information revolution. However, in the near future the limitations, both technical and economic, introduced by lithographic fabrication may inhibit further decreases in feature size. Chemically assembled electronic nanotechnology (CAEN) is a promising alternative to CMOS for constructing circuits with device sizes in the tens of nanometers, far smaller than is thought possible using lithography. In this paper we examine and contrast the constraints imposed by lithographic versus CAEN fabrication; the key limitation is that three-terminal devices, such as transistors, will be impractical at the nanoscale. We demonstrate that these constraints can be satisfied by outlining an architecture that uses only two-terminal CAEN devices to compute without transistors. One crucial requirement of this design circuit is that it be able to restore signals to a reference state without transistors. We present preliminary results for a molecular latch, constructed from molecular resonant tunneling diodes (RTDs) that can perform signal restoration, I/O isolation, and voltage buffering without transistors at the nanoscale.
DTIC
Fabrication; Integrated Circuits; Molecular Electronics; Nanotechnology; Tunnel Diodes

20070008586 Carnegie-Mellon Univ., Pittsburgh, PA USA
Exploiting the Cognitive and Social Benefits of Physically Large Displays
Tan, Desney S; Aug 2004; 202 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461180; CMU-CS-04-154; No Copyright; Avail.: CASI: A10, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461180

There exists an emerging trend in the workplace towards multiple display systems. Within these workplaces, large wall-sized displays are becoming prevalent. Although researchers have articulated qualitative benefits of large displays, little has been done to systematically quantify and exploit these benefits. My work is composed of three distinct components, each contributing to an improved understanding of physically large displays. First, I isolate and study specific cognitive benefits unique to large displays. I present results from a series of experiments suggesting that large displays immerse users more within virtual environments and bias them into adopting egocentric strategies when performing spatial tasks. These strategies allow users to perform tasks such as 3D navigation and mental map formation more effectively on large displays than on smaller ones, even when viewed at constant visual angles. Second, I explore social affordances offered by large displays and describe tools that I have developed to exploit these affordances. Recognizing the potential of large displays for facilitating co-located collaboration, I have developed WinCuts, an interaction technique that allows multiple users, each with their own personal computing devices, to simultaneously place and arrange information on a large shared display. In separate work, I explore the issue of privacy on large displays. Using a novel application of an implicit memory priming paradigm, I show that people are more likely to read someone else's private content on large displays than on smaller ones, even with constant visual angles and legibility. Finally, I explore some of the pragmatic issues surrounding the integration of large displays into our workspaces. I describe Preemptive Shadows, a system that uses infrared light and computer vision to eliminate blinding light cast onto an observer standing in front of a projector.
DTIC
Display Devices; Layouts

20070008612 Air Force Research Lab., Wright-Patterson AFB, OH USA
Substrate Planarization Studies on IBAD Substrates
Sathiraju, Srinivas; Murphy, John P; Evans, Julianna M; Campbell, Angela L; Brunke, Lyle B; Barnes, Paul N; Mar 2004; 5 pp.; In English
Contract(s)/Grant(s): Proj-3145
Report No.(s): AD-A461224; AFRL-PR-WP-TP-2006-226; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461224

To achieve high critical currents in 2nd generation superconductors deposited on metallic substrates, substrate average roughness and texture of the buffer layer are key factors. This study is about planarization of IBAD substrates using an inductively coupled RF discharge operating at 13.56MHz. A pancake coil antenna was used to construct the inductively coupled discharge system. Exposure to an Ar plasma for varying Ar pressures and time 15 min to 1 hr created linearized substrates. Surface roughness was measured using AFM as well as surface profilometer. Unpolished lnconel substrates have been studied under varying RF plasma conditions, such as pressure, RF power, and etch time to determine effects on substrate roughness. AFM and KLA-TENCOR SP measured average surface roughness (Ra) of the planarized samples. The best Ra found on plasma etched substrate is 4nm under 240 mTorr pressure and 100 W RF power and 30 min time from AFM analysis. The Ra values for lnconel substrates vary between 35-51 nm under varying conditions. Our initial results suggest that there is a decreasing tendency in Ra with the increase of Ar pressure.
DTIC
Antennas; Deposition; Ion Beams; Substrates; Superconductors (Materials); Surface Roughness

20070008640 California Univ., Santa Cruz, CA USA
Real Time Sub-Micron Thermal Imaging Using Thermoreflectance
Christofferson, James; Vashaee, Daryoosh; Shakouri, Ali; Melese, Philip; Jan 2001; 6 pp.; In English
Report No.(s): AD-A461268; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461268

Thermal measurements on a sub-micron scale are non-trivial, but are important of the characterization of modern, semiconductor and opto-electronic devices. In this paper we will discuss the application of the thermoreflectance method for real time sub-micron thermal imaging. By using light in the visible spectrum, the diffraction limit, and this spatial resolution is improved over a traditional infrared camera based on blackbody emission. With active excitation of the sample and

frequency domain filtering, thermal images with 100 mK temperature resolution are obtained. Experiments performed on semiconductor micro-coolers and micro-heaters are presented.
DTIC
Electro-Optics; Real Time Operation; Reflectance; Semiconductors (Materials); Thermal Mapping

20070008659 Naval Undersea Warfare Center, Newport, RI USA
Design and Development of a Constant Beamwidth Transducer for Sub-Bottom Acoustic Profiling
Benjamin, K C; Walden, A K; Van Buren, A L; Jan 1997; 7 pp.; In English
Report No.(s): AD-A461296; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461296

The design, fabrication, and acoustic calibration for a new Constant Beamwidth Transducer (CBT) is presented. Although designed for a sub-bottom profiling application, the transducer may be used whenever a spatially constant sound beam is desired over a relatively wide frequency range. The CBT design is based on the theoretical work presented earlier by Van Buren et al. [1] and relies on an axis-symmetric velocity distribution acting over a spherically curved surface. The velocity distribution follows a Legendre shading function that is accomplished by dividing the surface electrode pattern into several discrete concentric rings. Design theory, fabrication, and measured results for a prototype transducer are presented.
DTIC
Acoustic Sounding; Acoustics; Beams (Radiation); Transducers

20070008686 California Univ., Santa Cruz, CA USA
A Receiver-Initiated Collision-Avoidance Protocol for Multi-Channel Networks
Tzamaloukas, Asimakis; Garcia-Luna-Aceves, J J; Jan 2001; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-97-2-0338
Report No.(s): AD-A461349; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461349

The medium-access control (MAC) protocols for wireless networks proposed or implemented to date based on collision-avoidance handshakes between sender and receiver either require carrier sensing or the assignment of unique codes to nodes to ensure that intended receivers hear data packets without interference from hidden sources. We present and analyze a new collision-avoidance MAC protocol that we call receiver-initiated channel-hopping with dual polling (RICH-DP). RICH-DP is the first MAC protocol based on a receiver-initiated collision-avoidance handshake that does not require carrier sensing or the assignment of unique codes to nodes in order to ensure collision-free reception of data at the intended receivers in the presence of hidden terminals. The throughput and delay characteristics of RICH-DP is studied analytically, and extensive simulations are presented to verify the analysis and to present a more accurate prediction of how RICH-DP would operate in realistic scenarios. RICH-DP is applicable to ad-hoc networks based on commercial off-the-shelf frequency hopping radios operating in unlicensed frequency bands.
DTIC
Access Control; Collision Avoidance; Communication Networks; Protocol (Computers); Receivers

20070008723 Defence Science and Technology Organisation, Victoria, Australia
The Effects of Ionising Radiation on MEMS Silicon Strain Gauges: Preliminary Background and Methodology
Marinaro, Damian; McMahon, Phillip; Wilson, Alan; Sep 2006; 26 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461458; DSTO-TN-0713; AR-013-737; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461458

Despite limited reporting in the open literature describing the effects of ionising radiation on MicroElectroMechanical System (MEMS) devices or components, there are indications that some MEMS technologies exhibit vulnerability to radiation effects. To begin to gain an understanding of the issues surrounding the susceptibility of MEMS technologies, an investigation into the effects of radiation damage on the electronic and the mechanical properties of a specific MEMS silicon strain gauge will be conducted. The methodology followed is outlined in this report.
DTIC
Ionizing Radiation; Microelectromechanical Systems; Radiation Damage; Radiation Effects; Silicon

20070008824 Office of Science and Technology, London, UK

New Dimensions for Manufacturing: A UK Strategy for Nanotechnology

Taylor, John M; Jun 2002; 77 pp.; In English; Original contains color illustrations

Report No.(s): AD-A461594; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA461594

While the UK has excellent research credentials in nanoscience and nanotechnology, it lacks the coherent and coordinated national strategy for developing and applying the technology that characterises many of its leading industrial competitor nations. Partly as a result of this,much of the UK industry has yet to respond to the challenge and put in place its own R&D for nanotechnology. This report, of the UK Advisory Group on Nanotechnology Applications, examines the growth of nanotechnology, its potential implications for industry in the UK, and proposes the elements of a strategy to accelerate and support the industrial application of nanotechnology in the UK.

DTIC

Industries; Nanotechnology; United Kingdom

20070008837 Naval Research Lab., Washington, DC USA

Test of Model RDZ-1 Radio Receiving Equipment

Howe, W E; Aug 19, 1946; 65 pp.; In English

Report No.(s): AD-A461609; NRL-R-2929; No Copyright; Avail.: CASI: A04, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461609

The model RDZ-1 receiver is designed for ten-channel, crystal-controlled communication in the frequency range from 200 to 400 megacycles. It was manufactured by the Admiral Corporation, Chicago, Illinois, under contract NXsr-7194. The equipment is intended to be electrically and mechanically identical to the Model RDZ receivers, furnished under contract NXsr-55624 by the National Company, Inc., Malden, Massachusetts. Acceptability tests were conducted at the Laboratory to determine whether the performance and mechanical construction of the Model RDZ-1 receiver compared favorably with that of the Model RDZ. Authorization for these tests is contained in reference (a). The governing specifications are outline in reference (e). No complete tests have been conducted at the Laboratory on a production Model RDZ manufactured by the National Company. The preproduction model of this receiver, designated as the model CXHY, was subjected to type test, and results are to be found in reference (f). This preproduction model is, however, representative of a production unit in many respects. The tests of two Model RDZ-1 receivers revealed that electrical performance is generally equal to that of the CXHY. The r-f gain control characteristics were found to be satisfactory after both it and the silencer control were interchanges. The a-f leakage in the silencer circuits was reduced at the Laboratory by a minor change in the wiring of these circuits. The only other serious electrical defect was excessive loss of gain during vibration tests and at elevated temperatures. The majority of mechanical defects have been outlined previously in conference (references (b) and (c)), and their correction is recommended. The manufacturer has succeeded in producing a unit which is very similar to this prototype model RDZ. If careful attention is given to the correction of defects outlined herein, performance of the RDZ-1 in shipboard service should be equal to that provided by the RDZ.

DTIC

Acceptability; Radio Equipment; Radio Receivers; Receivers

20070008911 Massachusetts Univ., Lowell, MA USA

A 585 GHZ Compact Range for Scale-Model RCS Measurements

Coulombe, M J; Ferdinand, T; Horgan, T; Giles, R H; Waldman, Jerry; Oct 1993; 7 pp.; In English; Original contains color illustrations

Report No.(s): AD-A461718; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461718

A 585 GHz compact range has been developed for obtaining full-scale radar cross-section (RCS) measurements on scale-model targets. The transceiver consists of two continuous wave (CW) submillimeter-wave gas lasers along with two cooled-InSb heterodyne mixers. Coherent detection was implemented to maximize sensitivity and allow for a vector measurement capability. In addition, the target can be rapidly translated in range to generate a doppler modulation that is used to reject background signals during low-RCS measurements. Although most scaling is accomplished with metal targets, a materials program has evolved to develop non-metallic materials with scaled dielectric properties as well as submillimeter-wave anechoics. As part of an on-going validation and test program, RCS measurements are made on scaled simple and

complex shapes and compared with full-scale measurements and computer predictions. A description of this 585 GHz compact range along with measurement examples are presented in this paper.
DTIC
Carbon Dioxide Lasers; Measurement; Radar Cross Sections; Scale Models; Submillimeter Waves; Target Recognition; Transmitter Receivers

20070008954 California Univ., Santa Cruz, CA USA
3D Photonic Integrated Circuits for WDM Applications
Shakouri, Ali; Liu, Bin; Abraham, Patrick; Bowers, John E; Jan 1998; 25 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461796; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461796

The wafer fusion technique for realization of compact waveguide switches, filters and 3D photonic integrated circuits is investigated theoretically and experimentally. Calculations based on the beam propagation method show that very short vertical directional couplers with 40-220 micrometers coupling lengths and high extinction ratios from 20 to 32 dB can be realized. These extinction ratios can be further improved using a slight asymmetry in waveguide structure. The optical loss at the fused interface was investigated by comparison of the transmission loss in InGaAsP-based ridge-loaded waveguide structures with and without a fused layer near the core region. This reveals an excess loss of 1.1 dB/cm at 1.55 micrometers wavelength due to the fused interface. Fused straight vertical directional couplers have been fabricated and characterized. Waveguides separated by 0.6 micrometer gap layer exhibit a coupling length of 62 micrometers and a switching voltage of about 12 volts. Since GaAs and InP have different material dispersion at 1.55 micrometer wavelength, a combination of InP and GaAs couplers is used to demonstrate an inherent polarization independent and narrowband filter.
DTIC
Integrated Circuits; Wavelength Division Multiplexing

20070008960 Brown Univ., Providence, RI USA
Adaptively Optimizing the Algorithms for Adaptive Antenna Arrays for Randomly Time-Varying Mobile Communications Systems
Buche, Robert T; Kushner, Harold J; Jan 2002; 13 pp.; In English
Contract(s)/Grant(s): DAAD19-00-1-0549; ECS-9989250
Report No.(s): AD-A461804; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461804

Adaptive antenna arrays are widely used and have great promise to reduce the effects of interference and to increase capacity in mobile communications systems. Consider a single cell system with an (receiving) antenna array at the base station. The usual algorithms for obtaining the antenna weights for the adaptive array depend on parameters that are held fixed no matter what the operating situation, and the performance can strongly depend on the values of these parameters.
DTIC
Adaptation; Algorithms; Antenna Arrays; Mobile Communication Systems; Time; Variations

20070008973 Space and Naval Warfare Systems Center, San Diego, CA USA
Testing and Integration of the COMWIN Antenna System
Adams, Richard C; Oct 2002; 6 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461840; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461840

Future warrior-carried communications systems have at least two needs that must be met if current plans are implemented. The first is the ability to transmit or receive voice, video, and data over an extremely wide frequency range. The hand-held version of the Joint Tactical Radio (JTR) scheduled for production in 2006 is designed to meet part of this need. The second is the ability to hide the identity of the radio operator from snipers who seek to disrupt command, communications, and control functions at the squad level. Integrating the antenna into the uniform provides both ultra broadband transceiving capability and the ability to make the radio operator indistinguishable from any other soldier or marine. The Combat Wear Integration (COMWIN) Antenna System in conjunction with the hand-held JTR fulfills both needs.
DTIC
Antenna Design; Antennas; Combat; Radio Equipment; Wear

20070008974 Massachusetts Univ., Lowell, MA USA
A 524 GHZ Polarimetric Compact Range for Scale Model RCS Measurements
Coulombe, M J; Horgan, T; Waldman, Jerry; Szatkowski, G; Nixon, W; Oct 1999; 7 pp.; In English
Report No.(s): AD-A461842; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461842

A fully polarimetric compact range operating at 524 GHz was developed for obtaining Ka-band radar cross-section (RCS) measurements on 1:16th scale-model targets. The transceiver consisted of a fast switching, stepped, continuous wave (CW), X-band synthesizer driving dual X48 transmit multiplier chains and dual X48 local oscillator multiplier chains. Software range-gating was used to reject unwanted spurious responses in the compact range. A motorized target positioning system allowed for fully automated sequencing of calibration and target measurements over a desired set of target aspect and depression angles. A flat disk and a dihedral at two seam orientations were used for both polarization and RCS calibration. Cross-polarization rejection ratios of better than 45 dB were routinely achieved. The compact range reflector consisted of a 1.5-meter diameter aluminum reflector fed from the side to produce a 0.5-meter diameter quiet zone. Targets were measured in free-space or on a variety of ground planes designed to model most typical ground surfaces. A description of this 524 GHz compact range along with 3D ISAR measurement examples are presented in this paper.
DTIC
Extremely High Frequencies; Measurement; Polarimetry; Radar Cross Sections; Scale Models; Submillimeter Waves; Target Recognition; Transmitter Receivers

20070008980 Air Force Research Lab., Wright-Patterson AFB, OH USA
Phenomenology of Conduction in Incoherent Layered Crystals
Levin, George A; Feb 2004; 16 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-3145
Report No.(s): AD-A461852; AFRL-PR-WP-TP-2006-228; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461852

A phenomenological approach to the analysis of the conductivities of incoherent layered crystals is presented. It is based on the fundamental relationship between the resistive anisotropy sigma(ab)/sigma(c) and the ratio of the phase coherence lengths in the respective directions. We explore the model-independent consequences of a general assumption that the out-of-plane phase coherence length of single electrons is a short fixed distance of the order of interlayer spacing. Several topics are discussed: application of the scaling theory, magnetoresistivity, the effects of substitutions, and the intermediate regime of conduction when both coherence lengths change with temperature, but at a different rate.
DTIC
Crystals; Electrons; Incoherence; Magnetoresistivity; Phenomenology; Superconductivity

20070009000 California Univ., Santa Cruz, CA USA
Thermoreflectance Imaging of Superlattice Micro Refrigerators
Christofferson, James; Vashaee, Daryoosh; Shakouri, Ali; Melese, Philip; Fan, Xiaofeng; Zeng, Gehong; Labounty, Chris; Bowers, John E; Croke, Edward T; Mar 2001; 6 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461899; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461899

High resolution thermal images of operating micro refrigerators are presented. Using the thermo reflectance method and a high dynamic range PIN array camera, thermal images with 50mK thermal resolution and high spatial resolution are presented. This general method can be applied to any operating semiconductors, and can be used as a tool for identifying fabrication failures. With further optimization of the experimental setup, we expect to achieve sub-micron spatial resolution thermal images.
DTIC
Imaging Techniques; Refrigerators; Semiconductors (Materials); Superlattices; Temperature Measuring Instruments; Thermal Mapping

20070009059 Army Tank-Automotive Research and Development Command, Warren, MI USA
Can MEMS Technology Provide Switching Components Necessary for Next Generation Radar Systems?
Rathgeb, Brian; Revello, James; Caito, Steven; Scott, Andrew; Mar 29, 2004; 15 pp.; In English
Report No.(s): AD-A461467; No Copyright; Avail.: CASI: A03, Hardcopy

This paper will inform the reader of how the use of MEMS switches in radar systems has the potential for significant performance improvements. The need for improved radars is defined with a description of one technology driver of MEMS switches. MEMS switch technologies are introduced to establish a foundation of knowledge for the rest of the paper. Significant research has been done in the area of applying MEMS technologies to radar systems. The reader will find information on four MEMS capacitive shunt switches, which were devised at the University of Michigan. The performance of each switch is presented along with the theory behind each device.
DTIC
Microelectromechanical Systems; Radar Equipment; Switches; Switching

20070009069 California Univ., Santa Cruz, CA USA
Wafer-Fused Optoelectronics for Switching
Shakouri, Ali; Liu, Bin; Kim, Boo-Gyoun; Abraham, Patrick; Jackson, Andrew W; Gossard, Arthur C; Bowers, John E; Dec 1998; 8 pp.; In English
Report No.(s): AD-A461780; No Copyright; Avail.: CASI: A02, Hardcopy

Wafer fusion technique for realization of compact waveguide switches and three-dimensional (3-D) photonic integrated circuits is investigated theoretically and experimentally. Calculations based on beam propagation method show that very short vertical directional couplers with coupling lengths from 40 to 220 micrometers and high extinction ratios from 20 to 32 dB can be realized. These extinction ratios can be further improved using a slight asymmetry in waveguide structure. The optical loss at the fused interface is investigated. Comparison of the transmission loss in InGaAsP-based ridge-loaded waveguide structures with and without a fused layer near the core region, reveals an excess loss of 1.1 dB/cm at 1.55 micrometers wavelength. Fused straight vertical directional couplers have been fabricated and characterized. Waveguides separated by 0.6 micrometers gap layer exhibit a coupling length of 62 micrometers and a switching voltage of about 2.2 V. Implications for GaAs-based fused couplers for 850 nm applications will also be discussed.
DTIC
Electro-Optics; Switching; Wafers

20070009077 Naval Research Lab., Washington, DC USA
Designer Infrared Filters Using Stacked Metal Lattices
Smith, Howard A; Rebbert, M; Sternberg, O; May 26, 2003; 4 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461847; No Copyright; Avail.: CASI: A01, Hardcopy

The authors have designed and fabricated infrared filters for use at wavelengths greater than or equal to 15 microns. Unlike conventional dielectric filters used at short wavelengths, these are made from stacked metal grids spaced at a very small fraction of the performance wavelengths. The individual lattice layers are gold, the spacers are polyimide, and they are assembled using integrated circuit processing techniques, They resemble some metallic photonic band-gap structures. The authors simulated the filter's performance, including the coupling of the propagating near-field electromagnetic modes, using computer-aided design codes, and found no anomalous absorption. The geometrical parameters of the grids are easily altered in practice, allowing for the production of tuned filters with predictable and useful transmission characteristics. Although developed for astronomical instrumentation, the filters are broadly applicable in systems across infrared and terahertz bands.
DTIC
Bandpass Filters; Fabrication; Infrared Filters; Submillimeter Waves

20070009145 LEI, Pittsburgh, PA USA
AC Transport Current Loss in a Coated Superconductor in the Bean Model
Carr, Jr, W J; Apr 2004; 11 pp.; In English
Contract(s)/Grant(s): Proj-3145
Report No.(s): AD-A461994; No Copyright; Avail.: CASI: A03, Hardcopy

A new and straightforward calculation is made of the loss in a very thin superconducting strip of rectangular cross section carrying ac transport current in zero applied magnetic field, with a similar strip acting as the return path. The computation is made assuming only that the strip is composed of uniform material which obeys Maxwell's equations and the Bean model. A consequence of the Bean model is the existence of a field-free region about the middle of the superconductor cross-section. The loss calculation now is novel in that: 1) It uses an actual computation of the shape of the field-free region rather than using qualitative assumptions, and 2) it uses a new approach for making the loss calculation. The solution treats the problem as 3-D, having a time-dependent charge on the surface of the superconductor, and having the electric field described by both a vector

and a scalar potential. Loss computations are made for the ratio of peak to critical current in the approximate range of one-half to one, where within this range the loss decreases by about two powers of 10. The most important result is a confirmation of Norris's previously estimated loss expression.
DTIC
Alternating Current; Coatings; Electric Fields; Losses; Maxwell Equation; Superconductors (Materials)

20070009153 Michigan State Univ., East Lansing, MI USA
Radiation by a Linear Array of Half-Width Leaky-Wave Antennas (Preprint)
Killips,, Daniel; Radcliffe, Joshua; Kempel, Leo; Schneider, Stephen; May 2006; 9 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F49620-02-1-0196; Proj-7622
Report No.(s): AD-A462008; No Copyright; Avail.: CASI: A02, Hardcopy

Leaky-wave antennas are interesting apertures for a variety of applications due to their low profile and wide bandwidth. They are inherently traveling wave antennas, and hence are best suited for end-fire applications. A new type of leaky-wave antenna, the half-width leaky-wave antenna (HWLW), has been recently investigated and found to have similar radiation properties as its full-width leaky-wave (FWLW) counterpart, but only requiring half the transverse dimension. In addition, the feeding mechanism for a HWLW antenna is considerably simplified compared to the FWLW antenna. This paper discusses arraying these antennas to provide both increased gain and scanning capability. It will be seen that arraying HWLW antennas is more complex than its narrowband counterpart, the patch antenna.
DTIC
Antenna Arrays; Antennas; Finite Element Method; Linear Arrays; Microstrip Antennas; Waveguide Antennas

20070009155 Air Force Research Lab., Wright-Patterson AFB, OH USA
Termination of A Half-Width Leaky-Wave Antenna (Preprint)
Killips, Daniel; Corwin, Michael; Kempel, Leo; Schneider, Stephen; Jul 2006; 6 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-7622
Report No.(s): AD-A462011; No Copyright; Avail.: CASI: A02, Hardcopy

Leaky-wave antennas offer the potential for a wide operational bandwidth from a very thin antenna. Recently, a leaky-wave antenna that is half the usual width of a planar microstrip leaky-wave antenna was proposed. One of the major advantages of this design is that it requires only a single, rather simple, feed mechanism. To maintain the full potential bandwidth of that antenna, an appropriate termination is required. In this paper, a termination scheme is proposed and validated using a finite element-boundary integral model. In addition, a dual half-width antenna is shown to allow greater flexibility as compared to traditional microstrip leaky-wave antennas.
DTIC
Antennas; Boundaries; Finite Element Method; Models; Waveguide Antennas

20070009205 Library of Congress, Washington, DC USA
Electronic Surveillance Modernization Act, as Passed by the House of Representatives
Bazan, Elizabeth B; Jan 18, 2007; 45 pp.; In English; Original contains color illustrations
Report No.(s): AD-A462094; CRS-RL33637; No Copyright; Avail.: CASI: A03, Hardcopy

After the New York Times reported that the National Security Agency (NSA) was conducting a secret Terrorist Surveillance Program (TSP), a national debate emerged about whether the program was subject to the Foreign Intelligence Surveillance Act (FISA), whether the Administration needed additional authority to continue the program, and how and whether Congress should oversee the program. The TSP involved surveillance without a warrant or court order under FISA of international communications of persons within the USA, where one party to the communication is believed to be a member of al Qaeda, affiliated with al Qaeda, a member of an organization affiliated with al Qaeda, or working in support of al Qaeda. The Bush Administration asserted constitutional and statutory support for its program. While describing electronic surveillance under FISA as a valuable tool in combating terrorism, the Administration argued that it lacked the speed and agility to deal with such terrorists or terrorist groups. In a January 17, 2007, letter to Chairman Leahy and Senator Specter of the Senate Judiciary Committee, Attorney General Gonzales advised them that, on January 10, 2007, a Foreign Intelligence Surveillance Court (FISC) judge issued orders authorizing the Government to target for collection international communications into or out of the USA where there is probable cause to believe that one of the communicants is a member

or agent of al Qaeda or an associated terrorist organization. In light of these orders, which will allow the necessary speed and agility, he stated that all surveillance previously occurring under the TSP will now be conducted subject to the approval of the FISC. He indicated further that the President has determined not to reauthorize the TSP when the current authorization expires. The NSA program has been challenged on legal and constitutional grounds.
DTIC
Congressional Reports; Electronic Equipment; Security; Surveillance; Terrorism

20070009207 Naval Research Lab., Washington, DC USA
Formation of Nanometer-Scale Contacts to Viscoelastic Materials
Wahl, K J; Unertl, W N; Jan 2007; 12 pp.; In English; Original contains color illustrations
Report No.(s): AD-A462096; No Copyright; Avail.: CASI: A03, Hardcopy

The making and breaking of nanometer-scale contacts is an essential operation in MEMS devices with moving parts. The behavior of contacts in this size range is not well understood, especially if viscoelastic materials are involved. This article describes shear modulation spectroscopy, a new scanning force microscope technique especially well suited for quantitative studies of nanometer-scale contacts to viscoelastic materials such as lubricants and some polymers. The technique is illustrated by measurements and analysis of contacts to poly(vinylethylene).
DTIC
Microelectromechanical Systems; Modulation; Spectroscopy; Viscoelasticity

20070009216 Catholic Univ. of America, Washington, DC USA
Synchronization and Detection of Binary Data in Free-Space Optical Communication Systems using Haar Wavelet Transformation
Namazi, Nader; Burris, Jr, Harris R; Conner, Charles; Gilbreath, G C; Jan 2006; 14 pp.; In English; Original contains color illustrations
Report No.(s): AD-A462110; No Copyright; Avail.: CASI: A03, Hardcopy

A new method is presented to perform bit synchronization and detection of binary nonreturn-to-zero (NRZ) data from a free-space optical (FSO) communication link. Based on the wavelet transformation, a new bandpass filter is developed and implemented. It is shown that the Haar wavelet is an excellent choice for this purpose. The center frequency of this filter is a function of the scale and could be adjusted to adapt to the variation of the channel. The output of the filter is zero mean and is closely related to the derivative of the binary data. The filter has a linear phase; therefore, its output is used for synchronization and detection of the data. Analysis of the method is presented using Fourier transformation. In addition, adaptive Wiener filtering is utilized to reduce the effect of the additive white Gaussian noise in the data. Simulation experiments are performed and presented using real and synthetic data. The results of the experiments indicate that the Haar wavelet transform and adaptive Wiener filtering are robust and effective tools in dealing with FSO data.
DTIC
Binary Data; Data Transmission; Detection; Free-Space Optical Communication; Optical Communication; Synchronism; Transformations (Mathematics); Wavelet Analysis

20070009219 Naval Research Lab., Washington, DC USA
Photovoltaically Powered Modulating Retroreflectors
Walters, R J; Murphy, J L; Rabinovich, W S; Gilbreath, G C; Wilt, D M; Smith, M A; Krasowski, M J; Jenkins, P P; Schelman, D; Warner, J H; Mar 2006; 7 pp.; In English; Original contains color illustrations
Report No.(s): AD-A462114; No Copyright; Avail.: CASI: A02, Hardcopy

Abstract. The development of a photovoltaically PV powered laser communication system that constitutes a miniature, highly energy efficient wireless communication technology is described. The technology is based on the direct integration of a multiquantum well (MQW) modulating retroreflector (MRR) optical communication node and a monolithically integrated module (MIM) PV power source. The MQW MRR optical data link exploits the shift in the MQW absorption peak under an applied reverse bias to modulate incident laser light, enabling binary encoding of data for transfer. A MIM consists of many individual solar cells monolithically integrated on a single substrate and offers the design versatility necessary to enable efficient electrical conversion of both incident sunlight and the system laser light and the ability to match the voltage output to the MRR requirements. A description of the development of the MRR and MIM components of the system is given. Results

of bench-top demonstrations of the operational system are presented. 2006 Society of Photo-Optical Instrumentation Engineers.
DTIC
Construction; Electrical Properties; Laser Beams; Modulation; Optical Communication; Photovoltaic Effect; Retroreflectors; Systems Integration

20070009221 Naval Research Lab., Washington, DC USA
Role of Third Bodies in Friction and Wear
Singer, I L; Wahl, K J; Jan 2007; 4 pp.; In English
Report No.(s): AD-A462117; No Copyright; Avail.: CASI: A01, Hardcopy

Friction is usually treated as a two-body problem, in which the two counterfaces move against each other and a 'magical' parameter the friction coefficient comes into being. Not so. At some scale, from atomically thin surface films to chunks of wear particles, third bodies play an important role in friction. These third bodies are often born in the sliding contact and sometimes growing up to be wear particles. They might come about because the tribologist intended to lubricate one or both counterfaces, or they might arise simply from atmospheric gases. Either way, they play a far more important role in friction and wear than you would gather from treatments of friction and wear found in the literature. For the past fifteen years, our studies at the Naval Research Laboratory have focused on sliding behavior of 'low wear' coatings and surface treatments in concentrated contacts. We have been interested mainly in 'how' films transfer to the stationary counterface and 'what' compositions and phases of films and third body particles form. Friction and wear tests have been carried out at relatively low speeds, typically 0.1 - 100 mm/s, with sphere-vs.-flat geometries at high normal contact stresses, 0.5 - 1.5 GPa, in unidirectional or reciprocating sliding. Surface topography, chemistry and microstructure are characterized before and after wear tests and, more recently, by in-situ and in-vivo studies; in the latter, we have focused our sights on the contact itself, watching third bodies form and move in the contact and using Raman microscopy to identify compounds in the sliding interface. Although original films wear away, subsequent films can grow if the environment provides a replenishing material (e.g., oxygen) or the sliding contact replenishes transfer films by forming third body reservoirs.
DTIC
Coatings; Friction; Reservoirs; Tensile Stress; Wear

20070009230 Naval Research Lab., Washington, DC USA
Experimental Results of a MEMS-Based Adaptive Optics System
Restaino, Sergio R; Gilbreath, G C; Payne, Don M; Andrews, Jonathan R; Dec 2005; 5 pp.; In English; Original contains color illustrations
Report No.(s): AD-A462132; No Copyright; Avail.: CASI: A01, Hardcopy

Adaptive optics techniques have been demonstrated in both laboratory and field tests, with a great level of scientific satisfaction, especially in astronomical and surveillance communities. Such successes have sparked the interest for these techniques in other fields, like biomedical imaging and industrial applications. However, to decrease complexity and costs, both very important issues for applications other than astronomical and surveillance, new technologies have to be brought to fruition. MEMS are becoming a very important player in this arena. We describe a portable adaptive optics (AO) system based on a MEM device that has been tested in both laboratory and field experiments. Results of these tests are discussed. Capabilities and shortcomings of this technology are discussed. A look at future applications and trends is given.
DTIC
Adaptive Optics; Cameras; Image Processing; Microelectromechanical Systems; Portable Equipment

20070009275 Army Research Lab., Adelphi, MD USA
Performance Assessment: University of Michigan Meta-Material-Backed Patch Antenna
Dahlstrom, Robert; Weiss, Steve; Jan 2007; 11 pp.; In English; Original contains color illustrations
Report No.(s): AD-A462188; ARL-TN-0269; No Copyright; Avail.: CASI: A03, Hardcopy

This report describes measurements performed on a meta-material-backed patch antenna designed and fabricated at the University of Michigan for use by CERDEC. The purpose of the measurements was to resolve inconsistencies between the performance measured at these two organizations. The antenna consists of a microstrip patch, with a broad-banding slot, backed by a reactive impedance surface. The gain and impedance characteristics of the meta-material-backed patch antenna were found to be in agreement with the values reported by the University of Michigan within the accuracy of our

measurement. The antenna proves to be broadband, both in impedance and antenna pattern characteristics, and promises to be useful for many applications.
DTIC
Antenna Radiation Patterns; Patch Antennas

20070009282 Mississippi State Univ., Mississippi State, MS USA
Development of High-Temperature, High-Power, High-Efficiency, High-Voltage Converters Using Silicon Carbide (SiC) Delivery Order 0003: SiC High Voltage Converters, N-Type Ohmic Contract Development for SiC Power Devices
Cheng, Lin; Mazzola, Michael S; Dec 2006; 13 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F33615-01-D-2103-0003; Proj-1660
Report No.(s): AD-A462202; No Copyright; Avail.: CASI: A03, Hardcopy

The durability and reliability of metal-semiconductor contacts are two of the main factors limiting the operational high-temperature limits of SiC electronic devices. To date, nickel (Ni) has been the most widely used metal for ohmic contacts to n-type SiC. The way to make smooth Ni-silicide ? SiC interfaces and silicide top surfaces is important for producing uniformly low contact resistances to achieve device operation at high-current levels without hot spot formation and contact degradation. For as-deposited single Ni thin layers, agglomeration of Ni-silicide after annealing can happen depending on the conditions of deposition and thermal annealing processes. This is mainly due to the residual stress on the Ni films after deposition on SiC with a significantly lower coefficient of thermal expansion. Typically, an additional stress reduction layer, such as titanium, is deposition on top of the Ni thin contact film to prevent silicide agglomeration. The objective of this Delivery Order Task was to study and develop a process to produce robust, smooth ohmic contact, with low contact resistivity, to n-type SiC for high power, high temperature, and harsh radiation environments.
DTIC
High Temperature; High Voltages; Silicon Carbides

20070009289 Massachusetts Inst. of Tech., Cambridge, MA USA
Few-cycle Optical Parametric Chirped Pulse Amplification
Kaertner, Franz X; Jan 8, 2007; 15 pp.; In English
Contract(s)/Grant(s): FA9550-05-1-0281
Report No.(s): AD-A462219; No Copyright; Avail.: CASI: A03, Hardcopy

Over the last few years, ultrafast laser physics and frequency metrology has merged and provided us with unprecedented (sub-cycle) control over the electric field of few-cycle laser pulses emitted from modelocked lasers. These pulses and the corresponding technology are the prerequisite for high energy phase controlled few-cycle laser pulses, needed for reliable extreme ultraviolet (EUV) and soft x-ray production via high harmonic generation. It has been shown over the last few years that this technology leads to the generation of attosecond pulses and therefore opens up a new frontier in time and frequency measurements.
DTIC
Amplification; Electric Fields; Laser Mode Locking; Measurement; Ultraviolet Radiation

20070009303 Massachusetts Univ., Lowell, MA USA
Submillimeter-Wave Polarimetric Compact Ranges for Scale-Model Radar Measurements
Coulombe, Michael J; Waldman, Jerry; Giles, R H; Gatesman, Andrew J; Goyette, Thomas M; Nixon, William; Jan 2002; 5 pp.; In English
Report No.(s): AD-A462245; No Copyright; Avail.: CASI: A01, Hardcopy

Fully-polarimetric, wideband compact radar ranges based on transceivers operating in the submillimeter-wave regime have been developed for obtaining radar measurements on scale models (nominally 1:16). These transceivers use fixed-tuned Schottky-diode mixers and varactor multiplier sources to obtain reasonable wideband performance. Optically pumped gas lasers, combined with tunable microwave sideband generation in corner-cube mounted Schottky diodes, have been implemented to extend the operating frequencies into the THz regime. A dielectric material fabrication and characterization capability has also been developed to fabricate custom anechoic materials for the ranges as well as scaled dielectric parts for the models and clutter scenes. The general approach to designing submillimeter-wave compact ranges and the particular details of systems operating at 524 GHz and 1.56 THz will be presented in this paper.
DTIC
Laser Beams; Polarimetry; Radar Measurement; Radar Signatures; Scale Models; Submillimeter Waves; Target Recognition; Transmitter Receivers

20070009304 Massachusetts Univ., Lowell, MA USA

A 1.56 THz Spot Scanning Radar Range for Fully Polarimetric W-Band Scale Model Measurements

DeMartinis, Guy B; Goyette, Thomas M; Coulombe, Michael J; Waldman, Jerry; Nixon, William; Oct 2000; 7 pp.; In English

Report No.(s): AD-A462247; No Copyright; Avail.: CASI: A02, Hardcopy

A radar transceiver operating at 1.56 THz was recently developed to obtain coherent, fully polarimetric W-band (98 GHz) Radar Cross Section (RCS) images of 1:16 scale-model targets. The associated optical system operates by scanning a small focused beam of swept frequency radiation across a scale-model target to resolve individual scattering centers and to obtain the scaled RCS values for the centers. Output from a tunable microwave source (10-17 GHz) is mixed with narrow band submillimeter-wave radiation in a Schottky diode mixer to produce the chirped transmit signal. Two high-frequency Schottky diode mixers are used for reception of the V-pol and H-pol receive states, with a fourth mixer providing a system phase reference. The full 2x2 complex polarization scattering matrix (PSM) for each resolved center is obtained following off-line data processing. Measurement examples of five simple calibration objects and a tank are presented.

DTIC

Polarimetry; Radar Range; Radar Scanning; Scale Models; Submillimeter Waves; Target Recognition; Transmitter Receivers

20070009305 Massachusetts Univ., Lowell, MA USA

A 160 GHZ Polarimetric Compact Range for Scale Model RCS Measurements

Coulombe, Michael J; Horgan, T; Waldman, Jerry; Neilson, J; Carter, S; Nixon, William; Oct 1996; 7 pp.; In English

Report No.(s): AD-A462248; No Copyright; Avail.: CASI: A02, Hardcopy

A fully polarimetric compact range operating at 160 GHz has been developed for obtaining X-band radar cross-section (RCS) measurements on 1:16th scale-model targets. The transceiver consists of a fast switching, stepped, continuous wave, X-band synthesizer driving dual X16 transmit multiplier chains and dual X16 local oscillator multiplier chains. The system alternately transmits horizontal (H) and vertical (V) radiation while simultaneously receiving H and V. Software range gating is used to reject unwanted spurious responses in the compact range. A flat disk and a rotating circular dihedral are used for polarimetric as well as RCS calibration. Cross-polarization rejection ratios of better than 40 dB are routinely achieved. The compact range reflector consists of a 60-inch diameter, CNC-machined aluminum mirror fed from the side to produce a clean 20-inch quiet zone. The range has capabilities for both free-space and ground-plane measurements. A fully automated positioning and calibration system allows unattended range operation 24 hours a day. The comparison between a computer prediction and scale-model measurement on a relatively complex target was shown to be in good agreement. Because small models are inexpensive to fabricate and since range space requirements are modest, submillimeter compact ranges are proving to be a cost-effective, viable complement to full-scale systems and computer codes. A complete description of this 160 GHz compact range along with measurement examples are presented in this paper.

DTIC

Polarimetry; Radar Cross Sections; Scale Models; Submillimeter Waves; Superhigh Frequencies; Target Recognition; Transmitter Receivers

20070009313 BAE Systems Electronics and Integrated Solutions, Nashua, NH USA

Device Demonstration

Dec 31, 2006; 190 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00019-01-C-0088

Report No.(s): AD-A462260; No Copyright; Avail.: CASI: A09, Hardcopy

The goal of the Defense Advanced Research Projects Agency (DARPA) Advanced Lithography research program was to revolutionize semiconductor lithography through accelerated research of highly innovative approaches that would enable pattern transfer to wafers of features 100 nm and below. To this end, DARPA, via a Broad Agency Announcement, BAA 00-04, solicited proposals for R&D to understand and overcome specific technological obstacles to the realization of lithography for critical dimensions of 100 nm and smaller and the supporting technologies relevant to more than one lithography technology option. In response, Sanders, A Lockheed Martin Company, proposed 'Device Demonstrations Using Point Source X-ray Lithography Technology' to enhance and utilize a previously developed X-ray lithography system to address next-generation sub-100 nm lithography demonstrations using point source X- ray Lithography. This program started in December 2001 and was eventually taken over by BAE Systems, Inc. after their acquisition of Sanders. Summarized in this Final Report are the highlights and current status of this effort.

DTIC

Lithography; X Rays

34
FLUID MECHANICS AND THERMODYNAMICS

Includes fluid dynamics and kinematics and all forms of heat transfer; boundary layer flow; hydrodynamics; hydraulics; fluidics; mass transfer and ablation cooling. For related information see also *02 Aerodynamics*.

20070006592 Sandia National Labs., Albuquerque, NM, USA, Harper International Corp., Lancaster, NY, USA
Circulating Fluidized Bed Hydrodynamics Experiments for the Multiphase Fluid Dynamics Research Consortium (MFDRC)
O'Hern, T. J.; Trujillo, S. M.; Torczynski, J. R.; Tortora, P. R.; Bhusarapu, S.; Aug. 2006; 236 pp.; In English
Report No.(s): DE2006-891368; No Copyright; Avail.: National Technical Information Service (NTIS)

An experimental program was conducted to study the multiphase gas-solid flow in a pilot-scale circulating fluidized bed (CFB). This report describes the CFB experimental facility assembled for this program, the diagnostics developed and/or applied to make measurements in the riser section of the CFB, and the data acquired for several different flow conditions. Primary data acquired included pressures around the flow loop and solids loadings at selected locations in the riser. Tomographic techniques using gamma radiation and electrical capacitance were used to determine radial profiles of solids volume fraction in the riser, and axial profiles of the integrated solids volume fraction were produced. Computer Aided Radioactive Particle Tracking was used to measure solids velocities, fluxes, and residence time distributions. In addition, a series of computational fluid dynamics simulations was performed using the commercial code Arenaflow(trademark).
NTIS
Circulation; Combustion; Fluid Dynamics; Hydrodynamics; Multiphase Flow; Organizations

20070006608 Naval Research Lab., Washington, DC, USA, Hughes Associates, Inc., Baltimore, MD, USA, Naval Research Lab., Washington, DC, USA
Electronic Space Fire Protection: False Deck Mockup Fire Testing of Nanomist Systems
Adiga, K. C.; Hatcher, R. F.; Forssell, E. W.; Scheffey, J. L.; Farley, J. P.; January 2005; 12 pp.; In English
Report No.(s): PB2007-105063; No Copyright; Avail.: CASI: A03, Hardcopy

Reduced manned Naval vessels require automated fire suppression systems to compensate for the reduced size of damage control parties. Fine water mist systems are attractive from a total ship protection standpoint. However, the interaction between the applied mist and the compartment boundaries and obstructions in the sub-floor causes excessive mist loss because of flow obstructions NanoMist Systems, LLC, has a patented technology (NanoMist) that generates and discharges ultra fine mist (UFM) at ambient pressure with average drop sizes smaller than 10 microns. This drop size is significantly lower than that generated in conventional water mist systems that utilize high fluid pressure or shearing air flows to generate the water mist. Mist characterization testing on mist samples withdrawn from the back of the mock-up revealed an average drop size, Dv50, of 7 microns. The mist behaves like a dense gas in terms of transport and dispersion inside a cluttered volume. In the constant search for a nearly clean-gas-like water mist system, NanoMist ultrafine water mist was investigated for fire suppression in electronic space fire suppression in a sub-floor mockup using telltale flames behind obstruction caused by a baffle. The electronic exposure test was conducted using a modem card. The ultrafine mist (UFM) extinguished the telltale fire with a 0.053 LPM/m2 water application flux in approximately 3 minutes. The lower water application flux tested, 0.037 LPM/m2 after 8.5 minutes which corresponded to 2.6 air changes. The polypropylene array fire was more readily extinguished by the NanoMist tested. The external communication modems exposed to the generated water mists were able to continue operating for at least 7 minutes after mister actuation. The ultra fine water mist showed significant promise in this application. The small drop size and high initial mist water concentration enabled the generated mist to extinguish the test fires located behind a baffle spanning a third of the enclosure width and the entire enclosure height.
NTIS
Automatic Control; Fires; Protection; Ships

20070006638 National Inst. of Standards and Technology, Gaithersburg, MD USA
Full-Scale House Fire Experiment for InterFIRE VR, May 6, 1998. Report of Test FR 4009. (Revised April 10, 2000)
Putorti, A. D.; McElroy, J.; Apr. 2000; 19 pp.; In English
Report No.(s): PB2007-105060; No Copyright; Avail.: CASI: A03, Hardcopy

In order to characterize the water spray from a standard orifice, independent spray sprinkler, measurements were made using an optical array probe droplet analyzer. The water droplet sizes and speeds from the sprinkler were measured at various

locations in the spray field. The study resulted in mean droplet speeds, droplet size distributions, and median droplet sizes based on both the number and volume of the measured drops.
NTIS
Drop Size; Fires; Sprayers; Water; Residential Areas

20070006640 Lumen Intellectual Property, Palo Alto, CA, USA
Multilayer Microfluidic Device
Osterfeld, S. J.; Wang, S. X.; 22 Mar 06; 27 pp.; In English
Contract(s)/Grant(s): SPO-26739
Patent Info.: Filed Filed 22 Mar 06; US-Patent-Appl-SN-11-388-223
Report No.(s): PB2007-101350; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention provides microfluidic devices constructed from four layers. The layers include a rigid substrate layer, a patterned rigid layer having thickness t, a patterned elastomeric layer having thickness greater than t, and a rigid support layer. Microfluidic structures in the devices are defined by the alignment of openings in the patterned rigid layer and the patterned elastomeric layer. The rigid support layer, rigid substrate layer, and patterned rigid layer may be made of any rigid material, including but not limited to plastic or silicon-containing materials, such as glass, quartz, or SiO.sub.2-coated materials. Similarly, the patterned elastomeric layer may be made of any elastomeric material, including but not limited to polydimethylsiloxanes, polymethylmethacrylates, perfluoropolyethers, or combinations thereof. Microfluidic devices according to the present invention may include sensors or sensor arrays. The microfluidic devices are fabricated using the provided error-tolerant alignment, biocompatible process.
NTIS
Microfluidic Devices; Fabrication; Layers

20070007460 Florida International Univ., Miami, FL USA
Heat Transfer Enhancement Through Self-Sustained Oscillating Flow in Microchannels
Lin, C X; May 2006; 54 pp.; In English
Contract(s)/Grant(s): FA8650-04-C-2405; HBCU/MI BAA 2003-01; Proj-1602
Report No.(s): AD-A460536; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460536

The main objectives of this research were to understand the hydraulic and thermal characteristics of self-sustained oscillating flow through microchannels, and then to obtain correlations of parameters to assist in the design of heat sinks / heat exchangers that would utilize this oscillating flow to improve the thermal management of electronics. The oscillating flows are achieved by placing vortex generating blocks in the microchannels to create the oscillating vortices that are meant to enhance heat transfer. Experimental studies were carried out on various configurations of microchannels, with various numbers of vortex generators, and the results were reported. Also, the results of a numerical study on the heat transfer and hydraulic behavior around the vortex generators are reported.
DTIC
Augmentation; Heat Transfer; Microchannels; Oscillating Flow; Self Oscillation; Vortex Generators

20070007464 Naval Ship Research and Development Center, Bethesda, MD USA
Progress in Frictional Drag Reduction Summer 1971 to Summer 1972
Granville, Paul S; Jan 1973; 54 pp.; In English
Report No.(s): AD-A460544; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460544

A summary of progress in the achievement of frictional drag reduction is presented in terms of highlights, laboratory activities, and bibliographic entries from the summer of 1971 to the summer of 1972.
DTIC
Drag Reduction; Friction Factor; Progress; Summer

20070007483 New South Wales Dept. of Public Works, Manly, Australia
A Laboratory Study Of Wave Growth And Air Flow Behaviour Over Waves Strongly Forced By Wind
Peirson, W L; Pells, S E; Jul 1, 2004; 29 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460586; WRL-RR-219; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460586

Existing normalisations of wave response to prevailing winds remain unreconciled with theoretical predictions. Accurate predictive schemes are essential for the intense storms that are responsible for the most severe wave fields but show signficant complexity as observed by Wright et al. (2001).
DTIC
Air Flow; Shear Stress; Water Waves; Wind Shear

20070007491 Naval Ship Research and Development Center, Bethesda, MD USA
Application of the Stanton Tube to the Measurements of Wall Shear Stress on a Flat Plate with Polymer Ejection
Souders, William G; May 1973; 38 pp.; In English
Report No.(s): AD-A460597; DTNSRDC-3849; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460597

An experimental investigation was made to determine the effects on drag of injecting aqueous solutions of polyethylene oxide (Polyox WSR-301) into the turbulent boundary layer of a flat plate. The local mean wall shear stress was measured with a Stanton tube located in the laminar sublayer. Diffusion of the polymer in the boundary layer was also investigated by analysis of fluid samples withdrawn from the flat plate surface. In addition, a related but independent experimental turbulent pipe flow study was undertaken to determine any changes in Stanton tube sensitivity caused by the viscoelasticity of the polymer solutions. The wall friction on the plate was determined with and without polymer injection and the results compared well with available shear data. The measured wall shear stresses showed reductions of up to 50 percent with polymer injection and decreased with increasing mean wall polymer concentration.
DTIC
Aqueous Solutions; Ejection; Flat Plates; Shear Stress; Stanton Number; Turbulent Boundary Layer; Walls

20070007520 Brown Univ., Providence, RI USA
A Semi-Lagrangian Method for Turbulence Simulations Using Mixed Spectral Discretizations
Xu, Jin; Xiu, Dongbin; Karniadakis, George E; Nov 9, 2001; 16 pp.; In English
Report No.(s): AD-A460652; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA460652

We present a semi-Lagrangian method for integrating the three-dimensional incompressible Navier-Stokes equations. We develop stable schemes of second-order accuracy in time and spectral accuracy in space. Specifically, we employ a spectral element (Jacobi) expansion in one direction and Fourier collocation in the other two directions. We demonstrate exponential convergence for this method, and investigate the non-monotonic behavior of the temporal error for an exact three-dimensional solution. We also present direct numerical simulations of a turbulent channel-flow, and demonstrate the stability of this approach even for marginal resolution unlike its Eulerian counterpart.
DTIC
Lagrangian Function; Navier-Stokes Equation; Simulation; Spectra; Turbulence

20070007557 Lehigh Univ., Bethlehem, PA USA
Wake Structure, Loading and Vibration of Cylinders: Effects of Surface Nonuniformities and Unsteady Inflow
Rockwell, Donald; Jan 17, 2007; 7 pp.; In English
Contract(s)/Grant(s): N00014-94-1-0185
Report No.(s): AD-A460740; LU-TR-533679; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460740

The flow structure from stationary and oscillating cylinders, both with and without surface treatment, has been characterized in steady currents and waves using techniques of high-image-density particle image velocimetry. This quantitative imaging has led to new insight into the quasi-two-dimensional and three-dimensional features of the near-wake, which are intimately related to the loading on the cylinder, for cases where the cylinder is either stationary or elastically mounted. This program has resulted in a total of 46 publications in leading journals and the support of 15 graduate students.
DTIC
Cylindrical Bodies; Particle Image Velocimetry; Vibration Effects; Vortices; Wakes

20070008202 NASA Glenn Research Center, Cleveland, OH, USA
Porous Media Approach for Modeling Closed Cell Foam
Ghosn, Louis J.; Sullivan, Roy M.; [2006]; 34 pp.; In English; 43rd Annual Technical Meeting of the Society of Engineering Science, 13-16 Aug. 2006, University Park, PA, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 524238.08.02.03.04; Copyright; Avail.: CASI: A03, Hardcopy

In order to minimize boil off of the liquid oxygen and liquid hydrogen and to prevent the formation of ice on its exterior surface, the Space Shuttle External Tank (ET) is insulated using various low-density, closed-cell polymeric foams. Improved analysis methods for these foam materials are needed to predict the foam structural response and to help identify the foam fracture behavior in order to help minimize foam shedding occurrences. This presentation describes a continuum based approach to modeling the foam thermo-mechanical behavior that accounts for the cellular nature of the material and explicitly addresses the effect of the internal cell gas pressure. A porous media approach is implemented in a finite element frame work to model the mechanical behavior of the closed cell foam. The ABAQUS general purpose finite element program is used to simulate the continuum behavior of the foam. The soil mechanics element is implemented to account for the cell internal pressure and its effect on the stress and strain fields. The pressure variation inside the closed cells is calculated using the ideal gas laws. The soil mechanics element is compatible with an orthotropic materials model to capture the different behavior between the rise and in-plane directions of the foam. The porous media approach is applied to model the foam thermal strain and calculate the foam effective coefficient of thermal expansion. The calculated foam coefficients of thermal expansion were able to simulate the measured thermal strain during heat up from cryogenic temperature to room temperature in vacuum. The porous media approach was applied to an insulated substrate with one inch foam and compared to a simple elastic solution without pore pressure. The porous media approach is also applied to model the foam mechanical behavior during subscale laboratory experiments. In this test, a foam layer sprayed on a metal substrate is subjected to a temperature variation while the metal substrate is stretched to simulate the structural response of the tank during operation. The thermal expansion mismatch between the foam and the metal substrate and the thermal gradient in the foam layer causes high tensile stresses near the metal/foam interface that can lead to delamination.

Author

Mechanical Properties; Metal Foams; Porosity; Media; Thermodynamics; Continuum Modeling

20070008257 Sandia National Labs., Albuquerque, NM USA

Mixing in Polymeric Microfluidic Devices

Brotherton, C. M.; Davis, R. H.; Sun, A. C.; Schunk, P. R.; Sep. 2006; 35 pp.; In English

Report No.(s): DE2006-892761; SAND2006-4313; No Copyright; Avail.: National Technical Information Service (NTIS)

This SAND report describes progress made during a Sandia National Laboratories sponsored graduate fellowship. The fellowship was funded through an LDRD proposal. The goal of this project is development and characterization of mixing strategies for polymeric microfluidic devices. The mixing strategies under investigation include electroosmotic flow focusing, hydrodynamic focusing, physical constrictions and porous polymer monoliths. For electroosmotic flow focusing, simulations were performed to determine the effect of electroosmotic flow in a microchannel with heterogeneous surface potential. The heterogeneous surface potential caused recirculations to form within the microchannel. These recirculations could then be used to restrict two mixing streams and reduce the characteristic diffusion length. Maximum mixing occurred when the ratio of the mixing region surface potential to the average channel surface potential was made large in magnitude and negative in sign, and when the ratio of the characteristic convection time to the characteristic diffusion time was minimized. Based on these results, experiments were performed to evaluate the manipulation of surface potential using living-radical photopolymerization. The material chosen to manipulate typically exhibits a negative surface potential. Using living-radical surface grafting, a positive surface potential was produced using 2-(Dimethylamino)ethyl methacrylate and a neutral surface was produced using a poly(ethylene glycol) surface graft. Simulations investigating hydrodynamic focusing were also performed. For this technique, mixing is enhanced by using a tertiary fluid stream to constrict the two mixing streams and reduce the characteristic diffusion length. Maximum mixing occurred when the ratio of the tertiary flow stream flow-rate to the mixing streams flow-rate was maximized. Also, like the electroosmotic focusing mixer, mixing was also maximized when the ratio of the characteristic convection time to the characteristic diffusion time was minimized. Physical constrictions were investigated through simulations. The results show that the maximum mixing occurs when the height of the mixing region is minimized. Finally, experiments were performed to determine the effectiveness of using porous polymer monoliths to enhance mixing. The porous polymer monoliths were constructed using a monomer/salt paste. Two salt crystal size ranges were used; 75 to 106 microns and 53 to 180 microns. Mixing in the porous polymer monoliths fabricated with the 75 to 106 micron salt crystal size range was six times higher than a channel without a monolith. Mixing in the monolith fabricated with the 53 to 180 micron salt crystal size range was nine times higher.

NTIS

Fluid Flow; Microfluidic Devices

20070008333 Iowa State Univ. of Science and Technology, Ames, IA USA

Computational Fluid Dynamics Simulation of Fluidized Bed Polymerization Reactors

Fan, R.; Aug. 09, 2006; 197 pp.; In English

Report No.(s): DE2006-892730; No Copyright; Avail.: Department of Energy Information Bridge

Fluidized beds (FB) reactors are widely used in the polymerization industry due to their superior heat- and mass-transfer characteristics. Nevertheless, problems associated with local overheating of polymer particles and excessive agglomeration leading to FB reactors defluidization still persist and limit the range of operating temperatures that can be safely achieved in plant-scale reactors. Many people have been worked on the modeling of FB polymerization reactors, and quite a few models are available in the open literature, such as the well-mixed model developed by McAuley, Talbot, and Harris (1994), the constant bubble size model (Choi and Ray, 1985) and the heterogeneous three phase model (Fernandes and Lona, 2002). Most these research works focus on the kinetic aspects, but from industrial viewpoint, the behavior of FB reactors should be modeled by considering the particle and fluid dynamics in the reactor. Computational fluid dynamics (CFD) is a powerful tool for understanding the effect of fluid dynamics on chemical reactor performance. For single-phase flows, CFD models for turbulent reacting flows are now well understood and routinely applied to investigate complex flows with detailed chemistry. For multiphase flows, the state-of-the-art in CFD models is changing rapidly and it is now possible to predict reasonably well the flow characteristics of gas-solid FB reactors with mono-dispersed, non-cohesive solids. This thesis is organized into seven chapters. In Chapter 2, an overview of fluidized bed polymerization reactors is given, and a simplified two-site kinetic mechanism are discussed. Some basic theories used in our work are given in detail in Chapter 3. First, the governing equations and other constitutive equations for the multi-fluid model are summarized, and the kinetic theory for describing the solid stress tensor is discussed. The detailed derivation of DQMOM for the population balance equation is given as the second section. In this section, monovariate population balance, bivariate population balance, aggregation and breakage equation and DQMOM-Multi-Fluid model are described. In the last section of Chapter 3, numerical methods involved in the multi-fluid model and time-splitting method are presented. Chapter 4 is based on a paper about application of DQMOM to polydisperse gas-solid fluidized beds. Results for a constant aggregation and breakage kernel and a kernel developed from kinetic theory are shown. The effect of the aggregation success factor and the fragment distribution function are investigated. Chapter 5 shows the work on validation of mixing and segregation phenomena in gas-solid fluidized beds with a binary mixture or a continuous size distribution. The simulation results are compared with available experiment data and discrete-particle simulation. Chapter 6 presents the project with Univation Technologies on CFD simulation of a Polyethylene pilot-scale FB reactor, The fluid dynamics, mass/heat transfer and particle size distribution are investigated through CFD simulation and validated with available experimental data. The conclusions of this study and future work are discussed in Chapter 7.

NTIS

Chemical Reactors; Computational Fluid Dynamics; Fluidized Bed Processors; Polymerization; Simulation

20070008437 Florida State Univ., Tallahassee, FL, USA

A Computational Study of the Flow Physics of Acoustic Liners

Tam, Christopher; September 2006; 10 pp.; In English

Contract(s)/Grant(s): NNL04AA01A; WBS 561581.02.08.07; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070008437

The present investigation is a continuation of a previous joint project between the Florida State University and the NASA Langley Research Center Liner Physics Team. In the previous project, a study of acoustic liners, in two dimensions, inside a normal incidence impedance tube was carried out. The study consisted of two parts. The NASA team was responsible for the experimental part of the project. This involved performing measurements in an impedance tube with a large aspect ratio slit resonator. The FSU team was responsible for the computation part of the project. This involved performing direct numerical simulation (DNS) of the NASA experiment in two dimensions using CAA methodology. It was agreed that upon completion of numerical simulation, the computed values of the liner impedance were to be sent to NASA for validation with experimental results. On following this procedure good agreements were found between numerical results and experimental measurements over a wide range of frequencies and sound-pressure-level. Broadband incident sound waves were also simulated numerically and measured experimentally. Overall, good agreements were also found.

Derived from text

Linings; Mathematical Models; Aeroacoustics; Computational Fluid Dynamics

20070008641 Air Force Research Lab., Wright-Patterson AFB, OH USA
Performance Impacts Due to Wake in Axil-Flow Turbomachinery (Postprint)
Praisner, T J; Clark, J P; Nash, T C; Rice, M J; Grover, E A; Sep 2006; 12 pp.; In English
Report No.(s): AD-A461269; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461269

Here, we demonstrate that the unsteady losses incurred as turbomachinery wakes mix in downstream rows are a function of the velocity ratio across the downstream row as calculated in the frame of reference of wake generation. Analytical and computational results, compared to measurements of wakes mixing under variable free-stream velocity conditions, reveal that wake-loss alteration is primarily a result of an inviscid dilation of the stream tubes that comprise the wake fluid. Further, simulations of wakes exposed to a range of turbomachinery-specific velocity ratios indicate that wake-loss augmentation caused by stream-tube dilation is significantly more pronounced than wake-loss reductions imparted by stream-tube contraction. It is demonstrated that wakes in turbines are dilated in the adjacent downstream row, whether it is a vane or a blade row, through a work extraction process that occurs in the wake-generation reference frame. Finally, comparisons between rig data and CFD simulations suggest that wake-mixing losses, enhanced by downstream rows, can contribute as much as 1.5 percent of lost efficiency in multi-stage LPTs.
DTIC
Flow Distribution; Turbomachinery; Wakes

20070008646 Missouri Univ., Rolla, MO USA
Development of an Abrasive Water Jet Optimum Abrasive Flow Rate Model for Titanium Alloy Cutting (Preprint)
Zhang, S J; Galecki, G; Summers, D A; Swallow, C; May 2006; 14 pp.; In English
Contract(s)/Grant(s): FA8650-04-C-5704; Proj-2865
Report No.(s): AD-A461274; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461274

As the abrasive water jet (AWJ) is used in industry extensively, optimization of the process parameters that determine efficiency, economy and quality of the process is becoming more and more important for its successful application. However, being a complicated cutting system, an abrasive water jet is characterized by a large number of process parameters, which include water pressure, orifice diameter, traverse rate, standoff distance, impact angle, focusing tube diameter, abrasive flow rate, etc. Therefore, optimizing the process parameters involves lots of challenging efforts. This paper concentrates on investigating the optimum abrasive flow rate under different water pressures, orifice diameters and focusing tube diameters. Based on theory derivation and experimental study, an empirical model for calculating the optimal abrasive flow rate is created.
DTIC
Abrasives; Cutting; Flow Velocity; Hydraulic Jets; Jet Flow; Titanium Alloys

20070008777 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Scramjet Flow Field Control Using Magnetogasdynamics
McMullan, Richard J; Apr 2006; 102 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461539; AFIT/EN/TR-06-04; No Copyright; Avail.: CASI: A06, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461539

Sustained hypersonic fight using scramjet propulsion is the key technology bridging the gap between turbojets and the exoatmospheric environment where a rocket is required. Recent efforts have focused on electromagnetic (EM) flow control to mitigate the problems of high thermomechanical loads and low propulsion efficiencies associated with scramjet propulsion. Numerical simulations were employed to determine how EM flow control can improve scramjet performance. The research effort focused on applying both local flow field control and the system level magnetogasdynamic (MGD) energy bypass method to a flight-scale scramjet. This report highlights the major accomplishments of this research effort. Combustor-based MGD generators proved superior to inlet generators with respect to power density and overall engine efficiency. MGD acceleration was shown to be ineffective in improving overall performance with all of the bypass engines having approximately 33% more drag than baseline engine without EM flow control, and none of them achieved a self-powered state.
DTIC
Computational Fluid Dynamics; Electromagnets; Flow Distribution; Hypersonic Flight; Magnetohydrodynamics; Propulsion; Supersonic Combustion Ramjet Engines

20070008932 Northwestern Univ., Evanston, IL USA

OSSE Observations of Galactic 511 KeV Annihilation Radiation

Purcell, W R; Grabelsky, D A; Johnson, W N; Jung, G V; Kinzer, R L; Kurfess, J D\g; Strickman, M S; Ulmer, M P; Jan 1991; 9 pp.; In English

Report No.(s): AD-A461755; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461755

The Oriented Scintillation Spectrometer Experiment (OSSE) on the Compton Gamma-Ray Observatory has performed several observations of the Galactic plane and Galactic center region to measure the distribution of Galactic 511 keV positron annihilation radiation. Preliminary analysis of data collected during the observation of the Galactic center region over the period July 13{24, 1991, indicates the presence of a 511 keV line and positronium continuum superimposed on a power-law continuum.

DTIC

Annihilation Reactions; Galactic Radiation; Radiation Dosage; Spectrometers

20070009002 Virginia Polytechnic Inst. and State Univ., Blacksburg, VA USA

Effects of Various Shaped Roughness Elements in Two-Dimensional High Reynolds Number Turbulent Boundary Layers

Bennington, Jeremy L; Simpson, Roger L; Aug 28, 2004; 305 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-01-1-0421

Report No.(s): AD-A461902; VPI-AOE-291; No Copyright; Avail.: CASI: A14, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461902

The present research is centered around the experimental investigation of seven various shaped single roughness elements and their effects on turbulence quantities in a two-dimensional turbulent boundary layer. The elements under scrutiny are as follows: cone, cone with spatial variations equal to the smallest sublayer structure length scale, cone with spatial variations equal to 2.5 times the smallest sublayer structure length scale, Gaussian-shaped element, hemisphere, cube aligned perpendicular to the flow (cube at 90 degrees), and a cube rotated 45 degrees relative to the flow.

DTIC

High Reynolds Number; Surface Roughness; Turbulent Boundary Layer; Two Dimensional Flow; Walls

20070009161 Virginia Polytechnic Inst. and State Univ., Blacksburg, VA USA

Application of a Novel Laser-Doppler Velocimeter for Turbulence: Structural Measurements in Turbulent Boundary Layers

Lowe, Kevin T; Simpson, Roger L; Oct 18, 2006; 205 pp.; In English

Contract(s)/Grant(s): F49620-03-1-0057

Report No.(s): AD-A462018; VPI-AOE-301; No Copyright; Avail.: CASI: A10, Hardcopy

An advanced laser-Doppler velocimeter (LDV), deemed the 'comprehensive LDV', is designed to acquire fully-resolved turbulence structural measurements in high Reynolds number two- and three-dimensional turbulent boundary layers. The new instrument combines, for the first time, new techniques allowing for the direct measurement of particle acceleration and sub-measurement-volume-scale position resolution so that second-order 3D particle trajectories may be measured at high repetitions. Using these measurements, several terms in the Reynolds stress transport equations may be directly estimated, giving new data for modeling and understanding the processes leading to the transport of turbulence in boundary layer flows. Measurements utilizing the CompLDV technologies are presented and include turbulence dissipation rate and fluctuating velocity-pressure gradient correlations that have been measured in 2D and 3D turbulent boundary layers using the unique capabilities of the 'comprehensive' LDV. Many of these measurements are the first of their kind ever acquired in high Reynolds number turbulent flows. The flat-plate turbulent boundary layer is studied at several Reynolds numbers up to Re-theta ~7500 to examine Reynolds numbers effects on terms such as the velocity-pressure gradient correlation and the dissipation rate in the Reynolds transport equations. Measurements are also presented in a pressure-driven three-dimensional turbulent boundary layer created upstream from a wing-body junction. The current results complement the extensive data from previous studies and provide even richer depth of knowledge on the most completely-documented 3D boundary layer flow in existence. Further measurements include the effects of high free-stream turbulence on flat plate turbulent boundary layers and a wing/body junction flow that is similar to a gas turbine flow.

DTIC

Laser Doppler Velocimeters; Measurement; Three Dimensional Flow; Turbulence; Turbulent Boundary Layer

20070009162 Virginia Polytechnic Inst. and State Univ., Blacksburg, VA USA
Structure of 2-D and 3-D Turbulent Boundary Layers with Sparsely Distributed Roughness Elements
George, Jacob; Simpson, Roger L; Jun 28, 2005; 262 pp.; In English
Contract(s)/Grant(s): N00014-99-1-0228; N00014-01-1-0421
Report No.(s): AD-A462019; VPI-AOE-302; No Copyright; Avail.: CASI: A12, Hardcopy

The present study deals with the effects of sparsely distributed three-dimensional elements on two-dimensional (2-D) and three-dimensional (3-D) turbulent boundary layers (TBL) in three parts: Part 1 with isolated cylinders in the turbulent boundary layers, thus considering the effect of a single perturbation on the TBL; Part 2 when the same individual elements were placed in a sparse and regular distribution, thus showing the response of the flow to a sequence of perturbations; and Part 3, with the distributions subjected to 3-D turbulent boundary layers, thus examining the effects of streamwise and spanwise pressure gradients on the same perturbed flows as considered in Part 2. The 3-D turbulent boundary layers were generated by an idealized wing-body junction flow. Detailed 3-velocity-component Laser-Doppler Velocimetry (LDV) and other measurements were carried out to understand and describe the rough-wall flow structure around the elements. The measurements include mean velocities, turbulence quantities (Reynolds stresses and triple products), skin friction, surface pressure and oil flow visualizations in 2-D and 3-D rough-wall flows for Reynolds numbers, based on momentum thickness, greater than 7000. For the 2-D rough-wall flows, the roughness Reynolds numbers, k', based on the element height (k) and the friction velocity (Ur), range from 26 to 131. When these elements are placed in a distribution, the roughness elements create a large region of back flow behind them which is continuously replenished by faster moving fluid flowing through the gaps in the rough-wall. The fluid in the back flow region moves upward as low speed ejections where it collides with the inrushing high speed flow, thus, leading to a strong mixing of shear layers. This is responsible for the generation of large levels of turbulent kinetic energy (TKE) in the vicinity of the element height.
DTIC
Surface Roughness; Three Dimensional Flow; Turbulent Boundary Layer; Two Dimensional Flow; Walls

20070009206 Virginia Polytechnic Inst. and State Univ., Blacksburg, VA USA
An Experimental Study of Turbulent Boundary Layers Subjected to High Free-Stream Turbulence Effects
Orsi, Edgar; Simpson, Roger L; Dec 30, 2005; 109 pp.; In English
Contract(s)/Grant(s): F49620-03-1-0057
Report No.(s): AD-A462095; VPI-AOE-298; No Copyright; Avail.: CASI: A06, Hardcopy

The work presented in this thesis was on nominally two-dimensional turbulent boundary layers at zero pressure gradient subjected to high free-stream turbulent intensities of up to 7.9% in preparations for high free-stream turbulence studies on three-dimensional boundary layers. The two-dimensional turbulent flow that will impinge three-dimensional bodies needed to be characterized, before the three-dimensional studies can be made. An active turbulence generator designed to create high free-stream turbulence intensities in the wind tunnel was tested and modified in order to obtain the lowest possible mean flow non-uniformities. A seven-hole pressure probe was used to obtain planes of mean velocity measurements. A three-component state of the art laser-Doppler velocimeter (LDV) was used to obtain mean and fluctuating velocities. Previous high free-stream turbulence studies have been reviewed and are discussed, and some of the previously published data of other authors have been corrected. Based on the measurements obtained with the LDV, it was also determined that the semi-log law of the wall is valid for high free-stream turbulence cases, but with different constants than the ones proposed by Coles, where the constants for the high free-stream cases may be dependent on the turbulence intensity. For the first time, the skin friction coefficient (CO was deduced from the viscous sublayer. The difference between the Utau obtained in the viscous sublayer mean velocity profile and the Utau obtained in the semi-log layer was 1.5%. The skin friction coefficient was determined to increase by 10.5% when the two-dimensional turbulent boundary layer was subjected to high free-stream turbulence effects. Spectral data were compared to the von Karmen and Pope's model spectra; the von Karman spectrum was proven to fit slightly better. Finally the Hancoc-Bradshaw-Blair parameter agreed very well with previously published data.
DTIC
Free Flow; Turbulence Effects; Turbulent Boundary Layer

20070009208 Virginia Polytechnic Inst. and State Univ., Blacksburg, VA USA
Structure of Three-Dimensional Separated Flow on Symmetric Bumps
Byun, Gwibo; Nov 30, 2005; 288 pp.; In English
Contract(s)/Grant(s): N00014-99-1-0228; N00014-01-1-0421
Report No.(s): AD-A462097; VPI-AOE-297; No Copyright; Avail.: CASI: A13, Hardcopy

Surface mean pressures, oil flow visualization, and 3-velocity-component laser-Doppler velocimeter measurements are

presented for a turbulent boundary layer (TBL) of momentum thickness Reynolds number, Re(theta) and TBL thickness delta over two axisymmetric and one symmetric bump. LDV data were obtained at one plane x/H = 3.26 for each case. Vortical separations on the leeside merge into large stream-wise mean vortices downstream. The near-wall flow (y \h 90) is dominated by the wall. For the axisymmetric cases, the vortices in the outer region produce large turbulence levels near the centerline and appear to have low frequency motions that contribute to turbulent diffusion. For symmetrical bump there are sharper separation lines and lower turbulence intensities in the vortical downstream flow. Fine-spatial-resolution LDV measurements were also obtained on half of the leeside of the axisymmetric bump. Three-dimensional (3-D) separations occur on the leeside with one saddle separation on the centerline that is connected by a separation line to one focus separation on each side of the centerline. Downstream of the saddle point the mean backflow converges to the focal separation points in a thin region. The mean backflow zone is supplied by the intermittent large eddies as well as by the near surface flow from the side of the bump. The separated flow has a higher turbulent kinetic energy and shows bimodal histograms in local U and W , which appear to be due to highly unsteady turbulent motions. By the mode-averaged analysis of bimodal histograms, highly unsteady flow structures are estimated and unsteady 3-D separations seem to be occurring over a wide region on the bump leeside. Because of the variation of the mean flow angle in the separation zones, turbulent flow from different directions is non-correlated, resulting in lower shearing stresses. Farther from the wall, large stream-wise vortices form from flow around the sides of the bump.
DTIC
Separated Flow; Three Dimensional Flow; Turbulent Flow

20070009210 Virginia Polytechnic Inst. and State Univ., Blacksburg, VA USA
Effects of Spacing and Geometry of Distributed Roughness Elements on a Two-Dimensional Turbulent Boundary Layer
Stewart, Devin O; Simpson, Roger L; Dec 15, 2005; 198 pp.; In English
Contract(s)/Grant(s): N00014-01-1-0421
Report No.(s): AD-A462101; VPI-AOE-293; No Copyright; Avail.: CASI: A09, Hardcopy

This thesis is a study of the effects of distributed roughness elements on a two-dimensional turbulent boundary layer. Measurements were taken on a total of ten rough wall configurations: four involving Gaussian spikes, and six with circular cylindrical posts. Rough wall flows are particularly suited to study with Laser Doppler Velocimetry (LDV) due to the fact that measurements are required near a solid surface, as well has in highly turbulent fluid. The LDV system used in this study is a fine resolution (50pm), three-component, fiber-optic system. All mean velocities, Reynolds stresses, and triple products are measured. This study is unique in the range and variety of roughness cases for which data was taken. The data show that flow over a rough wall is characterized by high levels of turbulence near the roughness element peaks at the interface between low-speed, near-wall fluid and the higher speed fluid above. Behind an element, high-momentum fluid sweeps toward the wall, and there is a small region of ejection of low-momentum fluid. Cylindrical elements typically have larger magnitudes of turbulent stresses at their peaks compared to Gaussian elements. Trends in mean velocity profile parameters such as displacement height, roughness effect, and wake parameter are examined with respect to roughness element geometry and spacing.
DTIC
Spacing; Surface Roughness; Turbulent Boundary Layer; Two Dimensional Boundary Layer

20070009245 Puerto Rico Univ., Mayaguez, Puerto Rico
Humidity Contribution to the Refractive Index Structure Function C2n
Font, Carlos O; Chang, Mark P; Oh, Eun; Gilbreath, Charmaine; Jan 2006; 10 pp.; In English; Original contains color illustrations
Report No.(s): AD-A462151; No Copyright; Avail.: CASI: A02, Hardcopy

Humidity and C2n data collected from the Chesapeake Bay area during the 2003/2004 period have been analyzed. We demonstrate that there is an unequivocal correlation between the data during the same time periods, in the absence of solar insolation. This correlation manifests itself as an inverse relationship. We suggest that C2n in the infrared region is also a function of humidity, in addition to temperature and pressure.
DTIC
Humidity; Refractivity

20070009284 Naval Surface Warfare Center, Bethesda, MD USA
The Induced Forces and Motions of a Tumblehome Hullform (Model 5613) Undergoing Forced Roll
Fullerton, Anne M; Fu, Thomas C; Walker, Don C; Rice, James R; Hong, Young S; Dec 2006; 30 pp.; In English
Report No.(s): AD-A462207; NSWCCD-50-TR-2006/062; No Copyright; Avail.: CASI: A03, Hardcopy

Predictions of large amplitude roll motions and capsize events have proven to be difficult and include large uncertainty. One of the reasons for this is a lack of knowledge of resultant forces and moments for large roll angles. Currently, the equations used by numerical models to predict forces and moments due to roll motion are based on experimental data performed within a small range of roll amplitudes. A data set of forces and moments is necessary to verify that the model predictions are accurate in the upper ranges, or to develop new models to predict the forces and moments for these larger roll amplitudes. In 2005, the Naval Surface Warfare Center, Carderock Division, tested NSWC Model 5613, a tumblehome hullform, with the primary objective of obtaining model scale constrained seakeeping results to provide information necessary to perform verification of surge, sway, heave forces and motions, and roll, pitch, and yaw moments and motions acting on a surface combatant hull during large amplitude motions and capsize events. This report describes the testing and the resultant acquired data and begins to establish a database defining non-linear forces and moments associated with large amplitude motions and capsize events. DTIC

Amplitudes; Motion; Roll

35
INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography. For aerial photography see *43 Earth Resources and Remote Sensing*. For related information see also *06 Avionics and Aircraft Instrumentation*; and *19 Spacecraft Instrumentation and Astrionics*.

20070007357 Mitre Corp., Bedford, MA USA
Finite Sampling Considerations for GMTI STAP and Sensor Modeling
Guella, T P; Suresh Babu, B M; Sep 2003; 30 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F19628-99-C-0001; Proj-03035518-CC
Report No.(s): AD-A460216; MTR-03-B00000-75; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460216

The continuing objectives of Project 5518 are to develop and enhance the simulation capabilities for evaluating advanced modular sensor designs such as MP-RTIP and Global Hawk. The use of reduced subspace Space Time Adaptive Processing (STAP) architectures increases the probability of detection and improves the minimum detectable velocity (MDV). References [1 and 2] discuss the details of earlier steady state performance evaluation for a Global Hawk weight compliant system using these architectures. This report will present the effects of finite sampling on system performance using the properties of the Wishart distribution and will present a method by which some of the finite sample losses may be recovered through subaperture processing to improve the performance. DTIC

Detection; Sampling; Simulation; Target Acquisition

20070007361 Prins Maurits Lab. TNO, Rijswijk, Netherlands
Overview of Anti-Terrorism Related Research Ongoing at the TNO Defence Research Organisation
Doormaal, J C van; Absil, L H; Oct 25, 2004; 15 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460223; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA460223

No abstract available

Security; Terrorism

20070007363 Naval Research Lab., Washington, DC USA
Infrared Detection and Geolocation of Gunfire and Ordnance Events from Ground and Air Platforms
Pauli, Myron; Seisler, William; Price, Jamie; Williams, Al; Maraviglia, Carlos; Evans, Robert; Moroz, Stanley; Ertem, M C; Heidhausen, Eric; Burchick, Duane A; Oct 25, 2004; 36 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460225; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460225

No abstract available

Gunfire; Guns (Ordnance); Infrared Detectors; Ordnance; Position (Location)

20070007427 Naval Postgraduate School, Monterey, CA USA

Assessing the Ability of Hyperspectral Data to Detect Lyngbya SPP.: A Potential Biological Indicator for Presence of Metal Objects in the Littoral Environment

Blankenship, James R; Dec 2006; 261 pp.; In English; Original contains color illustrations

Report No.(s): AD-A460474; No Copyright; Avail.: CASI: A12, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460474

The aquatic filamentous bacteria (Cyanobacterium) Lyngbya majuscula is a nitrogen-fixer found in coastal waters often attached or adjacent to sea grass, algae and coral. It is characterized by phycobiliproteins, unique pigments found only in cyanobacteria. To sustain photosynthesis and nitrogen fixation, L. majuscula requires iron proteins and is therefore sensitive to the availability of this metal. The hypothesis tested in this study concerns the potential use of hyperspectral imaging in detecting L. majuscula in coastal regions as biological indicators for the presence of iron debris or metal objects in the littoral environment. This concept would have potential benefits and applications in mine detection and countermeasure techniques. Using a USB2000 field spectroradiometer, a spectral library was developed for the benthic substrates of Midway Atoll, Northwest Hawaiian Islands, spectrally characterizing L. majuscula and the surrounding coral reef substrates. The data was analyzed to determine unique spectral characteristics of the benthic cyanobacteria in a mixed coral environment and evaluated against the resampled spectral resolution of a number of hyperspectral sensors. The results of the in situ spectroscopy suggest a strong potential for all three sensors to detect these cyanobacteria in a mixed coral reef environment at four distinct wavelengths attributable to phycobiliprotein pigment absorptions unique to cyanobacteria. Of these four discriminative absorption ranges, the phycoerythrin absorption of 565-576 nm shows the greatest potential for segregating cyanobacteria from a mixed algal/ coral / sand environment so long as the coral Montipora spp. is not present within the scene, since it has an overlapping absorption in those wavelengths. In the presence of Montipora corals, these cyanobacteria are more difficult to detect.

DTIC

Bacteria; Detection; Imagery; Iron; Metals; Regions; Remote Sensing

20070007444 Naval Postgraduate School, Monterey, CA USA

Digital Array Radar for Ballistic Missile Defense and Counter-Stealth Systems Analysis and Parameter Tradeoff Study

Bacchus, Carla; Bedford, David; Dailey, Paul; Hill, Stanley; Barford, Ian; Chung, Jack; Hazle, Robert; Mihocka, Mark; Sep 14, 2006; 304 pp.; In English; Original contains color illustrations

Report No.(s): AD-A460500; NPS-SE-06-001; No Copyright; Avail.: CASI: A14, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460500

USA Navy (USN) sources indicate a need for long-range shipboard radar for the Ballistic Missile Defense (BMD) program to augment and expand the USN's current capabilities. The Naval Postgraduate School (NPS) conducted a study on radar architecture research based on a digital Opportunistic Array (OA) integrated into a ship's hull. Our research defined the operational and technical requirements for the system, called the Digital Array Radar for BMD and Counter-stealth (DARBC). Initial analysis included characterization of the threat and definition of the Concept of Operations (CONOPS). Basic operational Key Performance Parameters (KPPs) were defined. Based on a notional ballistic missile Radar Cross Section (RCS), a radar technical parameters study derived the technical requirements for the radar necessary to meet the KPPs. Related research topics included radar parameter sensitivity, cooling, search pattern options, Electronic Attack (EA), ship flexure, topside array layout, supportability, and cost. Finally, reaction time modeling was conducted to quantify the increase in search volume and decision making time using the DARBC.

DTIC

Antimissile Defense; Ballistic Missiles; Digital Radar Systems; Digital Systems; Missile Defense; Radar Equipment; Systems Analysis; Tradeoffs

20070007660 California Univ., Santa Cruz, CA USA

An Adaptive Framework for Image and Video Sensing

Zimet, Lior; Shahram, Morteza; Milanfar, Peyman; Mar 2005; 13 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F49620-03-1-0387

Report No.(s): AD-A460915; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460915

Current digital imaging devices often enable the user to capture still frames at a high spatial resolution, or a short video clip at a lower spatial resolution. With bandwidth limitations inherent to any sensor, there is clearly a tradeoff between spatial and temporal sampling rates, which can be studied, and which present-day sensors do not exploit. The fixed sampling rate that

is normally used does not capture the scene according to its temporal and spatial content and artifacts such as aliasing and motion blur appear. Moreover, the available bandwidth on the camera transmission or memory is not optimally utilized. In this paper, we outline a framework for an adaptive sensor where the spatial and temporal sampling rates are adapted to the scene. The sensor is adjusted to capture the scene with respect to its content. In the adaptation process, the spatial and temporal content of the video sequence are measured to evaluate the required sampling rate. We propose a robust, computationally inexpensive, content measure that works in the spatio-temporal domain as opposed to the traditional frequency domain methods. We show that the measure is accurate and robust in the presence of noise and aliasing. The varying sampling rate stream captures the scene more efficiently and with fewer artifacts such that in a post-processing step an enhanced resolution sequence can be effectively composed or an overall lower bandwidth for the capture of the scene can be realized, with small distortion.
DTIC
Detection; Digital Systems; Image Processing; Imaging Techniques

20070008030 Naval Postgraduate School, Monterey, CA USA
Total Ownership Cost Reduction Case Study: AEGIS Radar Phase Shifters
Bridger, Wray W; Ruiz, Mark D; Dec 2006; 69 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460426; No Copyright; Avail.: CASI: A04, Hardcopy

The goal of this research is to provide a case study that captures the production and design processes and program management solutions used to reduce total ownership costs of AEGIS Radar Phase Shifters. Specifically, it will focus on the design and redesign of the SPY-1 radar phase shifter; a redesign that dramatically improved performance without increasing Average Procurement Unit Costs (APUC). The researchers will analyze various process-improvement projects (PIP) used to reduce touch-labor and improve production process yield (percentage of manufactured items that are defect-free) of SPY-1B/D phase shifters, and will review programs that improved phase shifter production either directly or indirectly, i.e., consolidated purchasing, lean and six sigma, productivity improvement projects, etc. This case study was conducted with the sponsorship and assistance of the Acquisition Research Program, Graduate School of Business and Public Policy, Naval Postgraduate School, Monterey, CA.
DTIC
Cost Reduction; Phase Shift; Radar Equipment

20070008102 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Microshutter Arrays for the JWST NIRSpec
Moseley, Samuel H.; [2006]; 1 pp.; In English; XXVIth General Assembly of the international Astronomical Union, 14-25 Aug. 2006, Prague, Czech Republic; No Copyright; Avail.: Other Sources; Abstract Only

A primary goal of the James Webb Space Telescope (JWST) is to characterize the birth and evolution of galaxies by imaging and spectroscopic observations. The telescope will use a Near Infrared Camera and a Near Infrared Spectrometer (NIRSpec) to carry out this program. The 3.6 x 3.6 field of NIRSpec will contain thousands of candidate high redshift galaxies. With such a high candidate object density, simultaneous multi-object capability is essential. This capability requires a programmable object selection mask to eliminate sky background and to reduce source confusion caused. We are developing a two-dimensional programmable field mask for NIRSpec. These masks employ micromechanical (MEMS) techniques to provide source selection over the NIRSpec field of view. The first flight format arrays (171x365 shutters) have been fabricated and full functionality of these arrays has been demonstrated in lab tests. Qualification tests are in progress to demonstrate readiness for flight, and will be complete in the early fall of 2006. In this paper, I describe performance of this critical new technology, and progress in making the devices ready for a 2008 delivery to ESA for inclusion in the NIRSpec.
Author
James Webb Space Telescope; Microelectromechanical Systems; Field of View; Imaging Techniques; Galactic Evolution; Performance Tests

20070008117 Mitre Corp., Bedford, MA USA
Conversion Between Sine Wave and Square Wave Spatial Frequency Response of an Imaging System
Nill, Norman B; Jul 2001; 44 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAB07-01-C-C201; Proj-0701E02X
Report No.(s): AD-A460454; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460454

The spatial frequency response of an imaging system, known as the Modulation Transfer Function (MTF), is a primary image quality metric that is commonly measured with a sine wave target. The FBI certification program for commercial fingerprint capture devices, which MITRE actively supports, has an MTF requirement. In some cases, however, a square wave ('bar target') must be used in testing, which results in a similar quantity called the Contrast Transfer Function (CTF). This document reports on an investigation of the mathematical relationship between the MTF and CTF, methods for converting between the two, and derives an equivalent CTF from the given spec MTF, for use in the FBI certification program. The methodology presented is applicable to the general case, i.e., whenever conversion between the MTF and CTF of an imaging system is needed.
DTIC
Frequency Response; Image Processing; Imaging Techniques; Modulation Transfer Function; Sine Waves; Square Waves; Transfer Functions

20070008206 NASA Wallops Flight Center, Wallops Island, VA, USA
GEOSAT Follow-On (GFO) Altimeter Document Series, Volume 8: GFO Altimeter Engineering Assessment Report Update:The First 109 Cycles Since Acceptance November 29, 2000 to December 26, 2005, Version 1, Volume 8
Conger, A. M.; Hancock, D. W., III; Hayne, G. S.; Brooks, R. L.; October 13, 2006; 146 pp.; In English
Report No.(s): NASA/TM-2006-209984/Ver.11/VOL8; Copyright; Avail.: CASI: A07, Hardcopy

The purpose of this document is to present and document GFO performance analyses and results. This is the fifth Assessment Report since the initial report. This report extends the performance assessment since acceptance to 26 December 2005. The initial GFO Altimeter Engineering Assessment Report, March 2001 (NASA/TM-2001-209984/Ver.1/Vol.1) covered the GFO performance from Launch to Acceptance (10 February 1998 to 29 November 2000). The second of the series covered the performance from Acceptance to the end of Cycle 20 (29 November 2000 to 21 November 2001). The third of the series covered the performance from Acceptance to the end of Cycle 42 (29 November 2000 to 30 November 2002). The fourth of the series covered the performance from Acceptance to the end of Cycle 64 (29 November 2000 to 17 December 2003). The fifth of the series covered performance from Acceptance to the end of Cycle 86 (29 November 2000 to 17 December 2004). Since launch, we have performed a variety of GFO performance studies; an accumulative index of those studies is provided in Appendix A.
Author
Altimeters; GEOSAT Satellites; Engineering; Instrument Packages

20070008497 SRI International Corp., Menlo Park, CA USA
A Forward-Looking High-Resolution GPR System
Kositsky, Joel; Milanfar, Peyman; Apr 1999; 12 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD07-98-C-6007
Report No.(s): AD-A461034; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461034

A high-resolution ground penetrating radar (GPR) system was designed to help define the optimal radar parameters needed for the efficient standoff detection of buried and surface-laid antitank mines. The design requirements call for a forward-looking GPR capable of detecting antitank mines in a 5 to 8 meter wide swath, 7 to 60 meters in front of a mobile platform. The system has a resolution goal of 15 cm both in range and azimuth. The range and azimuthal resolutions are achieved by using a 2.7 GHz bandwidth and a 4 meter synthetic aperture, respectively. The system uses a fully coherent homodyne stepped-frequency approach with a modulation scheme that produces range dependent power gain to partially offset range losses. Transmit power of 1 to 10 W is available over the entire band, and a large effective dynamic range was built into the receiver. The antennas are mounted on separate transmit and receive computer-controlled high-precision linear drives for creating the synthetic aperture. A data scan entails stepping through all the frequencies, polarizations, and antenna positions before the van is driven forward for the next scan. Preliminary data, the resulting images, and preliminary work on automatic target detection will be presented.
DTIC
Ground Penetrating Radar; High Resolution

20070008526 Army Tank-Automotive and Armaments Command, Warren, MI USA
Embedded Diagonostics in Combat Systems
Miles, Christopher; Bankowski, Elena; Feb 10, 2004; 9 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461083; 13999; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461083

Diagnostics capability of combat systems shall be compatible with the Army Diagnostic Improvement Program. Present systems are capable of performing health monitoring and health checks using internal embedded resources. They employ standard sensors and data busses that monitor data signals and built-in test (BIT). These devices provide a comprehensive source of data to accomplish an accurate system level diagnostics and fault isolation at line replaceable unit (LRU) level. Prognostics routines provide capability to identify the cause of predicted failure and corrective action to prevent unscheduled maintenance action. Combat systems health status and prognostic information are displayed to operator, crew, and maintenance personnel. Present systems use common data/information interchange network in accordance with standard defined in the Joint Technical Architecture (JTA) to provide access to vehicle's health data. The technology% utilized in present systems include embedded diagnostics, combat maintainer, schematic viewer, etc. Implementation of these technologies significantly reduced maintenance hours of combat systems Health monitoring, diagnostics and prognostics of future systems will utilize federated software and process approach.
DTIC
Combat; Detectors; Embedding; Weapon Systems

20070008588 Nebraska Univ., Lincoln, NE USA
A Set of New Sea Ice Feature Descriptors for SAR Images
Soh, Leen-Kiat; Jan 2002; 22 pp.; In English
Contract(s)/Grant(s): N00014-95-C-6038
Report No.(s): AD-A461182; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461182

In this paper, we present a set of algorithms for describing sea ice features in SAR images. These algorithms we have implemented and incorporated in the ARKTOS software package, an intelligent sea ice classification. These algorithms have unique characteristics. Some are extensions or adaptations of existing image processing techniques to the specific problem domain of satellite sea ice classification, while some are innovative designs, inspired by the aforementioned problem domain. These feature descriptors may be generalized to other remote sensing applications.
DTIC
Radar Imagery; Sea Ice; Synthetic Aperture Radar; Terms

20070008597 University of Southern California, Marina del Rey, CA USA
INSPECT: A Tool to Evaluate Air Campaign Plans
Valente, Andre; Gil, Yolanda; Swartout, William; Jan 1997; 8 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DABT63-95-C-0059
Report No.(s): AD-A461199; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461199

INSPECT is a mixed-initiative plan evaluation tool in the domain of air campaign planning that has been a central component of several major DARPA demonstrations of integrated planning environments and tools. The creation process of an air campaign plan is manually driven at its higher levels, and because plans are complex and always changing they often (our experience says always) contain errors or inconsistencies. INSPECT evaluates user-generated plans and alerts the user about inconsistencies and potential problems. INSPECT has received wide acceptance by air campaign planning experts, and is currently undergoing new extensions and further integrations with other tools in this domain. The paper describes our work on INSPECT, analyzes the key contributions of this tool, and draws some conclusions about the design and integration of planning applications.
DTIC
Planning; Warning Systems

20070008694 Army Aviation and Missile Command, Redstone Arsenal, AL USA
AMRDEC's HWIL Synthetic Environment Development Efforts for LADAR Sensors
Kim, Hajin J; Cornell, Michael C; Naumann, Charles B; Jan 2004; 13 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461374; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461374

Hardware-in-the-loop (HWIL) testing has been an integral part of the modeling and simulation efforts at the U.S. Army Aviation and Missile Command's (AMCOM) Aviation and Missile Research, Engineering, and Development Center (AMRDEC). ACOM's history includes the development and implementation of several unique technologies for producing

synthetic environments in the visible infrared MMW and RF regions. With the emerging sensor/electronics technology LADAR sensors are becoming more viable option as an integral part of weapon systems, and AMCOM has been expending efforts to develop the capabilities for testing LADAR sensors in a HWIL environment. There are several areas of challenges in LADAR HWIL testing since the simulation requirements for the electronics and computation are stressing combinations of the passive image and active sensor HWIL testing. There have been several key areas where advancement have been made to address the challenges in developing a synthetic environment for the LADAR sensor testing. In this paper we will present the latest results from the LADAR projector development and test efforts at AMCOM's Advanced Simulation Center (ASC).
DTIC
Laser Range Finders; Optical Measuring Instruments; Optical Radar

20070008714 Optical Sciences Corp., Huntsville, AL USA
Advancements in the Micromirror Array Projector Technology
Beasley, D B; Bender, Matt; Crosby, Jay; Messer, Tim; Saylor, Daniel A; Jan 2003; 13 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAH01-00-C-R093
Report No.(s): AD-A461443; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461443

The Micromirror Array Projector System (MAPS) is a state-of-the-art dynamic scene projector developed by Optical Sciences Corporation (OSC) for Hardware-In-the-Loop (HWIL) simulation and sensor test applications. Since the introduction of the first MAPS in 2001, OSC has continued to improve the technology and develop systems for new projection and test applications. The MAPS is based upon the Texas Instruments Digital Micromirror Device (DMD)TM which has been modified to project high resolution, realistic imagery suitable for testing sensors and seekers operating in the UV, visible, NIR, and IR wavebands. This paper reviews the basic design and describes recent developments and new applications of the MAPS technology. Recent developments for the MAPS include increasing the format of the micromirror array to 1024x768 and increasing the binary frame rate to 10KHz. The MAPS technology has also been applied to the design of a Mobile Extended Spectrum Electro-Optical Test Set (MESEOTS). This test set is designed for testing UV, visible, NIR and IR sensors as well as laser rangefinders, laser trackers, and laser designators. The design and performance of the improved MAPS and the MESEOTS are discussed in paper.
DTIC
Arrays; Photographs; Projectors

20070008716 Optical Sciences Corp., Huntsville, AL USA
Application of Multiple IR Projector Technologies for AMCOM HWIL Simulations
Beasley, D B; Saylor, Daniel A; Jan 1999; 10 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461445; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461445

This paper describes the application of multiple IR projector technologies to Hardware-in-the-Loop (HWIL) simulations at the US Army Aviation and Missile Command's (AMCOM) Missile Research, Development, and Engineering Center (MRDEC). Several projectors utilizing a variety of emerging technologies are currently being successfully applied within the HWIL facilities of AMCOM's MRDEC. Projector technologies utilized at AMCOM include laser diode array projectors (LDAP). Honeywell's bright resistive infrared thermal emitter (BRITE) arrays, an IR zoom projector with thermoscenes, and steerable point source projectors. Future plans include a new resistor array projector called the Multispectral Infrared Animation Generation Equipment (MIRAGE). which is being manufactured by Santa Barbara Infrared. These projector technologies have been used to support multiple HWIL test entries of various seeker configurations. Seeker configurations tested include: two InSb 256x256 FPAs. an InSb 512x512 FPA. a PtSi 640X480 FPA. a PtSi 256x256 FRA. a HgCdTe 256x256 FPA. a scanning linear array, and an uncooled 320x240 microbolometer FPA. The application, capabilities, and performance of each technology are reviewed in the paper. Example imagery collected from each operational system is also presented.
DTIC
Photographs; Projectors; Simulation

20070008864 Massachusetts Univ., Lowell, MA USA

Terahertz Behavior of Optical Components and Common Materials

Gatesman, Andrew J; Danylov, Andriy; Goyette, Thomas M; Dickinson, Jason C; Giles, Robert H; Goodhue, William; Waldman, Jerry; Nixon, William E; Hoen, Weber; May 2006; 13 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DASC-01-01-C-0011; F19628-00-C-0002

Report No.(s): AD-A461642; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461642

As short range, ground based, surveillance systems operating at terahertz frequencies continue to evolve, increasing attention is being directed towards the behavior of dielectric materials at terahertz frequencies as well as the behavior of optical components used to control terahertz radiation. This work provides an overview of several terahertz optical components such as frequency selective filters, laser output couplers, artificial dielectrics, and electromagnetic absorbers. In addition, a database was established that contains terahertz properties of common materials that have been largely unexplored in this region of the spectrum. The database consists of transmittance and reflectance spectra of a variety of materials measured using Fourier transform infrared spectroscopy techniques from 175 GHz - 2 THz. In addition, ultra-stable, CO2 optically pumped, far-infrared gas lasers were used to collect fixed-frequency transmittance data at 326 GHz, 584 GHz, and 1.04 THz. A Gunn oscillator was used for measurements at 94 GHz.

DTIC

Dielectric Properties; Optical Equipment

20070008968 National Ground Intelligence Center, Charlottesville, VA USA

A Variability Study of Ka-Band HRR Polarimetric Signatures on Eleven T-72 Tanks

Nixon, W E; Neilson, H J; Szatkowski, G N; Giles, R H; Kersey, W T; Perkins, L C; Waldman, Jerry; Sep 1998; 18 pp.; In English; Original contains color illustrations

Report No.(s): AD-A461833; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461833

In an effort to effectively understand signature verification requirements through the variability of a structure's Radar Cross Section (RCS) characteristics, the U.S. Army National Ground Intelligence Center (NGIC), with technical support from the Submillimeter-Wave Technology Laboratory (STL), University of Massachusetts, Lowell, MA, originated a signature project plan to obtain millimeter-wave (MMW) signatures from multiple similar tanks. In implementing this plan, NGIC/STL directed and sponsored turntable measurements performed by the U.S. Army Research Laboratory (ARL) Sensors and Electromagnetic Resource Directorate on eleven T-72 tanks using a high-range resolution (HRR) full-polarimetric Ka-band radar. The physical condition and configuration of these vehicles were documented by careful inspection and then photographed during the acquisition sequence at 45 azimuth intervals. The turntable signature of one vehicle was acquired eight times over the 3-day signature acquisition period for establishing measurement variability on any single target. At several intervals between target measurements, the turntable signature of a 30 square meter trihedral also was acquired as a calibration reference for the signature library. Through an RCS goodness-of-fit correlation and ISAR comparison study, the signature-to-signature variability was evaluated for the 18 HRR turntable measurements of the T-72 tanks. This signature data is available from NGIC on request for Government Agencies and Government Contractors with an established need-to-know.

DTIC

Extremely High Frequencies; Polarimetry; Radar Cross Sections; Radar Signatures; Signatures; Target Recognition; Variability

20070008994 Massachusetts Univ., Lowell, MA USA

Three Dimensional Fully Polarimetric W-Band ISAR Imagery of Scale-Model Tactical Targets Using a 1.56THz Compact Range

Goyette, Thomas M; Dickinson, Jason C; Waldman, Jerry; Nixon, William E; Sep 2003; 10 pp.; In English

Report No.(s): AD-A461883; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461883

No abstract available

Imagery; Polarimetry; Radar Imagery; Scale Models; Synthetic Aperture Radar; Targets

20070008996 Massachusetts Univ., Lowell, MA USA

An Analysis of Fully Polarimetric W-Band ISAR Imagery on Seven Scale Model Main Battle Tanks for Use in Target Recognition

Goyette, Thomas M; Dickinson, Jason C; Giles, Robert H; Kersey, William T; Waldman, Jerry; Nixon, William E; Aug 2002; 10 pp.; In English

Report No.(s): AD-A461887; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461887

No abstract available

Imagery; Polarimetry; Radar Imagery; Scale Models; Signatures; Synthetic Aperture Radar; Target Recognition; Targets

20070008998 Massachusetts Univ., Lowell, MA USA

Fully Polarimetric W-Band ISAR Imagery of Scale-Model Tactical Targets Using a 1.56THz Compact Range

Goyette, Thomas M; Dickinson, Jason C; Waldman, Jerry; Nixon, William E; Carter, Steve; Aug 2001; 13 pp.; In English; Original contains color illustrations

Report No.(s): AD-A461895; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461895

No abstract available

Imagery; Polarimeters; Polarimetry; Radar Imagery; Scale Models; Synthetic Aperture Radar; Targets

20070009005 Massachusetts Univ., Lowell, MA USA

X-Band ISAR Imagery of Scale-Model Tactical Targets Using a Wide Bandwidth 350GHz Compact Range

Goyette, Thomas M; Dickinson, Jason C; Gorveatt, William J; Waldman, Jerry; Nixon, William E; Jan 2004; 11 pp.; In English; Original contains color illustrations

Report No.(s): AD-A461915; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461915

No abstract available

Bandwidth; Imagery; Radar Cross Sections; Radar Imagery; Scale Models; Signatures; Superhigh Frequencies; Synthetic Aperture Radar; Targets

20070009091 Massachusetts Univ., Lowell, MA USA

A 1.56THz Compact Radar Range for W-Band Imagery of Scale-Model Tactical Targets

Goyette, Thomas M; Dickinson, Jason C; Waldman, Jerry; Nixon, William E; Aug 2000; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A461903; No Copyright; Avail.: CASI: A02, Hardcopy

No abstract available

Detection; Imagery; Radar Imagery; Radar Range; Scale Models; Target Acquisition; Target Recognition; Targets

20070009106 Massachusetts Univ., Lowell, MA USA

W-Band Polarimetric Scattering Features of a Tactical Ground Target Using a 1.56THz 3D Imaging Compact Range

Culkin, Daniel R; DeMartinis, Guy B; Goyette, Thomas M; Dickinson, Jason C; Waldman, Jerry; Nixon, William E; Jan 2001; 12 pp.; In English

Report No.(s): AD-A461947; No Copyright; Avail.: CASI: A03, Hardcopy

No abstract available

Detection; Imaging Techniques; Polarimeters; Polarimetry; Scattering; Target Acquisition; Target Recognition; Targets

20070009112 Massachusetts Univ., Lowell, MA USA

A Study of the X-Band Radar Signature Characteristics for Main Battle Tanks in Operational Environments

Giles, R H; Kersey, W T; Gatesman, A J; Coulombe, M J; McFarlin, M S; Finley, R; Nixon, W E; Aug 2002; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A461955; No Copyright; Avail.: CASI: A02, Hardcopy

An analysis of target separability has been performed under an OSD Target Management Initiative program entitled Radar Variations.(1,3,5,7) The program has concentrated on analyzing radar signatures from multiple main battle tanks(MBTs) in order to quantify the differences in Ka-band signatures of vehicles due to intraclass and interclass target variations. As a

significant factor in the success of the Radar Variations program, U Mass Lowells Submillimeter-Wave Technology Laboratory (STL) and U.S. Army National Ground Intelligence Center (NGIC) fabricated 1/16th scale exact replicas of the vehicles used in the Ka-band radar signature acquisition study directed by Simulation Technologies, Inc. (SimTech) and Targets Management Office (TMO). These replicas enabled NGIC to measure statistically significant amounts of highfidelity signature data for a variety of target configurations with an indoor compact radar range. (3,7)
DTIC
Radar Signatures; Superhigh Frequencies

20070009113 Massachusetts Univ., Lowell, MA USA
A Study of Target Variability and Exact Signature Reproduction Requirements for Ka-Band Radar Data
Giles, R H; Kersey, W T; McFarlin, M S; Finley, R; Neilson, H J; Nixon, W E; Aug 2001; 11 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461956; No Copyright; Avail.: CASI: A03, Hardcopy

A variety of ATR algorithms have promised improved performance, not yet realized operationally. Typically, good results have been reported on data sets of limited size that have been tested in a laboratory environment, only to see the performance degrade when stressed with real-world target and environmental variability. To investigate exact signature reproduction requirements along with target and environment variability issues for stressing new ATR metrics, the U.S. Army s National Ground Intelligence Center (NGIC) and Targets Management Office (TMO) originated, sponsored, and directed a signature project plan to acquire multiple target full-polarimetric Ka-band radar signature data at Eglin AFB, as well as its submillimeter-wave compact radar range equivalent using high-fidelity exact 1/16th scale replicas fabricated by the ERADS program. To effectively understand signature reproduction requirements through the variability of multiple target RCS characteristics, TMO and NGIC sponsored researchers at U Mass Lowell s Submillimeter-Wave Technology Laboratory (STL) and Simulation Technologies (SimTech) to analyze the intra-class and inter-class variability of the fullscale Ka-band turntable signature data. NGIC, TMO, STL and SimTech researchers then traveled to the location of the vehicles measured at Eglin AFB and conducted extensive documentation and mensuration on these vehicles. Using this information, ERADS built high fidelity, articulatable exact replicas for measurement in the NGIC s compact radar ranges. Signal processing software established by STL researchers in an NGIC directed signature study was used to execute an HRR and ISAR cross-correlation study of the field and scale-model signature data. The signature-to-signature variability quantified is presented, along with a description and examples of the signature analysis techniques exploited.
DTIC
Extremely High Frequencies; Radar Data; Radar Imagery; Signatures; Target Recognition; Targets; Variability

20070009115 Massachusetts Univ., Lowell, MA USA
Physical Scale Modeling of VHF/UHF SAR Collection Geometries
Beaudoin, C; Gatesman, A; Clinard, M; Waldman, J; Giles, R; Nixon, W; Apr 2004; 7 pp.; In English
Report No.(s): AD-A461959; No Copyright; Avail.: CASI: A02, Hardcopy

A method of physically modeling a linear flight path SAR collection in a scale-model VHF/UHF ISAR facility is presented. Accurate modeling of a SAR's collection geometry is necessary if meaningful comparisons are to be made between scale-model and field imagery. The advantage of collecting data in a linear flight path geometry is that height-unlimited focusing of scatterers can be achieved. The technique utilizes precise orientation of the target's azimuth and elevation relative to the fixed radar antenna, thereby effectively simulating a linear flight path collection. The impact of such a collection at VHF/UHF frequencies is demonstrated by comparing linear flight path ISAR imagery with traditional fixed grazing angle ISAR imagery. Both simulated and instrumented imagery will be presented.
DTIC
High Frequencies; Synthetic Aperture Radar; Ultrahigh Frequencies; Very High Frequencies

20070009244 Massachusetts Univ., Lowell, MA USA
Physical Scale Modeling the Millimeter-Wave Backscattering Behavior of Ground Clutter
Gatesman, A J; Goyette, T M; Dickinson, J C; Waldman, J; Neilson, J; Nixon, W E; Sep 2001; 13 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAHC90-96-C-0011
Report No.(s): AD-A462149; No Copyright; Avail.: CASI: A03, Hardcopy

The VV-polarized W-band backscattering behavior of homogeneous ground clutter has been investigated by measuring

the radar cross section per unit area of 1/16th scale rough surface terrain in a 1.56 THz compact radar range. An array of scale model ground planes was fabricated with the appropriate roughness to model smooth to rough soil terrain. In addition to studying the backscattering behavior as a function of surface roughness, the dependence on soil moisture content was also characterized by tailoring the dielectric constant of the scale models. Radar imagery of the rough surfaces were acquired in a 1.56 THz compact radar range by collecting single frequency backscatter data over a solid angle in both azimuth and elevation. The data were Fourier transformed in both the azimuth and elevation directions to produce two-dimensional imagery. The backscattering coefficient per unit illuminated area (sigma(exp 0)) was calculated as a function of elevation angle between 5 degrees and 85 degrees. The results of this work have been used in the fabrication of scale model ground planes for collection of W-band radar imagery from scaled threat targets in realistic environments. Backscattering data, including clutter statistics, are compared to Wband clutter data found in the literature.
DTIC
Backscattering; Clutter; Ground Effect (Communications); Millimeter Waves

20070009265 Battelle Memorial Inst., Columbus, OH USA
Impacts of Fire Ecology Range Management (FERM) on the Fate and Transport of Energetic Materials on Testing and Training Ranges
Foote, Eric; Apr 2006; 87 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DACA72-02-C-0038
Report No.(s): AD-A462175; No Copyright; Avail.: CASI: A05, Hardcopy

A growing concern exists that the accumulation of unexploded or unconsumed energetic compound residues in soils on military testing and training ranges represents a threat to human health and the environment and that the ultimate fate and transport of these compounds can be influenced by land management practices. One such practice may be prescribed or controlled burning, which is used on military training ranges for a variety of purposes including safety clearance prior to detection and demolition of unexploded ordnance (UXO), wildfire avoidance, and plant and wildlife management.
DTIC
Ammunition; Ecology; Education; Explosives; Explosives Detection; Fires; Land Management; Rangelands

20070009266 Nomadics, Inc., Stillwater, OK USA
Novel Technology for Wide-Area Screening of ERC-Contaminated Soils
Fisher, Mark; Jul 22, 2005; 18 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DACA72-01-C-0037
Report No.(s): AD-A462176; No Copyright; Avail.: CASI: A03, Hardcopy

Long-term use of high explosives (HE) on DoD training ranges and other defense installations has in some cases resulted in contamination of soil and groundwater with residues of HE and explosive-related compounds (ERCs). The vast majority of the millions of acres of DoD lands are likely free of contamination, or are contaminated at levels that cause little concern. Nevertheless, virtually all lands on all defense sites have become subject to more rigorous environmental monitoring and regulation. There is an urgent need for technologies that can rapidly detect, quantify, and delineate soils that contain contaminants associated with the use of energetic compounds. These technologies will give site managers the ability to perform cost-effective screening of large areas for possible contamination and to pinpoint specific areas of high contamination.
DTIC
Contamination; Explosives; Explosives Detection; Ground Water; Soils

20070009273 Catholic Univ. of America, Washington, DC USA
Composite Signature Based Watermarking for Fingerprint Authentication
Ahmed, Farid; Moskowitz, Ira S; Aug 9, 2005; 8 pp.; In English; Original contains color illustrations
Report No.(s): AD-A462186; XB-NRL/MR/5540; No Copyright; Avail.: CASI: A02, Hardcopy

Digital watermarking is a technology to hide information in digital media. We extend the digital watermarking technique Phasemark(trademark), originally developed solely for image authentication, to biometrics to assist in forensic analysis. Using a signature extracted from the Fourier phase of the original image, we hide an encoded signature back into the original image forming a watermarked image. The hiding occurs in the Fourier transform frequency domain. The detection process computes the Fourier transform of the watermarked images, extracts the embedded signature and then correlates it with a calculated signature. Various correlation metrics determine the identity degree of biometric authentication. We show how a composite

filter can be used in conjunction with Phasemark(trademark) for robust authentication of fingerprints.
DTIC
Biometrics; Computer Information Security; Security; Signatures

20070009321 Massachusetts Univ., Lowell, MA USA
A Signature Correlation Study of Ground Target VHF/UHF ISAR Imagery
Gatesman, A J; Beaudoin, C; Giles, R H; Kersey, W T; Waldman, J; Carter, S; Nixon, W E; Sep 2003; 13 pp.; In English; Original contains color illustrations
Report No.(s): AD-A462278; No Copyright; Avail.: CASI: A03, Hardcopy

VV and HH-polarized radar signatures of several ground targets were acquired in the VHF/UHF band (171- 342 MHz) by using 1/35th scale models and an indoor radar range operating from 6 to 12 GHz. Data were processed into medianized radar cross sections as well as focused, ISAR imagery. Measurement validation was confirmed by comparing the radar cross section of a test object with a method of moments radar cross section prediction code. The signatures of several vehicles from three vehicle classes (tanks, trunks, and TELs) were measured and a signature cross correlation study was performed. The VHF/UHF band is currently being exploited for its foliage penetration ability, however, the coarse image resolution which results from the relatively long radar wavelengths suggests a more challenging target recognition problem. One of the study's goals was to determine the amount of unique signature content in VHF/UHF ISAR imagery of military ground vehicles. Open-field signatures are compared with each other as well as with simplified shapes of similar size. Signatures were also acquired on one vehicle in a variety of configurations to determine the impact of minor target variations on the signature content at these frequencies.
DTIC
Cross Correlation; High Frequencies; Imagery; Radar Imagery; Signatures; Targets; Ultrahigh Frequencies; Very High Frequencies

20070009325 Massachusetts Univ., Lowell, MA USA
Acquisition and Analysis of X-Band Moving Target Signature Data Using a 160 GHz Compact Range
Giles, R H; Neilson, H J; Healy, Jr , D M; Grayson, T; Williams, R; Nixon, W E; Oct 2001; 12 pp.; In English; Original contains color illustrations
Report No.(s): AD-A462283; No Copyright; Avail.: CASI: A03, Hardcopy

Acquisition of full-polarimetric millimeter-wave, or microwave, moving target signature sets sufficient for developing ATR algorithms have proven to be costly and difficult to achieve operationally. Thorough investigations involving moving targets are often hindered by the lack of rigorously consistent signature data for a sufficient number of targets across requisite viewing angles, articulations and environmental conditions. Under the support of DARPA's TRUMPETS (through Mission Research Corporation) and AMSTE programs in conjunction with the US Army National Ground Intelligence Center (NGIC), X-band far-field turntable signature data has been acquired on 1/16th scaled models of the Bradley and BTR-70 vehicles specifically constructed for moving target investigations using ERADS 160 GHz fully polarimetric compact range. The tracks/wheels of the scale models were translated incrementally as the radar's transmit frequency was stepped across a 10.5 GHz bandwidth. By acquiring a full frequency sweep at each track/wheel position with appropriate translation resolution, HRR RCS profiles of doppler-shifted body/track components were generated. HRR profiles of the equivalent stationary vehicle were also generated for analysis using the vehicle's HRR profiles for any given track position.
DTIC
Signatures; Superhigh Frequencies; Target Acquisition; Targets

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LASERS AND MASERS

Includes lasing theory, laser pumping techniques, maser amplifiers, laser materials, and the assessment of laser and maser outputs. For cases where the application of the laser or maser is emphasized see also the specific category where the application is treated. For related information see also *76 Solid-State Physics*.

20070006842 NASA Langley Research Center, Hampton, VA, USA
Injection Seeded/Phase-Conjugated 2-micron Laser System
Bai, Yingxin; Yu, Jirong; Petros,M.; Petzar, Paul; Trieu, Bo; Lee, Hyung; Singh, U.; Leyva, V.; Shkunov, V.; Rockwell, D.; Betin, A.; Wang, J.; [2007]; 3 pp.; In English; OSA 2007 Advanced Solid-State Photonics Conference, 28-31 Jan. 2007, Vancouver, Canada; Original contains color illustrations
Contract(s)/Grant(s): WBS 478643.02.02.02.09; Copyright; Avail.: CASI: A01, Hardcopy

For the first time, beam quality improvement of 2 micron laser using a fiber based phase conjugation mirror has been demonstrated. Single frequency operation is necessary to lower threshold. The reflectivity of PCM is approx. 50%.
Author
Mirrors; Phase Conjugation; Solid State Lasers; Injection Lasers

20070007362 Swedish Defence Research Establishment, Linkoeping, Sweden
3-D Imaging by Laser Radar and Applications in Preventing and Combating Crime and Terrorism
Letalick, Dietmar; Ahlberg, Joergen; Andersson, Pierre; Chevalier, Tomas; Groenwall, Christina; Larsson, Hakan; Persson, Asa; Klasen, Lena; Oct 25, 2004; 48 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460224; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460224
No abstract available
Crime; Imaging Radar; Optical Radar; Terrorism

20070007368 Naval Air Warfare Center, China Lake, CA USA
A Century of Sapphire Crystal Growth
Harris, Daniel C; May 17, 2004; 74 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460239; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460239
In Paris around 1890, A. V. L. Verneuil developed a flame fusion process to produce ruby and sapphire. By 1900 there was brisk demand for ruby manufactured by Verneuil's method, which was used with little alteration for 50 years. From 1932-1953, S. K. Popov in the Soviet Union established a capability for manufacturing high quality sapphire by the Verneuil process. In the U.S., under government contract during World War II, Linde Air Products Co. implemented the Verneuil process for making jewel bearings for precision instruments. In the 1960s and 1970s, the Czochralski process was implemented by Linde and its successor, Union Carbide, to make higher quality crystals for ruby lasers. Stimulated by a government contract for structural fibers in 1966, H. LaBelle invented edge-defined film-fed growth (EFG). The Saphikon company, owned now by Saint-Gobain, evolved from this effort. Stepanov independently developed edge-defined film-fed growth in the Soviet Union. In 1967 F. Schmid and D. Viechnicki at the Army Materials Research Lab grew sapphire by the heat exchanger method (HEM). Schmid later established Crystal Systems, Inc. around this technology. Rotem Industries, founded in Israel in 1969, perfected the growth of sapphire hemispheres and near-net-shape domes by gradient solidification. In the U.S., growth of near-net-shape sapphire domes was demonstrated by both the EFG and HEM methods in the 1980s but neither method became commercial. Today, domes in the U.S. are made by scooping sapphire boules with diamond-impregnated cutting tools. Commercial markets for sapphire, especially in the semiconductor industry, are healthy and growing at the dawn of the 21st century.
DTIC
Crystal Growth; Heat Exchangers; Ruby Lasers; Sapphire

20070007468 Army Tank-Automotive and Armaments Command, Warren, MI USA
Upgrading Readiness: Successes and Improvements of the Mobile Parts Hospital
Gady, Benton R; Apr 11, 2005; 5 pp.; In English
Report No.(s): AD-A460558; TACOM-14083; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460558
The Mobile Parts Hospital (MPH) helps the Army with logistical backups in maintaining sustainment and readiness at the battlefield front. Now going into its third phase of the program and scheduled to be transitioned to a Program Manager (PM), the MPH has proven its ability to build parts in a mobile rapid manufacturing environment. This paper will outline the progress of the Lathe Manufacturing Module (LMM) and it's successes in deployment to Kuwait and advances with the Laser Engineered Net-Shaping(Trademark) (LENS(Registered)) technology and the ability to rapidly build near net shape parts from powdered metal in a mobile environment. The LENS(Registered) has been upgraded for increased performance in build speed and advances in near net-shaping of parts. Increased laser power and newly added equipment effects on build profile and deposited material will be discussed, in audition to lessons learned from the current prototype LMM to advances & developments in future changes made to the LMM modules for deployment.
DTIC
Construction; Hospitals; Lasers; Manufacturing; Medical Services; Military Operations

20070007561 New Mexico Univ., Albuquerque, NM USA
Developing and Modeling Fiber Amplifier Arrays
Berdine, Richard; Sep 1, 2006; 8 pp.; In English
Contract(s)/Grant(s): FA9451-04-C-0379; Proj-4866
Report No.(s): AD-A460745; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460745

High Energy Lasers (HEL) are required for a number of military applications including missile defense. Electric lasers are considered the laser of choice in the long term since the energy supply is rechargeable and clean. The preferred type of electric laser is the semiconductor diode-pumped solid state laser, which integrates well with other sensors and electro-optical elements in an aerospace, land, or maritime environment. One method for scaling solid state lasers to high power is combining beams of a large number of lower power laser modules. These modules can be either oscillator (laser) modules or power amplifier modules. This effort was to analyze arrays of coherent fiber amplifiers and the beam quality associated with the fill factor, beam shape, and degree of coherence.
DTIC
Laser Beams; Power Amplifiers

20070008121 Naval Academy, Annapolis, MD USA
High Energy Laser Progressive Wavefront Modeling
Needham, Donald M; Izbicki, Michael J; Dec 9, 2006; 28 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460427; USNA-CS-TR-2006-03; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460427

High energy lasers have the potential to revolutionize naval warfighting by providing a weapons platform that has greater precision and speed than anything currently available. These lasers can be mounted on ships for surface warfare or mounted on satellites for strikes anywhere around the world. Crucial to the development of these lasers is an understanding of how different atmospheric conditions affect the laser's propagation and the shape of the beam when it finally illuminates the target. Dr. Bill Colson from the Naval Postgraduate School Physics Department developed a computer model for simulating these beams; however, his program can only output two dimensional slices of the three dimensional laser. Theoretically, the beams should be forming 'noodles' of energy that break off from the main beam, but that can be difficult to see from Colson's original output. This project aims to modify Colson's program so that it can create three dimensional models of the laser beams, and show the progression of the beams over time.
DTIC
High Power Lasers; Navy; Warfare; Wave Fronts; Weapon Systems

20070008651 Massachusetts Univ., Lowell, MA USA
Terahertz Imaging of Subjects With Concealed Weapons
Dickinson, Jason C; Goyette, Thoms M; Gatesman, Andrew J; Joseph, Cecil S; Root, Zachary G; Giles, Robert H; Waldman, Jerry; Nixon, William E; May 2006; 13 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461284; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461284

In response to the growing interest in developing terahertz imaging systems for concealed weapons detection, the Submillimeter-Wave Technology Laboratory (STL) at the University of Massachusetts Lowell has produced full-body terahertz imagery using coherent active radar measurement techniques. The proof-of-principle results were readily obtained utilizing the compact radar range resources at STL. Two contrasting techniques were used to collect the imagery. Both methods made use of in-house transceivers, consisting of two ultra-stable far-infrared lasers, terahertz heterodyne detection systems, and terahertz anechoic chambers. The first technique involved full beam subject illumination with precision azimuth and elevation control to produce high resolution images via two axis Fourier transforms. Imagery collected in this manner is presented at 1.56THz and 350GHz. The second method utilized a focused spot, moved across the target subject in a high speed two dimensional raster pattern created by a large two-axis positioning mirror. The existing 1.56THz compact radar range was modified to project a focused illumination spot on the target subject several meters away, and receive the back-reflected intensity. The process was repeated across two dimensions, and the resultant image was assembled and displayed utilizing minimal on-the-fly processing. Imagery at 1.56THz of human subjects with concealed weapons are presented and discussed for this scan type.
DTIC
Detection; Imagery; Imaging Techniques; Infrared Lasers

20070008691 Optical Sciences Corp., Huntsville, AL USA

Performance Capabilities and Utilization of MICOM's Diode Laser Based Infrared Scene Projector Technology

Beasley, D B; Cooper, John B; Jan 1996; 10 pp.; In English

Report No.(s): AD-A461367; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461367

This paper describes the current design characteristics and performance capabilities of the US Army Missile Command's (USAMICOM's) diode laser based infrared scene projector technology. The projector is now operational at the US Army Missile Command's Research, Development, and Engineering Center (RDEC) and is being integrated into several HWIL simulation facilities. The projector is based upon a linear array of Pb-salt diode lasers coupled with a high-speed optical scanning system, drive electronics and synchronization electronics. The projector design has been upgraded to generate 256X256 resolution scenes at 4 KHz frame rates, and the fabrication of a 544X544 projector is in progress. The projector system now includes real-time non-uniformity correction electronics and is interfaced with a real-time scene generation computer. In addition, a closed-cycle cryogenic cooling system has been added for increased dynamic range and maintenance-free operation. The system's modularity provides upgradability to meet specific performance requirements such as increased spatial resolution, different emission wavelengths, or dual-band scene projection. The projector's upgrade design and performance characteristics are presented in the paper, as well as sample images generated with the projector and captured by an InSh FPA sensor.

DTIC

Diodes; Infrared Radiation; Lasers; Optical Scanners; Photographs; Projectors; Semiconductor Lasers

20070008747 Optical Sciences Corp., Huntsville, AL USA

Characterization of Quantum Well Laser Diodes for Application within the AMRDEC HWIL Facilities

Saylor, Daniel A; Bender, Matt; Cantey, Thomas M; Beasley, David B; Buford, Jim; Jan 2004; 12 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAH01-00-D-0012

Report No.(s): AD-A461492; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461492

The U.S. Army's Research, Development, and Engineering Command's (RDECOM) Aviation and Missile Research, Development, and Engineering Center (AMRDEC) provides Hardware-in-the-Loop (HWIL) test support to numerous tactical and theatre missile programs. Critical to the successful execution of these tests is the state-of-the-art technologies employed in the visible and infrared scene projector systems. This paper describes the results of characterization tests performed on new mid-wave infrared (MWIR) quantum well laser diodes recently provided to AMRDEC by the Naval Research Labs and Sarnoff Industries. These lasers provide a + IOX improvement in MWIR output power over the previous technology of lead-salt laser diodes. Performance data on output power, linearity, and solid-angle coverage are presented. A discussion of the laser packages is also provided.

DTIC

Quantum Well Lasers; Quantum Wells; Semiconductor Lasers

20070008757 Optical Sciences Corp., Huntsville, AL USA

Current Status of the Laser Diode Array Projector Technology

Beasley, D B; Saylor, Daniel A; Jan 1998; 11 pp.; In English; Original contains color illustrations

Report No.(s): AD-A461510; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461510

This paper describes recent developments and the current status of the Laser Diode Array Projector (LDAP) Technology. The LDAP is a state-of-the-art dynamic infrared scene projector system capable of generating high resolution in-band infrared imagery at high frame rates. Three LDAPs are now operational at the US Army Aviation and Missile Command's (AMCOM) Missile Research, Development, and Engineering Center (MRDEC). These projectors have been used to support multiple Hardware-in-the-Loop test entries of various seeker configurations. Seeker configurations tested include an InSb 256x256 focal-plane array (FPA), an InSb 512x512 FPA, a PtSi 640x480 FPA, a PtSi 256x256 FPA, an uncooled 320x240 microbolometer FPA, and two dual field-of-view (FOV) seekers. Several improvements in the projector technology have been made since we last reported in 1997. The format size has been increased to 544x544, and 672x512, and it has been proven that the LDAP can be synchronized without a signal from the unit-under test (UUT). The control software has been enhanced to provide point and click control for setup, calibration, image display, image capture, and data analysis. In addition, the first long-wave infrared (LWIR) LDAP is now operational, as well as a dual field of view LDAP which can change its FOV within

0.25 seconds. The projector is interfaced to a Silicon Graphics scene generation computer which is capable of real-time 3-D scene generation. Sample images generated with the projector and captured by an InSb FPA sensor are included in the text.
DTIC
Arrays; Projectors; Semiconductor Lasers

20070008760 Optical Sciences Corp., Huntsville, AL USA
Calibration and Non-Uniformity Correction of MICOM's Diode Laser Based Infrared Scene Projector
Beasley, D B; Cooper, John B; Saylor, Daniel A; Buford, Jr, James A; Jan 1997; 12 pp.; In English
Report No.(s): AD-A461513; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461513

A dynamic infrared (IR) scene projector which is based upon diode lasers is now operational at the US Army Missile Command's (MICOM) Research, Development, and Engineering Center (RDEC). The projector is referred to as the Laser Diode Array Projector (LDAP). It utilizes a 64-element linear array of Pb-salt diode lasers coupled with a high-speed optical scanning system, drive electronics and synchronization electronics to generate in-band IR scenes. The projector is interfaced to a real-time scene generation computer which is capable of 3-D scene generation. This paper describes the process for calibration of the projector and the correction of spatial non-uniformities which are inherent in the projector design. Each laser within the system must be calibrated so that its output power is linear with respect to input gray level. The calibration table for each laser is stored in the projector electronics memory and is applied in real-time. In addition, spatial variations in perceived pixel intensity must be corrected such that the output scene is uniform. Gain and offset correction factors for each pixel are used to correct the spatial non-uniformities. The gain and offset terms are applied to each pixel in real-time by the projector drive electronics. The projector's overall performance characteristics, including the non-uniformity correction (NUC) performance level achieved to-date, are presented in the paper. Issues associated with NUC limitations are also discussed. Sample images generated with the projector and captured by an InSb FPA sensor are included in the text.
DTIC
Calibrating; Diodes; Infrared Radiation; Lasers; Optical Scanners; Projectors; Semiconductor Lasers

20070008969 Massachusetts Univ., Lowell, MA USA
A High Precision Reflectometer for Submillimeter Wavelengths
Gatesman, A J; Giles, R H; Waldman, Jerry; Feb 1995; 30 pp.; In English
Report No.(s): AD-A461834; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461834

A high-precision reflectometer was designed and built to measure directly the specular reflectance of materials in the submillimeter (SM) region of the spectrum. Problems that typically limit measurement precision, such as sample positioning, lack of an absolute reflection standard, and instabilities in the SM laser system, were investigated. Critical in this effort was the optical characterization of a high purity silicon wafer such that an etalon fabricated from this material had a calculable SM reflectivity with an uncertainty of less than +/- 0.03%. This SM reflection standard was achieved using an ellipsometer specifically designed for materials characterization at SM wavelengths. Sample positioning was achieved through construction of a specially designed sample fixture that was mounted on an air-bearing rotary stage. These efforts reduced the overall uncertainty in reflectance from +/- 1% achieved in previous systems to less than +/- 0.1%. This order of magnitude improvement makes possible, for the first time, high precision reflectance measurements of common metals, such as copper, gold, aluminum, and chromium, whose predicted reflectivities exceed 99% in the SM. Furthermore, precise measurement of the high frequency losses in high-temperature superconducting materials is now also possible. Measurements reported here of thin metal films at a laser wavelength of lambda = 513.01 micrometers indicate a slight discrepancy between experimental and theoretically predicted values, with measured results falling between 0.1% and 0.3% below predicted values. This discrepancy also has been observed by other researchers in the SM and millimeter-wave frequency regions. High precision reflectometry can be used as a sensitive technique to measure the surface resistance of high-temperature superconducting materials and to study the relationship between metal film preparation and its reflectance.
DTIC
Laser Beams; Measurement; Precision; Reflectance; Reflectometers; Specular Reflection; Submillimeter Waves

20070009243 Academy of Sciences (Russia), Moscow, Russian Federation
Active Laser and Raman Materials for 1.3-5 Micron Spectral Range
Basiev, Tasoltan; Mar 2006; 183 pp.; In English; Original contains color illustrations
Report No.(s): AD-A462147; No Copyright; Avail.: CASI: A09, Hardcopy

This report results from a contract tasking General Physics Institute of the Russian Academy of Sciences as follows: The spectral range of 4 - 5 microns is one of the most interesting atmospheric optical transmission windows. High peak power laser sources operating in this region are of special importance for various lidar applications. Solid state lasers with their compactness, high efficiency, and reliability in rugged conditions are quite promising for these purposes. Active laser materials for the mid-IR spectral range (1.3-5 microns), based on rare-earth doped heavy metal fluoride, chloride, and sulfide crystals and glasses will be developed, synthesized, studied, and tested. Selective laser pumping, laser oscillation, fluorescence decay and spectral measurements as well as radiative and nonradiative transitions calculations and optimization will be done. Stimulated Raman Scattering (SRS) nonlinear process was discovered in 1962 at the beginning of the laser era. Now application of solid-state Raman materials for stimulated Raman scattering (SRS) is one of the most perspective ways to develop high-gain, reliable, and small-size devices for shifting laser radiation frequency in new spectral regions. SRS devices are very promising for covering near and mid-infrared spectral range from 1.3 to 5 microns, which fits a lot of molecular resonances and is one of the best atmospheric windows for laser lidars. Prospective Raman materials for coherent radiation frequency shifting in mid-IR will be studied and developed. Integral and peak Raman scattering cross-section, line broadening, gain, lasing and laser damage threshold measurements will be performed and analyzed.
DTIC
Atmospheric Physics; Emittance; Laser Applications; Laser Materials; Raman Spectra; Spectra

20070009290 Missouri Univ., Columbia, MO USA
Fundamental Models of Selective Laser Sintering of Metal Powders
Zhang, Yuwen; Dec 2006; 13 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-04-0303
Report No.(s): AD-A462220; No Copyright; Avail.: CASI: A03, Hardcopy

This project involves state-of-the-art, flindamental modeling of the laser beam-material interactions associated with Selective Laser Sintering (SLS) of single and multiple components powders. The research tasks carried out in the project include modeling of (I) coupling of laser beam and metal powders, (2) Liquid phase sintering of two-component metal powders, (3) Liquid phase sintering and Selective Laser Powder Remelting (SLPR) of single-component metal powders, and (4) the post-processing of the sintered parts with infiltration of liquid metal. The developed models are capable to handle any material combination, and can handle selective placement of different materials prior to laser scanning.
DTIC
Laser Beams; Lasers; Liquid Metals; Manufacturing; Melting; Metal Powder; Powder (Particles); Sintering

37
MECHANICAL ENGINEERING

Includes mechanical devices and equipment; machine elements and processes. For cases where the application of a device or the host vehicle is emphasized see also the specific category where the application or vehicle is treated. For robotics see *63 Cybernetics, Artificial Intelligence, and Robotics*; and *54 Man/System Technology and Life Support*.

20070006709 Westinghouse Savannah River Co., Aiken, SC, USA
Examples of Radiation Shielding Models
Willison, J.; January 2006; 10 pp.; In English
Report No.(s): DE2006-891650; WSRC-MS-2006-00332; No Copyright; Avail.: Department of Energy Information Bridge

The attached pictures are examples of shielding models used by WSMS. The models were used in shielding evaluations for Tank 50 pump replacement. They show the relative location of shielding to radiation sources for pumps and pipes. None of the calculations that were associated with these models involved UCNI. The last page contains two pictures from a shielding calculation for the saltstone area. The upper picture is a conceptual drawing. The lower picture is an image copied from the website of a supplier for the project.
NTIS
Pipes (Tubes); Pumps; Radiation Sources; Radiation Shielding

20070006852 NASA Glenn Research Center, Cleveland, OH, USA
A New High-Speed Oil-Free Turbine Engine Rotordynamic Simulator Test Rig
Howard, Samuel A.; January 2007; 16 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): WBS 561581.02.07.03.03.02
Report No.(s): NASA/TM-2007-214489; E-15557; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070006852

A new test rig has been developed for simulating high-speed turbomachinery rotor systems using Oil-Free foil air bearing technology. Foil air bearings have been used in turbomachinery, primarily air cycle machines, for the past four decades to eliminate the need for oil lubrication. The goal of applying this bearing technology to other classes of turbomachinery has prompted the fabrication of this test rig. The facility gives bearing designers the capability to test potential bearing designs with shafts that simulate the rotating components of a target machine without the high cost of building 'make-and-break' hardware. The data collected from this rig can be used to make design changes to the shaft and bearings in subsequent design iterations. This paper describes the new test rig and demonstrates its capabilities through the initial run with a simulated shaft system.
Author
Foil Bearings; Gas Bearings; Rotor Dynamics; Shafts (Machine Elements); Turbomachinery; Engine Tests; Lubrication

20070007367 Lindab Ltd., West Midlands, UK
Energy Conservation Through Duct Leakage Reduction
Glatt, Rich; Feb 26, 2004; 20 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460237; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460237
AGENDA: * Lindlab worldwide * Lindlab USA * Product lines * Operating cost and energy savings * Installed cost labor savings * Additional cost reduction opportunities * CADvent duct design and drafting software.
DTIC
Ducts; Energy Conservation; Leakage

20070007389 New World Associates, Inc., Fredericksburg, VA USA
CBR/TIC Filter Design and Evaluation
Doren, Thomas W Van; Johnson, Ezra S; Whittier, William B; Dec 29, 2006; 41 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): HR0011-04-C-0100
Report No.(s): AD-A460378; NW002566; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460378
New World Associates in association with ECBC, Hunter Manufacturing, and Portsmouth Aviation has proved the concept of a layered bed CBR/TIC filter. Filters have been developed that provide toxic industrial chemical protection in addition to the chemical, biological and radiological protection provided by the standard M98 filter set. This concept can be extended to other TICs in addition to the ones selected for this effort. A layered filter can be made with a sorbent selected for the specific TICs of concern for a particular application. It has been shown that it is possible to retrofit these filters into existing collective protective (ColPro) systems with housings designed to hold the M98 filter. With relatively minor modifications to accommodate the increase in pressure drop and a replacement housing cover, these filters can be installed in any land based ColPro system. These filters are complete such that with minor modifications they could be ready for production very quickly if there was a demand for them. The majority of filters passed the particulate and chemical tests and proved they would remove the contaminants as design.
DTIC
Chemical Warfare; Toxicity

20070008036 Air Force Research Lab., Wright-Patterson AFB, OH USA
Computational Hypersonics and Plasmadynamics
Gaitonde, Datta V; Jul 2006; 9 pp.; In English
Contract(s)/Grant(s): Proj-A03S
Report No.(s): AD-A460533; AFRL-VA-WP-TM-2006-3196; No Copyright; Avail.: CASI: A02, Hardcopy
Several independent efforts addressing simulation capability development and high-speed flow control application were pursued by team members during the reporting period. Control of laminar and turbulent shock/boundary layer and shock/shock interactions was explored with active and passive techniques. Unsteady plasma actuators and laser-based volumetric heat deposition were introduced in ramp and Edney interactions to mitigate integrated and localized heat loads. Separately, porous walls were shown to reduce separation and enhance total pressure recovery in three-dimensional viscous/inviscid interactions. A high-fidelity procedure was developed to couple an unsteady first-principles plasma force model at kilohertz frequencies to full Navier-Stokes solvers. The effect of dielectric barrier discharge-based body forces on excitation of turbulence mechanisms

in separated shear layers was investigated. Preliminary simulations were also performed to guide development of a test article for flight testing. State-to-state kinetics simulations were employed to evaluate vibrational bias in dissociation and recombination.
DTIC
Actuators; Computational Fluid Dynamics; Hypersonics; Shock Waves; Turbulence

20070008662 Missouri Univ., Rolla, MO USA
Disbond Thickness Evaluation Employing Multiple-Frequency Near-Field Microwave Measurements
Abou-Khasa, M; Zoughi, R; May 2006; 19 pp.; In English
Contract(s)/Grant(s): FA8650-04-C-5704; Proj-2510
Report No.(s): AD-A461299; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461299

Near-field microwave nondestructive evaluation (NDE) techniques have shown great potential for disbond detection in multi-layer dielectric composite structures. The high detection capability associated with these techniques stems from the fact that near-field microwave signals are sensitive to minute variations in the dielectric properties and geometry of the medium in which they propagate. In the past, the sensitivity of the near-field microwave NDE techniques to the presence and properties of disbonds in multi-layer dielectric composites has been investigated extensively. However, a quantitative disbond thickness estimation method has yet to be introduced. In this paper, we propose a maximum-likelihood (ML) disbond thickness evaluation method utilizing multiple independent measurements obtained at different frequencies. We also introduce a statistical lower limit on the thickness resolution based on the mean squared error (MSE) in thickness estimation and a given confidence interval. The effectiveness of the proposed ML method is also verified by comparing simulation results with actual measurements.
DTIC
Debonding (Materials); Defects; Frequencies; Joints (Junctions); Measurement; Microwaves; Near Fields; Nondestructive Tests; Thickness

20070008796 Texas Univ., Austin, TX USA
The Analysis and Development of a Mechanical Breadboard Structure
Mikes, James A; Dec 2006; 142 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461564; No Copyright; Avail.: CASI: A07, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461564

This thesis introduces the mechanical breadboard as a learning / development tool and details the creation of one concept. It begins with a review of the state of the art for mechanical breadboards to include commercial and academic developments and products. It defines what a mechanical breadboard is for this research, what the customer needs are, and what critical functions the breadboard should be able to prototype. Following this analysis, a development team created a new novel structural system for a mechanical breadboard as the research indicated these components were both important to the overall system and had a great opportunity for innovation and improvement. The solution developed is based on node and frame member structural system that allows multiple degrees of freedom in the structural layout. The node is the key component of the structural system and utilizes a three section design to give multiple degrees of freedom and attachment points.
DTIC
Breadboard Models; Mechanical Engineering

20070008983 Virginia Polytechnic Inst. and State Univ., Blacksburg, VA USA
Measurements of the Tip-Gap Turbulent Flow Structure in a Low-speed Compressor Cascade
Tang, Genglin; Simpson, Roger L; May 15, 2004; 384 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-99-1-0302; N00014-04-1-0291
Report No.(s): AD-A461860; VPI-AOE-288; No Copyright; Avail.: CASI: A17, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461860

Experimental results are presented from a study of the tip-gap turbulent flow structure in a low-speed linear compressor cascade wind tunnel at Virginia Tech that includes a moving belt system to simulate the relative motion between the tip and the casing. Endwall pressure measurements and surface oil flow visualizations were made on a stationary endwall to obtain some global flow features. A custom-made miniature 3-orthogonal-velocity-component fiber-optic laser-Doppler velocimeter (LDV) with a 50 micron spherical measurement volume was used to measure all three components of instantaneous velocity

within the gap between the endwall and the blade tip, mainly for the stationary wall with 1.65% and 3.30% of chord tip gaps, as well as some initial experiments with the moving wall. The surface skin friction velocity was obtained by using viscous sublayer velocity profiles, which verified the presence of an intense lateral shear layer that was observed from surface oil flow visualizations. All second- and third-order turbulence quantities are presented. Tip gap flows are complex, pressure-driven, unsteady highly skewed three-dimensional turbulent flows. The crossflow velocity normal to the blade chord is nearly uniform in the mid tip-gap and changes substantially from the pressure to suction side due to the local tip pressure loading, which is different from the mid-span pressure loading because of tip leakage vortex influence. Normalized circulation within the tip gap is independent of the gap size. The tip gap flow interacts with the primary flow, separates from the endwall, and rolls up on the suction side to form the tip leakage vortex, which is unsteady as observed from the TKE transport vector and oil flow visualizations. Other than the nearest endwall and blade tip regions, the TKE does not vary much in tip gap. The tip leakage vortex produces high turbulence intensities.
DTIC
Blade Tips; Compressors; Flow Visualization; Laser Doppler Velocimeters; Low Speed; Three Dimensional Flow; Turbulent Boundary Layer; Turbulent Flow

39
STRUCTURAL MECHANICS

Includes structural element design, analysis and testing; dynamic responses of structures; weight analysis; fatigue and other structural properties; and mechanical and thermal stresses in structures. For applications see *05 Aircraft Design, Testing and Performance*; and *18 Spacecraft Design, Testing and Performance*.

20070006635 National Inst. of Standards and Technology, Gaithersburg, MD USA
2-D Analysis of a Building Frame under Gravity Load and Fire
Duthinh, D.; January 2004; 6 pp.; In English
Report No.(s): PB2007-105054; No Copyright; Avail.: CASI: A02, Hardcopy

A two-dimensional finite-element model is developed that provides some insight into the behavior and collapse of high-rise steel buildings with open web floor systems. For one prescribed temperature distribution that corresponds to a two-story, quarter-span fire, the diagonals of the heated trusses buckle inelastically, causing considerable sag in the fire floors. This behavior puts a high tension demand on the truss connections to the perimeter column, which remains at moderate temperatures in this model and does not experience buckling. Our analysis is based on temperatures and material properties that were selected for illustrative purposes. Therefore no claim is made as to its applicability to any specific structure.
NTIS
Fires; Gravitation; Loads (Forces); Two Dimensional Models

20070006649 National Inst. of Standards and Technology, Gaithersburg, MD USA
Coupled Thermal-Elastic Response of Structures to Fires
Prasad, H.; Baum, H. R.; January 2005; 6 pp.; In English
Report No.(s): PB2007-105059; No Copyright; Avail.: CASI: A02, Hardcopy

There has been a resurgence of interest in the response of building structures to fires over the past several years. This interest was greatly enhanced by the attack on, and subsequent collapse of, theWorld Trade Center (WTC) towers. Traditional methods of modeling this behavior are based on computing the thermal response of an un-deformed structure and performing structural analysis in a sequential manner. This procedure can lead to significant errors in the thermally induced structural response. While the applications of interest clearly involve highly non-linear calculations, the starting point for most fire scenarios is almost always an undamaged building at room temperature. Since virtually all buildings are designed to keep the stresses well below the elastic limit and the deflections of the load bearing structure reasonably small, the starting point for simulations of fire induced damage must lie within the domain of linear elasticity. Moreover, the difficulties that arise are evident before the temperature rise is large enough to affect the elastic or thermal properties of most structural materials. Under these circumstances the thermally induced stresses are also linear, and the temperature fields can be described by the heat conduction equation for the material(s) of interest. The facts described above justify an analysis of the coupling between the temperature and thermally induced stresses based on the linear thermo-elastic equations. The temporal dependence of the stresses is the focus of this analysis. A popular technique for solving the thermo-elastic equations is to first compute (or assume) the time dependent temperature distribution in the load bearing structure. Then, given this information, the temperature distributions are frozen at a succession of discretely chosen times and an equilibrium solution is sought for the

state of stress at each chosen time. The fact that the temperature is changing continuously and that this continuous change must affect the stresses is ignored in this approach. This technique is justified by noting that the elastic wave propagation speed is so fast compared with the time scales of interest in thermo-elastic phenomena induced by fires that a quasi-steady analysis is justified. The analyses that follow are intended to show that computational techniques that freeze the temperature at a given time and compute an equilibrium stress distribution may not be consistent with the dynamical equations of thermo-elasticity, even if the elastic wave propagation speed is taken to be infinite. The next section demonstrates how the general solutions to the equations of thermo-elasticity couple the the time scale for the evolution of the displacements to that of the temperature field. In particular, it is shown that the solutions for the displacements cannot obey an equilibrium equation unless the temperature field is independent of time. Following this, formal solutions for a half-space loaded thermally are derived. Again, it is clear that part of the solution for the stresses and displacements are inherently time dependent.
NTIS
Buildings; Fires; Temperature Effects

20070006787 Multidisciplinary Center for Earthquake Engineering Research, Buffalo, NY, USA
Seismic Retrofitting Guidelines for Complex Steel Truss Highway Bridges
Aug. 01, 2006; 196 pp.; In English
Contract(s)/Grant(s): DTFH61-98-C-00094; 094-C-1.1
Report No.(s): PB2007-105143; MCEER-06-SP05; No Copyright; Avail.: CASI: A09, Hardcopy

The Seismic Retrofitting Guidelines for Complex Steel Truss Highway Bridges present the state of the practice, through 2005, for retrofitting steel truss bridges in the US. A performance-based seismic retrofit philosophy is used. The guidelines cover all major aspects pertinent to the seismic retrofitting of steel truss bridges, with a focus on superstructure retrofit. Case studies are provided. These guidelines are a supplement to the 2006 FHWA Seismic Retrofitting Manual for Highway Structures for unusual or long span steel trusses.
NTIS
Highways; Retrofitting; Steels; Trusses

20070008700 Army Engineer Research and Development Center, Vicksburg, MS USA
Irregular Wave Forces on Heavily Overtopped Thin Vertical Walls
Hughes, Steven A; Jan 2007; 14 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461398; ERDC/CHL-CHETN-III-75; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461398

The Coastal and Hydraulics Engineering Technical Note (CHETN) described herein provides empirical equations to estimate irregular wave forces and overturning moments on thin, vertical walls extending from the seafloor and having a top elevation that is below the still-water level. In this situation, the majority of the wave crest passes over the vertical wall. A worked example illustrates application of the empirical equations.
DTIC
Loads (Forces); Mississippi River (US); Thin Walls; Wave Generation

20070008721 Army War Coll., Carlisle Barracks, PA USA
Rebuilding Iraq: Holistic Synchronization Plan is the Key
Harrell, III, Leon L; Mar 31, 2006; 35 pp.; In English
Report No.(s): AD-A461453; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461453

This paper examines the processes that are an integral part of planning for the successful reconstruction of Iraq. The USA is spending billions of dollars on the Iraqi reconstruction effort. This effort consists of both restoring damaged areas and improving existing services to meet minimum standards. However, the resources slated for reconstruction will not last forever, and priorities will have to be established with regard to what ultimately gets accomplished. The author reviews lessons learned about reconstruction from past wars, including the Philippine War, World War II in both Europe and Japan, and the Vietnam War, and analyzes whether these lessons are still applicable today. Then he develops and analyzes four organizational structures for reconstruction that the USA may want to use to perform reconstruction and nation-building missions in Iraq. These four structures are full-time organization, standup organization, partially filled organization, and administrative organization. He explores the advantages and disadvantages of each organizational structure, how to make each one more efficient, and how to utilize each one to its fullest. The author concludes that a holistic synchronization plan is the key to

successful reconstruction in Iraq. The paper also incorporates recent observations from Lieutenant General Chiarelli, previous Commander 1st Calvary Division, on his experience in full-spectrum operations in Iraq.
DTIC
Construction; Military Operations; Planning; Structural Engineering; Synchronism

20070008894 Reinhart Boerner Van Deuren, P.C., Rockford, IL, USA
Real-Time Detection of Loss of Cantilever Sensing Loss
Salapaka, M. V.; De, T.; Agarwal, P.; Sahoo, D. R.; 22 May 06; 42 pp.; In English
Contract(s)/Grant(s): ECS-0330224
Patent Info.: Filed Filed 22 May 06; US-Patent-Appl-SN-11-419-616
Report No.(s): PB2007-101426; No Copyright; Avail.: CASI: A03, Hardcopy

An approach to detect when a cantilever loses interaction with a sample, thereby detecting when a portion of an image obtained using a cantilever is spurious is presented. An observer based estimation of cantilever deflection is compared to the cantilever deflection and the resulting innovation is used to detect when the cantilever loses interaction. The loss of interaction is determined when the innovation is outside of and/or below a threshold level.
NTIS
Detection; Losses; Real Time Operation; Cantilever Beams

20070008935 SRI International Corp., Menlo Park, CA USA
Synchronization of Multiagent Plans Using a Temporal Logic Theorem Prover
Stuart, Christopher; Dec 13, 1985; 72 pp.; In English
Contract(s)/Grant(s): N00014-85-C-0251; Proj-8342
Report No.(s): AD-A461763; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461763

Most of us at some time have stopped to watch the construction of a house. It is interesting to watch the successive stages of the project and the activity of workers engaged in the various tasks necessary to reach the desired product. This simple example is useful in considering aspects of the planning problem. The planning problem is to find some plan that can guide the activity of an agent or agents to achieve a desired goal. The particular subproblem considered here is that of resolving possible conflicts between elements of a plan. There are several ways subplans can interact: * One subplan may achieve the precondition of another. For example, the sides of a house must be built for support before the roof is laid. * One may remove the precondition of another. Plumbing is best connected before the wall is finished so that access is easier * One may upset a condition that needs to be maintained for a time. The act of building the front steps requires that, while the concrete is drying, others should avoid working on the roof where they may drop things on the new steps. * They may cooperate. If a truck is sent to pick up timber, it may be efficient to collect bricks on the same trip.
DTIC
Concretes; Roofs; Synchronism; Temporal Logic; Theorems

42
GEOSCIENCES (GENERAL)

Includes general research topics related to the Earth sciences, and the specific areas of petrology, mineralogy, and general geology. For other specific topics in geosciences see *categories 42 through 48*.

20070007337 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Global Change Data Center: Mission, Organization, Major Activities, and 2003 Highlights
FROM; June 2004; 74 pp.; In English; Original contains color illustrations
Report No.(s): NASA/TM-2004-212753; Rept-2004-01781-0; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070007337

Rapid, efficient access to Earth sciences data from satellites and ground validation stations is fundamental to the nation's efforts to understand the effects of global environmental changes and their implications for public policy. It becomes a bigger challenge in the future when data volumes increase from current levels to terabytes per day. Demands on data storage, data access, network throughput, processing power, and database and information management are increased by orders of magnitude, while budgets remain constant and even shrink.The Global Change Data Center's (GCDC) mission is to develop and operate data systems, generate science products, and provide archival and distribution services for Earth science data in

support of the U.S. Global Change Program and NASA's Earth Sciences Enterprise. The ultimate product of the GCDC activities is access to data to support research, education, and public policy.
Author
Data Base Management Systems; Earth Sciences; Information Management; Information Systems; Ground Truth; Data Systems; Computer Networks

20070008098 NASA Johnson Space Center, Houston, TX, USA
Liquidus Phases of the Richardson H5 Chondrite at High Pressures and Temperatures
Channon, M.; Garber, J.; Danielson, L. R.; Righter, K.; [2007]; 2 pp.; In English; Lunar and Planetary Science Conference, 12-16 Mar. 2007, League City, TX, USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy

Part of early mantle evolution may include a magma ocean, where core formation began before the proto-Earth reached half of its present radius. Temperatures were high and bombardment and accretion were still occurring, suggesting that the proto-Earth consisted of a core and an at least partially liquid mantle, the magma ocean. As the Earth accreted, pressure near the core increased and the magma ocean decreased in volume and became shallower as it began to cool and solidify. As crystals settled, or floated, the composition of the magma ocean could change significantly and begin to crystallize different minerals from the residual liquid. Therefore, the mantle may be stratified following the P-T phase diagram for the bulk silicate Earth. To understand mantle evolution, it is necessary to know liquidus phase relations at high pressures and temperatures. In order to model the evolution of the magma ocean, high pressure and temperature experiments have been conducted to simulate the crystallization process using a range of materials that most likely resemble the bulk composition of the early Earth.
Author
Chondrites; High Pressure; High Temperature; Earth Mantle; Liquidus; Magma; Minerals

20070008099 NASA Johnson Space Center, Houston, TX, USA
Formation of CaS-MgS in Enstatite Chondrites and Achondrites as a Function of Redox Conditions and Temperature: Constraints on Their Evolution in a Planetesimal and in a Proto-planet
Malavergne, Valerie; Berthet, S.; Righter, K.; [2007]; 2 pp.; In English; Lunar and Planetary Science Conference, 12-16 Mar. 2007, League City, TX, USA; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy

The cubic monosulfide series with the general formula (Mg,Mn,Ca,Fe)S are common phases in the enstatite chondrite (EH) and aubrite meteorite groups. In the Earth s mantle, sulfide minerals are associated with peridotites and eclogites. Study of these sulfide mineral systems is of interest for the mineralogy and petrology of planetary mantles. For example, MgS could occur in the primitive Earth and because it remains a low density phase compared to metal, would stay a separate phase during the core formation process, and thus not segregate to the core. (Mg,Ca,Mn,Fe)S sulphides might thus be important phases even in planetary differentiation processes. The importance of such minerals, and their formation, composition and textural relationships for understanding the genesis of enstatite chondrites and aubrites, has long been recognized. The main objective of this experimental study is to understand the formation and evolution of (Mg,Ca,Mn,Fe)S sulphides, particularly the oldhamite CaS and ningerite MgS, with pressure, temperature but also with redox conditions because EH and aubrites are meteorites that formed under reduced conditions. Piston-cylinder (PC) and multi-anvil (MA) experiments at high pressure (HP) and high temperature (HT) have been performed in order to simulate the evolution of these phases in a small planetary body from a planetesimal (with PC experiments) up to a proto-planet (with MA experiments).
Author
Sulfides; Meteoritic Composition; Oxidation-Reduction Reactions; Planetary Mantles; Chondrites; Mineralogy; Petrology; Peridotite

20070008100 NASA Johnson Space Center, Houston, TX, USA
Partitioning of Pd Between Fe-S-C and Mantle Liquids at High Pressure and Temperature: Implications for Core Formation
Righter, K.; Humayun, M.; Danielson, L.; [2007]; 2 pp.; In English; Luna and Planetart Science Conference, 12-16 Mar. 2007, League City, TX, USA; Original contains black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy

One of the most elusive geochemical aspects of the early Earth has been explaining the near chondritic relative abundances of the highly siderophile elements (HSE; Au, Re and the platinum group elements) in Earth's primitive upper mantle (PUM). Perhaps they were delivered to the Earth after core formation, by late addition of carbonaceous chondrite material. However, the recognition that many moderately siderophile elements can be explained by high pressure and

temperature (PT) metal-silicate equilibrium, leads to the question whether high PT equilibrium can also explain the HSE concentrations. Answers to this question have been slowed by experimental difficulties (nugget effect and very low solubilities). But two different perspectives have emerged from recent studies. One perspective is that D(M/S) for HSE at high PT are not low enough to explain terrestrial mantle depletions of these elements (for Pd and Pt). A second perspective is D(M/S) are reduced substantially at high PT and even low enough to explain terrestrial mantle depletions (for Au and Pt). Issues complicating interpretation of all experiments include use of MgO- and FeO-free silicate melts, and S-free and FeNi metal-free systems. In addition, conclusions for Pt rest on an interpretation that the tiny metallic nuggets plaguing many such experiments, were formed upon quench. There is not agreement on this issue, and the general question of HSE solubility at high PT remains unresolved

Author

Carbonaceous Chondrites; Earth Mantle; Magnesium Oxides; Silicates; Platinum; Melts (Crystal Growth); Iron Oxides; Geochemistry

20070008103 NASA Goddard Space Flight Center, Greenbelt, MD, USA

EOS Aqua AMSR-E Arctic Sea-Ice Validation Program: Arctic2006 Aircraft Campaign Flight Report

Cavalieri, D. J.; Markus, T.; October 2006; 36 pp.; In English; Original contains color illustrations

Report No.(s): NASA/TM-2006-214142; Rept-2006-02057-0; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070008103

In March 2006, a coordinated Arctic sea-ice validation field campaign using the NASA Wallops P-3B aircraft was successfully completed. This campaign was the second Alaskan Arctic field campaign for validating the Earth Observing System (EOS) Aqua Advanced Microwave Scanning Radiometer (AMSR-E) sea-ice products. The first campaign was completed in March 2003. The AMSR-E, designed and built by the Japanese Space Agency for NASA, was launched May 4, 2002 on the EOS Aqua spacecraft. The AMSR-E sea-ice products to be validated include sea-ice concentration, sea-ice temperature, and snow depth on sea ice. The focus of this campaign was on the validation of snow depth on sea ice and sea-ice temperature. This flight report describes the suite of instruments flown on the P-3, the objectives of each of the six flights, the Arctic regions overflown, and the coordination among satellite, aircraft, and surface-based measurements.

Author

Arctic Regions; Sea Ice; Aqua Spacecraft; Earth Observing System (EOS); Satellite Observation

20070008104 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Laboratory for Atmospheres 2005 Technical Highlights

September 2006; 134 pp.; In English; Original contains color illustrations

Report No.(s): NASA/TM-2006-214138; Rept-2006-01166-0; No Copyright; Avail.: CASI: A07, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070008104

The 2005 Technical highlights describes the efforts of all members of the Laboratory for Atmospheres. Their dedication to advancing Earth Science through conducting research, developing and running models, designing instruments, managing projects, running field campaigns, and numerous other activities, is highlighted in this report.

Author

Earth Sciences; Atmospheric Chemistry; Optical Radar; Laboratories; Climate Models; Aerosols; Remote Sensing

20070008221 NASA Johnson Space Center, Houston, TX, USA

The Oxidation State of Tungsten in Iron Bearing and Iron Free Silicate Glasses: Results from W L-Edge Xanes Measurements

Danielson, Lisa R.; Righter, K.; Sutton S.; Newville, M.; Le, L.; [2007]; 2 pp.; In English; Lunar and Planetart Science Conference, 12-16 Mar. 2007, League City, TX, USA; Original contains color illustrations

Contract(s)/Grant(s): W-31-109-eng-38; NSF EAR-02-17473; FG02-94ER-14466; Copyright; Avail.: CASI: A01, Hardcopy

Tungsten is important in constraining core formation of the Earth because this element is a moderately siderophile element (depleted approx. 10 relative to chondrites) and, as a member of the Hf-W isotopic system, it is useful in constraining the timing of core formation. A number of previous experimental studies have been carried out to determine the silicate solubility and metal-silicate partitioning behavior of W, including its concomitant oxidation state. However, results of previous studies (figure 1) are inconsistent on whether W occurs as W(4+) or W(6+).

Derived from text

Tungsten; Chondrites; Depletion; Earth Core; Iron

20070008240 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Use of Satellite Remote Sensing Data in the Mapping of Global Landslide Susceptibility
Hong, Yang; Adler, Robert F.; Huffman, George J.; [2007]; 28 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Satellite remote sensing data has significant potential use in analysis of natural hazards such as landslides. Relying on the recent advances in satellite remote sensing and geographic information system (GIS) techniques, this paper aims to map landslide susceptibility over most of the globe using a GIs-based weighted linear combination method. First , six relevant landslide-controlling factors are derived from geospatial remote sensing data and coded into a GIS system. Next, continuous susceptibility values from low to high are assigned to each of the six factors. Second, a continuous scale of a global landslide susceptibility index is derived using GIS weighted linear combination based on each factor's relative significance to the process of landslide occurrence (e.g., slope is the most important factor, soil types and soil texture are also primary-level parameters, while elevation, land cover types, and drainage density are secondary in importance). Finally, the continuous index map is further classified into six susceptibility categories. Results show the hot spots of landslide-prone regions include the Pacific Rim, the Himalayas and South Asia, Rocky Mountains, Appalachian Mountains, Alps, and parts of the Middle East and Africa. India, China, Nepal, Japan, the USA, and Peru are shown to have landslide-prone areas. This first-cut global landslide susceptibility map forms a starting point to provide a global view of landslide risks and may be used in conjunction with satellite-based precipitation information to potentially detect areas with significant landslide potential due to heavy rainfall. 1
Author
Satellite Imagery; Remote Sensing; Geographic Information Systems; Landslides; Satellite Observation; Soils

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EARTH RESOURCES AND REMOTE SENSING

Includes remote sensing of earth features, phenomena and resources by aircraft, balloon, rocket, and spacecraft; analysis of remote sensing data and imagery; development of remote sensing products; photogrammetry; and aerial photography. For related instrumentation see *35 Instrumentation and Photography*.

20070007381 SRI International Corp., Menlo Park, CA USA
Detection of Rivers in Low-Resolution Aerial Imagery
Smith, Grahame B; Jun 1981; 10 pp.; In English
Contract(s)/Grant(s): MDA903-79-C-0588
Report No.(s): AD-A460269; TN-244; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460269

This paper describes an operator for detecting rivers in low-resolution aerial imagery. The operator provides results that would allow graph-traversing routines to delineate these structures. The approach is to look for the typical river profile involving not only the water component of the river, but its surrounding vegetation as well.
DTIC
Aerial Photography; Rivers

20070007476 Colorado School of Mines, Golden, CO USA
Transparent Spinel Fabricated from Novel Powders: Synthesis, Microstructure and Optical Properties
Reimanis, I E; Kleebe, H J; Cook, R L; DiGiovanni, A; May 20, 2004; 30 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-01-1-0590
Report No.(s): AD-A460575; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460575

Magnesium aluminate spinel powders have been synthesized from boehmite by a unique method in which Mg2+ ions are metal exchanged into the boehmite surfaces. Excellent control over the starting particle size, size distribution, purity and stoichiometry of the Mg-doped boehmite powder is possible by this method. The microstructures, as well as the optical properties of dense, hot-pressed spinel are examined with the goal of better understanding the overall densification mechanisms and how they relate to the amount of LiF added to promote densification. Extreme sensitivity of the microstructure and transparency to the purity of the starting powders is shown.
DTIC
Fabrication; Microstructure; Optical Properties; Powder (Particles); Spinel; Transparence

20070007482 SRI International Corp., Menlo Park, CA USA

Random Sample Consensus: A Paradigm for Model Fitting with Applications to Image Analysis and Automated Cartography

Fischler, Martin A; Bolles, Robert C; Mar 1980; 40 pp.; In English

Contract(s)/Grant(s): DAAG29-76-C-0057; MDA903-79-C-0588

Report No.(s): AD-A460585; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460585

In this paper, the authors introduce a new paradigm, Random Sample Consensus (RANSAC), for fitting a model to experimental data. RANSAC is capable of interpreting/smoothing data containing a significant percentage of gross errors, and thus is ideally suited for applications in automated image analysis where interpretation is based on the data provided by error-prone feature detectors. A major portion of the paper describes the application of RANSAC to the Location Determination Problem (LDP): Given an image depicting a set of landmarks with known locations, determine that point in space from which the image was obtained. In response to a RANSAC requirement, the authors derive new results on the minimum number of landmarks needed to obtain a solution, and present algorithms for computing these minimum-landmark solutions in closed form. These results provide the basis for an automatic system that can solve the LDP under difficult viewing and analysis conditions. Implementation details and computational examples also are presented.

DTIC

Aerial Photography; Computer Aided Mapping; Errors; Fitting; Image Analysis; Photogrammetry; Position (Location); Position Sensing; Problem Solving; Random Sampling

20070007515 EA Engineering Science and Technology, Inc., Sparks, MD USA

Technical and Sampling/Analysis Plan for Fort Meade Base Closure Parcel Site Inspection and Phase II Remedial Investigation Studies

Sep 1990; 179 pp.; In English

Contract(s)/Grant(s): DAA15-88-D-0005; Proj-01559.05

Report No.(s): AD-A460646; No Copyright; Avail.: CASI: A09, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460646

This Technical and Sampling/Analysis Plan (T & S/A) supports the environmental studies to be completed by EA Engineering, Science and Technology, Inc. (EA) at specific sites located within the area identified for Base Closure at Fort Meade, Maryland. EA is conducting this work for the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA) under Contract No. DAAAl5-88-D-0005, Modification 000102. This Plan in conjunction with separate Safety and Health, Resource and Data Management, and Quality Assurance Plans form the framework upon which this project will be conducted. Fort Meade has been a permanent U.S. Army installation since 1917. It is located on approximately 13,000 acres in northwestern Anne Arundel County, Maryland. In December, 1988, the Secretary of Defense's Commission issued a Base Closure and Realignment and this report identified 9,000 acres for closure and realignment. Fort Meade is situated almost equidistant between Baltimore, Maryland and Washington, D.C. (Figure 1-1). Figure 1-2 is a map of the Fort Meade area and can be found in the back pocket of this plan. This figure shows the division between the Cantonment area and the land identified for closure plus the relative locations of- the sites to be studied during this project. The Cantonment area, which occupies the northernmost one-third of the installation contains administrative, recreational and housing facilities. The Base Closure Parcel (BCP) encompasses the southernmost two-thirds of the installation. This area is largely wooded and contains the active sanitary landfill, an inactive clean fill dump, three inactive sanitary/rubble fill areas, Tipton Airfield, numerous underground storage tank sites, four water supply wells and associated distribution system. Vast land areas are used for training troops. Virtually all of the BCP has been used as range and impact areas over the years. An additional

DTIC

Closures; Geology; Inspection; Landfills; Sampling; Supplying; Toxicity; Water; Wells

20070007630 SRI International Corp., Menlo Park, CA USA

Fast Parallel Surface Interpolation With Applications to Digital Cartography

Szeliski, Richard; Jun 16, 1989; 41 pp.; In English

Contract(s)/Grant(s): DACA76-85-C-0004

Report No.(s): AD-A460863; TN-470; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460863

The manipulation of two dimensional elevation maps is an important part of digital cartography. In many situations, these maps are computed by interpolating sparse data such as isolated elevation points obtained from stereo matching. In this paper,

we present a surface interpolation algorithm based on variational splines which is well suited to massively parallel computers. Using multiresolution parallel relaxation, we can efficiently compute the interpolated surface and also have local control over its continuity and smoothness. We apply this technique to sparse elevation data and to elevation contours, and show how to add realistic fractal detail through stochastic relaxation. We also present a multiresolution decomposition algorithm and a fast parallel 3-D rendering algorithm.
DTIC
Computer Aided Mapping; Digital Systems; Interpolation; Mapping

20070008017 SRI International Corp., Menlo Park, CA USA
Road Tracking and Anomaly Detection in Aerial Imagery
Quam, Lynn H; Mar 1978; 6 pp.; In English
Contract(s)/Grant(s): DAAG29-76-C-0057
Report No.(s): AD-A458710; No Copyright; Avail.: CASI: A02, Hardcopy

This report describes a new procedure for tracking road segments and finding potential vehicles in imagery of approximately 1-3 feet per pixel ground resolution. This work is part of a larger effort by SRI International to construct an image understanding system for monitoring roads in aerial imagery. The overall effort is directed towards specific problems that arise in processing aerial photographs for such military applications as cartography, intelligence, weapon guidance, and targeting. A key concept is the use of a generalized digital map data base to aid in the interpretation of imagery. The primary objectives of the overall 'knowledge-based road expert system' are to analyze images to accomplish the following: (1) find road fragments in low- to medium-resolution images; (2) track roads in medium- to high-resolution images; (3) find anomalies on roads; and (4) interpret anomalies as vehicles, shadows, signposts, surface markings, etc. The road tracking algorithm is started by indicating the center and direction of a road fragment found in low- to medium-resolution images. The nominal road width is supplied either from the data base or by an image analysis function that can determine the width of a road fragment. The road tracker produces two forms of output: a point list describing the track of the road center, and a binary image of all points in the road that are anomalous and might belong to vehicles. In the complete road-expert system, this image will then be analyzed to screen out false alarms and interpret the remaining anomalies.
DTIC
Aerial Photography; Anomalies; Detection; Image Processing; Knowledge Based Systems; Roads; Target Acquisition

20070008038 SRI International Corp., Menlo Park, CA USA
Computational Stereo
Barnard, Stephen T; Fischler, Martin A; Mar 1982; 41 pp.; In English
Contract(s)/Grant(s): MDA903-79-C-0588
Report No.(s): AD-A460600; No Copyright; Avail.: CASI: A03, Hardcopy

Perception of depth is a central problem in machine vision. Stereo is an attractive technique for depth perception because compared to monocular techniques, it leads to more direct, unambiguous, and quantitative depth measurements. Also, unlike such active approaches as radar and laser ranging, it is suitable in almost all application domains. The authors broadly define computational stereo as the recovery of the three-dimensional characteristics of a scene from multiple images taken from different points of view. The first part of the paper identifies and discusses each of the functional components of the computational stereo paradigm: image acquisition, camera modeling, feature acquisition, matching, depth determination, and interpolation. The second part discusses the criteria that are important for evaluating the effectiveness of various computational stereo techniques. The third part surveys a representative sampling of computational stereo research that is being conducted by Carnegie-Mellon University, Control Data Corporation, Lockheed Corporation, University of Minnesota, Massachusetts Institute of Technology (MIT), SRI International, and Stanford University.
DTIC
Cameras; Computer Vision; Depth Measurement; Image Processing; Space Perception; Visual Perception

20070008146 Army Construction Engineering Research Lab., Champaign, IL USA
Defilade, Stationary Target and Moving Target Embankment, Low Water Crossing, and Course Road Designs for Soil Loss Prevention
Svendsen, Niels G; Kalita, Prasanta K; Gebhart, Dick L; Denight, Michael L; Nov 2006; 108 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-A896
Report No.(s): AD-A460651; ERDC/CERL-TR-06-31; No Copyright; Avail.: Defense Technical Information Center (DTIC) ONLINE: http://hdl.handle.net/100.2/ADA460651

Military training structure designs currently do not employ adequate soil loss prevention technologies that reduce soil loss sufficiently to extend embankment useful life. New range structures must have reduced maintenance requirements and maintain functionality over a longer training interval. Additionally, incorporating sustainability into the range designs should remain a high priority to meet environmental compliance regulations and provide a durable long-lasting structure useful for military training requirements. This report proposes several new range structure designs to begin the iterative process of developing new range edifices that reduce soil loss, control erosion, promote sustainability, and enhance training. The designs for Defilades, Stationary Targets Embankments, Moving Target Embankments, Low Water Crossings, and Course Roads are presented as a demonstration and validation template for installation training areas in temperate climates. These designs are meant to illustrate the use of soil loss prevention measures on range structures.
DTIC
Crossings; Land Management; Losses; Prevention; Rangelands; Roads; Soil Erosion; Soils; Targets; Water

20070008498 SRI International Corp., Menlo Park, CA USA
Overview of the SRI Cartographic Modeling Environment
Hanson, Andrew J; Quam, Lynn; Jan 1992; 18 pp.; In English
Contract(s)/Grant(s): MDA903-86-C-0084
Report No.(s): AD-A461036; TN-515; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461036

The SRI Cartographic Modeling Environment has been created to support research on interactive, semiautomated, and automated computer-based cartographic activities. The underlying image manipulation capabilities are provided by the SRI ImagCalc(TM) system. The cartographic features and data that can be entered include multiple images, camera models, digital terrain elevation data, point, line, and area cartographic features, and a wide assortment of three-dimensional objects. Interactive capabilities include free-hand feature lighting entry, altering features while constraining them to conform to the terrain and lighting geometry, adjustment of feature parameters, and the adjustment of the camera model to display the scene features from arbitrary viewpoints. Cartographic features are depictable either as wire-frame sketches for interactive purposes or as texture-mapped renderings for realistic scene synthesis. High-quality simulated scenes are created by texture-mapping images onto terrain data and adding renderings of cartographic features using depth-buffering and antialiasing techniques. Motion sequences can be created by choosing a series of camera models and rendering the simulated appearance of the scene from each viewpoint.
DTIC
Computer Techniques; Image Processing; Mapping; Mathematical Models

20070008815 Massachusetts Univ., Lowell, MA USA
VHF/UHF Imagery and RCS Measurements of Ground Targets in Forested Terrain
Gatesman, A J; Beaudoin, C; Giles, R H; Waldman, J; Nixon, W E; Aug 2002; 12 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461584; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461584

The monostatic VV and HH-polarized radar signatures of several targets and trees have been measured at foliage penetration frequencies (VHF/UHF) by using 1/35th scale models and an indoor radar range operating at X-band. An array of high-fidelity scale model ground vehicles and test objects as well as scaled ground terrain and trees have been fabricated for the study. Radar measurement accuracy has been confirmed by comparing the signature of a test object with a method of moments radar cross section prediction code. In addition to acquiring signatures of targets located on a smooth, dielectric ground plane, data have also been acquired with targets located in simulated wooded terrain that included scaled tree trunks and tree branches. In order to assure the correct backscattering behavior, all dielectric properties of live tree wood and moist soil were scaled properly to match the complex dielectric constant of the full-scale materials. The impact of the surrounding tree clutter on the VHF/UHF radar signatures of ground vehicles was accessed. Data were processed into high-resolution, polar-formatted ISAR imagery and signature comparisons are made between targets in open-field and forested scenarios.
DTIC
Forests; Imagery; Radar Targets; Targets; Terrain; Ultrahigh Frequencies; Very High Frequencies

20070008819 Naval Research Lab., Washington, DC USA

Gas Hydrate Exploration, Mid Chilean Coast; Geochemical-Geophysical Survey

Coffin, Richard B; Diaz, Juan; Gardner, Joan; Sellanes, Javier; Dec 27, 2006; 63 pp.; In English; Original contains color illustrations

Report No.(s): AD-A461588; NRL/MR/6110-06-9006; No Copyright; Avail.: CASI: A04, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461588

The Naval Research Laboratory (NRL), supported through ONRG-Chile, DOE/NETL, and ONR, participated in a research cruise along the mid-Chilean coast. Specific research topics addressed by NRL in this program include survey and prediction of geotechnical and geoacoustical anomalies, estimation of coastal hydrate distribution, refining protocol for hydrate exploration, and understanding the variation in microbial community diversity in hydrate-rich regions. The Chile-FONDEF goal in this program is to locate hydrates along the Chilean coast in terms of distribution and methane content for understanding the available energy and geological hazards. This effort integrates future energy exploration with ocean and climate research topics. The examination of sediments in this region was conducted in a collaborative effort between NRL, Milbar Hydrotest, Inc., Virginia Institute of Marine Science, Pontificia Universidad Catolica de Valparaiso, University of Concepcion, and Rice University. Piston coring, heatflow and biological sample sites were selected in two regions on the basis of previous seismic surveys taken during April 2003 and work conducted by scientists at the University of Concepcion. The coring and heatflow, along the previous NRL seismic line (DTAGS), was run between 36'10.38S, 73'35.72W and 36'12.50S, 73'3976W. Sulfate, sulfide, methane, chloride, and dissolved inorganic carbon (DIC) probes from piston core porewater samples, heatflow data and seismic profiles were combined to survey the presence of hydrates in this region. Fourteen out of 15 piston cores in this region were successful. Heatflow data was collected at 21 sites through the transect. An additional sample region was selected at the base of a 40 meter sub-sea mound located at 36'22S, 73'43W where biologists from University of Concepcion located large concentrations of benthic organisms.

DTIC

Chile; Coasts; Geochemistry; Geophysics; Hydrates; Surveys

20070008921 SRI International Corp., Menlo Park, CA USA

Goal-Directed Textured-Image Segmentation

Laws, Kenneth I; Sep 1984; 33 pp.; In English

Contract(s)/Grant(s): MDA903-83-C-0027; Proj-5355

Report No.(s): AD-A461738; SRI-TN-334; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461738

The SLICE textured-image segmentation system identifies image regions that differ in gray-level distribution, color, spatial texture, or other local property. It has been developed for the analysis of aerial imagery, although it can be used for any domain in which homogeneous image regions must be found prior to interpretation or enhancement. This report concentrates on textured-image segmentation using local texture-energy measures and user-delimited training regions. The SLICE algorithm combines knowledge of target textures or signatures with knowledge of background textures by using histogram-similarity transforms. Regions of high similarity to a target texture and of low similarity to any negative examples are identified and then mapped back to the original image. This use of texture-similarity transforms during the segmentation process improves segmenter performance and focuses segmentation activity on material types of greatest interest. The system can also be used for goal-independent texture segmentation by omitting the similarity-transform computations, and its hierarchical, recursive segmentation strategy integrates very well with other image-analysis techniques.

DTIC

Aerial Photography; Algorithms; Imaging Techniques

20070008949 SRI International Corp., Menlo Park, CA USA

Description of SRI's Baseline Stereo System

Hannah, Marsha J; Oct 1984; 13 pp.; In English

Contract(s)/Grant(s): MDA903-83-C-0027

Report No.(s): AD-A461789; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461789

We are implementing a baseline system for automated area-based stereo compilation This system, STSYS, operates in several passes over the data, during which it iteratively builds, checks, and refines its model of the 3-dimensional world, as represented by a pair of images In this paper, we describe the components of STSYS and give examples of the results it

produces We find that these results agree reasonably well with those produced on the interactive DIMP system at ETL, the best available benchmark.
DTIC
Computer Vision; Image Processing

20070008991 SRI International Corp., Menlo Park, CA USA
Hierarchical Warp Stereo
Quam, Lynn H; Dec 11, 1986; 9 pp.; In English
Contract(s)/Grant(s): MDA-903-83-C-0027
Report No.(s): AD-A461877; SRI-AIC-TN-402; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461877

This paper describes a new technique for use in the automatic production of digital terrain models from stereo pairs of aerial images. This technique employs a coarse-to-fine hierarchical control structure both for global constraint propagation and for efficiency. By the use of disparity estimates from coarser levels of the hierarchy one of the images is geometrically warped to improve the performance of the cross-correlation- based matching operator. A newly developed surface interpolation algorithm is used to fill holes wherever the matching operator fails. Experimental results for the Phoenix Mountain Park data set are presented and compared with those obtained by ETL.
DTIC
Aerial Photography; Terrain

20070008992 SRI International Corp., Menlo Park, CA USA
Evidential Reasoning for Geographic Evaluation for Helicopter Route Planning (Preprint)
Garvey, Thomas D; Dec 18, 1986; 25 pp.; In English
Contract(s)/Grant(s): DAAB07-84-C-FO92
Report No.(s): AD-A461879; SRI-AIC-TN-405; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461879

In order to plan operations where knowledge of significant elements is imprecise and uncertain, a means of characterizing the situation in terms of the various factors that may influence those operations must be provided. In this paper we discuss an approach to that characterization that uses evidential reasoning to handle the uncertainty, imprecision, and incompleteness typical of sources of real-world information and knowledge, to support planning routes for military helicopters. Evidential reasoning is a maturing collection of inference techniques for reasoning with uncertain information. Based on the Shafer-Dempster theory of evidence, evidential reasoning uses a non-Bayesian updating scheme to combine evidence provided by multiple, diverse knowledge sources. Knowledge sources in an evidential reasoning system are not required to attribute their belief to a universe of discourse comprised solely of mutually exclusive, exhaustive, singleton events, as required by a classical probability approach. Rather, they may express levels of ignorance explicitly by allocating belief to disjunctions of propositions, thereby leading directly to an interval measure of belief; ignorance is expressed by the width of this interval. Evidential reasoning evolved from consideration of appropriate models for reasoning about information acquired from sensors, and therefore seems natural for drawing conclusions from sensor data and prestored maps regarding the degree to which a selected geographic area will support certain activities. Here, we discuss evidential reasoning and illustrate the utility of the technology for classifying geographic areas by describing our current map-and-sensor-based research in which we estimate the utility of land areas for concealing helicopter operations.
DTIC
Helicopters; Routes; Topography

20070009007 Smithsonian Institution, Washington, DC USA
Microstructure Technology for Fabrication of Metal-Mesh Grids
Rebbert, Milton; Isaacson, Peter; Fischer, Jacqueline; Greenhouse, Matthew A; Grossman, Julius; Peckerar, Martin; Smith, Howard A; Mar 1, 1994; 8 pp.; In English
Contract(s)/Grant(s): NAGW-1711
Report No.(s): AD-A461918; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461918

Motivated by the need for highly efficient far-IR Fabry-Perot etalons for airborne and space astronomy, we have developed a high-yield photolithographic technique for producing low-loss metal-mesh reflectors. We describe the production

technique and report on the mesh flatness and uniformity. Optical measurements of meshes produced by this technique show that absorptivity of less than 1% with reflectivity of more than 98% was achieved at the longest wavelengths measured, which proved them to be significantly more efficient than commercially available meshes. This process can achieve wire widths that are less than the mesh thicknesses (typically 3 micrometers), which extends their applicability to wavelengths as short as ~20 micrometers without sacrificing mechanical strength for airborne and space-flight applications. Key words: Fabry-Perot, far-infrared, metal mesh, microstructure technology.
DTIC
Absorption; Computational Grids; Fabrication; Mesh; Microstructure; Reflectance; Reflectors; Spaceborne Astronomy

20070009277 Library of Congress, Washington, DC USA
Oil Shale: History, Incentives, and Policy
Andrews, Anthony; Apr 13, 2006; 33 pp.; In English
Report No.(s): AD-A462192; CRS-RL33359; No Copyright; Avail.: CASI: A03, Hardcopy

Oil shale is prevalent in the western states of Colorado, Utah, and Wyoming. The resource potential of these shales is estimated to be the equivalent of 1.8 trillion barrels of oil in place. Retorted oil shale yields liquid hydrocarbons in the range of middle-distillate fuels, such as jet and diesel fuel. However, because oil shales have not proved to be economically recoverable, they are considered a contingent resource and not true reserves. It remains to be demonstrated whether an economically significant oil volume can be extracted under existing operating conditions. In comparison, Saudi Arabia reportedly holds proved reserves of 267 billion barrels. Federal interest in oil shale dates back to the early 20th Century, when the Naval Petroleum and Oil Shale Reserves were set aside. Out of World War II concerns for a secure oil supply, a Bureau of Mines program began research into exploiting the resource. Commercial interest followed during the 1960s. After a second oil embargo in the 1970s, Congress created a synthetic fuels program to stimulate largescale commercial development of oil shale and other unconventional resources. The federal program proved short-lived, and commercially backed oil shale projects ended in the early 1980s when oil prices began declining.
DTIC
Incentives; Oils; Policies; Shales

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ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells; and solar, geothermal, windpower, and waterwave conversion systems; energy storage; and traditional power generators. For technologies related to nuclear energy production see *73 Nuclear Physics*. For related information see also *07 Aircraft Propulsion and Power; 20 Spacecraft Propulsion and Power*, and *28 Propellants and Fuels*.

20070006655 National Renewable Energy Lab., Golden, CO USA
Formation of ZnTe:Cu/Ti Contacts at High Temperature for CdS/CdTe Devices. Preprint
Gessert, T. A.; Asher, S.; Johnston, S.; Duda, A.; Young, M. R.; May 2006; 6 pp.; In English
Report No.(s): DE2006-891462; NREL/CP-520-39804; No Copyright; Avail.: Department of Energy Information Bridge

We study the performance of CdS/CdTe thin-film devices contacted with ZnTe:Cu/Ti of various thickness at a higher-than-optimum temperature of (approx)360 C. At this temperature, optimum device performance requires the same thickness of ZnTe:Cu as for similar contacts formed at a lower temperature of 320 C. C-V analysis indicates that a ZnTe:Cu layer thickness of (approx)\h 0.5 mu m does not yield the degree of CdTe net acceptor concentration necessary to reduce space charge width to its optimum value for n-p device operation. The thickest ZnTe:Cu layer investigated (1 mu m) yields the highest CdTe net acceptor concentration, lowest value of Jo, and highest Voc. However, performance is limited for this device by poor fill factor. We suggest poor fill factor is due to Cu-related acceptors compensating donors in CdS.
NTIS
Cadmium Tellurides; High Temperature; Solar Energy; Space Charge; Thin Films

20070006656 National Renewable Energy Lab., Golden, CO USA, Purdue Univ., West Lafayette, IN USA
Linearity Testing of Photovaltaic Cells. Preprint
Emery, K.; Winter, S.; Pinegar, S.; Nalley, D.; May 2006; 6 pp.; In English
Report No.(s): DE2006-891463; NREL/CP-520-39854; No Copyright; Avail.: Department of Energy Information Bridge

Photovoltaic devices are rated in terms of their peak power with respect to a specific spectrum, total irradiance, and temperature. To rate photovoltaic devices, a reference detector is required whose response is linear with total irradiance. This

paper describes a procedure to determine the linearity of the short-circuit current (Isc) versus the total irradiance (Etot) by illuminating a reference cell with two lamps. A device is linear if the current measured with both lamps illuminating the cell is the same as the sum of the currents with each lamp illuminating the cell. The two-lamp method is insensitive to the light spectra or spatial nonuniformity changing with irradiance. The two-lamp method is rapid, easy to implement, and does not require operator intervention to change the irradiances. The presence of room light only limits the lowest irradiance that can be evaluated. Unlike other methods, the two-lamp method does not allow the current to be corrected for nonlinear effects.
NTIS
Linearity; Loads (Forces); Photovoltaic Cells

20070006657 National Renewable Energy Lab., Golden, CO USA
Multijunction Photovoltaic Technologies for High-Performance Concentrators. Preprint
McConnell, R.; Symko-Davies, M.; May 2006; 6 pp.; In English
Report No.(s): DE2006-891464; NREL/CP-520-39791; No Copyright; Avail.: Department of Energy Information Bridge

Multijunction solar cells provide high-performance technology pathways leading to potentially low-cost electricity generated from concentrated sunlight. The National Center for Photovoltaics at the National Renewable Energy Laboratory has funded different III-V multijunction solar cell technologies and various solar concentration approaches. Within this group of projects, III-V solar cell efficiencies of 41% are close at hand and will likely be reported in these conference proceedings. Companies with well-developed solar concentrator structures foresee installed system costs of $3/watt--half of today's costs--within the next 2 to 5 years as these high-efficiency photovoltaic technologies are incorporated into their concentrator photovoltaic systems. These technology improvements are timely as new large-scale multi-megawatt markets, appropriate for high performance PV concentrators, open around the world.
NTIS
Concentrators; Photovoltaic Cells; Solar Cells

20070006658 National Renewable Energy Lab., Golden, CO USA
Cross-Sectional Conductive Atomic Force Microscopy of CdTe/CdS Solar Cells: Effects of Etching and Back-Contact Processes. Preprint
Moutinho, H. R.; Dhere, R. G.; Jiang, C. S.; Gessert, T.; Duda, A.; May 2006; 6 pp.; In English
Report No.(s): DE2006-891465; NREL/CP-520-39802; No Copyright; Avail.: Department of Energy Information Bridge

We investigated the effects of the etching processes using bromine and nitric-phosphoric acid solutions, as well as of Cu, in the bulk electrical conductivity of CdTe/CdS solar cells using conductive atomic force microscopy (C-AFM). Although the etching process can create a conductive layer on the surface of the CdTe, the layer is very shallow. In contrast, the addition of a thin layer of Cu to the surface creates a conductive layer inside the CdTe that is not uniform in depth, is concentrated at grains boundaries, and may short circuit the device if the CdTe is too thin. The etching process facilitates the Cu diffusion and results in thicker conductive layers. The existence of this inhomogeneous conductive layer directly affects the current transport and is probably the reason for needing thick CdTe in these devices.
NTIS
Atomic Force Microscopy; Cadmium Tellurides; Etching; Solar Cells; Solar Energy

20070006736 National Renewable Energy Lab., Golden, CO USA, Florida Univ., Gainesville, FL, USA
Fundamental Materials Research and Advanced Process Development for Thin-Film CIS-Based Photovoltaics
Anderson, T. J.; Li, S. S.; Crisalle, O. D.; Craciun, V.; Sep. 2006; 226 pp.; In English
Report No.(s): DE2006-891600; NREL/SR-520-40568; No Copyright; Avail.: National Technical Information Service (NTIS)

The objectives for this thin-film copper-indium-diselenide (CIS) solar cell project cover the following areas: Develop and characterize buffer layers for CIS-based solar cell; grow and characterize chemical-bath deposition of Znx Cd1-xS buffer layers grown on CIGS absorbers; study effects of buffer-layer processing on CIGS thin films characterized by the dual-beam optical modulation technique; grow epitaxial CuInSe2 at high temperature; study the defect structure of CGS by photoluminescence spectroscopy; investigate deep-level defects in Cu(In,Ga)Se2 solar cells by deep-level transient spectroscopy; conduct thermodynamic modeling of the isothermal 500 C section of the Cu-In-Se system using a defect model; form alpha-CuInSe2 by rapid thermal processing of a stacked binary compound bilayer; investigate pulsed non-melt laser

annealing on the film properties and performance of Cu(In,Ga)Se2 solar cells; and conduct device modeling and simulation of CIGS solar cells.
NTIS
Copper Selenides; Indium Selenides; Photovoltaic Conversion; Solar Cells; Thin Films

20070006767 Jagtiani and Guttag, Fairfax, VA, USA
Non-Aqueous Electrolytes for Lithium Ion Batteries
Chen, Z.; Amine, K.; 10 Mar 06; 9 pp.; In English
Contract(s)/Grant(s): W31-109-ENG-38
Patent Info.: Filed Filed 10 Mar 06; US-Patent-Appl-SN-11-373 054
Report No.(s): PB2007-101362; No Copyright; Avail.: CASI: A02, Hardcopy

An article comprising a silicon carbide and/or silicon metal-containing substrate and an environmental barrier layer overlaying the substrate, wherein the environmental barrier layer has a thickness up to about 5 mils (127 microns) and comprises a reaction-generated corrosion resistant metal silicate. A process is also provided for reacting a metal source and a silica source over the silicon carbide and/or silicon metal-containing substrate to form the environmental barrier layer comprising the reaction-generated corrosion resistant metal silicate.
NTIS
Electric Batteries; Electrolytes; Lithium; Metal Ions; Patent Applications

20070006804 National Renewable Energy Lab., Golden, CO USA
BEopt (TRADE MARK) Software for Building Energy Optimization: Features and Capabilities
Christensen, C.; Anderson, R.; Horowitz, S.; Courtney, A.; Spencer, J.; Aug. 2006; 21 pp.; In English
Report No.(s): DE2006-891598; NREL/TP-550-39923; No Copyright; Avail.: National Technical Information Service (NTIS)

BEopt is a computer program designed to find optimal building designs along the path to ZNE. A user selects from predefined options in various categories to specify options to be considered in the optimization. Energy savings are calculated relative to a reference. The reference can be either a user-defined base-case building or a climate-specific Building America Benchmark building automatically generated by BEopt. The user can also review and modify detailed information on all available options in a linked options library spreadsheet. BEopt calls the DOE2 and TRNSYS simulation engines and uses a sequential search technique to automate the process of identifying optimal building designs along the path to ZNE. BEopt finds these optimal and near-optimal designs based on discrete building options reflecting realistic construction options. BEopt handles special situations with positive or negative interactions between options in different categories. The BEopt software includes a results browser that allows the user to navigate among different design points and retrieve detailed results regarding energy end-use and option costs in different categories. Multiple cases, based on a selected parameter such as climate, can be included in a BEopt project file for comparative purposes.
NTIS
Buildings; Computer Programs; Energy Conservation

20070006809 National Renewable Energy Lab., Golden, CO USA, Sandia National Labs., Albuquerque, NM USA
PV Manufacturing R&D Project Status and Accomplishments under 'In-Line Diagnostics and Intelligent Processing and Yield, Durability and Reliability
Firedman, D. J.; Mitchell, R. L.; Keyes, B. M.; Bower, W. I.; King, R.; May 2006; 6 pp.; In English
Report No.(s): DE2006-891551; NREL/CP-520-39904; No Copyright; Avail.: Department of Energy Information Bridge

The PV Manufacturing R&D (PVMR&D) Project conducts cost-shared research and development programs with U.S. PV industry partners. There are currently two active industry partnership activities. 'In-line Diagnostics and Intelligent Processing', launched in 2002, supports development of new in-line diagnostics and monitoring with real-time feedback for optimal process control and increased yield in the fabrication of PV modules, systems, and other system components. 'Yield, Durability and Reliability', launched in late 2004, supports enhancement of PV module, system component, and complete system reliability in high-volume manufacturing. A second key undertaking of the PVMR&D Project is the collection and analysis of module production cost-capacity metrics for the U.S. PV industry. In the period from 1992 through 2005, the average module manufacturing cost in 2005 dollars fell 54% (5.7% annualized) to $2.74/Wp, and the capacity increased

18.6-fold (25% annualized) to 253 MW/yr. An experience curve analysis gives progress ratios of 87% and 81%, respectively, for U.S. silicon and thin-film module production.
NTIS
Diagnosis; Durability; Fabrication; Manufacturing; Photovoltaic Conversion; Reliability

20070006812 National Renewable Energy Lab., Golden, CO USA
Effect of the Film Hydrogen Content and Deposition Type on the Grain Nucleation and Grain Growth During Crystallization of a-Si:H Films
Mahan, A. H.; Ahrenkiel, S. P.; Ginley, D. S.; Roy, B.; Schropp, R. E. I.; May 2006; 6 pp.; In English
Report No.(s): DE2006-891549; NREL/CRP-520-39901; No Copyright; Avail.: Department of Energy Information Bridge
We report the effect of the initial film hydrogen content (CH) on the crystallization kinetics, crystallite nucleation rate and grain growth rate when HWCVD and PECVD a-Si:H films are crystallized by annealing at 600 C. For the HWCVD films, both the incubation time and crystallization time decrease, and the full width at half maximum (FWHM) of the XRD (111) peak decreases with decreasing film CH. However, other sources of XRD line broadening exist in such materials in addition to crystallite size, including the density of crystallite defects. To address these issues, TEM measurements have also been performed on a-Si:H films deposited directly onto TEM grids.
NTIS
Amorphous Silicon; Annealing; Crystallization; Deposition; Hydrogen; Hydrogenation; Nucleation

20070006813 National Renewable Energy Lab., Golden, CO USA
Multi-Layer Inkjet Printed Contacts for Silicon Solar Cells
Curtis, C. J.; van Hest, M.; Miedaner, A.; Kaydanova, T.; Smith, L.; May 2006; 5 pp.; In English
Report No.(s): DE2006-891550; NREL/CP-520-39902; No Copyright; Avail.: Department of Energy Information Bridge
Ag, Cu, and Ni metallizations were inkjet printed with near vacuum deposition quality. The approach developed can be easily extended to other conductors such as Pt, Pd, Au, etc. Thick highly conducting lines of Ag and Cu demonstrating good adhesion to glass, Si, and printed circuit board (PCB) have been printed at 100-200 C in air and N2 respectively. Ag grids were inkjet-printed on Si solar cells and fired through the silicon nitride AR layer at 850 C, resulting in 8% cells. Next generation inks, including an ink that etches silicon nitride, have now been developed. Multi-layer inkjet printing of the etching ink followed by Ag ink produced contacts under milder conditions and gave solar cells with efficiencies as high as 12%.
NTIS
Adhesion; Deposition; Glass; Printing; Solar Cells

20070006814 National Renewable Energy Lab., Golden, CO USA
Effect of Sb on the Properties of GaLnP Top Cells
Olson, W. M.; McMahon, W. E.; Kurtz, S.; May 2006; 6 pp.; In English
Report No.(s): DE2006-891548; NREL/CP-520-39903; No Copyright; Avail.: Department of Energy Information Bridge
It is well known that the efficiency of GaInP/GaAs tandem solar cells is limited by the band gap of the GaInP top cell, which, in turn, is determined by the degree of compositional ordering in GaInP base layer. Attempts to raise the band gap by the addition of Al to the top cell have met with limited success due to the strong affinity between Al and oxygen. Here we investigate a different approach. It has been shown that the presence of antimony on the surface of GaInP during its growth suppresses the ordering process and increases the band gap. In this paper, we study the effects of Sb on the properties of GaInP top cells. We show that, in addition to raising the band gap of GaInP, it also increases the incorporation of Zn and changes the relative incorporation of Ga and In. These effects depend strongly on the substrate orientation, growth temperature and rate, and the Sb/P ratio in the gas phase. We show that the band gap of the GaInP top cell (and the Voc) can be increased without reducing the minority carrier collection efficiency. The implications of these results are presented and discussed.
NTIS
Energy Conversion; Solar Cells

20070006815 National Renewable Energy Lab., Golden, CO USA, Sandia National Labs., Albuquerque, NM USA
Ethylene-Vinyl Acetate Potential Problems for Photovoltaic Packaging
Kempe, M. D.; Jorgensen, G. J.; Terwilliger, K. M.; McMahon, T. J.; Kennedy, C. E.; May 2006; 6 pp.; In English
Report No.(s): DE2006-891546; NREL/CP-520-39915; No Copyright; Avail.: Department of Energy Information Bridge
Photovoltaic (PV) devices are typically encapsulated using ethylene-vinyl acetate (EVA) to provide mechanical support,

optical coupling, electrical isolation, and protection against environmental exposure. Under exposure to atmospheric water and/or ultraviolet radiation, EVA will decompose to produce acetic acid, lowering the pH and increasing the surface corrosion rates of embedded devices. Even though acetic acid is produced at a very slow rate, it may not take much to catalyze reactions that lead to rapid module deterioration. Another consideration is that the glass transition of EVA, as measured using dynamic mechanical analysis, begins at temperatures of about 15C. Temperatures lower than this can be reached for extended periods of time in some climates. Because of increased moduli below the glass transition temperature, a module may be more vulnerable to damage if a mechanical load is applied by snow or wind at low temperatures. Modules using EVA should not be rated for use at such low temperatures without additional low-temperature mechanical testing beyond the scope of UL 1703.
NTIS
Acetates; Acetic Acid; Climate; Corrosion; Packaging

20070006816 National Renewable Energy Lab., Golden, CO USA
Investigation of Cd(sup 1-x)Mg(sup x)Te Alloys for Tandem Solar Cell Applications
Dhere, R.; Ramanathan, K.; Scharf, J.; Moutinho, H.; To, B.; May 2006; 6 pp.; In English
Report No.(s): DE2006-891547; NREL/CP-520-39899; No Copyright; Avail.: Department of Energy Information Bridge

Theoretical modeling of two-junction tandem solar cells shows that for optimal device performance, the bandgap of the top cell should be in the range of 1.6 to 1.8 eV. Cd1-xMgxTe (CMT) alloys have a lattice constant close to that of CdTe, and the addition of a small amount of Mg changes the bandgap considerably. In this paper, we present our work on developing CMT for solar cell applications. CMT films were prepared by vacuum deposition with co-evaporation of CdTe and Mg on substrates heated to 300-400 C. Films with a composition in the range of x = 0 to 0.66 were fabricated, and optical analysis of the films showed that the bandgap of the samples ranged from 1.5 to 2.3 eV and varied linearly with composition. For the fabrication of devices using these alloy films, we also investigated the effect of post-deposition CdCl2 heat treatment. We have investigated junctions between CdS and CMT alloys in the bandgap range of 1.5 to 1.8 eV for tandem cell applications. We have also worked on the ohmic contacts to the CMT alloy films using Cu/Au bilayers, and the preliminary data shows a significant effect of the contact processing on the device performance.
NTIS
Fabrication; Solar Cells

20070007269 National Renewable Energy Lab., Golden, CO USA
Silicon Heterojunction Solar Cell Characterization and Optimization Using In Situ and Ex Situ Spectroscopic Ellipsometry
Levi, D.; Iwaniczko, E.; Page, M.; Wang, Q.; Branz, H.; May 2006; 6 pp.; In English
Report No.(s): DE2006-891543; NRELCP-520-39932; No Copyright; Avail.: Department of Energy Information Bridge

We use in-situ and ex-situ spectroscopic ellipsometry to characterize the optical, electronic, and structural properties of individual layers and completed silicon heterojunction devices. The combination of in-situ measurements during thin film deposition with ex-situ measurements of completed devices allows us to understand both the growth dynamics of the materials and the effects of each processing step on material properties. In-situ ellipsometry measurements enable us to map out how the optical properties change with deposition conditions, pointing the way towards reducing the absorption loss and increasing device efficiency. We use the measured optical properties and thickness of the i-, n-, and p-layers in optical device modeling to determine how the material properties affect device performance. Our best solar energy conversion efficiencies are 16.9% for a non-textured, single-sided device with an aluminum back surface field contact on a p-type float zone silicon wafer, and 17.8% for a textured double-sided device on a p-type float zone silicon wafer.
NTIS
Characterization; Ellipsometry; Heterojunction Devices; Solar Cells; Spectroscopy

20070007279 Texas A&M Univ., College Station, TX USA
Energy Analysis Tools
Fournier, Donald; Oct 8, 2003; 89 pp.; In English; Original contains color illustrations
Report No.(s): AD-A459999; ERDC/CERL-SR-04-26; No Copyright; Avail.: Defense Technical Information Center (DTIC) ONLINE: http://hdl.handle.net/100.2/ADA459999

Partial contents: Managing Energy, Water and Pollution Is a Big Challenge, REEP provides Quick Answers to Tough Questions, High Level Screening of Facilities Retrofits, REEP screens 104 projects at 210 DoD Installations, Major Impact

Analysis, Potential Users, Preloaded data from 210 Installations, REEP Analysis.
DTIC
Energy Conservation; Pollution Control

20070007282 National Renewable Energy Lab., Golden, CO USA
0.7-eV GaInAs Junction for a GaInAs(0.7-eV) Four-Junction Solar Cell
Friedman, D. J.; Geisz, J. F.; Norman, A. G.; Wanlass, M. W.; Kurtz, S. R.; May 2006; 7 pp.; In English
Report No.(s): DE2006-891544; NREL/CP-520-39913; No Copyright; Avail.: Department of Energy Information Bridge

We discuss recent developments in III-V multijunction solar cells, focusing on adding a fourth junction to the Ga0.5In0.5P/GaAs/Ga0.75In0.25As inverted three-junction cell. This cell, grown inverted on GaAs so that the lattice-mismatched Ga0.75In0.25As third junction is the last one grown, has demonstrated 38% efficiency, and 40% is likely in the near future. To achieve still further gains, a lower-bandgap GaxIn1-xAs fourth junction could be added to the three-junction structure for a four-junction cell whose efficiency could exceed 45% under concentration. Here, we present the initial development of the GaxIn1-xAs fourth junction. Junctions of various bandgaps ranging from 0.88 to 0.73 eV were grown, in order to study the effect of the different amounts of lattice mismatch. At a bandgap of 0.88 eV, junctions were obtained with very encouraging (approx)80% quantum efficiency, 57% fill factor, and 0.36 eV open-circuit voltage. The device performance degrades with decreasing bandgap (i.e., increasing lattice mismatch). We model the four-junction device efficiency vs. fourth junction bandgap to show that an 0.7-eV fourth-junction bandgap, while optimal if it could be achieved in practice, is not necessary; an 0.9-eV bandgap would still permit significant gains in multijunction cell efficiency while being easier to achieve than the lower-bandgap junction.
NTIS
Energy Conversion; Solar Cells; Gallium Arsenides; Indium Arsenides

20070007479 Naval Ship Research and Development Center, Bethesda, MD USA
Factors Influencing Accelerometer Measurement Capabilities - A Practical Measurement Guide
Miller, R W; Sep 1973; 47 pp.; In English
Report No.(s): AD-A460580; DTNSRDC-3941; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460580

After a brief review of the electromechanical functioning of the piezoelectric accelerometer, factors affecting its dynamic response characteristics and therefore the validity of vibration measurement are discussed. Consideration is given to variables such as shunt resistance and capacitance, mounting methods, base bending, cable noise, ground- loop currents, and environmental effects. Approved accelerometer mounting techniques that will ensure the accuracy and repeatability of the measurement are also described.
DTIC
Accelerometers; Electromechanical Devices

20070007523 Oak Ridge National Lab., TN USA
Energy-Saving and Process Technologies Development at ORNL
MacDonald, Michael; Feb 26, 2004; 43 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460655; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460655

Overview of energy-saving and process technologies being developed at Oak Ridge National Laboratory.
DTIC
Buildings; Energy Conservation

20070007598 Illinois Univ. at Urbana-Champaign, Urbana, IL USA
Maximum Utilization of On-Base Emergency Generation after Sustained Utility Outage
Cooper, Bryan J; Oct 27, 2006; 66 pp.; In English
Report No.(s): AD-A460799; AFIT-CI07-0006; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460799

The focus of this research will take advantage of the excess emergency generation capacity typically seen at any Air Force base and use it to backfeed the local distribution system to maximize the load supplied for sustained power outages. The model developed was intended to represent all Air Force bases and includes 2 distribution substations, 7 feeders, and 39 dispersed

emergency generators. The generators range in size from 7.5 kW to 2.5 MW and provide a total of 13.9 MVA of potential capacity. Four system states were simulated in this research. Power flow and short-circuit tests were performed for each state to verify and check solution feasibility. The base case modeled normal operating conditions with the utility supplying the entire load. The first scenario simulated the loss of utility so only critical loads were powered by their respective emergency generators. This created 39 electrical islands leaving an excess generating capacity of 8.23 MVA. The second scenario attempted to connect generators so power could be supplied to some noncritical loads. Through trial and error, while verifying feasibility, 22 electrical islands were created reducing the excess generating capacity to 4.07 MVA. The third scenario employed essential loading tactics to maximize the quantity of loads supplied. Here, 18 electrical islands were formed giving an excess generating capacity of 4.71 MVA. There are several issues that may prohibit connecting generators to an existing distribution system. Transformers will need to act as step-up transformers for the generators, and may have adverse effects on short-circuit currents and harmonics, depending on their size, impedance rating, and configuration. Unintentional islanding may damage equipment and cause harm to crews who maintain the system, and the coordination and existing protection scheme may become invalid as a result of adding distributed generators.
DTIC
Emergencies; Military Air Facilities; Supplying

20070008029 Fraunhofer-Inst fuer Bauphysik, Stuttgart, Germany
Energy Concept Adviser: A new Internet-based Tool for Decision Makers and their Technical Staff
Woessnet, Simon; Feb 26, 2004; 54 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460238; No Copyright; Avail.: CASI: A04, Hardcopy

SUBTASK B, CASE STUDIES: * Targets for building types and climates * Case studies + status * Conceptual design forum * Observe the case study construction * Monitoring of the case studies * Final design guidelines * Document the case studies.
DTIC
Energy Conservation; Internets; Software Development Tools

20070008168 Army Construction Engineering Research Lab., Champaign, IL USA
Control Dynamics of Adaptive and Scalable Power and Energy Systems for Military Micro Grids
Abdallah, Tarek; Ducey, Roch; Feickert, Carl A; Balog, Robert S; Weaver, Wayne; Akhil, Abbas; Menicucci, David; Dec 2006; 55 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460715; ERDC/CERL-TR-06-35; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460715

Aging transmission and substation infrastructure linking military bases to commercial utility power coupled with aging distribution systems inside the base threatens installation mission readiness. Traditionally, the practice of providing critical facility power contingency has been to install building-dedicated engine generators. However, the presence of these units provides a false sense of security because actual reliability is reduced due to sub-optimal and intermittent loading. A major energy challenge for military installations is to improve their energy security while conforming to Assistant Chief of Staff for Installation Management requirements (mandating reduced economic and environmental impact of installation energy). This report provides a technical explanation of the power electronic and control response challenges associated with the design of an autonomous military installation scalable power system capable of operating independently from the commercial grid for extended periods of time in an emergency. Rather than providing power only to pre-determined mission essential facilities, the micro grid will give the mission commander the ability to dynamically designate and prioritize which facilities receive available power. Implementing a scalable power grid will assure significant enhancement of mission readiness, and as a direct consequence, intelligent system control will enable base personnel to quantify the state of mission readiness.
DTIC
Adaptive Control; Energy Policy; Electric Power Plants; Electronic Control

20070008342 National Energy Technology Lab., Morgantown, WV, USA, Utah State Univ., Logan, UT, USA, Oak Ridge National Lab., TN USA
Adaptive Full-Spectrum Solar Energy Systems Cross-Cutting R & D on Adaptive Full-Spectrum Solar Energy Systems for More Efficient and Affordable Use of Solar Energy in Buildings and Hybrid Photobioreactors. Semi Annual Technical Progress Report for period ending January 31, 2006
Wood, B. D.; Beshears, D. L.; Jan. 31, 2006; 39 pp.; In English
Report No.(s): DE2006-893092; DE-FC26-01NT41164; No Copyright; Avail.: National Technical Information Service (NTIS)

This RD&D project is a three year team effort to develop a hybrid solar lighting (HSL) system that transports daylight from a paraboloidal dish concentrator to a luminaire via a bundle of polymer fiber optics. The luminaire can be a device to distribute sunlight into a space for the production of algae or it can be a device that is a combination of daylighting and electric lighting for space/task lighting. In this project, the sunlight is collected using a one-meter paraboloidal concentrator dish with two-axis tracking. For the third generation (beta) system, the secondary mirror is an ellipsoidal mirror that directs the visible light into a bundle of 3 mm diameter fibers. The IR spectrum is filtered out to minimize unnecessary heating at the fiber entrance region. This report describes the following investigations: (1)Niche applications for HSL technology, (2)Luminaire design characteristics for linear and point lighting fixtures, (3) Daylight affects on productivity.
NTIS
Buildings; Cutting; Fiber Optics; Illuminating; Solar Energy; Spectra

20070008397 Stanford Linear Accelerator Center, CA, USA, Illinois Univ. at Urbana-Champaign, Urbana, IL, USA, Stanford Univ., CA, USA
X-ray Photoelectron Spectroscopy ofGaP-(1-x)N-x Photocorroded as a Result of Hydrogen Production through Water Electrolysis
Mayer, M. A.; Aug. 18, 2006; 18 pp.; In English
Report No.(s): DE2006-892610; SLAC-TN-06-010; No Copyright; Avail.: National Technical Information Service (NTIS)
Photoelectrochemical (PEC) cells produce hydrogen gas through the sunlight driven electrolysis of water. By extracting hydrogen and oxygen from water and storing solar energy in the H-H bond, they offer a promising renewable energy technology. Addition of dilute amounts of nitrogen to III-V semiconductors has been shown to dramatically increase the stability of these materials for hydrogen production. In an effort to learn more about the origin of semiconductor photocorrosion in PEC cells, three samples of p-type GaP with varying levels of nitrogen content (0%, 0.2%, 2%) were photocorroded and examined by X-ray Photoelectron Spectroscopy (XPS). GaPN samples were observed to be more efficient during the hydrogen production process than the pure GaP samples. Sample surfaces contained gallium oxides in the form of Ga(sub 2)O(sub 3) and Ga(OH)(sub 3) and phosphorus oxide (P(sub 2)O(sub 5)), as well as surface oxides from exposure to air. A significant shift in intensity from bulk to surface peaks dramatic nitrogen segregation to the surface during photoelectrochemical hydrogen production. Further investigations, including using a scanning electron microscope to investigate sample topography and inductively coupled plasma mass spectroscopy (ICP-MS) analysis for solution analyses, are under way to determine the mechanism for these changes.
NTIS
Electrolysis; Hydrogen; Hydrogen Production; Mass Spectroscopy; Photoelectron Spectroscopy; Solar Energy; Water Splitting; X Ray Spectroscopy

20070008601 Carnegie-Mellon Univ., Pittsburgh, PA USA
Extending Mobile Computer Battery Life through Energy-Aware Adaptation
Flinn, Jason; Dec 2001; 166 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F19628-93-C-0193; F19628-96-C-0061
Report No.(s): AD-A461207; CMU-CS-01-171; No Copyright; Avail.: CASI: A08, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461207
Energy management has been a critical problem since the earliest days of mobile computing. The amount of work one can perform while mobile is fundamentally constrained by the limited energy supplied by one's battery. Although a large research investment in low-power circuit design and hardware power management has led to more energy-efficient systems, there is a growing realization that more is needed the higher levels of the system, the operating system and applications, must also contribute to energy conservation. This dissertation puts forth the claim that energy-aware adaptation, the dynamic balancing of application quality and energy conservation, is an essential part of a complete energy management strategy. Energy-aware applications identify possible tradeoffs between energy use and application quality, but defer decisions about which tradeoffs to make until runtime. The operating system uses additional information available during execution, such as resource supply and demand, to advise applications which tradeoffs are best. This dissertation first shows how one can measure the energy impact of the higher levels of the system. It describes the design and implementation of PowerScope, an energy profiling tool that maps energy consumption to specific code components. PowerScope helps developers increase the energy-efficiency of their software by focusing attention on those processes and procedures that are responsible for the bulk of energy use. PowerScope is used to perform a detailed study of energy-aware adaptation, focusing on two dimensions: reduction of data and computation quality, and relocation of execution to remote machines. The results of the study show that applications can significantly extend the battery lifetimes of the systems on which they execute by modifying their behavior.

On some platforms, quality reduction and remote execution can decrease application energy usage by up to 94%.
DTIC
Electric Batteries; Energy Conservation

20070008699 Army Construction Engineering Research Lab., Champaign, IL USA
Evaluation of European District Heating Systems for Application to Army Installations in the USA
Zhivov, Alexander M; Vavrin, John L; Woody, Alfred; Fournier, Donald; Richter, Stephen; Droste, Daniel; Paiho, Satu; Jahn, Jenni; Kohonen, Reijo; Jul 2006; 245 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461391; ERDC/CERL TR-06-20; No Copyright; Avail.: CASI: A11, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461391

District heating (DH) is much less common in the USA than in Europe, where it is widely accepted as a method for providing safe, efficient, low-cost heating energy to the consumer. This study investigated and evaluated experiences with DH systems in Europe, focusing on systems in Germany and Finland, to offer recommendations for improving U.S. Army DH systems in the Continental USA (CONUS), specifically to evaluate the feasibility and economics of converting existing systems, to reduce heat and water losses, to improve thermal efficiencies, and to reduce the high cost of pipe replacement. This work investigated technical details of energy plant and DH systems, including some U.S. Army and municipal district heating systems in Germany, and recommended that CONUS Army central energy plants be investigated for conversion to cogeneration facilities, with sliding temperature-variable flow of medium/low temperature hot water as a heating source.
DTIC
Cogeneration; Heating; Replacing; United States

20070008710 Army War Coll., Carlisle Barracks, PA USA
A Need for Change: The Looming Energy Crisis
Holzman, Simon L; Feb 8, 2006; 31 pp.; In English
Report No.(s): AD-A461433; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461433

The USA (US) national interest in the Middle East has grown more complex over the years, but fundamental concerns regarding oil protection and availability remain a central theme. U.S. dependency on Middle Eastern oil to meet ever-increasing energy consumption demands have returned to the levels found just prior to the 1978-1980 oil crisis. Current Middle Eastern instability and the rise of the al-Qaeda insurgency revive questions regarding the ability of the USA to weather an abrupt and significant loss of Middle Eastern oil. This paper analyzes current and projected energy sources, consumption demands, risk associated with foreign energy dependencies, and alternative energy sources. The paper also addresses implications to the economy, the military, and other nations should an energy crisis appear prior to the elimination of foreign energy dependencies. Finally, the paper provides policy recommendations for strategic leaders, planners, and politicians regarding prudent measures needed to minimize the required use of force to protect the flow of oil from the Middle East in the advent of another oil crisis.
DTIC
Energy Consumption; Energy Technology; Fuel Oils; Middle East; Terrorism

20070008719 Army Tank-Automotive Research and Development Command, Warren, MI USA
VRLA Battery Technology for Military Vehicle Applications
Krestik, Fred; Jun 13, 2005; 13 pp.; In English
Report No.(s): AD-A461450; TARDEC-14837; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461450

Valve regulated lead acid (VRLA) batteries offer performance advantages for military vehicle applications. Thus the Army is looking for alternative sources of military-sized VRLA batteries.
DTIC
Electric Batteries; Lead Acid Batteries; Technology Utilization

20070009274 Army Research Lab., Adelphi, MD USA
Parametric Study of Beta-Endpoint Energy in Direct Energy Converters
Blaine, Kara; Litz, Marc; Jan 2007; 62 pp.; In English; Original contains color illustrations
Report No.(s): AD-A462187; ARL-TR-4034; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Several solid-state materials have been identified for potential use as direct-energy-converter (DEC) for isotope-based batteries. Numerical simulations, using a nuclear scattering code (MCNPX), have been performed to determine the electron energy deposited in the material. Two different parametric studies were performed 1) varying Beta-endpoint energy of a spectrum illuminating layers of silicon-carbide (SiC), 2) the other varying the material layers while keeping the Beta-endpoint energy constant. The goal of the simulations is to identify the regions within the materials of maximum energy deposition so DEC devices can be fabricated for higher efficiency. The results show that 50 keV and 100 keV Beta-endpoint energies stand to have most impact to future Schottky devices, generating the largest number density of carriers, and highest energy deposition efficiency in the first 10 micrometers of SiC.
DTIC
Direct Power Generators; Weapon Systems

20070009601 Naval Undersea Warfare Center, Newport, RI USA
Method for Increasing Fiber Density in Electrostatic Flocking
Patrissi, Charles J, Inventor; Oct 26, 2006; 16 pp.; In English
Report No.(s): AD-D020277; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention relates generally to methods of fabricating fibrous structures, and more particularly to a direct charging electrostatic flocking method for fabricating a fibrous structure that can be used in a variety of electrochemical applications including utilization as an electrode or as a catalyst support.
DTIC
Electrodes; Electrostatics; Fabrication; Patent Applications

45
ENVIRONMENT POLLUTION

Includes atmospheric, water, soil, noise, and thermal pollution.

20070006586 Ohio Univ., Athens, OH, USA
Evaluation of the Emission, Transport, and Deposition of Mercury, Fine Particulate Matter, and Arsenic from Coal-Based Power Plants in the Ohio River Valley Region. (Semi-Annual Report, October 3, 2005-April 2, 2006)
January 2006; 21 pp.; In English
Report No.(s): DE2006-891303; No Copyright; Avail.: Department of Energy Information Bridge

The scope of work for the ambient air monitoring will include the deployment of a surface air monitoring (SAM) station in southeastern Ohio. The SAM station will contain sampling equipment to collect and measure mercury (including speciated forms of mercury and wet and dry deposited mercury), arsenic, particulate matter (PM) mass, PM composition, and gaseous criteria pollutants (CO, NOx, SO2, O3, etc.). Laboratory analysis of time-integrated samples will be used to obtain chemical speciation of ambient PM composition and mercury in precipitation. Near-real-time measurements will be used to measure the ambient concentrations of PM mass and all gaseous species including Hg0 and RGM. Approximately 18 months of field data will be collected at the SAM site to validate the proposed regional model simulations for episodic and seasonal model runs. The ambient air quality data will also provide mercury, arsenic, and fine particulate matter data that can be used by Ohio Valley industries to assess performance on multi-pollutant control systems. The scope of work for the modeling analysis will include (1) development of updated inventories of mercury and arsenic emissions from coal plants and other important sources in the modeled domain; (2) adapting an existing 3-D atmospheric chemical transport model to incorporate recent advancements in the understanding of mercury transformations in the atmosphere; (3) analyses of the flux of Hg0, RGM, arsenic, and fine particulate matter in the different sectors of the study region to identify key transport mechanisms; (4) comparison of cross correlations between species from the model results to observations in order to evaluate characteristics of specific air masses associated with long-range transport from a specified source region; and (5) evaluation of the sensitivity of these correlations to emissions from regions along the transport path. This will be accomplished by multiple model runs with emissions simulations switched on and off from the various source regions. To the greatest extent possible, model results will also be compared to field data collected at other air monitoring sites in the Ohio Valley region, operated independently of this project. These sites may include (1) the DOE National Energy Technologies Laboratorys monitoring site at its suburban Pittsburgh, PA facility; (2) sites in Pittsburgh (Lawrenceville) PA and Holbrook, PA operated by ATS; (3) sites in Steubenville, OH and Pittsburgh, PA operated by the USEPA and/or its contractors; and (4) sites operated by State or local air regulatory agencies. Field verification of model results and predictions will provide critical information for the development of cost effective air

pollution control strategies by the coal-fired power plants in the Ohio River Valley region.
NTIS
Air Pollution; Arsenic; Coal; Deposition; Particulates; Pollution Monitoring; Rivers; Valleys

20070006591 Brookhaven National Lab., Upton, NY USA
Perfluocarbon Gas Tracer Studies to Support Risk Assessment Modeling of Critical Infrastructure Subjected to Terrorist Attacks
Sullivan, T. M.; Heiser, J.; Watson, T.; Allwine, K. J.; Flaherty, J. E.; May 2006; 12 pp.; In English
Report No.(s): DE2006-891291; No Copyright; Avail.: National Technical Information Service (NTIS)

Development of real-time predictive modeling to identify the dispersion and/or source(s) of airborne weapons of mass destruction including chemical, biological, radiological, and nuclear material in urban environments is needed to improve response to potential releases of these materials via either terrorist or accidental means. These models will also prove useful in defining airborne pollution dispersion in urban environments for pollution management/abatement programs. Predicting gas flow in an urban setting on a scale of less than a few kilometers is a complicated and challenging task due to the irregular flow paths that occur along streets and alleys and around buildings of different sizes and shapes, i.e., 'urban canyons'. In addition, air exchange between the outside and buildings and subway areas further complicate the situation. Transport models that are used to predict dispersion of WMD/CBRN materials or to back track the source of the release require high-density data and need defensible parameterizations of urban processes. Errors in the data or any of the parameter inputs or assumptions will lead to misidentification of the airborne spread or source release location(s). The need for these models to provide output in a real-time fashion if they are to be useful for emergency response provides another challenge. To improve the ability of New York City's (NYC's) emergency management teams and first response personnel to protect the public during releases of hazardous materials, the New York City Urban Dispersion Program (UDP) has been initiated. This is a four year research program being conducted from 2004 through 2007. This paper will discuss ground level and subway Perfluorocarbon tracer (PFT) release studies conducted in New York City. The studies released multiple tracers to study ground level and vertical transport of contaminants. This paper will discuss the results from these tests and how these results can be used for improving transport models needed for risk assessment.
NTIS
Air Pollution; Assessments; Destruction; New York City (NY); Risk; Simulation

20070006631 Environmental Protection Agency, Washington, DC, USA, Office of Air Quality Planning and Standards, Research Triangle Park, NC USA
NO(x) Budget Trading Program: 2005 Program Compliance and Environmental Results
Sep. 2006; 40 pp.; In English
Report No.(s): PB2007-104880; EPA/430/R-06/013; No Copyright; Avail.: National Technical Information Service (NTIS)

The NOx Budget Trading Program (NBP) is ax market-based cap and trade program created to reduce emissions of nitrogen oxides (NOx) from power plants and other large combustion sources in the eastern USA. NOis ax prime ingredient in the formation of ground-level ozone (smog), a pervasive air pollution problem in many areas of the eastern USA. The NBP was designed to reduce NOx emissions during the warm summer months, referred to as the ozone season, when ground-level ozone concentrations are highest. This report evaluates progress under the NBP in 2005 by examining emission reductions, comparing changes in emissions to changes in ozone concentrations, and reviewing compliance results and market activity.
NTIS
Combustion; Nitrogen Oxides

20070006639 National Inst. for Occupational Safety and Health, Pittsburgh, PA, USA
Equipment Noise and Worker Exposure in the Coal Mining Industry
Bauer, E. R.; Babich, D. R.; Vipperman, J. R.; Dec. 2006; 85 pp.; In English
Report No.(s): PB2007-104846; NIOSH-IC-9492; DHHS/PUB/NIOSH-2007-105; No Copyright; Avail.: CASI: A05, Hardcopy

Prolonged exposure to loud noise can cause permanent damage to the auditory nerve and/or its sensory components. Despite regulations and efforts by government and industry to reduce noise-induced hearing loss (NIHL), it is still a problem in the U.S. coal mining industry. The Mine Safety and Health Administration noise standard (30 CFR3 62), which was enacted in September 2000, is aimed at reducing NIHL in the mining industry. To address NIHL in various aspects of coal mining and provide the necessary information to effectively implement control technologies, the National Institute for Occupational Safety

and Health conducted a cross-sectional survey of noise sources and worker noise exposures. Noise surveys consisting of full-shift worker noise exposure (dose) determination, time/motion studies (task observations), and equipment and/or area noise profiling were completed in 8 underground coal mines, 10 surface coal mines, and 8 coal preparation plants. The studies revealed that more than 40% of all workers monitored were subject to noise exposures above 90 dBA TWA8. A summary of these studies is presented, their application to administrative and engineering controls is discussed, and exposure reduction methods are reviewed.
NTIS
Auditory Defects; Exposure; Health; Mining; Safety; Coal

20070006654 Clark-Atlanta Univ., GA, USA
Integrated Hydrogen Production-CO2 Capture Process from Fossil Fuel. (Semiannual Report, September 16, 2005-March 15, 2006)
Wang, Z.; Bota, K. B.; Sep. 2006; 15 pp.; In English
Report No.(s): DE2006-891456; No Copyright; Avail.: Department of Energy Information Bridge
The major project objective is to determine the feasibility of using the char from coal and/or biomass pyrolysis, ammonia and CO2 emissions at smokestacks to produce clean hydrogen and a sequestered carbon fertilizer. During this work period, the project plan, design and test schedules were made on the basis of discussion with partner in experimental issues. Installation of pilot scale units was finished and major units tests were fully performed. Modification of the pyrolyzer, reformer and gas absorption tank have been done. Integration testing is performing recently. Lab scale tests have been performed. Field tests of char/fertilizer have been conducted.
NTIS
By-Products; Carbon Dioxide; Fertilizers; Fossil Fuels; Hydrogen; Hydrogen Production; Pyrolysis

20070006671 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Indoor Residential Chemical Exposures as Risk Factors for Asthma and Allergy in Infants and Children: A Review
Mendell, M. J.; Mar. 2006; 7 pp.; In English
Report No.(s): DE2006-888773; LBNL-59781; No Copyright; Avail.: Department of Energy Information Bridge
Most research into effects of residential indoor air exposures on asthma and allergies has focused on exposures to biologic allergens, moisture and mold, endotoxin, or combustion byproducts. This paper briefly reviews reported findings on associations of asthma or allergy in infants or children with risk factors related to indoor chemical emissions from residential materials or surface coatings. Associations, some strong (e.g., odds ratios up to 13), were reported. The most frequently identified risk factors were formaldehyde, aromatic organic compounds such as toluene and benzene, plastic materials and plasticizers, and recent painting. Exposures and consequent effects from indoor sources may be exacerbated by decreased ventilation. Identified risk factors may be proxies for correlated exposures. Findings suggest the frequent occurrence of important but preventable effects on asthma and allergy in infants and children worldwide from modern residential building materials and coatings.
NTIS
Allergic Diseases; Asthma; Children; Exposure; Risk

20070006735 Westinghouse Savannah River Co., Aiken, SC, USA
Lagrangian Particle Dispersion Model (LPDM) Technical Description
Jul. 20, 2006; 31 pp.; In English
Report No.(s): DE2006-891677; WSRC-STI-2006-00058; No Copyright; Avail.: Department of Energy Information Bridge
The Savannah River National Laboratory (SRNL) uses the Lagrangian Particle Dispersion Model (LPDM) in conjunction with the Regional Atmospheric Modeling System as an operational tool for emergency response consequence assessments for the Savannah River Site (SRS). The LPDM is an advanced stochastic atmospheric transport model used to transport and disperse passive tracers subject to the meteorological field generated by RAMS from sources of varying number and shape. The Atmospheric Technologies Group (ATG) of the SRNL is undertaking the task of reviewing documentation and code for LPDM Quality Assurance (QA). The LPDM QA task will include a model technical description, computer coding descriptions, model applications, and configuration control. This report provides a comprehensive technical description of the LPDM model.
NTIS
Environmental Transport; Grasslands; Lagrangian Function; Rivers

20070006739 Bernhelm, Gutierres and McCready, Dixon, CA, USA
Ventilated Dissection Table
Irwin, P.; 31 Dec 03; 12 pp.; In English
Patent Info.: Filed Filed 31 Dec 03; US-Patent-Appl-SN-10-751 248
Report No.(s): PB2007-102834; No Copyright; Avail.: CASI: A03, Hardcopy

Applicant's invention defines a ventilated dissection table having an air chamber atop a pedestal. Said air chamber comprises a support structure for a removable stainless steel work surface positioned at an optimal distance below an air inlet, said air inlet having a negative pressure created by a blower attached to an exhaust duct which draws undesirable noxious fumes from said air inlet through said chamber past a screen into a plenum and out the exhaust. The positioning of said work surface to air inlet provides improved capture performance. Primary and secondary drains are provided for the removal of fluids generated by the dissection process, as well as the facilitation of basic cleaning. The table is made of stainless steel to aid cleaning and is sized for ease of transfer and mobility via size and weight.
NTIS
Air Pollution; Dissection; Patent Applications; Pollution Control

20070008245 Kentucky Univ., Lexington, KY, USA
Advanced Multi Product Coal Utilization By-Product Processing Plant
Groppo, J.; Robl, T.; Jun. 30, 2006; 9 pp.; In English
Report No.(s): DE2006-892740; No Copyright; Avail.: National Technical Information Service (NTIS)

The objective of the project is to build a multi-product ash beneficiation plant at Kentucky Utilitys 2,200-MW Ghent Generating Station, located in Carroll County, Kentucky. This part of the study includes an investigation of the secondary classification characteristics of the ash feedstock excavated from the lower ash pond at Ghent Station. The secondary classification testing was concluded using a continuous demonstration-scale lamella classifier that was operated at a feed rate of 0.3 to 1.5 tons/hr. Feed to the secondary classifier was generated by operating the primary classifier at the conditions shown to be effective previously. Samples were taken while the secondary classifier was operated under a variety of conditions in order to determine the range of conditions where the unit could be efficiently operated. A Topical Report was prepared and included all of the pertinent processing data generated during Budget Period 1 of the project as well as results of beneficiated ash product evaluations in mortar and concrete, schematic plant designs with mass and water balances for the four flowsheets tested with equipment lists, capital and installation costs, expected product outputs and equipment justifications. A proposal for continuation of the project to Budget Period 2 was also prepared and submitted, with the exception of a Letter of Commitment from Cemex. The proposal is currently under internal review with Cemex and a decision is expected by the end of September, 2006.
NTIS
Ashes; Beneficiation; By-Products; Coal Utilization

20070008259 CONSOL Energy, Inc., South Park, PA, USA
Evaluation of Mercury Emissions from Coal-Fired Facilities with SCR and FGD Systems. Project Final Report for September 9, 2002 through March 7, 2006
Withum, J. A.; Apr. 2006; 39 pp.; In English
Report No.(s): DE2006-893601; No Copyright; Avail.: National Technical Information Service (NTIS)

This project final report summarizes the results and discusses the findings of the body of work as a whole. Eleven Topical Reports were issued (prior to this report) that describe in great detail the sampling results at each of the ten power plants individually. The results showed that the SCR-FGD combination removed a substantial fraction of mercury from flue gas. The coal-to-stack mercury removals ranged from 65% to 97% for the units with SCR and from 53% to 87% for the units without SCR. There was no indication that any type of FGD system was more effective at mercury removal than others. The coal-to-stack mercury removal and the removal in the wet scrubber were both negatively correlated with the elemental mercury content of the flue gas and positively correlated with the scrubber liquid chloride concentration. The coal chlorine content was not a statistically significant factor in either case. Mercury removal in the ESP was positively correlated with the fly ash carbon content and negatively correlated with the flue gas temperature.
NTIS
Coal; Combustion; Emission; Mercury (Metal)

20070008293 Sparkman (Klarquist), LLP, Portland, OR, USA
Sulfur Oxide Adsorbents and Emissions Control
Li, L.; King, D. L.; 4 Feb 04; 25 pp.; In English
Contract(s)/Grant(s): DE-AC06-76RLO1830
Patent Info.: Filed Filed 4 Feb 04; US-Patent-Appl-SN-10-771 866
Report No.(s): PB2007-102965; No Copyright; Avail.: CASI: A03, Hardcopy

High capacity sulfur oxide absorbents utilizing manganese-based octahedral molecular sieve (Mn--OMS) materials are disclosed. An emissions reduction system for a combustion exhaust includes a scrubber 24 containing these high capacity sulfur oxide absorbents located upstream from a NOX filter 26 or particulate trap.
NTIS
Adsorbents; Sulfur Oxides; Exhaust Emission

20070008561 Washington Univ., Seattle, WA USA
Broadcast Enforced Threshold Schemes with Disenrollment
Li, Mingyan; Poovendran, Radha; Jan 2003; 16 pp.; In English
Contract(s)/Grant(s): ANI-0093187; DAAD19-02-1-0242
Report No.(s): AD-A461136; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461136

Blakley, Blakley, Chan and Massey conjectured a lower bound on the entropy of broadcast messages in threshold schemes with disenrollment. In an effort to examine the conjecture, we identify their original scheme definition has a limitation: a coalition of participants can reconstruct all shared secrets without broadcast from the dealer, and hence render the dealer no control over disenrollment. We introduce a constraint that delays this lack of control of the dealer over disenrollment. We also establish the lower bounds on the entropy of broadcast messages in such a model. We demonstrate the need for new models by presenting a construction under open problems.
DTIC
Broadcasting; Radioactive Decay

20070009050 Atomics International Div., Canoga Park, CA USA
Alabama Army Ammunition Plant Leaseback Area Decontamination Operations Project. Part 1 - Executive Summary
Lillie, Anthony F; Sep 1982; 148 pp.; In English
Contract(s)/Grant(s): DAAK11-81-C-0094
Report No.(s): AD-A461087; ESG-82-38; No Copyright; Avail.: CASI: A07, Hardcopy

The decontamination/cleanup of the Leaseback Area of the Alabama Army Ammunition Plant (AAAP) was conducted in three phases. During Phase I, verification tests were conducted to demonstrate the effectiveness of various decontamination and cleanup methods. Standing Operating Procedures (SOPs) required to conduct the decontamination/cleanup operations were prepared during Phase II. Actual decontamination/cleanup operations were conducted during Phase III. The decontamination/cleanup at the 272-acre Leaseback Area of AAAP consisted of decontamination of explosive/explosive residues mainly consisting of nitro-cellulose (NC) and 2,4 and 2,6 Dinitrotoluene (DNT) which had resulted from production operations at the plant. Prior to decontamination operations 21,000 cubic feet of friable asbestos, 186 POB-contaminated electrical switches, and 789 mercury-containing components were removed and disposed of according to approved Federal and State of Alabama regulations. A total of 193 buildings, 407 tanks, 445 sumps, nine miles of industrial sewer system, and many miles of process lines were decontaminated to meet established cleanness criteria so that the Leaseback Area could be released to Kimberly Clark Paper Company for industrial use. An extensive sampling, analysis, and data management program was implemented to allow certification of the effectiveness of the decontamination operations.
DTIC
Ammunition; Decontamination; Explosives; Tetryl

46
GEOPHYSICS

Includes Earth structure and dynamics, aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism. For related information see *47 Meteorology and Climatology*; and *93 Space Radiation*.

20070006745 NASA Johnson Space Center, Houston, TX, USA
Ejecta- and Size-Scaling Considerations from Impacts of Glass Projectiles into Sand
Anderson J. L. B.; Cintala, M. J.; Siebenaler, S. A.; Barnouin-Jha, O. S.; [2007]; 2 pp.; In English; Lunar and Planetary

Science Conference, 12-16 Mar. 2007, Houston, TX, USA; Original contains black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy

One of the most promising means of learning how initial impact conditions are related to the processes leading to the formation of a planetary-scale crater is through scaling relationships.1,2,3 The first phase of deriving such relationships has led to great insight into the cratering process and has yielded predictive capabilities that are mathematically rigorous and internally consistent. Such derivations typically have treated targets as continuous media; in many, cases, however, planetary materials represent irregular and discontinuous targets, the effects of which on the scaling relationships are still poorly understood.4,5 We continue to examine the effects of varying impact conditions on the excavation and final dimensions of craters formed in sand. Along with the more commonly treated variables such as impact speed, projectile size and material, and impact angle,6 such experiments also permit the study of changing granularity and friction angle of the target materials. This contribution presents some of the data collected during and after the impact of glass spheres into a medium-grained sand. Author

Ejecta; Planetary Craters; Sands; Projectiles; Cratering; Glass; Planetary Composition

20070007532 Defence Science and Technology Organisation, Edinburgh, Australia

Atmospheric Retrieval Algorithms for Long-Wave Infrared and Solar Radiance Scenarios

Hackett, Michelle; Jun 2006; 57 pp.; In English; Original contains color illustrations

Report No.(s): AD-A460677; DSTO-TR-1879; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA460677

Atmospheric retrieval is the extraction of atmospheric data from spectral radiance, as observed at a remote sensor. In particular, consider the retrieval of temperature and humidity profiles, and aerosol size distribution and the scattering refractive index from long-wave infrared and solar radiance spectra, respectively. The application of retrieval, in this report, primarily involves inversion of a radiative transfer equation (RTE). However, due to the ill-posed nature of the problem and the inherent errors involved, such inversions are non-trivial. This report presents a combined, generalised approach to retrieval via statistical inversion, which is derived in detail for the atmospheric parameters mentioned above.

DTIC

Algorithms; Information Retrieval; Infrared Radiation; Radiance; Radiative Transfer; Solar Radiation

20070007548 North Carolina State Univ., Raleigh, NC USA

The Development of a Stratospheric Real-Time Turbulence Modeling SystemScient

Lin, Yuh-Lang; Suffern, Paul S; Kaplan, Michael L; Brown, Zachary G; Ringley, Chad J; Kiefer, Michael T; Vollmer, David R; Jul 7, 2006; 84 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8718-04-C-OO11; Proj-1010

Report No.(s): AD-A460712; No Copyright; Avail.: CASI: A05, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460712

The research project focused on the development of an automated numerical prediction system for stratospheric turbulence. This involved modifying and testing a stratospheric mesoscale numerical model with observed initial data from several case studies. A sequence of events was simulated that likely organized environments favorable for stratospheric turbulence. This sequence involved the development of large amplitude hydrostatic gravity waves that in turn modified the lower stratospheric environment making it favorable for wave breaking and significant eddy dissipation. An automatic grid nesting location system was tested that exploited three different dynamical indices, which would be indicators of the potential for stratospheric turbulence, i.e., the NCSUl index, vertical variation of the Scorer parameter as well as the eddy dissipation rate derived from the complete turbulence kinetic energy equation. The automatic grid nesting scheme was utilized for several case studies wherein large amplitude gravity waves were simulated.

DTIC

Atmospheric Circulation; Prediction Analysis Techniques; Real Time Operation; Stratosphere; Turbulence Models

20070008096 NASA Johnson Space Center, Houston, TX, USA

Symmetry, Statistics and Structure in MHD Turbulence

Shebalin, John V.; [2007]; 1 pp.; In English; IGPP 6th Annual International Astrophysics Conference, 16-22 Mar. 2007, Honolulu, HI, USA; No Copyright; Avail.: Other Sources; Abstract Only

Here, we examine homogeneous MHD turbulence in terms of truncated Fourier series. The ideal MHD equations and the associated statistical theory of absolute equilibrium ensembles are symmetric under P, C and T. However, the presence of

invariant helicities, which are pseudoscalars under P and C, dynamically breaks this symmetry. This occurs because the surface of constant energy in phase space has disjoint parts, called components: while ensemble averages are taken over all components, a dynamical phase trajectory is confined to only one component. As the Birkhoff-Khinchin theorem tells us, ideal MHD turbulence is thus non-ergodic. This non-ergodicity manifests itself in low-wave number Fourier modes that have large mean values (while absolute ensemble theory predicts mean values of zero). Therefore, we have coherent structure in ideal MHD turbulence. The level of non-ergodicity and amount of energy contained in the associated coherent structure depends on the values of the helicities, as well as on the presence, or not, of a mean magnetic field and/or overall rotation. In addition to the well known cross and magnetic helicities, we also present a new invariant, which we call the parallel helicity, since it occurs when mean field and rotation axis are aligned. The question of applicability of these results to real (i.e., dissipative) MHD turbulence is also examined. Several long-time numerical simulations on a 64(exp 3) grid are given as examples. It is seen that coherent structure begins to form before decay dominates over nonlinearity. The connection of these results with inverse spectral cascades, selective decay, and magnetic dynamos is also discussed.
Author
Magnetohydrodynamic Turbulence; Symmetry; Statistical Analysis; Homogeneous Turbulence; Magnetic Fields; Surface Energy

20070008688 Naval Research Lab., Washington, DC USA
Effects of Model Chemistry and Data Biases on Stratospheric Ozone Assimilation
Coy, L; Allen, D R; Eckermann, S D; McCormack, J P; Stajner, I; Hogan, T F; Jan 22, 2007; 27 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461353; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461353

The innovations or observation minus forecast (O-F) residuals produced by a data assimilation system provide a convenient metric of evaluating global analyses. In this study, O-F statistics from the Global Ozone Assimilation Testing System (GOATS) are used to examine how ozone assimilation products and their associated O-F statistics depend on input data biases and ozone photochemistry parameterizations (OPP). All the GOATS results shown are based on a 6-h forecast and analysis cycle using observations from SBUV/2 (Solar Backscatter UltraViolet instrument-2) during September vations October 2002. Results show that zonal mean ozone analyses are more independent of observation biases and drifts when using an OPP, while the mean ozone O-Fs are 10 more sensitive to observation drifts when using an OPP. In addition, SD O-Fs (standard deviations) are reduced in the upper stratosphere when using an OPP due to a reduction of forecast model noise and to increased covariance between the forecast model and the observations. Experiments that changed the OPP reference state to match the observations by using an 'adaptive' OPP scheme reduced the mean ozone O-Fs at the expense of zonal mean ozone analyses being more susceptible to data biases and drifts. Additional experiments showed that the upper boundary of the ozone DAS can affect the quality of the ozone analysis and therefore should be placed well above (at least a scale height) the region of interest.
DTIC
Assimilation; Atmospheric Composition; Bias; Ozone; Stratosphere

20070008693 Library of Congress, Washington, DC USA
Indian Ocean Earthquake and Tsunami: Humanitarian Assistance and Relief Operations
Margesson, Rhoda; Feb 10, 2005; 57 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461370; CRS-RL32715; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461370

On December 26, 2004, a magnitude 9.0 undersea earthquake off the west coast of northern Sumatra, Indonesia, unleashed a tsunami that affected more than 12 countries throughout south and southeast Asia and stretched as far as the northeastern African coast. Current official estimates indicate that more than 160,000 people are dead and millions of others are affected, including those injured, missing, or displaced, making this the deadliest tsunami on record. News reports suggest that the death toll may be well above 200,000. Sections of Indonesia, Sri Lanka, India, and Thailand have suffered the worst devastation. Eighteen Americans are confirmed dead, with another sixteen presumed dead, and 153 remain unaccounted for. In response, the United Nations, the USA, and other donor nations have organized what some have called the world's largest relief and recovery operation to date. President Bush pledged $350 million in aid and mobilized the U.S. military to provide logistical and other assistance. Funding the Indian Ocean tsunami relief and reconstruction effort is likely to be a challenge faced by the 109th Congress. Even before the disaster struck, Congress was expected to struggle to find the resources to sustain U.S. aid pledges amid efforts to tackle rising budget deficits by, among other measures, slowing or reducing discretionary spending.

Congress also may wish to consider debt relief as a means of helping those nations hit by the tsunami to recover economically. Additionally, there have been calls to institute a tsunami detection and warning system in the Atlantic and/or Indian Oceans, both of which would require allocations of funds.
DTIC
Coasts; Earthquakes; Indian Ocean; Southeast Asia; Tsunami Waves; Warning Systems

20070008697 Naval Research Lab., Washington, DC USA
NOGAPS-ALPHA Simulations of the 2002 Southern Hemisphere Stratospheric Major Warming
Allen, Douglas R; Coy, Lawrence; Eckermann, Stephen D; McCormack, John P; Manney, Gloria L; Hogan, Timothy F; Kim, Young-Joon; Jan 2006; 22 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461388; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461388

A high-altitude version of the Navy Operational Global Atmospheric Prediction System (NOGAPS) spectral forecast model is used to simulate the unusual September 2002 Southern Hemisphere stratospheric major warming. Designated as NOGAPS-Advanced Level Physics and High Altitude (NOGAPS-ALPHA), this model extends from the surface to 0.005 hPa (~85 km altitude) and includes modifications to multiple components of the operational NOGAPS system, including a new radiative heating scheme, middle-atmosphere gravity wave drag parameterizations, hybrid vertical coordinate, upper-level meteorological initialization, and radiatively active prognostic ozone with parameterized photochemistry. NOGAPS-ALPHA forecasts (hindcasts) out to 6 days capture the main features of the major warming, such as the zonal mean wind reversal, planetary-scale wave amplification, large upward Eliassen Palm (EP) fluxes, and splitting of the polar vortex in the middle stratosphere. Forecasts beyond 6 days have reduced upward EP flux in the lower stratosphere, reduced amplitude of zonal wave-numbers 2 and 3, and a middle stratospheric vortex that does not split. Three-dimensional EP-flux diagnostics in the troposphere reveal that the longer forecasts underestimate upward-propagating planetary wave energy emanating from a significant blocking pattern over the South Atlantic that played a large role in forcing the major warming. Forecasts of less than 6 days are initialized with the blocking in place, and therefore are not required to predict the blocking onset. For a more thorough skill assessment, NOGAPS-ALPHA forecasts over 3 weeks during September-October 2002 are compared with operational NOGAPS 5-day forecasts made at the time. NOGAPS-ALPHA forecasts initialized with 2002 operational NOGAPS analyses show a modest improvement in skill over the NOGAPS operational forecasts.
DTIC
Greenhouse Effect; Simulation; Southern Hemisphere; Stratosphere; Stratospheric Warming

20070008797 North Carolina State Univ., Raleigh, NC USA
Preparation of Chameleon Coatings for Space and Ambient Environments (Preprint)
Baker, C C; Chromik, R R; Wahl, K J; Hu, J J; Voevodin, A A; Jul 2006; 28 pp.; In English
Contract(s)/Grant(s): F33615-03-D-5801; FA9550-04-1-0381; Proj-M06R
Report No.(s): AD-A461565; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461565

Tribological coatings of yttria stabilized zirconia (YSZ), gold, diamond like carbon (DLC) and MoS2 were synthesized using magnetron assisted pulsed laser deposition (MSPLD). The coatings were synthesized in four-component and three-component combinations that included YSZ/Au/DLC/MoS2, YSZ/Au/MoS2, and YSZ/Au/DLC. A range of coating compositions was studied to explore coating optimization for low friction in varying environments (dry, humid and high temperature). For four-component YSZ/Au/DLC/MoS2 coatings, the optimal compositions for friction adaptation between dry nitrogen and humid air included relatively high concentrations of the soft phase, Au (\g20 at. %), and low amounts of the hard phases, DLC and YSZ. Ex situ Raman spectroscopy analysis indicates that friction adaptation involves a combination of both lubricating species, MoS2 and carbon where transitions of DLC to graphitic-carbon and amorphous MoS2 to its hexagonal phase occurs after cycling between both room temperature humid air and dry nitrogen. In large carbon concentrations (\g30 at. %), the DLC component was found to be detrimental for friction in dry nitrogen and humid air, but promoted a longer coating wear life at 500 deg C. The three-component coating of YSZ/Au/MoS2 performed well in both dry nitrogen and humid air, suggesting a synergism between Au and MoS2, where carbon was not necessary for lubrication in humid air.
DTIC
Aerospace Environments; Ambience; Protective Coatings

20070009267 Library of Congress, Washington, DC USA

Earthquakes: Risk, Monitoring, Notification, and Research

Folger, Peter; Feb 2, 2007; 22 pp.; In English; Original contains color illustrations

Report No.(s): AD-A462177; CRS-RL33861; No Copyright; Avail.: CASI: A03, Hardcopy

Close to 75 million people in 39 states face some risk from earthquakes. Seismic hazards are greatest in the western USA, particularly California, Alaska, Washington, Oregon, and Hawaii. The Rocky Mountain region, a portion of the central USA known as the New Madrid Seismic Zone, and portions of the eastern seaboard, particularly South Carolina, also have a relatively high earthquake hazard. Compared to citizens of other countries, relatively few Americans have died as a result of earthquakes over the past 100 years, but the country faces the possibility of large economic losses from earthquake-damaged buildings and infrastructure. Until Hurricane Katrina in 2005, the 1994 Northridge (CA) earthquake was the costliest natural catastrophe to strike the USA; some damage estimates were $26 billion (in today's dollars). Estimates of total loss from a hypothetical earthquake of magnitude more than 7.0 range as high as $500 billion for the Los Angeles area. Given the potentially huge costs associated with a severe earthquake, an ongoing issue for Congress is whether the federally supported programs aimed at reducing U.S. vulnerability to earthquakes are an appropriate response to the earthquake hazard. Under the National Earthquake Hazards Reduction Program (NEHRP), four federal agencies have responsibility for long-term earthquake risk reduction: the U.S. Geological Survey (USGS), the National Science Foundation (NSF), the Federal Emergency Management Agency (FEMA), and the National Institute of Standards and Technology (NIST). They variously assess U.S. earthquake hazards, send notifications of seismic events, develop measures to reduce earthquake hazards, and conduct research to help reduce overall U.S. vulnerability to earthquakes.

DTIC

Earthquakes; Hazards; Risk

20070009276 University of Central Florida, Orlando, FL USA

Initial Measurements of Atmospheric Parameters in a Marine Environment

Vetelino, Frida S; Young, Cynthia; Grant, Kenneth; Wasiczko, Linda; Burris, Harris; Moore, Christopher; Mahon, Rita; Suite, Michele; Corbett, Kerry; Clare, Bradley; May 2006; 11 pp.; In English

Contract(s)/Grant(s): N00014-01-1-0412

Report No.(s): AD-A462189; No Copyright; Avail.: CASI: A03, Hardcopy

In April 2005, a laser propagation experiment was conducted over a 470m horizontal maritime path. Scintillation measurements of a divergent Gaussian beam wave were taken simultaneously for different receiver aperture sizes. Terrestrial scintillation theory combined with a numerical algorithm was used to infer the atmospheric parameters refractive index structure constant, C(sub n) squared, and inner scale of turbulence, I(sub 0), from the optical maritime scintillation measurements. This paper presents the initial results.

DTIC

Atmospheric Circulation; Marine Environments; Meteorological Parameters; Refractivity; Scintillation

47
METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification.

20070006725 Westinghouse Savannah River Co., Aiken, SC, USA, Washington Safety Management Solutions, LLC, Aiken, SC, USA

Analytical Evaluation of Surface Roughness Length at a Large DOE Site

O'Kula, K. R.; Thoman, D. C.; January 2006; 4 pp.; In English

Report No.(s): DE2006-891659; WSRC-MS-2006-00338; No Copyright; Avail.: Department of Energy Information Bridge

In Gaussian dispersion model calculations performed for accident analysis purposes, the axial dispersion parameters, oz, account for the vertical spread in the atmospheric cloud with downwind distance, and are a function of stability category. Dispersion parameters are usually developed using mathematical fits of experimental data where tracer gases are released and the downwind concentrations measured under varying conditions. It is desirable that dispersion parameters be based on testing over regions of transport that are approximately equivalent to the region where the analysis is being applied. Various adjustment procedures are typically applied to scale dispersion parameters for applicability in situations were the environments differ. In most cases, the scaling is based on a parameter, the surface roughness length (zo), a measure of the amount of

mechanical mixing introduced by the surface roughness elements over a region of transport.
NTIS
Surface Roughness; Mathematical Models; Normal Density Functions

20070006788 Multidisciplinary Center for Earthquake Engineering Research, Buffalo, NY, USA
Engineering and Organizational Issues Before, During and After Hurricane Katrina. Volume 2. Remote Sensing, Advanced Damage Detection for Hurricane Katrina: Integrating Remote Sensing and VIEWS(Trade Name) Field Reconnaissance
Womble, J. A.; Ghosh, S.; Adams, B. J.; Friedland, C. J.; Mar. 2006; 156 pp.; In English
Contract(s)/Grant(s): EEC-9701471
Report No.(s): PB2007-105142; MCEER-06-SP02; No Copyright; Avail.: National Technical Information Service (NTIS)
The report is volume two in a series detailing post-Katrina field investigations by the MCEER team. The study documents the integrated implementation of remote sensing and VIEWS field reconnaissance technologies for characterizing the multi-hazard impacts of Hurricane Katrina upon the built environment along the Mississippi Coast and in New Orleans.
NTIS
Damage; Damage Assessment; Detection; Hurricanes; Reconnaissance; Remote Sensing

20070007398 Naval Postgraduate School, Monterey, CA USA
Disaster Response Contracting in a Post-Katrina World: Analyzing Current Disaster Response Strategies and Exploring Alternatives to Improve Processes for Rapid Reaction to Large Scale Disasters within the USA
King, Jerry A; McKay, Joshua H; Dec 2006; 140 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460411; No Copyright; Avail.: CASI: A07, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460411
Considerable public scrutiny has been focused on the Federal Government's, especially the Federal Emergency Management Agency's (FEMA) supposed inadequate, misdirected, and slow response to the acquisition needs required for responding to the aftermath of Hurricane Katrina. This seemingly failed response quite possibly cost the Federal Government billions in wasted taxpayer dollars and has affected the livelihood of thousands. Analyzing what went wrong and examining available acquisition concepts, organizations, processes, and technologies that could be leveraged for future disaster responses is the focus of our MBA project. The project's product provides some proposed solutions to assist FEMA's acquisition mission, along with some recommended technologies for executing these solutions.
DTIC
Alternatives; Disasters; Responses; United States

20070007631 Naval Research Lab., Washington, DC USA
A Search Relevance Algorithm for Weather Effects Products
Nevitt, Justin; Brown, Don; Dec 29, 2006; 19 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460864; NRL/MR/5510--06-9023; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA460864
This paper is concerned with providing the user with an efficient way to find information, specifically weather effects products within a Service Oriented Architecture (SOA). The work outlined in this paper pertains to searching and ranking weather effects products from the EVIS (Environmental Visualization) data provider. EVIS is a data provider to a Federated Search engine in the NCES (Network Centric Enterprise Service) ECB (Early Capabilities Baseline). Several off-the-shelf search solutions are examined and a custom search/relevance algorithm is discussed. This algorithm is based on the idea that searching weather products is more akin to a database search. The paper concludes with a look at cross-provider relevance and the complications that arise with a larger-scale, growing SOA.
DTIC
Algorithms; Graphical User Interface

20070008089 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Status and Future of the Tropical Rainfall, Measuring Mission (TRMM)
Adler, Robert F.; [2006]; 1 pp.; In English; International Precipitation Working Group, 20-30 Oct. 2006, Melbourne, Australia; No Copyright; Avail.: Other Sources; Abstract Only

The Tropical Rainfall Measuring Mission (TRMM) will have completed nine years in orbit in November 2006. This successful research mission, a joint U.S./Japan effort, has become a key element in the routine monitoring of global precipitation. The package of rain measuring instrumentation, including the first meteorological radar in space, continues to function perfectly, and with the increase in orbital altitude (from 350 km to 400 km) in August 2001 and the mission extension approval in 2005, the satellite has sufficient station-keeping fuel to potentially last until 2012, or perhaps longer. The status of TRMM algorithms and products will be summarized, including the impact of the altitude boost in 2001, and the plans for the upcoming Version 7 of the products will be outlined. The role of TRMM as part of the constellation of rain-measuring satellites preceding GPM will be discussed, as well as its role in climate analysis using its unique radar/radiometer combination.
Author
Precipitation (Meteorology); TRMM Satellite; Rain; Meteorological Radar; Climate

20070008091 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Flood and Landslide Applications of High Time Resolution Satellite Rain Products
Adler, Robert F.; Hong, Yang; Huffman, George J.; [2006]; 1 pp.; In English; International Precipitation Working Group, 20-30 Oct. 2006, Melbourne, Australia; No Copyright; Avail.: Other Sources; Abstract Only

Experimental, potentially real-time systems to detect floods and landslides related to heavy rain events are described. A key basis for these applications is high time resolution satellite rainfall analyses. Rainfall is the primary cause for devastating floods across the world. However, in many countries, satellite-based precipitation estimation may be the best source of rainfall data due to insufficient ground networks and absence of data sharing along many trans-boundary river basins. Remotely sensed precipitation from the NASA's TRMM Multi-satellite Precipitation Analysis (TMPA) operational system (near real-time precipitation at a spatial-temporal resolution of 3 hours and 0.25deg x 0.25deg) is used to monitor extreme precipitation events. Then these data are ingested into a macro-scale hydrological model which is parameterized using spatially distributed elevation, soil and land cover datasets available globally from satellite remote sensing. Preliminary flood results appear reasonable in terms of location and frequency of events, with implementation on a quasi-global basis underway. With the availability of satellite rainfall analyses at fine time resolution, it has also become possible to assess landslide risk on a near-global basis. Early results show that landslide occurrence is closely associated with the spatial patterns and temporal distribution of TRMM rainfall characteristics. Particularly, the number of landslides triggered by rainfall is related to rainfall climatology, antecedent rainfall accumulation, and intensity-duration of rainstorms. For the purpose of prediction, an empirical TMPA-based rainfall intensity-duration threshold is developed and shown to have skill in determining potential areas of landslides. These experimental findings, in combination with landslide surface susceptibility information based on satellite-based land surface information, form a starting point towards a potential operational landslide monitoring/warning system around the globe.
Author
Rain; Floods; Landslides; Hydrology Models; Climatology; Warning Systems; Real Time Operation; Remote Sensing; TRMM Satellite

20070008218 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Relative Contribution of Greenhouse Gases and Ozone Change to Temperature Trends in the Stratosphere: A Chemistry/Climate Model Study
Stolarski, Richard S.; Douglass, A. R.; Newman, P. A.; Pawson, S.; Schoeberl, M. R.; [2006]; 1 pp.; In English; Copyright; Avail.: Other Sources; Abstract Only

Long-term changes in greenhouse gases, primarily carbon dioxide, are expected to lead to a warming of the troposphere and a cooling of the stratosphere. We examine the cooling of the stratosphere and compare the contributions greenhouse gases and ozone change for the decades between 1980 and 2000. We use 150 years of simulation done with our coupled chemistry/climate model (GEOS 4 GCM with GSFC CTM chemistry) to calculate temperatures and constituents fiom,1950 through 2100. The contributions of greenhouse gases and ozone to temperature change are separated by a time-series analysis using a linear trend term throughout the period to represent the effects of greenhouse gases and an equivalent effective stratospheric chlorine (EESC) term to represent the effects of ozone change. The temperature changes over the 150 years of the simulation are dominated by the changes in greenhouse gases. Over the relatively short period (approx. 20 years) of ozone decline between 1980 and 2000 changes in ozone are competitive with changes in greenhouse gases. The changes in temperature induced by the ozone change are comparable to, but smaller than, those of greenhouse gases in the upper stratosphere (1-3 hPa) at mid latitudes. The ozone term dominates the temperature change near both poles with a negative temperature change below about 3-5 hPa and a positive change above. At mid latitudes in the upper stratosphere and

mesosphere (above about 1 hPa) and in the middle stratosphere (3 to 70 ma), the greenhouse has term dominates. From about 70 hPa down to the tropopause at mid latitudes, cooling due to ozone changes is the largest influence on temperature. Over the 150 years of the simulation, the change in greenhouse gases is the most important contributor to temperature change. Ozone caused a perturbation that is expected to reverse over the coming decades. We show a model simulation of the expected temperature change over the next two decades (2006-2026). The simulation shows a crossover between lower atmospheric heating and upper atmospheric cooling that is located at about 90 hPa in the tropics and 30-40 hPa in the polar regions. This results from the combination of continuing increases in greehouse gases and recovery from ozone depletion.
Author
Climate Models; Greenhouse Effect; Stratosphere; Atmospheric Chemistry; Ozone Depletion

20070008219 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Characterizing the LANDSAT Global Long-Term Data Record
Arvidson, T.; Goward, S. N.; Williams, D. L.; [2006]; 4 pp.; In English; Australian Remote Sensing Conference, 20-24 Nov. 2006, Canberra, Australia; Original contains black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy

The effects of global climate change are fast becoming politically, sociologically, and personally important: increasing storm frequency and intensity, lengthening cycles of drought and flood, expanding desertification and soil salinization. A vital asset in the analysis of climate change on a global basis is the 34-year record of Landsat imagery. In recognition of its increasing importance, a detailed analysis of the Landsat observation coverage within the US archive was commissioned. Results to date indicate some unexpected gaps in the US-held archive. Fortunately, throughout the Landsat program, data have been downlinked routinely to International Cooperator (IC) ground stations for archival, processing, and distribution. These IC data could be combined with the current US holdings to build a nearly global, annual observation record over this 34-year period. Today, we have inadequate information as to which scenes are available from which IC archives. Our best estimate is that there are over four million digital scenes in the IC archives, compared with the nearly two million scenes held in the US archive. This vast pool of Landsat observations needs to be accurately documented, via metadata, to determine the existence of complementary scenes and to characterize the potential scope of the global Landsat observation record. Of course, knowing the extent and completeness of the data record is but the first step. It will be necessary to assure that the data record is easy to use, internally consistent in terms of calibration and data format, and fully accessible in order to fully realize its potential.
Author
Landsat Satellites; Climate Change; Climatology; Satellite Imagery; Soils; Storms

20070008226 NASA Goddard Space Flight Center, Greenbelt, MD, USA
GPM Constellation Reconfiguration and Mission Status
Hou, Arthur Y.; October 23, 2006; 1 pp.; In English; 23rd WMO International Precipitation Working Group: GPM and Future Missions/Sensors, 19-28 Oct. 2006, Melbourne, Australia; No Copyright; Avail.: Other Sources; Abstract Only

The Global Precipitation Measurement (GPM) Mission is an international satellite mission that uses combined active and passive remote sensing techniques to improve global precipitation measurements derived from dedicated and operational passive microwave sensors. GPM is a science mission with integrated applications goals to (1) advance the knowledge of precipitation physics and the global water cycle variability, and (2) improve weather, climate, and hydrological prediction capabilities through more accurate and frequent measurements of global precipitation and innovative application methods. The GPM Mission is currently a partnership between NASA and the Japan Aerospace Exploration Agency (JAXA), with opportunities for additional domestic and international partners in satellite constellation buildup and ground validation activities. The GPM concept is centered on employing a dualfrequency precipitation radar and a microwave radiometer with high-frequency capabilities on a core satellite to serve as a physics observatory and calibration standard to provide a consistent framework for unifying precipitation measurements from a heterogeneous constellation of passive microwave sensors. Building on the siccess of TRMM, GPM extends combined radadradiometer precipitation measurements into the mid and high latitudes, with new science foci on improved capabilities for light-rain and snowfall measurements, as well as more accurate precipitation retrievals over land. With recent studies indicating that AMSU-B rainfall estimates are comparable in quality to those derived from conically-scanning radiometers over land, it is envisioned that cross-track microwave sounders with high-frequency channels on operational satellites such as the National Polar-orbiting Operational Environmental Satellite System (NPOESS), NPOESS Preparatory Project (NPP), NOAA-N', and MetOp satellites can play a significant role in augmenting conically-scanning microwave radiometers to achieve better sampling and coverage over land. Plans to reconfigure the baseline GPM constellation to include cross-track microwave sounders over land and the status of other GPM

mission elements such as snowfall algorithm development and ground validation plans will be presented
Author
Precipitation Measurement; Remote Sensing; TRMM Satellite; Meteorological Radar; Microwave Radiometers; Climate

20070008227 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Influence of Aerosols on Monsoon Circulation and Hydroclimate
Lau, William K.; [2006]; 1 pp.; In English; First Pan-World Climate Programme Global Energy and Water CYcle Experiment, 9-13 Oct. 2006, Frascati, Italy; No Copyright; Avail.: Other Sources; Abstract Only

Long recognized as a major environmental hazard, aerosol is now known to have strong impacts on both regional and global water cycles and climate change. In the Asian monsoon regions, the response of the regional water cycle and climate to aerosol forcing is very complex, not only because of presence of diverse mix of aerosol species with vastly different radiative properties, but also because the monsoon is strongly influenced by ocean and land surface processes, land use, land change, as well as regional and global greenhouse warming effects. Thus, sorting out the impacts of aerosol forcing, and interaction with the monsoon water cycle is a very challenging problem. Up to now, besides the general notion that aerosols may significantly impact monsoon through altering large scale radiative heating gradients, there has been very little information regarding the specific signatures, and mechanisms of aerosol-monsoon water cycle interaction. In this talk, based on preliminary results from observations and climate model experiments, I will offer some insights into how aerosols may impact the Asian monsoon water cycle, in particular the effects of absorbing aerosols (dust and black carbon), and the role of the Tibetan Plateau. The influence of aerosol forcing relative to those due to sea surface temperature and land surface processes, and impact on potential predictability of the monsoon climate system will also be discussed.
Author
Aerosols; Climate Change; Greenhouse Effect; Monsoons; Climatology; Atmospheric Heating; Climate Models

20070008230 NASA Langley Research Center, Hampton, VA, USA
Retrieval Lesson Learned from NAST-I Hyperspectral Data
Zhou, Daniel K.; Smith, William L.; Liu, Xu; Larar, Allen M.; Mango, Stephen A.; [2007]; 3 pp.; In English; Hyperspectral Imaging and Sounding of the Environment Topical Meeting and Tabletop Exhibit (HISE), 11-15 Feb. 2007, Santa Fe, NM, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 509496.02.01.91.03; Copyright; Avail.: CASI: A01, Hardcopy

The retrieval lesson learned is important to many current and future hyperspectral remote sensors. Validated retrieval algorithms demonstrate the advancement of hyperspectral remote sensing capabilities to be achieved with current and future satellite instruments.
Author
Interferometers; Remote Sensing; Data Acquisition; Airborne Equipment; Satellite Sounding; Test Stands; NOESS; Polar Orbits

20070008241 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Evaluation of the Potential of NASA Multi-satellite Precipitation Analysis in Global Landslide Hazard Assessment
Hong, Yang; Adler, Robert F.; Huffman, George J.; [2007]; 20 pp.; In English; Original contains black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070008241

Landslides are one of the most widespread natural hazards on Earth, responsible for thousands of deaths and billions of dollars in property damage every year. In the U.S. alone landslides occur in every state, causing an estimated $2 billion in damage and 25- 50 deaths each year. Annual average loss of life from landslide hazards in Japan is 170. The situation is much worse in developing countries and remote mountainous regions due to lack of financial resources and inadequate disaster management ability. Recently, a landslide buried an entire village on the Philippines Island of Leyte on Feb 17,2006, with at least 1800 reported deaths and only 3 houses left standing of the original 300. Intense storms with high-intensity , long-duration rainfall have great potential to trigger rapidly moving landslides, resulting in casualties and property damage across the world. In recent years, through the availability of remotely sensed datasets, it has become possible to conduct global-scale landslide hazard assessment. This paper evaluates the potential of the real-time NASA TRMM-based Multi-satellite Precipitation Analysis (TMPA) system to advance our understanding of and predictive ability for rainfall-triggered landslides. Early results show that the landslide occurrences are closely associated with the spatial patterns and temporal distribution of rainfall characteristics. Particularly, the number of landslide occurrences and the relative importance

of rainfall in triggering landslides rely on the influence of rainfall attributes [e.g. rainfall climatology, antecedent rainfall accumulation, and intensity-duration of rainstorms). TMPA precipitation data are available in both real-time and post-real-time versions, which are useful to assess the location and timing of rainfall-triggered landslide hazards by monitoring landslide-prone areas while receiving heavy rainfall. For the purpose of identifying rainfall-triggered landslides, an empirical global rainfall intensity-duration threshold is developed by examining a number of landslide occurrences and their corresponding TMPA precipitation characteristics across the world. These early results , in combination with TRMM real-time precipitation estimation system, may form a starting point for developing an operational early warning system for rainfall-triggered landslides around the globe.
Author
Landslides; Early Warning Systems; TRMM Satellite; Remote Sensing; Rainstorms; Climatology; Real Time Operation

20070008242 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Status and Plans for the WCRP/GEWEX Global Precipitation Climatology Project (GPCP)
Adler, Robert F.; [2007]; 1 pp.; In English; International Precipitation Working Group, 20-30 Oct. 2006, Melbourne, Australia; No Copyright; Avail.: Other Sources; Abstract Only

The Global Precipitation Climatology Project (GPCP) is an international project under the auspices of the World Climate Research Program (WCRP) and GEWEX (Global Water and Energy Experiment). The GPCP group consists of scientists from agencies and universities in various countries that work together to produce a set of global precipitation analyses at time scales of monthly, pentad, and daily. The status of the current products will be briefly summarized, focusing on the monthly analysis. Global and large regional rainfall variations and possible long-term changes are examined using the 27-year (1 979-2005) monthly dataset. In addition to global patterns associated with phenomena such as ENSO, the data set is explored for evidence of long-term change. Although the global change of precipitation in the data set is near zero, the data set does indicate a small upward change in the Tropics (25s-25N) during the period,. especially over ocean. Techniques are derived to isolate and eliminate variations due to ENS0 and major volcanic eruptions and the significance of the linear change is examined. Plans for a GPCP reprocessing for a Version 3 of products, potentially including a fine-time resolution product will be discussed. Current and future links to IPWG will also be addressed.
Author
Precipitation (Meteorology); Climatology; International Cooperation; Rain; Climate

20070008258 California Univ., Santa Cruz, CA, USA, Scripps Institution of Oceanography, La Jolla, CA, USA, Geological Survey, Reston, VA USA, California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Regional Climate Efects of Irrigation and Urbanization in the Western USA: A Model Intercomparisons
Snyder, M. A.; Kueppers, L. M.; Sloan, L. C.; Cayan, D.; Jin, J.; May 2006; 43 pp.; In English
Report No.(s): DE2006-893610; CEC-500-2006-031; No Copyright; Avail.: National Technical Information Service (NTIS)

In the western USA, more than 30,500 square miles has been converted to irrigated agriculture and urban areas. This study compares the climate responses of four regional climate models (RCMs) to these past land-use changes. The RCMs used two contrasting land cover distributions: potential natural vegetation, and modern land cover that includes agriculture and urban areas. Three of the RCMs represented irrigation by supplementing soil moisture, producing large decreases in August mean (-2.5 F to -5.6 F) and maximum (-5.2 F to -10.1 F) 2-meter temperatures where natural vegetation was converted to irrigated agriculture. Conversion to irrigated agriculture also resulted in large increases in relative humidity (9 percent 36 percent absolute change). Only one of the RCMs produced increases in summer minimum temperature. Converting natural vegetation to urban land cover produced modest but discernable climate effects in all models, with the magnitude of the effects dependent upon the preexisting vegetation type. Overall, the RCM results indicate that land use change impacts are most pronounced during the summer months, when surface heating is strongest and differences in surface moisture between irrigated land and natural vegetation are largest. The irrigation effect on summer maximum temperatures is comparable in magnitude (but opposite in sign) to predicted future temperature change due to increasing greenhouse gas concentrations.
NTIS
Cities; Climate; Climate Models; Irrigation

20070008711 Army War Coll., Carlisle Barracks, PA USA
The Department of Defense's Role in Disaster Recovery
Arn, Mark R; Mar 31, 2006; 29 pp.; In English
Report No.(s): AD-A461435; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461435

During a recent speech to the American public in the aftermath of Hurricane Katrina, President George W. Bush announced, 'It is now clear that a challenge on this scale requires greater federal authority and a broader role for the armed forces -- the institution of our government capable of massive logistical operations on a moment's notice.' This paper will examine the historical role of the armed forces in disaster management, the current response plans as well as existing legislation that employ the Department of Defense (DoD), and what broader role, if any, is required by the DoD. The USA Government maintains a cabinet-level Department, the office of Homeland Security, created to provide the unifying core of the vast national network of organizations and institutions involved in efforts to secure the homeland. Incorporated into the office of Homeland Security is the Federal Emergency Management Agency (FEMA), which has a specific mission to lead, manage, and coordinate the national response for acts of terrorism, natural disasters, and other emergencies. This office maintains partnerships with state and local governments and the private sector. There are, and in the case of Katrina there were, plans in place to provide response to natural disasters that involve the military. So, what went wrong in the disaster management of Katrina, and does it require a broader role for the armed forces? This paper will provide some of the answers to these questions.
DTIC
Defense Program; Disasters; Emergencies; Management Methods; Management Planning

20070008738 Naval Research Lab., Washington, DC USA
CHEM2D-OPP: A New Linearized Gas-Phased Ozone Photochemistry Parameterization for HIih-Altitude NWP and Climate Models
McCormack, J P; Eckermann, S D; Siskind, D E; McGee, T J; Jan 2006; 31 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461481; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461481
The new CHEM2D-Ozone Photochemistry Parameterization (CHEM2D-OPP) for high-altitude numerical weather prediction (NWP) systems and climate models specifies the net ozone photochemical tendency and its sensitivity to changes in ozone mixing ratio, temperature and overhead ozone column based on calculations from the CHEM2D interactive middle atmospheric photochemical transport model. We evaluate CHEM2D-OPP performance using both short-term (6-day) and long-term (1-year) stratospheric ozone simulations with the prototype high-altitude NOGAPS-ALPHA forecast model. An inter-comparison of NOGAPS-ALPHA 6-day ozone hindcasts for 7 February 2005 with ozone photochemistry parameterizations currently used in operational NWP systems shows that CHEM2D-OPP yields the best overall agreement with both individual Aura Microwave Limb Sounder ozone profile measurements and independent hemispheric (10 90 N) ozone analysis fields. A 1-year free-running NOGAPS-ALPHA simulation using CHEM2D-OPP produces a realistic seasonal cycle in zonal mean ozone throughout the stratosphere. We find that the combination of a model cold temperature bias at high latitudes in winter and a warm bias in the CHEM2D-OPP temperature climatology can degrade the performance of the linearized ozone photochemistry parameterization over seasonal time scales despite the fact that the parameterized temperature dependence is weak in these regions.
DTIC
Climate; Climate Models; Gases; High Altitude; Ozone; Parameterization; Photochemical Reactions

20070009136 Army Research Lab., White Sands Missile Range, NM USA
Adding Weather to Wargames
O'Brien, Sean G; Shirkey, Richard C; Jan 2007; 84 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461984; ARL-TR-4005; No Copyright; Avail.: Defense Technical Information Center (DTIC)
Employing the capability of the Target Acquisition Weapons Software (TAWS) tactical decision aid, and the rules embodied in the Integrated Weather Effects Decision Aid (IWEDA) we developed techniques that allowed significant improvement in weather effects and impacts for wargames. TAWS was run for numerous and varied weather conditions; the resultant database was subsequently used to construct third-order polynomial curves to represent infrared sensors acquiring targets under those weather conditions. IWEDA rules were used in determination of go/no-go weather situations for platforms or systems. We found that the wargame realism was increased without impacting the run time. While these techniques are applicable to wargames in general, we tested them by incorporation into the Advanced Warfighting Simulation (AWARS) model. AWARS was modified to incorporate weather impacts upon sensor operation and platform mobility. These modifications included revision of the direct-fire sensor detection algorithm to reflect variations of the maximum number of resolution cycles over the direct fire target with meteorological visibility, time of day, sky cover, target state, and haze aerosol type. The speed of these computations was an important consideration, so the parametric fit technique was selected after a

favorable comparison with table look-up methods. Weather effects upon combatant platform mobility were modeled by implementation of IWEDA rules classes for both helicopters and fixed-wing aircraft platforms. The impacts of these modifications in both the presence and absence of adverse weather conditions were tested and are summarized.
DTIC
War Games; Weather

20070009232 Naval Research Lab., Washington, DC USA
Characterization of the Marine Atmosphere for Free-Space Optical Communication
Wasiczko, Linda M; Moore, Christopher I; Burris, Harris R; Suite, Michele; Stell, Mena; Murphy, James; Gilbreath, G C; Rabinovich, William; Scharpf, William; Jan 2006; 13 pp.; In English
Contract(s)/Grant(s): N00014-05-WR-20216
Report No.(s): AD-A462135; No Copyright; Avail.: CASI: A03, Hardcopy

The Chesapeake Bay Detachment of the Naval Research Laboratory (NRL-CBD) provides an ideal environment for characterizing the effects of the marine atmosphere on free space optical communication links. The site has recently been converted to an operational 10 mile (16.2 km) one-way test range to collect information on propagation statistics in a variety of atmospheric conditions. The results presented here compare the contributions of thermal gradients across the bay to the variations in intensity scintillations across the bay.
DTIC
Apertures; Free-Space Optical Communication; Marine Environments; Optical Communication

20070009269 Naval Research Lab., Washington, DC USA
WindSat On-Orbit Warm Load Calibration
Twarog, Elizabeth M; Purdy, William E; Gaiser, Peter W; Cheung, Kwok H; Kelm, Bernard E; Mar 2006; 15 pp.; In English; Original contains color illustrations
Report No.(s): AD-A462180; No Copyright; Avail.: CASI: A03, Hardcopy

Postlaunch calibration of the WindSat polarimetric microwave radiometer indicates the presence of thermal gradients across the calibration warm load during some portions of the year. These gradients are caused by reflected solar illumination or eclipse and increase total calibration errors. This paper describes the WindSat warm load and presents the measured on-orbit data which clearly illustrate the anomalous responses seen in the warm load calibration data. Detailed thermal modeling predictions of the WindSat on-orbit performance are presented along with the satellite orbital geometry model with solar inputs in order to explain the physical causes of the thermal gradients. To reduce the resultant calibration errors during periods of anomalous warm load behavior, a correction algorithm was developed which uses the physical temperatures of the gain stages in the receiver electronics to calculate an effective gain. This calibration algorithm is described, and its performance and expected accuracy are examined.
DTIC
Calibrating; Loads (Forces); Radiometers

51
LIFE SCIENCES (GENERAL)

Includes general research topics related to plant and animal biology (non-human); ecology; microbiology; and also the origin, development, structure, and maintenance of animals and plants in space and related environmental conditions. For specific topics in life sciences see *categories 52 through 55*.

20070006619 NASA Johnson Space Center, Houston, TX, USA
The Influence of Shielding on the Biological Effectiveness of Accelerated Particles for the Induction of Chromosome Damage
Goeorge, Kerry; Cucinotta, Francis A.; [2007]; 22 pp.; In English
Report No.(s): F2.1-0042.06; Copyright; Avail.: CASI: A03, Hardcopy

Chromosome damage was assessed in human peripheral blood lymphocytes after in vitro exposure to the either Si-28 (490 or 600 MeV/n), Ti-48 (1000 MeV/n), or Fe-56 (600, 1000, or 5000 MeV/n). LET values for these ions ranged from 51 to 184 keV/micron and doses ranged from 10 to 200 cGy. The effect of either aluminum or polyethylene shielding on the induction of chromosome aberrations was investigated for each ion. Chromosome exchanges were measured using fluorescence in situ hybridization (FISH) with whole chromosome probes in cells collected at G2 and mitosis in first division post irradiation after

chromosomes were prematurely condensed using calyculin-A. The yield of chromosomal aberrations increased linearly with dose and the relative biological effectiveness (RBE) for the primary beams, estimated from the initial slope of the dose response curve for total chromosomal exchanges with respect to gamma-rays, ranged from 9 to 35. The RBE values increased with LET, reaching a maximum for the 600 MeV/n Fe ions with LET of 184 keV/micron. When the LET of the primary beam was below approximately 100 keV/micron, the addition of shielding material increased the effectiveness per unit dose. Whereas shielding decreased the effectiveness per unit dose when the LET of primary beams was higher than 100 keV/micron. The yield of aberrations correlated with the dose-average LET of the beam after traversal through the shielding.
Author
Biological Effects; Chromosome Aberrations; Relative Biological Effectiveness (RBE); Shielding; Titanium Isotopes; Silicon Isotopes; Iron Isotopes; Lymphocytes; Exposure

20070006621 NASA Johnson Space Center, Houston, TX, USA
Stochastic Effects in Computational Biology of Space Radiation Cancer Risk
Cucinotta, Francis A.; Pluth, Janis; Harper, Jane; O'Neill, Peter; [2007]; 1 pp.; In English; First International Workshop on System Radiation, 14-16 Feb. 2007, Neuherberg/Munich, Germany; Copyright; Avail.: Other Sources; Abstract Only

Estimating risk from space radiation poses important questions on the radiobiology of protons and heavy ions. We are considering systems biology models to study radiation induced repair foci (RIRF) at low doses, in which less than one-track on average transverses the cell, and the subsequent DNA damage processing and signal transduction events. Computational approaches for describing protein regulatory networks coupled to DNA and oxidative damage sites include systems of differential equations, stochastic equations, and Monte-Carlo simulations. We review recent developments in the mathematical description of protein regulatory networks and possible approaches to radiation effects simulation. These include robustness, which states that regulatory networks maintain their functions against external and internal perturbations due to compensating properties of redundancy and molecular feedback controls, and modularity, which leads to general theorems for considering molecules that interact through a regulatory mechanism without exchange of matter leading to a block diagonal reduction of the connecting pathways. Identifying rate-limiting steps, robustness, and modularity in pathways perturbed by radiation damage are shown to be valid techniques for reducing large molecular systems to realistic computer simulations. Other techniques studied are the use of steady-state analysis, and the introduction of composite molecules or rate-constants to represent small collections of reactants. Applications of these techniques to describe spatial and temporal distributions of RIRF and cell populations following low dose irradiation are described.
Author
Cancer; Radiation Effects; Radiation Damage; Stochastic Processes; Deoxyribonucleic Acid; Monte Carlo Method

20070006623 NASA Johnson Space Center, Houston, TX, USA
Influence of Electrotactile Tongue Feedback on Controlling Upright Stance during Rotational and/or Translational Sway-referencing with Galvanic Vestibular Stimulation
Wood, Scott J.; Tyler, Mitchell E.; Bach-y-Rita, Paul; MacDougall, Hamish G.; Moore, Steven T.; Stallings, Valerie L.; Paloski, William H.; Black, F. Owen; [2007]; 1 pp.; In English; Association for Research in Otolaryngology 2007 MidWinter Meting, 10-15 Feb. 2007, Denver, CO, USA
Contract(s)/Grant(s): NCC9-58; Copyright; Avail.: Other Sources; Abstract Only

Integration of multi-sensory inputs to detect tilts relative to gravity is critical for sensorimotor control of upright orientation. Displaying body orientation using electrotactile feedback to the tongue has been developed by Bach-y-Rita and colleagues as a sensory aid to maintain upright stance with impaired vestibular feedback. MacDougall et al. (2006) recently demonstrated that unpredictably varying Galvanic vestibular stimulation (GVS) significantly increased anterior-posterior (AP) sway during rotational sway referencing with eyes closed. The purpose of this study was to assess the influence of electrotactile feedback on postural control performance with pseudorandom binaural bipolar GVS. Postural equilibrium was measured with a computerized hydraulic platform in 10 healthy adults (6M, 4F, 24-65 y). Tactile feedback (TF) of pitch and roll body orientation was derived from a two-axis linear accelerometer mounted on a torso belt and displayed on a 144-point electrotactile array held against the anterior dorsal tongue (BrainPort, Wicab, Inc., Middleton, WI). Subjects were trained to use TF by voluntarily swaying to draw figures on their tongue, both with and without GVS. Subjects were required to keep the intraoral display in their mouths on all trials, including those that did not provide TF. Subjects performed 24 randomized trials (20 s duration with eyes closed) including four support surface conditions (fixed, rotational sway-referenced, translating the support surface proportional to AP sway, and combined rotational-translational sway-referencing), each repeated twice with and without GVS, and with combined GVS and TF. Postural performance was assessed using deviations from upright (peak-to-peak and RMS sway) and convergence toward stability limits (time and distance to base of support boundaries).

Postural stability was impaired with GVS in all platform conditions, with larger decrements in performance during trials with rotation sway-referencing. Electrotactile feedback improved performance with GVS toward non-GVS levels, again with the greatest improvement during trials with rotation sway-referencing. These results demonstrate the effectiveness of tongue electrotactile feedback in providing sensory substitution to maintain postural stability with distorted vestibular input.
Author
Gravitation; Posture; Feedback Control; Stability; Pitch (Inclination); Binaural Hearing

20070006838 NASA Johnson Space Center, Houston, TX, USA
Effects of a Muscle Countermeasure on Bone Metabolism During Bed Rest
Smith, Scott M.; Zwart, S. R.; Paddon-Jones, D.; Wolfe, R. R.; [2007]; 1 pp.; In English; Human Research Program Investigator's Workshop, 12-14 Feb. 2007, League City, TX, USA; Copyright; Avail.: Other Sources; Abstract Only

Diet plays a significant role in maintaining bone health. It is well understood that diet can alter the acid/base balance of the body, and that acidic environments stimulate bone resorption. Previous data from our team indicates that giving subjects an essential amino acid supplement containing 1.5 g methionine per day during bed rest can alter acid/base balance and stimulate bone resorption. While the supplement protected against loss of lean body mass, the supplemented group tended to have increased bone resorption. Urinary calcium excretion was also greater in the amino acid-supplemented group. In this group urinary pH tended to be lower during bed rest than it was before bed rest, suggesting that the supplement may have altered acid/base balance. We also have supporting evidence that a low-grade metabolic acidosis induced by the diet has a more substantial effect on bone metabolism when bone is challenged, such as during bed rest. We found that the ratio of acid to base precursors in the diet was positively correlated with markers of bone resorption and urinary calcium excretion during the latter part of bed rest. There is some evidence that excess protein intake may increase calcium absorption to compensate for the increased urinary calcium excretion; however, during bed rest and space flight, calcium absorption is decreased. It is therefore likely that excess protein would elicit a greater bone response (e.g., increased resorption, increased loss) in subjects undergoing bed rest and/or space flight than in ambulatory subjects, who might already have a compensatory mechanism. In ongoing studies, the ability of an essential amino acid countermeasure with and without cortisol treatment to exacerbate the catabolic effects of bed rest is being investigated. We are measuring bone markers to extend our earlier findings and provide new information on the multi-system effects of this countermeasure. This study will help elucidate the impact of diet on bone health during bed rest and space flight.
Author
Bone Demineralization; Metabolism; Muscles; Countermeasures; Diets; Acid Base Equilibrium; Proteins; Bed Rest

20070006841 NASA Johnson Space Center, Houston, TX, USA
Toxicity of Carbon Nanotubes and Its Implications for Occupational and Environmental Health
Lam, Chiu-wing; James, John T.; [2007]; 1 pp.; In English; Society of Toxicology Annual Meeting, 25-29 Mar. 2007, Charlotte, NC, USA; Copyright; Avail.: Other Sources; Abstract Only

Carbon nanotubes (CNTs), which possess desirable electrical and mechanical properties, potentially have wide industrial applications. CNTs exist in two forms, single-wall (SW) and multi-wall (MW). There has been great concern that if CNTs enter the work environment as suspended respirable particulate matter (PM), they could pose an inhalation hazard. The results of recent rodent studies have collectively shown that CNTs can produce inflammation, epithelioid granulomas, fibrosis, and biochemical changes in the lungs. Studies in mice given equal amounts of test dusts showed that CNTs were more toxic than quartz and produced lesions that became progressively more pronounced. These results have led us to recommend that respirable CNT dust be considered a serious occupational health hazard, and that exposure limits be established in the expectation of expanded industrial applications. CNTs, which are totally insoluble and fibrous, would be expected to be more biopersistent than mineral fibers. Biopersistence is the key factor determining the long-term toxicity of mineral fibers and certainly of CNTs too. We have postulated that the electrical and fibrous properties of CNTs also play important roles in the toxicity of CNTs in the lungs. Recently, MWCNTs have been found in ultrafine PM aggregates in combustion streams of methane, propane, and natural-gas flames of typical stoves; indoor and outdoor fine (\h 2.5 micron) PM samples were reported to contain significant fractions of MWCNTs. Environmental fine PM is mainly formed from combustion of fuels, and fine PM has been reported to be a major contributor to the induction of cardiopulmonary diseases by pollutants. Given that manufactured SWCNTs and/or MWCNTs have elicited pathological changes in the lungs and heart, we have postulated that exposure to combustion-generated MWCNTs in fine PM in the air may play a significant role in air pollution-related

cardiopulmonary diseases. Therefore, CNTs from manufacturing and combustion sources in the environment could have adverse effects on human health.
Author
Carbon Nanotubes; Electrical Properties; Mechanical Properties; Hazards; Exposure; Particulates; Fibrosis; Respiration; Toxicity

20070007371 Academy of Sciences (Russia), Moscow, Russian Federation
Biosensor Detection of Neuropathy Target Esterase in Whole Blood as a Biomarker of Exposure to Neuropathic Organophosphorus Compounds
Makhaeva, Galina F; Sigolaeva, Larisa V; Zhuravleva, Lyudmila Z; Eremenko, Arkady V; Kurochkin, Ilya N; Malygin, Vladimir V; Richardson, Rudy J; Oct 15, 2002; 13 pp.; In English
Contract(s)/Grant(s): DAAD19-02-1-0388
Report No.(s): AD-A460243; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460243

Neuropathy target esterase (NTE) is the target for neuropathic organophosphonts compounds (OPs) that produce delayed neurotoxicity (OPIDN). Inhibition/aging of brain NTE predicts the potential for OPIDN in animal models. Lymphocyte NTE has also found use as a biomarker of human exposure to neuropathic OPs. Recently, a sensitive NTE biosensor was developed using a tyrosinase carbon-paste electrode for amperometric (Amp) detection of phenol produced by hydrolysis of the substrate, phenyl valerate. The I50 (20 min at 37 deg C) for N,N'-di-2 propylphosphorodiamidofiuoridate (mipafox) against hen lymphocyte NTE was 6.94 plus or minus 0.28 uM (Amp) and 6.02 plus or minus 0.71 uM colorimetrically (Col). For O.O-di-l-propyl O-2,2 -dichlorvinyl phosphate (PrDChVP), the I50 against hen brain NTE was 39 plus or minus 8 nM (Amp) and 42 plus or minus 2 nM (Col). I50 values (Amp) for PrDChVP against hen and human blood NTE were 66 plus or minus 3 and 70 plus or minus 14 nM, respectively. NTE activities in brain, lymphocytes. and blood were measured 24 h after dosing hens with PrDChVP. NTE inhibition was highly correlated between brain and lymphocyte (r=0.994) and brain and blood (r=0.997). Biosensor NTE assay for whole blood could serve as a biomarker of exposure to neuropathic OPs.
DTIC
Bioinstrumentation; Biomarkers; Blood; Detection; Enzymes; Exposure; Nervous System; Organic Phosphorus Compounds

20070007375 Naval Health Research Center, San Diego, CA USA
Test and Evaluation Report for the Field Medical Surveillance System (FMSS)
Olson, Cheryl; Bohannan, Britt; Leap, Tom; Peel, Ray; Jeschonek, Robert; Reed, Cheryl; Sep 10, 2003; 44 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-09162
Report No.(s): AD-A460261; NHRC-TR-06-2B; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460261

This report represents a test and evaluation of the Field Medical Surveillance System (FMSS), a product of the Field Medical Technologies program of the Naval Health Research Center (NHRC). The FMSS is a medical information and analysis system that incorporates new patient encounters, provider information, and medical reference information. Its goal is to minimize the impact of disease on deployed forces by providing access to medical summary and evaluation information. FMSS met nearly all of the claims advertised by the developers associated with creating and maintaining a patient database, generating disease surveillance graphs and reports, and providing current medical references. Survey results and user reviews indicated that FMSS was appropriate for use as a surveillance tool for deployed Environmental Health Officers and Preventive Medicine Officers. Developers should address inconsistencies between the program and the user's manual. Most importantly, time series and incidence rate graphs should function as indicated. Another concern is the compatibility of FMSS with other medical applications using ICD-9 codes. It is not clear whether codes are attached to diagnoses made through all available FMSS options. Finally, the addition of other required reports such as disease and nonbattle injury would be useful.
DTIC
Deployment; Diseases; Evaluation; Medical Services; Surveillance; System Effectiveness

20070007387 Sloan-Kettering Inst. for Cancer Research, New York, NY USA
Non-Invasive Markers of Tumor Growth, Metastases and Sensitivity to AntiNeoplastic Therapy
Koutcher, Jason A; Jan 2006; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-05-1-0108
Report No.(s): AD-A460278; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460278

The goals of this application are to develop methods to non-invasively differentiate fast and slow growing prostate tumors and also develop methods to evaluate response to anti-angiogenic agents. Validation of the results will be based on tumor growth, metastases, and microvessel density measurement (anti-angiogenic studies). To date, we have focused on optimizing the pulse sequences necessary for lactate detection, synthesizing a macromolecular contrast agent and optimizing its use. These goals have been more difficult to achieve but we are now able to localize lactate within an image plane of the tumor and have finished synthesizing the macromolecular contrast agent and optimizing its use.
DTIC
Cancer; Markers; Metastasis; Prostate Gland; Proteins; Sensitivity; Therapy; Tumors

20070007411 Tulane Univ., New Orleans, LA USA
Functional Characterization of Two Novel Human Prostate Cancer Metastasis Related Genes
Abdel-Mageed, Asim B; Feb 2005; 12 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-04-1-0210
Report No.(s): AD-A460439; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460439

We propose to identify the functional characterization of two novel cancer-specific, metastasis-related genes whose constitutive expression may be pivotal for prostate cancer progression. Work accomplished was performed based on the proposed statement of work. We have characterized the full-length cDNAs of the Seq1 and Seq2 genes using at least three 5' and '3 rapid amplifications of cDNA ends (RACE) commercial kits (Invitrogen Carlsbad, CA, BD Bioscience (Clontech Inc), and Seegene, Rockville, MD). To optimize the PCR conditions for each kit, we had designed several sets of gene-specific primers (GSP;23-28 nt long) with 50-70% GC and Tm of 55 to 75 degrees C for each gene. We have also designed several sets of nested GSPs to verify our cloned genes. Because of unique secondary structures, high GC content, short SSH sequences, and low levels of expression of these genes in prostate cancer cell lines, we had great deal of difficulty in accomplishing this task in a timely fashion. As such, we devised different strategies for the first-strand synthesis using a modified oligo(dT) primers (5'-CDS primer or 3'-CDS primer), and Smart oligo II primer under various conditions. The full-length cDNA sequences were subcloned into mammalian expression vectors (Invitrogen) and ready to be used for generation of recombinant proteins and antibody production.
DTIC
Antibodies; Cancer; Genes; Metastasis; Prostate Gland

20070007418 Texas Univ. Health Science Center, San Antonio, TX USA
Neurofibromin and Neuronal Apoptosis
Vogel, Kristine S; Jul 1, 2006; 9 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0653
Report No.(s): AD-A460462; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460462

Our purpose is to examine the role of neurofibromin in modulating the survival of embryonic sensory and sympathetic neurons. To understand how reduced neurofibromin levels might impact the survival responses to activity-mediated signaling (mimicked with KCl) and to neurotrophins, we used dissociated cultures of Nf1+/- and exon23a-/- sensory and sympathetic neurons in an NGF withdrawal paradigm. Reduction or elimination of neurofibromin through targeted mutation leads to a diminished apoptotic response when NGF is removed, and also results in an improved response to activity-mediated survival signaling. Thus, Nf1-deficient neurons may be more sensitive to signaling interactions in the developing nervous system, and may be more resistant to environmental insults (low levels of survival factors, hypoxia, DNA damage) that promote apoptotic death. To begin to address possible mechanisms of enhanced survival in Nf1-deficient neurons, we are examining the contributions of Egln3 and SDHD to modulating apoptosis in precursors and neurons of the peripheral nervous system.
DTIC
Apoptosis; Cells (Biology); Nervous System; Neurophysiology

20070007419 Alabama Univ., Birmingham, AL USA
Anti-Angiogenic Gene Therapy for Prostate Cancer
Ponnazhagan, Selvarangan; Oct 2006; 10 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-1-0223
Report No.(s): AD-A460463; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460463

In work supported by this funding, we produced high-titer recombinant AAV vectors encoding mouse endostatin and angiostatin, and human osteoprotegerin; established TRAMP mouse breeding colony, and performed in vitro and in vivo studies to determine the effects of anti-angiogenic therapy at two different stages of prostate cancer progression. Additionally, we constructed rAAV encoding human OPG, produced high-titer virus and validated the biological efficacy of the vector encoded protein in inhibiting osteoclastogenesis in vitro. Continuation of the ongoing studies in the next few months will conclude these studies on therapeutic effects of anti-angiogenic gene therapy using adeno-associated virus in prostate cancer growth and metastasis.
DTIC
Cancer; Gene Therapy; Prostate Gland

20070007420 Colorado Univ., Aurora, CO USA
Effects of Androgen Blockade on Cognitive Function and Quality of Life in Men with Prostate Cancer
Grigsby, James P; Brega, Angela G; Aug 2006; 29 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0040
Report No.(s): AD-A460464; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460464

The purpose of this project was to examine the nature and severity of cognitive impairments experienced by men undergoing continuous androgen deprivation or intermittent androgen deprivation treatment (ADT). The cognitive abilities of androgen deprivation patients were compared with those of a sample of healthy men. We undertook collection of data from 40 men on intermittent or continuous ADT and an age- and education-matched sample of 34 control subjects. Our major hypothesis was that patients undergoing ADT will experience impairments in those cognitive abilities reported in the research literature to be related to androgen levels (e.g. spatial ability working memory for visual information). Bureaucratic requirements (largely related to institutional research board and General Clinical Research Center reviews) delayed the start of the project by nearly 20 months necessitating two no-cost extensions. Data collection is complete and the data have been entered into a database. Because analysis of the data is only now getting underway there are as yet no results to report. We anticipate that data analysis will be completed during the fall of 2006 with at least one paper on the primary findings submitted for publication by the end of the calendar year.
DTIC
Cancer; Cognition; Hormones; Human Beings; Males; Mental Performance; Prostate Gland; Social Factors

20070007421 California Univ., Los Angeles, CA USA
A PSCA Promoter Based Avian Retroviral Transgene Model of Normal and Malignant Prostate
Reiter, Robert; Apr 2006; 9 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-1-0163
Report No.(s): AD-A460465; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460465

The molecular and cellular origins of prostate cancer are poorly understood. Recent evidence from our laboratory suggests that prostate cancer may arise from a basal/luminal precursor cell marked by cell surface expression of PSCA. The evidence supporting this hypothesis is that (I) PSCA marks an intermediate cell population that coexpresses basal and luminal cell cytokeratins (2) this cell population is does not express p63 and is androgen receptor positive, all hallmarks of prostate cancer, and (3) PSCA is highly expressed in HGPIN and prostate cancer and in all animal models of prostate cancer. To test this hypothesis and to develop new models of prostate, we propose to determine whether delivery of oncogenes specifically to the PSCA positive cells of mouse prostate is sufficient to cause cancer. To accomplish this, we will develop a transgenic mouse model in which the retroviral receptor gene tva is expressed in the prostate under control of the PSCA promoter. Virus containing one or more oncogenes will be delivered to the prostate and the resulting phenotype characterized.
DTIC
Birds; Cancer; Prostate Gland

20070007423 Mount Sinai Hospital, Toronto, Ontario Canada
Anti-Cancer Drug Discovery Using Synthetic Lethal Chemogenetic (SLC) Analysis
Bellows, David S; Jul 2006; 13 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0471
Report No.(s): AD-A460468; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460468

I am developing a novel cell-based small-molecule screening approach that can identify inhibitors of any non-essential protein function through a surrogate synthetic lethal phenotype in the baker's yeast, Saccharomyces cerevisiae. Synthetic lethality (SL) is a form of genetic enhancement in which two mutations are lethal in combination, but the corresponding individual mutants are viable. Thus, a sensitized yeast strain carrying a mutation that is synthetic lethal with a gene of interest will be inviable in the presence of a chemical inhibitor of the target protein. Systematic genome-wide genetic screens can simultaneously determine all the synthetic lethal genetic interactions for a given gene deletion in yeast. I will adopt this strategy to determine the SL partners for the yeast genes SCH9, the yeast homologue of the human oncogene AKT, and TEP1, the yeast equivalent of the human tumor suppressor PTEN. Selected confirmed synthetic lethal mutants will be used as sensitized strains to screen a commercial small-molecule library for inhibitors of the corresponding proteins. I have developed a yeast-based high-throughput screening platform to screen the Maybridge small-molecule library. Compounds derived from the initial chemical genetic screen will be validated biochemically and, ultimately, tested on mammalian cells for activity against the human homologues.
DTIC
Antigens; Cancer; Drugs; Genetics; Proteins; Targets

20070007424 Illinois Univ., Chicago, IL USA
Biochemical Characterization of Native Schwannonmin/Merlin
Chishti, Athar; Sep 2006; 6 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0647
Report No.(s): AD-A460469; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460469

Neurofibromatosis type 2 (NF2) is an autosomal dominant disorder characterized by the development of bilateral vestibular and spinal schwamomas meningiomas and ependymomas. The hF2 gene encodes a 595 amino acid polypeptide known as NF2 protein or Merlin or Schwanomin. The primary structure of the NF2 protein is homologous to the ERM family of peripheral membrane proteins which includes Eznn Radixin and Moesin. The founding member of the ERM superfamily is the erythrocyte membrane protein 4.1 which cross-links spectrin-actin complexes and attaches them to the plasma membrane. We have established that p55 a palmitoylated peripheral membrane phosphoprotein forms a ternary complex with protein 4.1 and glycophorin C. Notably the Drosophila homologue of pSS functions as a tumor suppressor in epithelial and neuronal tissues. In the 2nd year of the funding penod we demonstrated binding between pSS and the NF2 protein and established the existence of this complex in human erythrocyte plasma membrane. This unexpected finding revealed a new paradigm integrating the known functions of the pSS family of proteins with the pathophysiology of the NF2 protein.
DTIC
Biochemistry; Proteins

20070007425 Massachusetts General Hospital, Boston, MA USA
Molecular Identification of the Schwannomatosis Locus
MacCollin, Mia; Jul 1, 2006; 13 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-1-0445
Report No.(s): AD-A460470; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460470

Background: Schwannomatosis is a recently recognized third major type of neurofibromatosis. Our preliminary studies of the NF2 gene in tumors from schwannomatosis patients reveal a pattern of tumor suppressor gene inactivation not previously reported in any other human disease. Objective/Hypothesis: The objective of this project is to clone the locus responsible for familial schwannomatosis. We are exploring two competing hypotheses which address both the non random distribution of LOH observed in schwannomatosis tumors and the high rate of somatic NF2 mutation seen along the cis allele. Specific Aims: 1. To identify and clinically characterize schwannomatosis patients and maintain a resource of tumor an blood specimens. 2. To further refine the candidate region on chromosome 22 using linkage and loss of heterozygosity analyses. 3. To determine the molecular mechanism of tumor formation in these patients using complementary molecular and cytogenetic approaches. Study Design: Schwannomatosis patients and affected relatives will be identified.
DTIC
Loci; Molecules; Mutations

20070007426 Whitehead Inst. for Biomedical Research, Cambridge, MA USA

Identifying Novel Drug Targets for the Treatment of Tuberous Sclerosis Complex Using High Throughput Technologies

Sabatini, David; Jan 2006; 28 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0138

Report No.(s): AD-A460471; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460471

In a patient with Tuberous Sclerosis Complex (TSC), the problematic cells that initiate and constitute tumors have lost TSC1 or TSC2 function. A promising approach for treatment would be to target members of the pathway with which TSC1/2 proteins interact. In cultured drosophila cells, we proposed to rapidly identify genes whose RNAi-mediated reduction in expression (1) Prevents growth/proliferation of TSC1 or TSC2-deficient cells without affecting normal cells. (2) Induces apoptosis/cell death in TSC1 or TSC2-deficient cells without killing normal cells. (3) Reverts TSC1 or TSC2-deficient cells to a normal phenotype, as determined by measuring a reporter of cell growth pathway activation and cell morphology. We have (1) advanced genome-wide RNA interference living cell microarrays from proof-of-principle to a robust technology. (2) developed software to analyze these screens, a previously formidable challenge, and (3) completed genome-wide experiments on the scale required to complete the goals of this proposal. We will repeat these experiments under several experimental conditions in order to identify genes involved in the TSC pathway.

DTIC

Chemotherapy; Clinical Medicine; Drugs; Identifying; Medical Science; Targets

20070007429 California Univ., Los Angeles, CA USA

Increasing Adherence to Follow-Up of Breast Abnormalities in Low-Income Korean American Women: A Randomized Controlled Trial

Maxwell, Annette; Sep 1, 2006; 31 pp.; In English

Contract(s)/Grant(s): DAMD17-03-1-0676

Report No.(s): AD-A460476; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460476

Purpose: The purpose of this study is to design an intervention to assist Korean American (KA) women who require follow-up diagnostics after routine breast cancer screening who have missed their first follow-up appointment (at-risk women). Scope: We have conducted exploratory one-to-one interviews with health care providers who serve KA women with abnormal mammograms and with KA women who have been referred for follow-up diagnostics. We have designed an intervention that will utilize a peer navigator model and plan to test the intervention in a randomized trial among KA at risk women. Major Findings: We have identified a number of barriers that KA women who need a follow-up procedure encounter, including lack of provider interest, lack of time and resources on the part of providers and case managers, language barrier, lack of transportation, lack of understanding of the importance of follow-up, and fear of getting lost and being helpless at an unfamiliar and large health care facility. We found that the peer navigator should assist women by providing transportation and translation; providing support by answering questions and directing them to other available resources when appropriate; and serving as an advocate in the community to raise awareness and adherence.

DTIC

Abnormalities; Breast; Cancer; Females; Income; Mammary Glands; Medical Services

20070007430 Italian National Cancer Inst., Rome, Italy

Estrogen Metabolism and Prostate Cancer Risk: A Prospective Study

Muti, Paola; May 2006; 26 pp.; In English

Contract(s)/Grant(s): DAMD17-03-1-0315

Report No.(s): AD-A460477; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460477

Prostate cancer is the most common cancer among men in the USA and the second most common in the European Community. The causes of prostate cancer, however, remain largely unknown, with age, race, and family history being the only established risk factors. The prostate gland has historically been considered the prototype of an androgen-dependent organ. However, there is evidence that estrogens may induce mitosis of prostatic epithelial cells in many species, including humans. This report analyzes the association between prostate cancer and estrogen metabolism in a case-control study. In particular, the authors tested the hypothesis that the pathway favoring 2-hydroxylation over 16alpha-hydroxylation may be associated with a decrease in prostate cancer risk. This is the annual report for the third year of the study. During the third year of activity, the authors completed the definition of the large data set of the study, conducted quality control procedures

on the collected data, and developed new laboratory procedures for the determination of the estrogen metabolites using gas-chromatography. The hormone determinations are now in an advanced phase of progress.
DTIC
Cancer; Epidemiology; Estrogens; Metabolism; Prostate Gland; Risk

20070007431 Oregon Health Sciences Univ., Portland, OR USA
A Novel Mechanism of Androgen Receptor Action
Roberts, Jr, Charles T; Jan 2006; 8 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460478; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460478

This project had as its original goal the elucidation of a novel mode of action of the androgen receptor that may be of importance in the initiation and progression of prostate cancer. Specifically, the authors had determined that the androgen receptor controls the expression of the cell-surface receptor for the hormone IGF-1 at the level of translation of the IGF-1 receptor mRNA in an androgen-independent fashion. In the course of studies in the first year of funding, they serendipitously found another factor that also regulates IGF-1 receptor expression and action, and that also inhibits the expression and action of the EGFR/erbB/HER family of receptor tyrosine kinases. This protein, an alternative product of the HER2 proto-oncogene termed herstatin, has the potential ability to function as a novel bifunctional inhibitor of both the EGF and IGF signaling systems, which are themselves independently implicated in prostate cancer initiation and progression. The authors propose to re-orient their studies to focus on this potential anti-tumor factor in prostate cancer cells and to determine its potential therapeutic utility. These studies are conceptually in line with their original proposal in that they address a novel mechanism of control of IGF-1 receptor expression and action and its role in prostate cancer tumorigenesis and metastasis.
DTIC
Cancer; Chemoreceptors; Metastasis; Modulation; Prostate Gland; Proteins; Tumors

20070007433 Florida State Univ., Tallahassee, FL USA
Endometase in Androgen-Repressed Human Prostate Cancer
Sang, Qing-Xiang A; Mar 2006; 192 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0238
Report No.(s): AD-A460483; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA460483

This project investigated a biomedical problem related to human prostate cancer invasion and a possible biomarker for cancer diagnosis. We reported the identification and characterization of human matrix metalloproteinase-26 (MMP-26/endometase/matrilysin-2). We have tested three specific hypotheses: 1) The expression levels of MMP-26 is correlated with the metastatic potentials and the degrees of malignancy of human prostate cells; 2)MMP-26 has unique structure and enzymatic function; 3) MMP-26 enhances prostate cancer invasion by digesting extracellular matrix proteins and inactivating serine proteinase inhibitors, and specific inhibitors of MMP-26 block prostate cancer invasion. We report that levels of MMP-26 protein in human prostate carcinomas and high-grade prostate intraepithelial neoplasia from multiple patients were significantly higher than those in prostatitis, benign prostate hyperplasia, and normal prostate glandular tissues. Prostate cancer cells transfected with MMP-26 gene are more invasive and with an inactive mutant are less invasive than the parental cell lines. MMP-26 promoted prostate cancer invasion via activation of pro-gelatinase B/pro-MMP-9. Biochemical studies indicated that endometase active site has an intermediate S1 pocket. Multiple novel synthetic MMP inhibitors are designed, synthesized, and characterized, and they are able to block the invasion of prostate cancer cells. Sixteen papers are attached as part of this final report.
DTIC
Biomedical Data; Cancer; Hormones; Males; Medical Science; Prostate Gland

20070007434 Arizona Univ., Tucson, AZ USA
Vitamin E Succinate as an Adjuvant for Dendritic Cell Based Vaccines
Ramanathapuram, Lalitha V; Jul 1, 2006; 47 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0530
Report No.(s): AD-A460484; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA460484

Dendritic cells (DC) are considered attractive candidates for cancer immunotherapy due to their ability to process and

present antigens and stimulate the immune system. However DC have not been as effective in treating established disease in animal models. This provides the rationale for combining DC vaccines with a chemotherapeutic drug, which may act as an adjuvant for DC vaccines. Vitamin E succinate or alpha tocopheryl succinate (-TOS) is a non-toxic, esterified analogue of Vitamin E that has been shown to be selectively toxic to tumor cell lines in vitro as well as inhibit the growth of tumors in animal models in vivo. The objective of this study is to enhance the effectiveness of DC vaccines by using it in combination with the non-toxic chemotherapeutic agent, -TOS to treat pre-established tumors of the highly metastatic murine mammary cancer cell line 4T1. The specific aims are to 1) study the effect of -TOS and vesiculated -TOS in inducing apoptosis in tumor cells in vitro and in vivo, 2) determine the efficacy of the drug and DC combination therapy in treating a) pre-established murine mammary tumors and b) lung metastasis after resection of primary tumor in a residual disease setting, 3) identify the mechanism involved in mediating the anti-tumor response

DTIC

Tocopherol; Vaccines

20070007435 Melbourne Univ., Victoria, Australia

Stromal Gene Expression and Function in Primary Breast Tumors that Metastasize to Bone Cancer

Parker, Belinda S; Jul 2006; 47 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-03-10473

Report No.(s): AD-A460485; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460485

Tumor progression and metastasis is mediated not only by tumor cells but by the surrounding stroma as well, including the vascular endothelium. Knowledge of the molecular and cellular interactions that promote metastasis is required to determine prognostic markers and therapeutic targets for metastatic breast cancer. A clinically relevant syngeneic model of breast cancer metastasis has been used to determine gene expression alterations that occur in both tumor epithelial cells and the associated vascular endothelium throughout metastatic progression. A number of candidates have been identified as over-expressed or suppressed in tumor endothelium and in the tumor cells themselves during metastatic progression. Some of these have been verified and are being analysed further for their functional role in metastasis, and for their role in human breast cancer. Of particular interest are 3 groups of genes- the increased expression and activity of cathepsin proteases and their inhibitor Stefin A, suppression of interleukin receptors IL13r 1 and IL4r and the interferon regulatory factor IRF7 (genes involved in immune defence) and also suppression of a novel gene that may have promise as a metastasis suppressor, Lrch2. In the human disease, our studies have shown that a lack of Stefin A primary tumor expression decreased risk of recurrence and improved patient outcome in a small cohort study.

DTIC

Bones; Breast; Cancer; Endothelium; Epithelium; Gene Expression; Genes; Mammary Glands; Metastasis; Tumors

20070007436 Nebraska Univ., Omaha, NE USA

Expression and Promoter Methylation of P16INK4A During Estrogen-Induced Mammary Carcinogenesis in the ACI Rat

Deffenbacher, Karen E; Jul 2006; 11 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-03-1-0466

Report No.(s): AD-A460486; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460486

Breast cancer is one of the leading causes of death for women in the USA and estrogen exposure has been implicated in the development of this cancer. Our lab is studying the ACI rat an estrogen-induced breast cancer animal model to begin to elucidate the role of estrogen in breast cancer. The ACI rat develops mammary cancer after prolonged exposure to 17p-estradiol while the BN and genetically related COP rats do not. We have mapped a OTL conferring susceptibility to estrogen-induced mammary cancer on rat chromosome 5 for which the p16INK4A gene is a positional candidate. We found no differences in Cdkn2a gene expression between the COP, ACI and BN strains; however gene expression was significantly elevated in the tumors relative to normal ACI mammary tissue. Methylation status of the promoter region was examined and no significant differences were found between tumor and normal tissue suggesting that an alternative mechanism to loss of methylation accounts for upregulation of Cdkn2a gene expression in ACI mammary tumors. Sequencing of the p16INK4A gene using spleen cDNA revealed no polymorphisms in untreated ACI COP or BN rats. In contrast both tumors and hyperplastic mammary tissue from ACI rats treated with estrogen for 28 weeks revealed a number of independently arising mutations and polymorphisms. We will sequence genomic DNA isolated from the same tumors and mammary tissue to

confirm whether the intratumoral heterogeneity is at the genomic DNA or RNA level.
DTIC
Breast; Cancer; Carcinogens; Chromosomes; Estrogens; Mammary Glands; Methylation; Rats

20070007437 Alabama Univ., Birmingham, AL USA
Polyphenois and Prostate Cancer Chemoprevention
Lamartiniere, Coral A; Mar 2006; 13 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0153
Report No.(s): AD-A460489; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460489

The goal of this research is to investigate the potential of resveratrol genistein and (-) epigallocatechin-3-gallate (EGCG), alone in combination, to protect against prostate cancer in a transgenic rat model (TRAMP). The specific aims are 1) to investigate the potential of genistein, EGCG and resveratrol, alone and in combination, to suppress the development of spontaneously developing prostate tumors and 2) to investigate the potential of these polyphenols to regulate sex steroid - and specific growth factor-receptor and ligand expression as mechanism of prostate cancer prevention. To date, we have demonstrated that pure resveratrol in the diet, but not EGCG in the water, suppressed spontaneously developing prostate tumors in TRAMPs. Androgen and estrogen receptors and EGF.IGF-1, and ERK signaling pathways are differentially regulated in both the DLP and VP of genistein, resveratrol and EGCG treated mice. We are in the process of investigating combinational genistein and resveratrol treatments to suppress prostate cancer in TRAMPs and to investigate mechanisms of action in mice treated with these 2 polyphenols.
DTIC
Cancer; Prostate Gland

20070007439 Childrens Research Inst., Columbus, OH USA
The Role of Drosophila Merlin in the Control of Mitosis Exit and Development
Chang, Long-Sheng; Jul 1, 2006; 42 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-04-1-0509
Report No.(s): AD-A460492; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460492

Presently the mechanism by which Merlin functions as a tumor suppressor is not understood. By utilizing Drosophila genetics, we have found a role of Merlin in the control of mitosis exit. Merlin mutations lead to two types of mitosis exit asynchrony the asynchronous anaphase-telophase figures and the asynchronous telophase-interphase figures. Also we show that cells lacking Merlin possess greater ability to overcome vein restriction in the wing. The Merlin protein is colocalized with the Wingless morphogen in the cells at the dorsaliventral compartment border of the wing imaginal disc. Merlin inactivation may lead to an alteration on the determination/maintenance of Wg stripe expression. We have found potential genetic interactions between the Merlin and porcupine genes and between the Merlin and shibire genes. We also discover an interaction between the Merlin and lap (like-Ap180) which is important for clathrin-mediated endocytosis of synaptic vesicles was identified. Our results suggest that Merlin counteracts with Lap and through Lap Merlin may regulate the EGFR pathway required for vein fate determination in the wing. In addition by analyzing the evolution diversity and overall distribution of Merlin among different taxa we demonstrate a monophyletic origin of the Merlin proteins with their root in the early metazoa. The overall similarity among the primary and secondary structures of all Merlin proteins and the conservation of several functionally important residues suggest a universal role for Merlin in a wide range of metazoa.
DTIC
Drosophila; Mitosis; Mutations; Proteins

20070007442 Cornell Univ., Ithaca, NY USA
Role of RASGRF1 in Neurofibromatosis - Validating a Potential Therapeutic Target
Soloway, Paul D; Apr 1, 2006; 15 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0652
Report No.(s): AD-A460497; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460497

It was hypothesized that the gene encoding the RASGRF1 protein, a GTP exchange factor (GEF), controls the severity of neurofibromatosis. Over-expression of the Rasgrf1 gene was predicted to exacerbate neurofibromatosis while Rasgrf1

silencing will attenuate it. Two novel strains of mice ideally suited to test this hypothesis that were developed in my lab were used to evaluate the role or RASGRF1 on the manisfestations of neurofibromatosis type 1. One strain of mice over-express Rasgrf1, the other has diminished expression. These were crossed with a mouse model for NF1 and the effects of the altered level of RASGRF1 protein on tumorigenesis were monitored. The results of these studies support the hypothesis that attenuating the GEF activity of RASGRF1 protein also attenuates tumorigenic pathways controlled by NF1. Also, in characterizing the strains of mice we developed for this study, we obtained new insights into the regulation and functions of the Rasgrf1 gene.
DTIC
Neoplasms; Neurology; Targets; Therapy

20070007445 Cold Spring Harbor Lab., New York, NY USA
Using RNA Interference to Reveal Genetic: Vulnerabilities in Human Cancer Cells
Siolas, Despina; Hannon, Gregory; Jul 1, 2006; 12 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-1-0529
Report No.(s): AD-A460501; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460501

A major barrier to understanding breast cancer is the lack of comprehensive and systematic large scale studies that provide functional information about the entire genome. These insights can be obtained through RNAi (RNA interference) genetic studies RNAi is a cellular process that regulates gene expression in a sequence specific manner. We have developed a library of plasmids expressing shRNAs that engage the endogenous RNAi pathway and produce mature siRNAs that efficiently target any gene of interest. We have generated more than 200,000 constructs that allow us to perform loss of function studies of almost every gene in the human genome. Furthermore, we have developed a microarray-based analytical platform that facilitates the study of thousands of genes concurrently in pools. We conducted a screen to detect resistance to anoikis (cell death trigged by loss of attachment to the extracellular matrix, ECM) in the MCF10A breast epithelial cell line. Our screen of 1,500 shRNAs resulted in identifying the well known tumor suppressor, Pten, as an attenuator of anoikis among other candidate genes. In addition, we have validated an in vitro anoikis assay as an approach to identify putative tumor suppressors involved in breast epithelial cell transformation.
DTIC
Breast; Cancer; Genetics; Genome; Mammary Glands; Ribonucleic Acids; Vulnerability

20070007446 Johns Hopkins Univ., Baltimore, MD USA
Proof of Concept for Systematic Collection of Optimal Molecular Quality Anatomically Oriented Normal Prostate From Diverse Age and Race Transplant Donors
Bova, G S; Dec 2005; 5 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-05-1-0084
Report No.(s): AD-A460502; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460502

In a one-year Exploration-Resource Development project, we propose to collect additional normal prostate tissues from transplant donors, create tissue microarrays using these and previous samples, and use this experience to apply for funds beyond this pilot award for a large resource.
DTIC
Cancer; Medical Science; Prostate Gland; Transplantation

20070007462 Children's Hospital, Columbus, OH USA
Posttranscriptional Regulation of the Neurofibromatosis 2 Gene
Chang, Long-Sheng; Jul 2006; 122 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0680
Report No.(s): AD-A460540; No Copyright; Avail.: CASI: A06, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460540

Neurofibromatosis type 2 (NF2) is associated with a homozygous inactivation of the neurofibromatosis 2 (NF2) gene. Despite intense study of the NF2 gene, the mechanism by which the NF2 tumor suppressor acts to prevent tumor formation is not well understood. The goal of this research is to examine the role of posttranscriptional regulation of the NF2 gene. With this grant support, we have confirmed that vestibular schwannomas express a distinct pattern of alternatively spliced NF2

transcripts lacking specific exons. Analysis of NF2 expression during embryonic development reveals that NF2 is an early expression marker. Strong NF2 promoter activity was seen in the embryonic ectoderm and in all NF2-affected tissues examined. Importantly, we observed strong NF2 promoter activity in the developing brain and in sites containing migrating cells including the neural tube closure and branchial arches. Furthermore, we noted a transient change of NF2 promoter activity during neural crest cell migration. The NF2 promoter expression pattern during embryogenesis suggests a specific regulation of the NF2 gene during neural crest cell migration and further support the role of merlin in cell adhesion, motility, and proliferation during development. By using the conditional gene targeting approach, we have generated an Nf2flox8 allele. Transgenic and conditional knockout mice have been generated to address whether the alternative splicing NF2 isoform with exon 8 deletion preferentially expressed in schwannomas possess any additional properties conducive to tumor formation in vivo. Also, we show that the 3 UT sequence of the NF2 gene does not affect the stability of NF2 RNA or the efficiency of protein translation in vitro. Utilizing the vestibular schwannoma samples procured from this study, we have established a quantifiable human vestibular schwannoma xenograft model in SCID mice and identified cyclin D3 as a growth-promoting factor for vestibular schwannomas.
DTIC
Genes; Nervous System

20070007485 EA Engineering Science and Technology, Inc., Sparks, MD USA
Addendum to Site Specific Safety and Health Plan for Fort George G. Meade Base Closure Parcel Site Inspection Study
Sep 1990; 17 pp.; In English
Contract(s)/Grant(s): Proj-10559.05
Report No.(s): AD-A460589; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460589

This document serves as an addendum to the Final Site Specific Safety and Health Plan (SSHP) for the Ft. George C. Meade Base Closure Parcel Site Inspection Study (April 1990). It is not designed as a stand alone document. The scope of this addendum is limited to operations performed during the active and passive soil gas monitoring at the Active Sanitary Landfill. Requirements for Training, Medical Surveillance, Site Control, and Emergency Response are not addressed by this addendum, but instead are delineated in the Final SSRP for the Fort George C. Meade Base Closure Parcel Site Inspection Study (April 1990).
DTIC
Contaminants; Gases; Hazardous Materials; Health; Inspection; Safety; Soils; Toxicity

20070007514 Emory Univ., Atlanta, GA USA
Role of TMS1 Silencing in the Resistance of Breast Cancer Cells to Apoptosis
Parsons, Melissa J; Vertino, Paula M; Aug 2006; 59 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0578
Report No.(s): AD-A460645; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460645

Aberrant DNA methylation of promoter region CpG islands is associated with gene silencing and serves as an alternative to mutations in the inactivation of tumor suppressor genes in human cancers. We identified a gene TMS1 (for Target of Methylation-mediated Silencing) that is subject to such epigenetic silencing in a significant proportion of human breast and other cancers. TMS1 encodes a bipartite intracellular signaling molecule with proposed roles in apoptosis and inflammation. However the precise role of this protein in apoptosis has not been clearly defined, and the consequence of TMS1 silencing on the pathogenesis of breast cancer is unknown. In this study we identified two novel roles for TMS1 in apoptosis activation of caspase-8 and subsequent apoptosis induced by TNFa, and apoptosis induced by detachment from the extracellular matrix. Importantly, loss of TMS1 expression severely inhibits apoptosis induced by these stimuli. Therefore, loss of TMS1 expression through epigenetic silencing may contribute to breast carcinogenesis by dampening the apoptotic response to TNFa, and allowing cells to bypass cell death induced by detachment from the extracellular matrix.
DTIC
Apoptosis; Breast; Cancer; Mammary Glands; Methylation

20070007526 New York Hospital-Cornell Medical Center, New York, NY USA

Bioenergetic Defects and Oxidative Damage in Transgenic Mouse Models of Neurodegenerative Disorders

Browne, Susan E; Jun 2005; 297 pp.; In English

Contract(s)/Grant(s): DAMD17-98-1-8620

Report No.(s): AD-A460659; No Copyright; Avail.: CASI: A13, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460659

The initial three years of this project determined the contributions of bioenergetic defects and oxidative stress to neurodegeneration in Huntington's disease (HD) and amyotrophic lateral sclerosis (ALS). A Consortium project, 'Mitochondrial Free Radical Generation in Parkinson's Disease', was then incorporated into the grant award (2 years), to assess in vivo whether mitochondria are the source of free radical generation in animal models of Parkinson's disease (PD). Studies in the original grant period generated several novel observations of presymptomatic energetic abnormalities in mouse genetic models of both HD (R6/2, N171-82Q, Hdh Q50, 92, 111 mice) and ALS (G93A mice). Specifically, in vivo studies showed that glucose uptake is non-specifically elevated throughout the forebrain in two HD mouse models (N171-82Q and HdhQlll and Q92) before symptom onset, and that ATP defects and oxidative damage precede symptom onset in some models. In ALS mice, in contrast glucose use is reduced in discrete motor pathways in brain, preceding changes in spinal cord. Studies examining the relationship between mitochondrial complex I inhibition and free radical-mediated oxidative damage in rat neurotoxin models (rotenone and pyridaben) demonstrate increased oxidative damage rapidly after complex I inhibition (including lipid peroxidation and induction of the stress-response marker heme oxygenase-1).

DTIC

Cells (Biology); Damage; Defects; Mice; Nervous System

20070007528 Florida Univ., Gainesville, FL USA

Structure-Antimicrobial Activity Relationship for a New Class of Antimicrobials, Silanols, in Comparison to Alcohols and Phenols

Kim, Yun M; Aug 2006; 142 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8651-05-C-0136; Proj-ARMT

Report No.(s): AD-A460666; No Copyright; Avail.: CASI: A07, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460666

Concerns for microbial contamination and infection to the general population and military personnel have greatly increased due to the increased potential for bio-terrorism and microbial threats to health. Desirable antimicrobials are designed to be environmentally benign, strongly effective to various microorganisms, and economically affordable. We have recently discovered a new class of silicon based antimicrobials called silanols (R(CH3)2SiOH). The antimicrobial activity of the silanols was at least twice as strong as their analogous alcohols. The silanols are prepared from the hydrolysis of chlorosilanes. The silanols can be prepared by low cost processes. Silanols degrade into the environmentally benign species of silica, CO2 and H2O instead of accumulating in the environment. Understanding the mechanisms of the antimicrobial action is critical for the development of antimicrobials with improved antimicrobial effects. A structural XIV dependency of the antimicrobial activity was investigated with four bacteria, Escherichia coli, Staphylococcus aureus, Psudomanos aeruginosa, and Enterococcus faecalis. Silanols, alcohols with structures analogous to the silanols, (R(CH3)2SiOH, and substituted phenols were evaluated as a single class of materials. The minimum lethal concentrations (MLC) defined as the concentration required for a 7-log reduction in viable bacteria after one hour exposure period was used to measure the antimicrobial activity. The octano V water partition coefficients (log P) and H-bond acidities (-v) were used as the dispersive and the polar structural parameters of the antimicrobials. The correlations between the antimicrobial activity and the structural parameters of the antimicrobials demonstrated a linear free-energy relationship. The correlation models established by using the multiple regression analysis and their significantly high correlation.

DTIC

Alcohols; Antibiotics; Antiinfectives and Antibacterials; Contamination; Microorganisms; Military Personnel; Nanoparticles; Phenols

20070007541 Library of Congress, Washington, DC USA

Bioterrorism Countermeasure Development: Issues in Patents and Homeland Security

Schacht, Wendy H; Thomas, John R; Nov 27, 2006; 25 pp.; In English; Original contains color illustrations

Report No.(s): AD-A460696; CRS-RL32917; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460696

Congressional interest in the development of bioterrorism countermeasures remains strong, even after passage of

legislation establishing Project BioShield. Several bills considered, but not enacted during the 109th Congress, including S. 3, the Protecting America in the War on Terror Act of 2005; S. 975, the Project Bioshield II Act; and S. 1873, the Biodefense and Pandemic Vaccine and Drug Development Act, would have generated additional incentives for the creation of new products and processes by the private sector to counteract potential biological threats. These bills proposed reforms to current policies and practices associated with intellectual property, particularly patents, and the marketing of pharmaceuticals and related products. Patents appear to be important in the promotion of innovation, particularly in the pharmaceutical sector. This report explores the role of patents in encouraging the development and commercialization of new inventions and discusses the relationships between patent ownership and the generation of biomedical products. However, the grant of a patent on a pharmaceutical does not permit marketing of the product without the approval of the Food and Drug Administration (FDA). Thus, this report also examines policies concerning the use of FDA marketing exclusivity as an additional incentive to industry research and development (R&D) in this arena. Current law and suggested legislative changes are discussed to provide a context for any further exploration of related issues during the 110th Congress.
DTIC
Countermeasures; Drugs; Industries; Law (Jurisprudence); Patents; Pharmacology; Security

20070007543 Army Tank-Automotive Research and Development Command, Warren, MI USA
Development of a New Bio-Kinetic Model for Assessing the Environmental Property of Military Hydraulic Fluids
Rhee, In-Sik; Sep 27, 2006; 9 pp.; In English
Report No.(s): AD-A460703; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460703

The U.S. Army Tank-Automotive Research. Development and Engineering Center (TARDEC) is actively developing biodegradation technologies that can be used to minimize waste stream of Petroleum, Oils, and Lubricant (POL) products utilized in the current and future combat systems. As part of these efforts, a bio-kinetic model was developed to predict the biodegradability of lubricants including hydraulic fluids. This model can predict a biodegradability of lubricant based on a composition analysis within a short period. The advantages of this model are its predictable capability and excellent correlation with results obtained from the conventional biodegradation tests. This paper presents the results of development of a bio-kinetic model, its composition technique, and correlation study with the conventional biodegradation tests and the field demonstrations, and its applicability to the military hydraulic fluids.
DTIC
Biodegradation; Hydraulic Fluids

20070007545 Library of Congress, Washington, DC USA
The WTO, Intellectual Property Rights, and the Access to Medicines Controversy
Fergusson, Ian F; Dec 12, 2006; 12 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460706; CRS-RL33750; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460706

In August 2003, the World Trade Organization (WTO) reached an agreement on the use of compulsory licenses by developing countries without manufacturing capacity to access life-sustaining medicines. This agreement was incorporated as an amendment to Trade-Related Aspects of Intellectual Property Rights (TRIPS) Agreement on the eve of the Hong Kong Ministerial in December 2005. The issue of access to affordable medicines is one of great concern to developing countries whose health-care systems are often overwhelmed by HIV/AIDS and other infectious diseases. Some developing countries have viewed the TRIPS agreement as an impediment in their attempts to combat such public health emergencies by restricting drug availability and by transferring scarce resources from developing countries to developed country manufacturers. For the developing world, the issue of compulsory licenses is an important test as to whether the WTO can meet the development needs of its members, and conversely, whether the developing world can influence the actions of the world trading system. Developed country pharmaceutical industries view the TRIPS agreement as essential to encourage innovation in the pharmaceutical sector by assuring international compensation for their intellectual property. Without such protection, industry claims it could not recoup the high costs of developing new medicines. Producers have unilaterally undertaken to reduce prices for certain HIV/AIDS medicines, but these efforts at differential pricing have not been systematic. The USA has been forceful in defending the interest of the U.S. pharmaceutical industry in the negotiations. In December 2002, the USA blocked a compromise on the compulsory licensing issue to which all other nations had agreed; however, it was also the first nation to ratify the December 2005 amendment. In the 109th Congress, legislation was introduced (S. 3175) to establish procedures to grant compulsory licenses for exporting pa
DTIC
Developing Nations; Drugs; Intellectual Property; Law (Jurisprudence); Licensing; Patents; Public Health

20070007549 Uniformed Services Univ. of the Health Sciences, Bethesda, MD USA
Genetic and Biochemical Characterization of Peptidoglycan Synthesis in Chlamydia
McCoy, Andrea J; Sep 2005; 253 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460713; No Copyright; Avail.: CASI: A12, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460713

The Chlamydiaceae family of bacteria are obligate, intracellular pathogens that cause significant diseases world-wide in both humans and animals. Despite having a cell envelope that resembles other gram-negative bacteria, the presence of peptidoglycan in the Chlamydia cell envelope has long been debated. Unlike other wall-less bacteria, chlamydiae synthesize penicillin-binding proteins, are sensitive to antibiotics that inhibit cell wall synthesis, and encode a nearly complete pathway for the synthesis of peptidoglycan. However, peptidoglycan has yet to be detected. In this work, the functionality of the peptidoglycan synthesis pathway in C. trachomatis was examined by genetically and biochemically characterizing key enzymes in the pathway. The characterization of key enzymes in the PG synthesis pathway of Chlamydia suggests that these organisms synthesize PG and that the chlamydial PG structure is of the same composition as PG in other gram-negative bacteria. Furthermore, these findings pave the way for future research to answer the questions of how, when and why PG is synthesized in Chlamydia. The functionality of the PG synthesis pathway in Chlamydia opens the door to discovery of new and the use of pre-existing cell wall inhibitors for the treatment of chlamydial infections.
DTIC
Bacteria; Biochemistry; Biosynthesis; Genetics; Microorganisms

20070007556 Massachusetts General Hospital, Boston, MA USA
Caffeine, Adenosine Receptors and Estrogen in Toxin Models of Parkinson's Disease
Schwarzschild, Michael A; Oct 2005; 74 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0881
Report No.(s): AD-A460739; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460739

Substantial progress has been made toward each of the 3 Specific Aims (SAs) of our research project, 'Caffeine, adenosine receptors andestrogen in toxin models of Parkinson's disease (PD)'. The overarching hypothesis of the project is that multiple environmental protectants and toxins interact to influence of the health of the dopaminergic neurons lost in PD. To that end we are characterizing the interplay between several environmental agents (pesticides, caffeine and estrogen) that are leading candidate modulators of PD risk. A major finding and publication of this project (SA #3) in its first year entails our demonstration that estrogen can prevent the neuroprotective effect of caffeine in the mouse MPTP model of PD. We have obtained evidence that endogenous estrogen (in females) andexogenous estrogen (in males and in ovariectomized females) can prevent the protective effect of caffeine on MPTP- induced loss of brain dopamine. Estrogen did not alter caffeine pharmacokinetics arguing for a downstream estrogen-caffeine interaction in the modification of dopaminergic neuron injury. These findings establish an animal model of estrogen-caffeine interactions in the modification of PD risk in humans, along with the opportunity to understand its molecular mechanisms. In addition, our laboratory and human data for this interaction are now sufficiently compelling to influence the design and interpretation of neuroprotection trials of estrogen or caffeine currently underway or under consideration. Ultimately, a better understanding of the interplay between environmental factors like caffeine estrogen may suggest effective preventative as well as therapeutic strategies for this neurodegenerative disorder.
DTIC
Adenosines; Caffeine; Diseases; Estrogens; Toxins and Antitoxins

20070007558 Haematologic Technologies, Inc., Essex Junction, VT USA
Evaluation of Novel Hemostatic Agents in a Swine Model of Non-Compressible Hemorrhage
Dorfman, Ryan H; Ryan, Kathy L; Pusateri, Anthony E; Jenny, Richard J; Klemcke, Harold G; Aug 2005; 67 pp.; In English
Contract(s)/Grant(s): DAMD17-03-2-0046
Report No.(s): AD-A460742; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA460742

Uncontrolled hemorrhage is the leading cause of death from wounds on the battlefield, accounting for over 50% of mortality. Hemorrhage is also the second leading cause of death in civilian trauma. There is a significant correlation between increased evacuation time and deaths due to combat injuries which increases proportionally with increasing evacuation time. Of the increased death due to delayed evacuation, 62% are the result of hemorrhage. This represents a group of casualties who bleed from wounds that are not immediately fatal. Approximately 80% of the hemorrhagic combat deaths are from wounds that are not compressible (accessible for manual pressure). Currently, there is no method available forward of the operating

table that can provide hemorrhage control for non-compressible hemorrhage. In spite of the common use of pharmacologic methods for decreasing blood loss in elective surgeries and specific coagulopathies in which large blood losses are expected, the potential for use to aid homeostasis during traumatic hemorrhage has not been adequately studied.
DTIC
Blood Coagulation; Death; Hemorrhages; Injuries; Swine

20070007562 Burnham Inst., La Jolla, CA USA
Structural Genomics of Bacterial Virulence Factors
Liddington, Robert C; Godzik, Adam; Pellecchia, Maurizio; May 2005; 118 pp.; In English
Contract(s)/Grant(s): DAMD17-03-2-0038
Report No.(s): AD-A460747; No Copyright; Avail.: CASI: A06, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460747

We are continuing to apply a comprehensive but focused structural genomics approach to determine the atomic resolution crystal structures of key virulence factors from high priority pathogens. The work in our first year focused on proteins encoded by the B. anthracis virulence plasmid, pXOl, and the setting up of a virulence factor computational data base. In the second year we expanded our efforts to include genome-encoded proteins of B. anthracis, structural studies on proteins encoded by Variola virus, thecausative agent of smallpox; initiated work to characterize a SARS virus surface protein in complex with a neutralizing antibody; and inititated work on a close homolog of a Yersinia pestis SuMoylase. We have generated a large library of expression vectors for virulence factors, as well as research quantities of pure proteins, which could readily be adapted for vaccine design. In the broader and longer term, the accumulated structural information will generate important and testable hypotheses that will increase our understanding of the molecular mechanisms of pathogenicity, putting us in a stronger position to anticipate and react to emerging pathogens.
DTIC
Bacteria; Virulence; Viruses

20070007563 Pennsylvania State Univ., University Park, PA USA
Trafficking of Metastatic Breast Cancer Cells in Bone
Mastro, Andrea M; Aug 2006; 27 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-1-0584
Report No.(s): AD-A460748; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460748

Breast cancer metastases are usually found at the ends (metasphyses) of long bones where they cause osteolysis. The objective was to determine the trafficking of cancer cells in the marrow cavity and to identify factors that attract them. Human breast cancer cells that express green fluorescent protein (MDAMB 231GFP) were inoculated intracardiacly into athymic mice.; femurs harvested from 1 hr to 6 wk later and analyzed by fluorescence microscopy, immunohistochemistry, histomorphometry, flow cytometry and PCR. Single cells were detected within 1 hr in the distal metasphyses. Most cleared the marrow by 72 hr; but at 1 wk small foci formed in the ends near osteoblasts. At 2 wk the foci grew and coalesced. By 4 wk, the tumor masses were large and extended into the diaphysis. The osteoblasts were dramatically reduced (8% of control), while osteoclasts were reduced modestly (~60% of control). Ours is the first in vivo evidence that tumor cells influence not only osteoclasts, as widely believed, but also eliminate functional osteoblasts, thereby restructuring the bone microenvironment to strongly favor osteolysis. Using an ELISA array we also found that the metasphyseal bone was rich in several cyokines and factors that were only weakly detected in the shaft of the bone. Strategies that restore osteoblast function, perhaps by modifying the bone microenvironment, are needed to improve treatment of osteolytic bone metastases.
DTIC
Bones; Breast; Cancer; Mammary Glands; Metastasis

20070007564 Johns Hopkins Univ., Baltimore, MD USA
Pathogenesis of Ovarian Serous Carcinoma as the Basis for Immunologic Directed Diagnosis and Treatment
Kurman, Robert J; Aug 2006; 249 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0667
Report No.(s): AD-A460749; No Copyright; Avail.: CASI: A11, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460749

The purpose of this study is to elucidate the pathogenesis of serous carcinoma by identifying the molecular genetic

changes and preferentially expressed genes of different histological types of serous neoplasms. We hypothesize that the development of serous carcinoma proceeds along two main pathways: one is rapid progression from ovarian surface epithelium to high-grade serous carcinoma without well-established morphological precursors ('de novo' pathway) and the other is a gradual development from borderline tumors to non-invasive micropapillary serous carcinomas then to low- grade carcinomas (stepwise pathway). The first pathway results in a high-grade neoplasm (conventional serous carcinoma) and the second leads to the development of a low-grade indolent tumor. Both types of carcinomas and the putative precursor lesions of invasive MPSC are characterized by distinctive molecular genetic alterations and specific gene expression. We identified that mutations in KRAS/BRAF/ERRB2 genes characterized the development of low- grade serous carcinomas. Expression of HLA-G apoE and membralin molecules were confined to high-grade serous carcinomas. This project designed to test our proposed model of diverse pathways in the pathogenesis of ovarian serous carcinoma provides an etiologic basis for the other two projects.
DTIC
Cancer; Diagnosis; Ovaries; Pathogenesis

20070007565 Cincinnati Univ., OH USA
Ron in Breast Development and Cancer
Waltz, Susan E; Oct 1, 2006; 49 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0342
Report No.(s): AD-A460753; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460753

The objective of this project is to define the in vivo role of the receptor tyrosine kinase Ron in mammary gland biology. Virtually nothing is known regarding the function of Ron in the breast. However, two recent studies have shown that Ron is over-expressed and highly phosphorylated in a significant fraction of human and feline breast cancers. To define the in vivo significance of Ron, mice were generated with a targeted ablation of the tyrosine kinase domain of this receptor (TK4- mice). To determine the impact of Ron in a murine model of breast cancer, the TK4- mice were crossed to mice expressing the polyoma virus middle T antigen (pMT) under control of the mouse mammary tumor virus promoter. Both TK4- and control mice expressing pMT develop mammary tumors and lung metastasis. However, a significant decrease in mammary tumor initiation and growth was found in the TK4- mice compared to controls. This decrease was associated with a significant decrease in microvessel density, decreased cellular proliferation and increased apoptosis. Biochemical analyses showed that the pMT expressing TK4- tumors had defects in MAPK and AKT activation. Our studies are the first to demonstrate the impact of Ron signaling on tumorigenesis.
DTIC
Breast; Cancer; Mammary Glands

20070007566 California Univ., Berkeley, CA USA
Mechanisms of Matrix Metalloproteinase-Mediated p53 Regulation
Fata, Jimmie E; Aug 2006; 28 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-1-0486
Report No.(s): AD-A460754; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460754

Cell contraction and membrane blebbing are evolutionarily conserved events that occur during the execution phase of apoptosis. Several members of the TNF-ligand superfamily, which are associated with the promotion of a number of pathological processes, including inflammation and cancer are also capable of inducing membrane blebbing in some cell types. The majority of these ligands are transmembrane bound but can be shed from the cell surface through proteolytic processing where soluble ligands can act as antagonists, as in the case of FAS ligand, or agonists, as seen with TNF-. Here we provide evidence that the matrix metalloproteinase, MMP-3/stromelysin-1 induces rapid membrane blebbing in serum starved or cyclohexamide-treated MCF10A human breast epithelial cells. MMP-3-mediated membrane blebbing is associated with reorganization of the actin cytoskeleton, upregulation of both p53 (with phosphorylation of Ser-46) and p38 MAP kinase activity, and loss of cell surface E-cadherin. A broad-spectrum MMP inhibitor completely abolishes these reactions. To understand the signaling cascade initiated by MMP-3, we asked whether factors down-stream of TNF-superfamily signaling were involved. We show that inhibitors against JNK and caspase-3, and RNAi reduction of MKK7, a known activator of JNK inhibit membrane blebbing. Moreover, stable expression of a dominant negative FADD (dnFADD), a downstream effector of several TNF superfamily ligands, renders MCF10A cells resistant to membrane blebbing. Together these findings indicate that

MMP-3 induces cell membrane blebbing through a TNF-superfamily signaling pathway and provides an impetus to further explore this protease in inflammation and cancer.
DTIC
Epithelium; Mammary Glands; Matrix Materials

20070007567 Pittsburgh Univ., Pittsburgh, PA USA
Epigenetic Regulation of Chemokine Expression in Prostate Cancer
Shurin, Michael R; Dec 2006; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-06-1-0151
Report No.(s): AD-A460756; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460756

During the first year of support, we developed a marked progress toward the main goal of our proposal - understanding the mechanisms of chemokine regulation in prostate cancer. Specifically, we revealed that prostate cancer cell lines and tissues obtained from cancer patients express low or no CSCL14 chemokine protein and mRNA, which might results in low infiltration of the tumor mass by dendritic cells. Importantly, if dendritic cells are not attracted to the prostate cancer tissues, no antitumor immune responses may be generated due to the absence of tumor antigen recognition, processing and presentation. These fundamental findings will now allow us to move forward and investigate the biological significance of these findings and the mechanisms of CSCL14 regulation in tumor cells.
DTIC
Cancer; Prostate Gland

20070007568 Johns Hopkins Univ., Baltimore, MD USA
Pathogenesis of Ovarian Serous Carcinoma as the Basis for Immunologic Directed Diagnosis and Treatment
Kurman, Robert J; Shih, Ie-Ming; Roden, Richard; Aug 2005; 34 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0667
Report No.(s): AD-A460757; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460757

The purpose of this study is to elucidate the pathogenesis of serous carcinoma by identifying the molecular genetic changes and preferentially expressed genes of different histological types of serous neoplasms. We hypothesize that the development of serous carcinoma proceeds along two main pathways: one is rapid progression from ovarian surface epithelium to high-grade serous carcinoma without well-established morphological precursors (de novo pathway) and the other is a gradual development from borderline tumors, to non-invasive micropapillary serous carcinomas then to low-grade carcinomas (stepwise pathway). The first pathway results in a high-grade neoplasm (conventional serous carcinoma) and the second leads to the development of a lowgrade indolent tumor. Both types of carcinomas and the putative precursor lesions of invasive MPSC are characterized by distinctive molecular genetic alterations and specific gene expression. We identified that mutations in KRAS and BRAF genes characterized the development of low-grade serous carcinomas. Expression of HLA-G, apoE and membralin molecules were confined to high-grade serous carcinomas. This project, designed to test our proposed model of diverse pathways in the pathogenesis of ovarian serous carcinoma, provides an etiologic basis for the other two projects.
DTIC
Cancer; Diagnosis; Immunology; Ovaries; Pathogenesis

20070007569 Emory Univ., Atlanta, GA USA
Harnessing Technology for Evidence-Based Education and Training in Minimally Invasive Surgery
Smith, C D; Oct 1, 2005; 40 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0765
Report No.(s): AD-A460758; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460758

Training specific surgical skills on simulators has been proven to bring a better prepared student to a human operating room, and when the simulator-trained student performs a portion of a procedure fewer errors are made when compared to a learner who has not been trained on a simulator. This current study seeks to further this work by first developing a curriculation for training an entire procedure, laparoscopic cholecystectomy, using simulation technologies and integrating cognitive,

psychomotor aspects of full procedure training, and second to test the effectiveness of curriculum-based training through a multicenter, international research group, the MASTER group.
DTIC
Education; Medical Personnel; Medical Services; Surgery

20070007570 Hutchinson (Fred) Cancer Research Center, Seattle, WA USA
Center for the Evaluation of Biomarkers for Early Detection of Breast Cancer
Urban, Nicole; Oct 2006; 25 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0691
Report No.(s): AD-A460759; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460759

Breast Cancer remains a leading cause of death for women in the US despite the popularity of mammography as a preventive tool. At diagnosis, many breast cancers are at an advanced stage of disease, even for women undergoing annual screening, resulting in costly and painful follow-up procedures. It has been shown that molecular markers can increase our ability to diagnose early stages tumors. This has been demonstrated by current clinical practices using the CA-125 marker and PSA for the detection of ovarian and prostate cancer, respectively. The purpose of this study is to search for breast cancer biomarkers and evaluate their effectiveness in detecting early stage carcinoma. By combining molecular diagnosis with current imaging analysis of breast tissue, we may further reduce the number of deaths as well as the number of women undergoing surgery due to breast cancer. To date, we have created the infrastructure necessary for our interdisciplinary team of investigators to obtain study samples from a well-characterized population, analyze candidate biomarkers, and efficiently communicate research findings. We are also exploring more efficient and sensitive biotechnology that may better assist our study investigators.
DTIC
Biomarkers; Breast; Cancer; Detection; Mammary Glands

20070007572 Mayo Clinic, Rochester, MN USA
Lowering T Cell Activation Thresholds and Deregulating Homeostasis to Facilitate Immunotherapeutic Responses to Treat Prostate Cancer
Kwon, Eugene D; Apr 2005; 7 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0108
Report No.(s): AD-A460762; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460762

The induction of tumor-specific T cells remains a primary obstacle to immunotherapeutic approaches for most cancers including prostate cancer. This difficulty has been largely ascribed to mechanisms for tumor evasion of the immune system and host-imposed restrictions (collectively referred to as tolerance) that prevent cross-reactive autoimmunity against the parent tissues from which tumors arise. Limitations in techniques to identify novel and truly immunogenic prostate-specific antigens and efficient methods to modify autologous tissues for vaccine preparation have further constrained approaches to develop immune-based therapies for prostate cancer. Hence, relatively straightforward manipulations that induce specific T cell responses against prostate tumors or epithelial tissues, especially in vivo, might ultimately prove valuable for prostate cancer immunotherapy. Our studies explore a new paradigm in which we will exploit blockade of T cell purigenic receptors A2a and A2b (using caffeine) to alleviate tumor-induced impairments in T cell function to potentiate T cellmediated immunotherapeutic responses to treat established prostate tumors in mice.
DTIC
Cancer; Homeostasis; Prostate Gland

20070007575 Mayo Clinic, Rochester, MN USA
Lowering T Cell Activation Thresholds and Deregulating Homeostasis to Facilitate Immunotherapeutic Responses to Treat Prostate Cancer
Kwon, Eugene D; Jun 1, 2006; 7 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0108
Report No.(s): AD-A460766; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460766

The inductor of tumor-specific T cells remains a primary obstacle to immunotherapeutic approaches for most cancers

including prostate cancer This difficulty has been largely ascribed to mechanisms for tumor evasion of the immune system and host-imposed restrictions (collectively referred to as tolerance) that prevent cross-reactive autoimmunity against the parent tissues from which tumors arise. Limitations in techniques to identify novel and truly immunogenic prostate-spew antigens and efficient methods to modify autologous tissues for vaccine preparation have further constrained approaches to develop immune-based therapies for prostate cancer Hence, relatively straightforward manipulations that induce specific T cell responses against prostate tumors or epithelial tissues, especially in vivo, might ultimately prove valuable for prostate cancer immunotherapy Our studies explore a new paradigm in which we will exploit blockade of T cell purigenic receptors A2a and A2b (using caffeine) to alleviate tumor-induced impairments in T cell function to potentiate T cell-mediated immunotherapeutic responses to treat established prostate tumors in mice.
DTIC
Cancer; Homeostasis; Prostate Gland

20070007579 Naval Medical Research Inst., Bethesda, MD USA
The Physiological Effect of Compressive Forces on the Torso
Bierman, Howard R; Wilder, Jr , Russell M; Hellems, Harper K; Dec 19, 1946; 18 pp.; In English
Report No.(s): AD-A460774; NMRI-8; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460774

Under the stimulus of military aviation the physiological responses of the human body to radial accelerations have been carefully investigated. Until very recently, relatively few investigations have been undertaken to study the physiological problems of linear acceleration. With the advent of jet and rocket propulsion these studies will have added significance. During the earlier phases of the investigation of deceleration, it became apparent that human subjects would have to be used if experimental results were to be applied with any degree of validity to problems incident to aircraft accidents involving large decelerative forces. The 'impact decelerator' (fig. 1) has proved to be a useful device in the study of impact forces, which is one aspect of linear acceleration. Early studies with this instrument on the effects of impact forces on human subjects employed the regulation restraining harness composed of seat belt and shoulder straps (1). It was found that the usual level of the subject's tolerance* was about 2000 pounds. As impacts exceeded 2000 pounds. As impacts exceeded 2000 pounds, they became increasingly painful. due in part to the relatively narrow harness area which transmits the force to the mid-abdominal and clavicular areas.
DTIC
Compressibility; Compressive Strength; Human Body; Physiological Effects; Torso

20070007581 Dartmouth Coll., Hanover, NH USA
S14 as a Therapeutic Target in Breast Cancer
Kinlaw, William B; Aug 2006; 52 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-1-0544
Report No.(s): AD-A460779; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460779

This project aimed to determine the importance of 'S14', a nuclear protein that signals for lipid synthesis in breast cancer. Our aims were first to develop a model of anti-S14 breast cancer therapy. Intratumoral adenoviral delivery of an S14-antisense gene into human breast cancer cell xenografts significantly inhibited tumor growth and we verified the specificity of this effect using siRNA. We identified two siRNAs that knockdown S14 protein in breast cancer cells and found them to be cytotoxic. Second to define the structure of the S14 multimer. S14 proved very difficult to crystallize. We therefore used NMR and computer modeling to discern the structure of the S14 tetramerization domain and identified key residues for multimer assembly by mutagenesis. Third to define the utility of S14 as a clinical marker. We produced S14 antibodies for immunohistochemistry. This revealed strong associations of S14 staining with tumor size and grade and a striking power to predict tumor recurrence. Thus S14 is a driver and a marker of virulent breast cancer that identifies cases that are likely to recur.
DTIC
Breast; Cancer; Mammary Glands; Targets; Therapy

20070007583 California Univ., Berkeley, CA USA

Chromatin Regulation of EGFR Locus in Human Mammary Epithelial Cells

Xu, Ran; Bissell, Mina J; May 2005; 13 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-02-1-0441

Report No.(s): AD-A460782; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460782

Relationship between chromatin remodeling and mammary tissue-specific gene transcription is not well understood. Using milk protein beta-casein as a marker, we investigate how extracellular matrix (ECM) and lactogenic hormone control transcription factors activity, and elucidate the role of histone acetylation and A P-dependent chromatin remodeling in the transcriptional regulation. By ChIP assays, we show that ECM cooperates with prolactin to induce binding of Stat5 and C/EBPBeta in the Beta-casein promoter. We also show that the levels of acetylated histones increase in the Beta-casein promoter. However, increasing acetylated histone levels in the promoter region by TSA treatment failed to induce Beta-casein expression, suggesting histone acetylation is not sufficient for the gene transcription. Introduction of the ATPase-deficient SWI/SNF complex significantly blocked Beta-casein expression, indicating that ATP-dependent chromatin remodeling is required for the transcriptional activation of this gene. Taken together, these observations indicate that Beta-casein expression requires the concerted action of both transcription and chromatin remodeling factors.

DTIC

Chromatin; Epithelium; Estrogens; Hormones; Loci; Mammary Glands; Proteins

20070007584 Emory Univ., Atlanta, GA USA

Molecular Imaging with Quantum Dots Probing EMT and Prostate Cancer Metastasis in Live Animals

Chung, Leland W K; Oct 2006; 42 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0916

Report No.(s): AD-A460783; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460783

Despite the development of various animal and tissue culture models for the study of human prostate cancer growth and metastasis, there is no non-invasive model that provides real-time information on the behavior of prostate cancer cells in the prostate or at distant sites. The goal of this application is to devise a highly sensitive and specific nanotechnology- based molecular imaging technique to detect prostate cancer growth locally and at distant sites and observe the interaction between prostate cancer cells and their local microenvironment during their acquisition of migratory, invasive and metastatic capabilities. This technique was made possible by a close collaboration between Chung/Zhau, who have extensive experience in the development of human prostate cancer metastatic models, and Nie, a biomedical engineer who devised an ultrasensitive and specific nanotechnology quantum dot (QD) bioconjugate that can image cancer cells in live animals at a sensitivity close to the single cell level. This collaborative interaction between Chung/Zhau/Nie could significantly improve our ability to diagnose, prognose and treat human prostate cancer, first in experimental models and later in the clinic. We have proposed three highly interactive aims that allow the PIs and trainees to interact during the development of this highly innovative technology.

DTIC

Animals; Cancer; Imaging Techniques; Metastasis; Prostate Gland; Quantum Dots

20070007585 Emory Univ., Atlanta, GA USA

Molecular Imaging with Quantum Dots Probing EMT and Prostate Cancer Metastasis in Live Animals

Chung, Leland W K; Oct 1, 2005; 25 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0916

Report No.(s): AD-A460785; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460785

Despite the development of various animal and tissue culture models for the study of human prostate cancer growth and metastasis there is no non-invasive model that provides real-time information on the behavior of prostate cancer cells in the prostate or at distant sites. The goal of this application is to devise a highly sensitive and specific nanotechnology- based molecular imaging technique to detect prostate cancer growth locally and at distant sites and observe the interaction between prostate cancer cells and their local microenvironment during their acquisition of migratory invasive and metastatic capabilities. This technique was made possible by a close collaboration between Ghung/Zhau who have extensive experience in the development of human prostate cancer metastatic models and Nie a biomedical engineer who devised an ultrasensitive and specific nanotechnology quantum dot (QD) bioconjugate that can image cancer cells in live animals at a sensitivity close

to the single cell level. This collaborative interaction between Ghung/Zhau/Nie could significantly improve our ability to diagnose prognose and treat human prostate cancer first in experimental models and later in the clinic. We have proposed three highly interactive aims that allow the PIs and trainees to interact during the development of this highly innovative technology. Aim I is to synthesize and test QD conjugates for the molecular imaging of prostate cancer cells in culture and to improve the quality of the QDs so they will emit light at the near-infrared range for potential detection of cancer cells located in deep tissues. Aim 2 is to develop a highly reproducible and metastatic human prostate cancer model using immunocompromised mice.
DTIC
Animals; Cancer; Imaging Techniques; Metastasis; Prostate Gland; Quantum Dots

20070007586 Space and Naval Warfare Systems Center, San Diego, CA USA
Joint Medical Semi-Automated Forces (JmedSAF) to Joint Medical Workstation V2 (JMEWS2) Database
Hardy, Douglas R; Sep 1, 2006; 12 pp.; In English
Contract(s)/Grant(s): MIPR6GS5CM6060
Report No.(s): AD-A460786; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460786

JMedSAF provides medical facility, patient, patient treatment and patient evacuation simulation. The patient conditions (PC), treatment, and evacuation parameters are derived from the Deployable Medical Systems (DEPMEDS) data as defined by the Defense Medical Standardization Board. To support the Cobra Gold Command Post Exercises (CPX), additional patient conditions were created which represent milder forms of the DEPMEDS conditions and disease/non-battle injury distribution data was modified to provide a theater specific alternative distribution more in line with Master Scenario Event List (MSEL) objectives. JMedSAF supported the CPX by simulating the planned medical facilities and their treatment of sick call and battle injury patients over a fifteen day period. In addition, specific injections of patients in support of medical MSEL events were conducted. JMedSAF output facility and patient reports to the Joint Medical Workstation (JMEWS) II system which provides a theater database for the Theater Medical Information Program (TMIP). The JMEWS II database provided database access to the MSE program which provided the common operating picture (COP) to the training audience, the CPX Coalition Joint Task Force (CJTF) surgeon and staff. The Coalition Exercise Control Group (CECG) for Cobra Gold provided the CPX scenario environment via the Joint Tactical Logistics System (JTLS) simulation and response cell personnel. The CECG for CG06 was split between in country operations at Sattihip, Thailand, and Camp Smith, Hawaii. The Camp Smith component consisted of a JTLS database server and the medical cell systems (JMedSAF, JMEWS II, and MSE). Exercise communication was provided via a closed Coalition Wide Area Network (COWAN) established in Thailand with a reach back capability to Camp Smith.
DTIC
Data Bases; Evacuating (Transportation); Medical Services; Military Operations; Telecommunication; Workstations

20070007587 Georgetown Univ., Washington, DC USA
X-Box Binding Protein-1 in Breast Cancer
Clarke, Robert; Aug 2006; 14 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0388
Report No.(s): AD-A460787; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460787

The factors driving resistance to antiestrogens are unknown. Comparing the transcriptomes of antiestrogen responsive and resistant MOF-7 variants by serial analysis of gene expression, we have implicated several genes, including the human X-box binding protein-I (XBP-I). XBP-I is a cAMP response element (ORE) binding protein associated with estrogen receptor (ER) expression in gene expression profiles of human breast cancers. We hypothesize that overexpression of XBP-I andlor activation of ORE contribute functionally to the ability of responsive cells to survive the metabolic stresses induced by exposure to antiestrogens. We also hypothesize that measuring expression of the XBP-I protein will assist in better identifying antiestrogen resistant andlor responsive tumors. Aim I :We will further study the likely functional role of XBP- IlORE by overexpression through transfection into responsive cells, and inhibiting expression in resistant cells. Effects of these molecular manipulations on responsiveness to antiestrogens will be studied. We will; also identify signaling downstream of XBPI that may explain how XBPI modifies responsiveness to endocrine treatments in breast cancer cells. Aim 2: We will explore the prognostic and predictive significance of XBP-I expression in a unique series of human breast cancer biopsies.

Thus, we will begin to assess the extent to which XBP-I is a candidate prognostic factor.
DTIC
Breast; Cancer; Mammary Glands; Proteins

20070007588 Meharry Medical Coll., Nashville, TN USA
The Role of Dioxin Receptor in Mammary Development and Carcinogenesis
Eltom, Sakina E; Jun 2006; 67 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0483
Report No.(s): AD-A460788; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460788

This research is testing the hypothesis that the dioxin receptor (AhR) plays a central role in breast carcinogenesis. Following on preliminary observations of the dramatic up-regulation of AhR in advanced human breast carcinoma (HBC) cell lines, we addressed whether the overexpression of the AhR alone is sufficient to induce carcinogenic transformation in mammary epithelial cells. Overexpression of AhR in clones correlated with decrease in population doubling times subsequent to abrogation to cell cycle, enhanced motility and increased migration. Furthermore, these clones acquired the ability to invade matrigel matrix and to form colonies in soft agar. Conversely, retrovirus vectors producing siRNAs targeted against AhR were used to generate stable clones with a knockdown of 75- 90% in AhR expression. Although these clones exhibited subsequent suppression of AhR-transcriptional activity, they showed no change from the vector control clone or parent cells in population doubling times, cell cycle distribution, ability to invade matrigel matrix or to form colonies in soft agar. These results suggest that AhR alone is capable of inducing transformation of immortalized normal mammary epithelial cells into a malignant phenotype, but its depletion is insufficient to reverse the malignant phenotypes in metastatic breast cancer cells. More research is required to delineate the mechanisms of AhR involvement in breast cancer progression.
DTIC
Breast; Cancer; Carcinogens; Mammary Glands

20070007589 Temple Univ., Philadelphia, PA USA
Regulation of T-Type Cyclin/CDK9 Complexes in Breast Cancer Cells
Marshall, Renee M; Jul 1, 2005; 9 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0576
Report No.(s): AD-A460789; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460789

Positive transcription elongation b (P-TEFb) is a general transcription elongation factor and is composed of a catalytic subunit, CDK9, and a regulatory subunit, a T-type cyclin. The complex phosphorylates the C-terminal domain of RNA polymerase II as well as negative elongation factors to allow for the transcriptional elongation of paused transcripts. We have investigated the regulation and role of cyclin T1 in breast cancer cells. While cyclin T1 expression is regulated by multiple signaling pathways in T cells, it is constitutively expressed in breast cancer cells. Also, cyclin T1 associated kinase activity is not regulated in PMA treated MCF-7 and T47D cells. Flavopiridol (FVP), a drug being evaluated in clinical trials as an anti-cancer agent, and a potent inhibitor of HIV transcription, is believed to act, at least in part, by inhibiting CDK9. We have compared the effects of FVP with those effects induced by direct inhibition of CDK9 by a dominant negative (dnCDK9) in breast cancer cells and found that both treatments result in p53-independent apoptosis of breast cancer cells.
DTIC
Breast; Cancer; Chemotherapy; Drugs; Enzymes; Lymphocytes; Mammary Glands; Phosphorus

20070007596 Johns Hopkins Univ., Baltimore, MD USA
Selective Inhibition of T Cell Tolerance as a Means of Enhancing Tumor Vaccines in a Mouse Model of Breast Cancer
Powell, Jonathan; Jun 2006; 8 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-1-0402
Report No.(s): AD-A460797; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460797

To determine if the addition of Go6976 to vaccine protocols will inhibit neu specific tolerance and enhance immunotherapy for breast cancer. Scope: In the Her-2/neu model of spontaneous breast cancer the immune system of these transgenic mice are tolerant to the neu protein. While immunity to neu can be demonstrated in the neu-transgenic mice (partial breaking of tolerance), this immunity is inadequate to prevent the spontaneous development of tumors and to prevent death

from tumor challenge. Findings: By combining our regimen with a dose of cytoxan we can promote survival of tumor bearing mice when compared with no treatment, vaccine alone or vaccine + cytoxan. In particular, this combination is very effective in inhibiting tumor growth in the early period post-tumor challenge. Unfortunately, during the last year efforts to improve long term survival have not been successful. Significance: These data support the notion that the novel combination of PKC inhibitor + vaccine can enhance the efficacy of tumor vaccines. More work needs to be done to optimized the dosing schedule of this approach.
DTIC
Breast; Cancer; Lymphocytes; Mammary Glands; Mice; Tumors; Vaccines

20070007600 University of Central Florida, Orlando, FL USA
Prostasin Serine Protease as a Breast Cancer Invasion Marker and a Metastasis Suppressor
Chai, Karl X; Chen, Li-Mei; Zhang, Ying; Nov 1, 2006; 13 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0338
Report No.(s): AD-A460801; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460801

This project had one Specific Aim after the peer and programmatic reviews, to evaluate prostasin, a glycosylphosphatidylinositol (GPI)-anchored extracellular serine protease as a potential metastasis suppressor of breast cancer in nude mice models. Two types of breast cancer metastasis, experimental and spontaneous, were to be used with the cell lines MDA-MB-231 and MDA-MB-435, respectively. We have found that prostasin must be activated by another membrane serine protease, matriptase before becoming functionally active as a proteolytic enzyme. The activating enzyme matriptase, however, is not expressed by either of the two model cell lines, an essential factor previously unrecognized, as well as an underlying reason for our previous inconsistent findings concerning prostasin s impact on breast cancer cell metastasis. In future research on membrane serine proteases in breast cancer cell biology, the newly recognized proteolytic cascade should be addressed with consideration of all of its current and potentially new member proteases.
DTIC
Breast; Cancer; Mammary Glands; Markers; Metastasis; Protease; Suppressors

20070007601 Howard Univ., Washington, DC USA
Anti-Estrogen Regulations of Macrophage Products that Influence Breast Cancer Cell Proliferation and Susceptibility to Apoptosis
Brenner, Theodore; Aug 2006; 8 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0408
Report No.(s): AD-A460802; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460802

In June 2006, I applied for a final no-cost extension to complete Task 2c of the project which required more time than previously anticipated. Program was slow owing to difficulty in recruiting a qualified laboratory technician for a single year. During the spring and summer (2006). I trained an undergraduate student, Ms. Giaelle Burnett, who is now assisting me with cell culture, western blotting and RT-PCR. The project will be completed in the current year (06/07).
DTIC
Apoptosis; Breast; Cancer; Cells (Biology); Estrogens; Macrophages; Mammary Glands; Regeneration (Physiology); Regulations

20070007602 Texas Univ., Dallas, TX USA
Prostate Cancer Evaluation: Design, Synthesis, and Evaluation of Novel Enzyme-Activated Proton MRI Contrast Agents
Yu, Jian-Xin; Oct 1, 2006; 14 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-05-1-0593
Report No.(s): AD-A460803; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460803

The lacZ gene encoding E. coli beta-gal has already been recognized as the most commonly used reporter system in cancer gene therapy. Moreover, prostrate-specific membrane antigen (PSMA) has been identified as an ideal antigenic target in prostate cancer. We propose to develop a novel class of Gd(III)-based MRI contrast agents for in vivo detection of beta-gal or PSMA activity. This new concept of the GD(III)-based MRI contrast agents is composed of three moieties: (A) a signal

enhancement group, such as Gd-DOTA or Gd-PCTA; (B) an Fe(III) chelating group; (C) beta-D-galactose or glutamate. Following cleavage by lacZ transgene or PSMA in prostate cancer cells, the released, activated aglycone Fe(III)-ligand will spontaneously trap endogenous Fe(III) at the site of enzyme activity forming a highly stable complex, to restrict motion of the GD(III) chelates enhancing relaxivity and providing local contrast accumulation. We plan to synthesize 8 novel MRI contrast agents for imaging beta-gal or PSMA activity in prostate cancer cell culture, explore the feasibility of applying the most promising analogies to cells grown in vivo in mice and rats.
DTIC
Cancer; Enzymes; Prostate Gland; Protons

20070007603 Stanford Univ., Stanford, CA USA
Vitamin D Treatment of Prostate Cancer: The Inhibitory Role of IGFBP-3
Feldman, David; Jan 2006; 19 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0142
Report No.(s): AD-A460804; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460804

Calcitriol plays a critical role in maintaining mineral homeostasis but also exhibits antiproliferative activity in many cancers. We have shown that the antiproliferative actions of calcitriol in LNCaP human prostate cancer cells are mediated mainly by induction of insulin-like growth factor binding protein 3 (IGFBP-3). We also found that androgens increase expression of IGFBP-3 and cause a major enhancement of IGFBP-3 stimulation by calcitriol. The purpose of this study was to determine the molecular mechanisms involved in calcitriol and androgen regulation of IGFBP-3. We cloned 6 kb of the IGFBP-3 promoter and demonstrated its responsiveness to calcitriol and androgen in transactivation assays. Computer analysis identified a putative vitamin D response element (VDRE) and a potential androgen response element (ARE) in the IGFBP-3 promoter. We proved each to be inducible by calcitriol or androgen. Mutations created in the VDRE or ARE resulted in a loss of IGFBP-3 induction confirming the critical response element sequences. Chromatin immunoprecipitation assays demonstrated that calcitriol recruited VDR/RXR heterodimers to the VDRE site and androgen recruited the AR/AR homodimer to the ARE site. In conclusion, we have identified a functional VDRE and ARE in the human IGFBP-3 promoter that directly mediates the action of calcitriol and androgen to regulate IGFBP-3 expression.
DTIC
Calciferol; Cancer; Hormones; Males; Prostate Gland

20070007604 California Univ., Berkeley, CA USA
Breast Cancer in Context: New Tools and Paradigms for the Millennium
Bissell, Mina J; Jul 2006; 31 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0438
Report No.(s): AD-A460805; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460805

We hypothesize that breast tumors are capable of multiple differentiation pathways. A finite number of interconnected pathways establish homeostasis in normal tissues which, if still functional in tumors, may be manipulated. Our goal is to characterize -51 breast cancer cell lines with known genomic profiles utilizing a robust 3-dimensional assay with laminin-rich extracellular matrix (3D IrECM). In this assay non-malignant mammary epithelial cells form acinar structures whereby cells growth arrest, polarize and form a central lumen while tumorigenic cells continue to proliferate and form a disorganized mass. In this assay, treatment of tumorigenic cells with various signaling inhibitors alone or in combination phenotypically 'reverts' or kills cancer cells. To date, the majority of the tumor lines have been obtained and grouped according to their morphology in 3D IrECM. Refined analysis identified six distinct morphologies termed round, round mass, irregular mass, grape-like, grape-like stellate and invasive stellate. Twenty-six cell lines have been characterized by gene expression and proteomic profiles of selected signaling pathways. We are analyzing these expression profiles to identify common signaling themes and/or morphological regulators as well as performing studies correlating morphology and expression profiles with response to Herceptin and other therapeutic agents.
DTIC
Breast; Cancer; Clinical Medicine; Genes; Homeostasis; Mammary Glands

20070007610 Hutchinson (Fred) Cancer Research Center, Seattle, WA USA
Use of Exogenous Progestins and Risk of In Situ and Invasive Breast Cancer
Li, Christopher I; Oct 2006; 10 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-05-1-0482
Report No.(s): AD-A460813; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460813

Given the large number of women exposed to progestins through either contraceptives or menopausal hormone therapies, clarifying the etiologic role of progestin in relation to breast cancer is of public health importance. This study's two projects will further our understanding of the potential risk of breast cancer associated with progestin use. Project 1 involves the enrollment of 225 in situ breast cancer cases 20-44 years of age. Project 2 is a case-control study of women 55-74 years of age that will enroll 325 controls and 975 breast cancer cases (325 each of three different histologic types of breast cancer). Both projects involve a detailed in-person interview and review and testing of tumor samples for various tumor markers. There are no major findings from this study as subject ascertainment has not yet begun. This year has been spent entirely on trying to obtain human subjects approval from DOD, and since approval has not yet been granted, no participants have been enrolled.
DTIC
Breast; Cancer; Females; Hormones; Mammary Glands; Risk

20070007612 University of South Florida, Tampa, FL USA
Advanced Cancer Detection Center
Krischer, Jeffrey P; Oct 2005; 33 pp.; In English
Contract(s)/Grant(s): DAMD17-01-2-0056
Report No.(s): AD-A460817; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA460817

The goals of the Advanced Cancer Detection Center include the discovery of molecular and genetic markers of cancer risk, the identification of individuals at high risk for cancer through screening and the testing of methods to prevent cancer. The Center also focuses on the development of new technologies for enhancing education and communication via web-based tool development. The projects included in this report are: Lung Cancer Screening with Computed Tomography: Initial Results of Cohort Screening Trial, The Tampa Bay Ovarian Cancer Study, Development of the Moffitt Cancer Network, Epoxide Hydrolase Genetic Polymorphisms and Their Functional Significance, and African American Families with Inherited Breast or Ovarian Cancer.
DTIC
Cancer; Medical Science; Research Facilities

20070007620 Duke Univ., Durham, NC USA
CBP and Extracellular Matrix-Induced Apoptosis in p53(-) HMECs: A Model of Early Mammary Carcinogenesis
Seewaldt, Victoria; Sep 2006; 129 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0375
Report No.(s): AD-A460834; No Copyright; Avail.: CASI: A07, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460834

Interactions between normal mammary epithelial cells (HMECs) and extracellular matrix (ECM) are important for mammary gland homeostasis and loss of ECM-sensitivity is an early event in mammary carcinogenesis. The purpose of this grant is to investigate how the CREBP-binding protein (CBP) might target the elimination of damaged HMECs. We have observed that 1) suppression of CBP results in apoptosis-resistance through impaired laminin expression and 2) CBP promotes induction of interferon-regulated genes during apoptosis. These findings will provide novel targets for chemoprevention and are being used to develop markers for response to current prevention strategies.
DTIC
Apoptosis; Carcinogens; Mammary Glands; Prevention

20070007622 Michigan Univ., Ann Arbor, MI USA
(-)-Gossypol, A Potent Small Molecule Inhibitor of Bcl-Xl as a Novel Molecular Targeted Therapy for Prostate Cancer
Xu, Liang; Feb 2005; 15 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0215
Report No.(s): AD-A460837; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460837

The major goal in the first year of the project is to investigate the in vitro anti-tumor activity of (-)-grossypol using prostate cancer cell lines. We have finished the tasks proposed in the Statement of Work for the first year. Specifically, we have investigated the in vitro anti-tumor activity of (-)-gossypol and potential synergistic effects of (-)-gossypol in combination with chemotherapeutic drugs. (-)-gossypol showed potent anti-tumor activity in human prostate cancer PC-3, LnCaP, CL-1 cells, but only limited or minimal effect on DU-145 and human normal prostate epithelial cells (PrEC) with low Bcl-xL. (-)-gossypol potently enhanced apoptosis induction by CDDP and docetaxel, currently used chemotherapeutic agents for prostate cancer. In PC-3 and CL-1 cells, (-) gossypol showed either additive or more than additive effects in combination of CDDP and docetaxel using MTT-based WST-1 assay. (-)-gossypol potently enhanced X-ray irradiation induced growth inhibition in a clonogenic assay, and apoptosis induction in Annexin V and PI staining assays. The data obtained in the first year provide us a solid foundation to move the project to in vivo testing and further mechanism studies, to develop (-)-gossypol as a novel molecular targeted therapy for the treatment of prostate cancer with Bcl-xL overexpression.
DTIC
Apoptosis; Cancer; Inhibitors; Prostate Gland; Therapy

20070007624 CFD Research Corp., Huntsville, AL USA
Spatial Modeling Tools for Cell Biology
Przekwas, Andrzej; Friend, Tom; Teixeira, Rodrigo; Chen, Z J; Wilkerson, Patrick; Oct 2006; 115 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8750-04-C-0247; DARPA ORDER-J058/U040; Proj-BIOC
Report No.(s): AD-A460852; No Copyright; Avail.: CASI: A06, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460852

Rapid accumulation of genomic and proteomic data from novel high throughput experimental screening technologies demand novel mathematical approaches and models to process and interpret massive amounts of data. Scientific potentials and military relevance of computational biology and bioinformatics have inspired DARPA/IPTO's visionary BioSPICE project to develop computational framework and modeling tools for cell biology. The goal of this CFDRC project was to formulate fundamental mathematical models and their numerical solution procedures for solving spatiotemporal cell biology problems and to develop software tools for multi-dimensional modeling of cell and tissue biology. CFDRC has developed Computational Biology, CoBi, software tools to simulate complex cell and organ biology problems. The code has been successfully applied to a number of cell biology problems including: bacterial chemosensing and chemotaxis, bacterial sporulation, EGFR signal transduction, cellular and tissue calcium oscillations, cellular and tissue oxygen and energy metabolism, morphogenesis of the yeast cell, and perfusion of a cell in an organ.
DTIC
Cells (Biology); Models; Software Development Tools

20070007637 Civil Aeromedical Inst., Oklahoma City, OK USA
Enantiomeric Analysis of Ephedrines and Norephedrines
Wang, S M; Lewis, R J; Canfield, D; Lia, T L; Liu, R H; Apr 2005; 16 pp.; In English
Report No.(s): AD-A460874; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460874

Concerned with variations in abuse potential and control status among various isomers of ephedrines and norephedrines, this study was conducted to develop an effective method for the simultaneous analysis of eight ephedrine-related compounds along with structurally similar cathinones. Among various approaches studied, a 60m HP-5MS (0.25 mm ID, 0.25 micrometer film thickness) was successfully used to characterize the following compounds that were derivatized with (-)-alpha-methoxy-alpha-trifloromethylphenylacetic acid (MTPA): (+)-cathinone, (-)-cathinone, (+)-norephedrine, (-)-norephedrine, (+)-norpseudoephedrine, (+)-ephedrine, (-)-ephedrine, (-)-pseudoephedrine, (+)-pseudoephedrine. (-)-Cathine standard was not available but should also be resolvable under this analytical procedure. This method was successfully applied to the analysis of selected cold remedies for characterizing the enantiomeric compositions of the compounds present in these samples.
DTIC
Alkaloids; Enantiomers

20070007643 Civil Aeromedical Inst., Oklahoma City, OK USA

A Rapid and Inexpensive PCR-Based STR Genotyping Method for Identifying Forensic Specimens

Kupfer, Doris M; Huggins, Mark; Cassidy, Brandt; Vu, Nicole; Burian, Dennis; Canfield1, Dennis V; Jun 2006; 18 pp.; In English

Report No.(s): AD-A460885; DOT-FAA-AM-06-14; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460885

Situations arise where forensic samples can be inadvertently misidentified during field collection. Samples identified in the field as being from the same person that return conflicting toxicological results may suggest such misidentification. Polymerase chain reaction (PCR)-based human identity testing provides a reliable and independent method to confirm sample identification. In the study presented here, the Federal Bureau of Investigation's human Combined DNA Identity System (CODIS) loci were used on a rapid, inexpensive microfluidics chip electrophoresis platform to confirm the identity of forensic samples from an aircraft accident site. Absolute allele identification was not achieved with this method, but it was found to be suitable for comparative analysis, as demonstrated by validation of the results and conclusions from capillary electrophoresis. The nine CODIS Short Tandem Repeat loci and a gender discrimination locus used in this study have a greater than 5E+07 matching probability suitable for small sample sizes.

DTIC

Aerospace Medicine; Capillary Flow; Deoxyribonucleic Acid; Identifying; Law (Jurisprudence); Low Cost; Sampling

20070007655 Florida Univ., Gainesville, FL USA

Evaluation of New Technologies for Protection of Military Personnel From Filth and Biting Flies

Koehler, Philip G; Patterson, Richard S; Oct 1, 2005; 54 pp.; In English

Contract(s)/Grant(s): W81XWH-04-1-0868

Report No.(s): AD-A460909; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA460909

Flies serve as vectors for many diseases that pose a serious threat to the safety and well-being of deployed military personnel. Filth flies are a major problem anytime there is a military action, because commonly there is an absence or disruption of sanitary systems and governmental services.

DTIC

Insects; Military Personnel; Protection

20070007657 Mayo Clinic, Rochester, MN USA

Centrosome Amplification: A Potential Marker of Breast Cancer Agressiveness

D'Assoro, Antonino B; Jul 2006; 37 pp.; In English

Contract(s)/Grant(s): DAMD17-03-1-0470

Report No.(s): AD-A460911; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460911

The aim of our research is focused in elucidating the mechanisms by which the normal regulatory pathways coordinating centrosome duplication with cell cycle events may become uncoupled promoting breast cancer development, progression, chemoresistance and consequent poor outcome. The preliminary results reported in this grant suggest that the development and progression of breast cancer is a complex process involving the role of estrogens, growth factor signaling pathways and abrogation of the p53 protein leading to an inactivation of cell cycle checkpoints. We have demonstrated that although MCF-7 cells stable transfected with a dominant-negative p53 construct, maintain estrogen-dependent properties, the timing of centrosome duplication and cyclin/cdk complexes is deregulated following mitogen stimulation. Interestingly, over-expression of cyclin A plays a critical role in the development of centrosome amplification following hormone stimulation. We also have shown that genotoxic stress leads to centrosome amplification in MCF-7 breast cancer cells with mutant p53, but not in MCF-7 cells over-expressing oncoproteins in the EGF mitogen signaling pathway with wild-type p53 background. Our findings demonstrate that over-expression of EGF mitogen signaling proteins is not sufficient to induce centrosome amplification following genotoxic stress, conferring to p53 a key role in the control of centrosome homeostasis and genomic stability. They also suggest that chemotherapy agents inducing DNA damage may lead to the selection of resistant clones through centrosome amplification only in cells with mutant p53 regardless over-expression of the EGF signaling pathway.

DTIC

Breast; Cancer; Emotions; Mammary Glands; Markers

20070007665 Eisenhower Medical Center, Rancho Mirage, CA USA

Bioterror Preparedness-Educational Programming for Military, Public Health and Civilian Medical Personnel

Hurrell, Jr, George; West, Gordon; Oct 2006; 42 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-2-0087

Report No.(s): AD-A460920; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460920

This research focuses on how delivery formats and level of interactivity affect the assimilation and retention of information on bioterrorism threats and treatments. We are comparing live meetings presented in a didactic format vs active learning format, web based education in a didactic vs active learning format, PDA based format, and printed monograph based format. The research will focus on the effectiveness of distance learning and self-study methodologies regarding factors and characteristics that improve retention and assimilation of this information into practice. We have recruited a panel of 22 experts in the field of biopreparedness and infectious diseases to develop program content. The first of two live meetings has taken place. Initial data from this first meeting has been collected, tabulated and is being analyzed. A second live meeting will take place in January of 2007. Web based programs, a print monograph, and a PDA based program are being developed.

DTIC

Computer Programming; Education; Medical Personnel; Public Health

20070007677 Johns Hopkins Univ., Baltimore, MD USA

Enzymatic Activation of Peptide Prodrugs by Prostate-Specific Membrane Antigen (PSMA) as Targeted Therapy for Prostate Cancer

Denmeade, Samuel R; Jan 2005; 24 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-02-1-0076

Report No.(s): AD-A460938; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460938

The majority of our present chemotherapeutic agents only kill cells effectively when they are proliferating; this may explain why these agents have been of such limited success in patients. In contrast to these ineffective agents we have chemically modified a plant toxin Thapsigargin (TG) to produce primary amine-containing analogs that are potent cell proliferation independent inducers of apoptosis in prostate cancer cells. These TG-analogs however are not prostate cancer-specific cytotoxins. The hypothesis is that a potent TG analog can be converted to an inactive prodrug by coupling to a peptide carrier that is a substrate for Prostate Specific Membrane Antigen (PSMA). Since PSMA is expressed in high levels only by prostate cancer cells and not by normal cells this should allow specific targeting of the TG- analogs killing ability to prostate cancer cells thus minimizing toxicity to normal tissue. Two enzymatic activities for PSMA have been described: an N-acetyl- linked acid dipeptidase (NAALADase) activity and a pteroyl poly-y-glutamyl carboxypeptidase (folate hydrolase) activity. On the basis of preliminary data the ideal TG prodrug should consist of either an aspartate or glutamate containing TG analog coupled via to a peptide containing a series of alpha- and y-linked glutamates and ending in an alpha-linked aspartyl-glutamate 'cap'. This substrate would be readily cleaved by PSMA but would be stable to hydrolysis by proteases such as gamma-glutamyl hydrolase present in serum and extracellular fluid of some normal tissue types.

DTIC

Antigens; Cancer; Enzyme Activity; Enzymes; Membranes; Peptides; Prostate Gland; Therapy

20070007682 California Univ., San Francisco, CA USA

Mammary Stromal Effects on Epithelial Differentiation and Expression of ESX and ErbB2

Parmar, Hema R; Cunha, Gerald; Sep 2004; 7 pp.; In English

Contract(s)/Grant(s): DAMD17-01-1-0189

Report No.(s): AD-A460943; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460943

A novel system for studying growth of normal human mammary epithelium in vivo as grafts in athymic nude mice has been developed. The key feature of this mode is the reconstitution of the epithelial-stromal interactions that occur in the normal human breast. This model has been used to demonstrate the ability of carcinoma associated fibroblasts to cause abnormal growth of normal human mammary epithelium. The renal grafting technique has also been used to study tumor growth and tumor inhibition.

DTIC

Breast; Cancer; Mammary Glands

20070007699 Texas Univ., Brownsville, TX USA
DNA Conforming Dynamics and Protein Binding
Hanke, Andreas; Dec 2006; 8 pp.; In English
Contract(s)/Grant(s): FA9550-05-01-0472
Report No.(s): AD-A461014; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461014

Recent advances in single%molecule force spectroscopy of DNA make it possible to study the thermodynamics and kinetics of DNA binding proteins under a wide range of conditions. A biophysical model for the DNA binding T4 gene 32 protein has been developed to study the kinetics of DNA protein binding to transient single-stranded DNA regions due to thermal fluctuations. The model is used to analyze recent single-molecule spectroscopy data of this system.
DTIC
Deoxyribonucleic Acid; Proteins

20070007704 California Univ., Berkeley, CA USA
Development of an Uncooled Photomechanic Infrared Sensor Based on the IR Organ of the Pyrophilous Jewel Beetle Melanophila Acuminata
Pisano, Albert P; Schmitz, H; Lee, Luke; Jan 4, 2007; 77 pp.; In English
Contract(s)/Grant(s): FA9550-05-1-0422
Report No.(s): AD-A461022; No Copyright; Avail.: CASI: A05, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461022

Initial efforts focused on the MEMS materials development effort including deposition and patterning process for chitosan, and more recent work resulted in the development of a photolithography process for chitosan compatible with traditional microfabrication processes. In order to realize a bio-inspired imaging system based on melanophila acuminata, the polysaccharide chitosan (a water-soluble derivative of chitin which can be reacetylated back to chitin through post-processing) was engineered from a commercially available power into a thin film compatible with semiconductor microfabrication processes. Substantial, novel work went into the synthesis, characterization, deposition and patterning of chitosan. MEMS compatible fabrication methods were developed. Controlled deposition of chitosan up to 5 um thick, with uniformity of 10% and roughness of less than 1% has been achieved. Stress temperature curves were recorded from amient to dehydrated conditions showing a clear hysteresis curve which can be exploited for exploited for thermal IR transduction purposes.
DTIC
Beetles; Chitin; Infrared Detectors; Microelectromechanical Systems; Organs

20070008032 Utah Univ., Salt Lake City, UT USA
Malignant Peripheral Nerve Sheath Tumors in Neurofibromatosis Type 1: A Multicenter Project With 3 Clinical Trials
Viskochil, David; Widemann, Brigitte; Friedman, Jan; Ferner, Rosalie; Perry, Arie; Jun 2006; 21 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0502
Report No.(s): AD-A460467; No Copyright; Avail.: CASI: A03, Hardcopy

A major goal of this CTDA proposal is to optimize NF1 subject recruitment into 3 clinical trials related to MPNSTs. This CTDA project has been successful in being directly responsible for the implementation of 1 of the 3 clinical trials. Our initial efforts led to the submission of a clinical trial for neoadjuvant chemotherapy in MPNST (DAMD-NF043129; PI-David Viskochil). This proposal was not funded however it was revised by Brigitte Widemann M.D. as principal investigator with a dedicated focus on treatment of MPNSTs within an oncology Consortium (Sarcoma Alliance for Research through Collaboration known as SARC). This revision entitled: PHASE II TRIAL of NEOADJUVANT CHEMOTHERAPY IN SPORADIC and NF1-ASSOCIATED HIGH GRADE UNRESECTABLE MPNSTs (Proposal #NF050022; PI-Brigitte Widemann) was approved for funding through the 2005 DOD NF Program. A meeting between investigators in this MPNST CTDA project and members of an MPNST Committee of a newly formed NF1 Consortium (DoD contract#W81XWH-05-1-615; PI-Jeannette Lee) and a representative of SARC was held in April 2006 which allowed for the transition of aims from another CTDA-derived clinical trial (Identification of Risk Factors for MPNST in NF1) to potential implementation of its goals into an MPNST trial conducted through the NF1 Consortium. Finally website development from the CTDA study is being implemented for the recruitment and the enrollment of NF1 patients with spine abnormalities into a multi-center natural history study (RO1 NS050509-O1A1; PI-D. Viskochil).
DTIC
Cells (Biology); Chemotherapy; Clinical Medicine; Nerves; Nervous System; Sheaths; Tumors

20070008049 Cold Spring Harbor Lab., New York, NY USA
Searching the Epigenome for Novel Breast Cancer Tumor Suppressors
Hannon, Greg J; Sep 2005; 8 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0345
Report No.(s): AD-A460849; No Copyright; Avail.: CASI: A02, Hardcopy

Our initial proposal focused on developing technologies to uncover epigenetic changes that contribute to tumor development. Our initial attempts towards developing genome wide approaches to identify new genes silenced by epigenetic mechanisms encountered problems; however, our efforts to exploit epigenetic mechanisms of gene silencing to study tumor suppressor gene function have been very successful (see below). We have built upon these successes both to push the development of broadly useful technologies for the use of RNAi in cell culture, in transgenic animals and in mosaic animals. This has led to insights into the function of tumor suppressor genes and is leading toward the identification of epigenetic regulators that are potentially cancer relevant. Finally, we have found that senescent cells for heterochromatic foci, SAHFs, which may help this innate tumor suppression mechanism to maintain stable growth arrest.
DTIC
Breast; Cancer; Genes; Mammary Glands; Suppressors; Tumors

20070008087 NASA Johnson Space Center, Houston, TX, USA
Cardiac Repolarization Abnormalities and Potential Evidence for Loss of Cardiac Sodium Currents on ECGs of Patients with Chagas' Heart Disease
Schlegel, T. T.; Medina, R.; Jugo, D.; Nunez, T. J.; Borrego, A.; Arellano, E.; Arenare, B.; DePalma, J. L.; Greco, E. C.; Starc, V.; [2007]; 1 pp.; In English; International Society for Computerized Electrocardiology, 21-26 Apr. 2007, Cancun, Mexico; Copyright; Avail.: CASI: A01, Hardcopy

Some individuals with Chagas disease develop right precordial lead ST segment elevation in response to an ajmaline challenge test, and the prevalence of right bundle branch block (RBBB) is also high in Chagas disease. Because these same electrocardiographic abnormalities occur in the Brugada syndrome, which involves genetically defective cardiac sodium channels, acquired damage to cardiac sodium channels may also occur in Chagas disease. We studied several conventional and advanced resting 12-lead/derived Frank-lead ECG parameters in 34 patients with Chagas -related heart disease (mean age 39 14 years) and in 34 age-/gender-matched healthy controls. All ECG recordings were of 5-10 min duration, obtained in the supine position using high fidelity hardware/software (CardioSoft, Houston, TX). Even after excluding those Chagas patients who had resting BBBs, tachycardia and/or pathologic arrhythmia (n=8), significant differences remained in multiple conventional and advanced ECG parameters between the Chagas and control groups (n=26/group), especially in their respective QT interval variability indices, maximal spatial QRS-T angles and low frequency HRV powers (p=0.0006, p=0.0015 and p=0.0314 respectively). In relation to the issue of potential damage to cardiac sodium channels, the Chagas patients had: 1) greater than or equal to twice the incidence of resting ST segment elevation in leads V1-V3 (n=10/26 vs. n=5/26) and of both leftward (n=5/26 versus n=0/26) and rightward (n=7/26 versus n=3/26) QRS axis deviation than controls; 2) significantly increased filtered (40-250 Hz) QRS interval durations (92.1 8.5 versus 85.3 plus or minus 9.0 ms, p=0.022) versus controls; and 3) significantly decreased QT and especially JT interval durations versus controls (QT interval: 387.5 plus or minus 26.4 versus 408.9 plus or minus 34.6 ms, p=0.013; JT interval: 290.5 plus or minus 26.3 versus 314.8 plus or minus 31.3 ms; p=0.0029). Heart rates and Bazett-corrected QTc/JTc intervals were not significantly different between groups. Patients with Chagas heart disease have increased cardiac repolarization abnormalities, especially by advanced ECG. Moreover, as a group, they have decreased uncorrected JT and QT interval durations and increased filtered QRS interval durations (versus age/gender-matched controls), all suggesting a potential loss of cardiac sodium channel function that might be mediated, in part, by cardiac autonomic damage. Overall findings support Brugada et al's recent hypothesis that the pathway leading to sudden death may often be similar in Chagas' disease and Brugada syndrome i.e., damage to the sodium channel (infectious/immunologic/autonomic in Chagas' genetic in Brugada) with consequent loss of sodium currents may facilitate a phase II-reentry based arrhythmic substrate for ventricular fibrillation in both conditions. In general, JT interval-related results have been underreported in the Chagas literature.
Author
Abnormalities; Heart Diseases; Patients; Sodium; Electrocardiography

20070008113 NASA Marshall Space Flight Center, Huntsville, AL, USA
Multispecies Biofilm Development on Space Station Heat Exhanger Core Material
Pyle, B. H.; Roth, S. R.; Vega, L. M.; Pickering, K. D.; Alvarez, Pedro J. J.; Roman, M. C.; [2007]; 2 pp.; In English; 4th ASM Conference on Biofilms, 25-29 Mar. 2007, Quebec City, Quebec, Canada
Contract(s)/Grant(s): 516572.04.04.02; Copyright; Avail.: Other Sources; Abstract Only

Investigations of microbial contamination of the cooling system aboard the International Space Station (ISS) suggested that there may be a relationship between heat exchanger (HX) materials and the degree of microbial colonization and biofilm formation. Experiments were undertaken to test the hypothesis that biofilm formation is influenced by the type and previous exposure of HX surfaces. Acidovorax delafieldii, Comamonas acidovorans, Hydrogenophaga pseudoflava, Pseudomonas stutzeri, Sphingomonas paucimobilis, and Stenotrophomonas maltophilia, originally isolated from ISS cooling system fluid, were cultured on R2A agar and suspended separately in fresh filter-sterilized ISS cooling fluid, pH 8.3. Initial numbers in each suspension ranged from 10(exp 6)-10(exp 7) CFU/ml, and a mixture contained greater than 10(exp 7) CFU/ml. Coupons of ISS HX material, previously used on orbit (HXOO) or unused (HXUU), polycarbonate (PC) and 316L polished stainless steel (SS) were autoclaved, covered with multispecies suspension in sterile tubes and incubated in the dark at ambient (22-25 C). Original HX material contained greater than 90% Ni, 4.5% Si, and 3.2% B, with a borate buffer. For approximately 10 weeks, samples of fluid were plated on R2A agar, and surface colonization assessed by SYBR green or BacLight staining and microscopy. Suspension counts for the PC and SC samples remained steady at around 10(exp 7) CFU/ml. HXUU counts declined about 1 log in 21 d then remained steady, and HXOO counts declined 2 logs in 28 d, fluctuated and stabilized about 10(exp 3) CFU/ml from 47-54 d. Predominantly yellow S. paucimobilis predominated on plates from HXOO samples up to 26 d, then white or translucent colonies of other species appeared. All colony types were seen on plates from other samples throughout the trial. Epifluorescence microscopy indicated microbial growth on all surfaces by 21 d, followed by variable colonization. After 54 d, all but the HXOO samples had well-distributed live and dead cells; the HXOO samples had few cells and most were live by BacLight. The results suggest that HX materials themselves are inhibiting microbial growth on the surfaces. The HX exposed on orbit to cooling system fluid inhibited growth of some species originally isolated from the system, whereas the unused HX material had a moderate effect compared to no inhibition with PC or SS controls. It is possible that chemistry or microbiology of the ISS system increased deposition of inhibitory compounds on the HXOO coupon surfaces; these may inhibit inoculated species to differing degrees.

Author

Biofilms; Heat Exchangers; International Space Station; Microbiology; Contamination

20070008455 Kettering Medical Center Network, Network, OH USA

Advanced Neuroscience Interface Research

Ezzedine, Bilal; Adineh, Mehdi; Satter, Martin; Mantil, Joseph C; May 1, 2002; 244 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F33615-98-2-6002

Report No.(s): AD-A460602; No Copyright; Avail.: CASI: A11, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460602

WKNI completed a Cooperative Agreement with AFRL to attempt to develop an infrastructure and demonstration project to exhibit and utilize technological developments with applications potentially valuable to both a military and civilian mission. Integrating mission critical information from a variety of formats and sources, and making them available to a highly trained operator, were seen as parallels between Air Force pilot and flight crew needs and the needs of a neurosurgeon and surgery team. Using the specialized knowledge and experience of the Human Effectiveness Directorate, we attempted to apply this knowledge to a civilian environment in the application and development of this technology.

DTIC

Graphical User Interface; Life Sciences; Neurology; Neurophysiology

20070008460 Columbia Univ., New York, NY USA

Breast Cancer Cell Selective Apoptosis Induced by the Novel Activity of an IL-10 Related Cytokine

Sauane, Moira; May 2005; 35 pp.; In English

Contract(s)/Grant(s): W81XWH-04-1-0433

Report No.(s): AD-A460848; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA460848

Preliminary data document that signaling events loading to Ad.mda-7-induced transformed-cell specific apoptosis are tyrosine kinase-independent. These results suggest that mda-7/IL-24 cancer cell-specific activity could occur through mechanisms independent of binding to its currently recognized cognate receptors and might even occur independent of receptor function. An adenovirus vector expressing a non-secreted version of MDA-7/IL-24 protein was generated via deletion of its signal peptide. This non-secreted protein was as effective as wild-type secreted MDA-7/IL-24 in inducing apoptosis in cancer cell lines, and displayed transformed cell specificity and localization of MDA-7/IL-24 in the Golgi/ER compartments. Based on localization as well as signal transduction pathway activation, MDA-7/IL-24 protein appears to induce ER stress that

in turn induces proapoptotic events. A new reagent was generated i.e. a bacterially expressed and purified GST-MDA-7 fusion protein. We describe the properties and characteristics of this protein in this report. Treatment of breast cancer cell lines with GST-MDA-7 sensitizes both wild-type and mutant p53 expressing tumor cells to growth inhibitory and antisurvival effects of ionizing radiation. Our results indicate that mda-7/IL-24-mediated apoptosis can be triggered efficiently in the absence of protein secretion and is likely mediated by ER stress.
DTIC
Adenoviruses; Apoptosis; Breast; Cancer; Mammary Glands; Tyrosine

20070008490 Johns Hopkins Univ., Baltimore, MD USA
Prevention of Football Injuries: A Review of the Literature
Gazal-Carvalho, Cynthia; Pollack, Keshia M; Canham-Chervak, Michelle; Jones, Bruce H; Baker, Susan P; Jan 2005; 71 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461013; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461013

INTRODUCTION. Football has been a leading cause of military and civilian injury hospitalizations and outpatient care. This report provides detailed descriptions of epidemiologic risk factor studies of football-related injuries, and presents evidence supporting and/or refuting the effectiveness of specific interventions to prevent football-related injuries. METHODS. Medical and public health literature (1970-2004) were searched to identify relevant articles. Search terms included football combined with intervention, prevention, injury, and derivations of these (e.g., injuries). Quality of intervention papers was assessed using a standardized instrument. RESULTS. Two hundred twenty-four papers were reviewed; 39% were case reports/series and descriptive studies, 13% were laboratory studies, 31% were reviews, 15% were analytic epidemiologic studies, and 2% were intervention studies. Median quality scores of intervention papers ranged from 15-46 out of 100. CONCLUSIONS. Only one intervention, a ban on spearing, had scientifically-demonstrated effectiveness in preventing football-related injuries. Other measures such as holding games and practices on natural grass rather than artificial grass, preseason conditioning, and use of knee and ankle braces deserve future consideration and evaluation. To be of greatest benefit, future intervention studies should clearly describe the study population and exposures, provide rates of injury, control for confounding, and consider contemporary equipment and policies.
DTIC
Epidemiology; Injuries; Medical Services; Military Personnel; Prevention; Public Health

20070008687 Naval Submarine Medical Research Lab., Groton, CT USA
Model for Estimating Noise-Induced Hearing Loss Associated With Occupational Noise Exposure in a Specified US Navy Population
Tufts, Jennifer; Weathersby, Paul K; Marshall, Lynne; Sachs, Felix; Jan 10, 2007; 61 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461351; NSMRL/50518/TR-2007-1247; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461351

This report details the initial steps in the development of a method for modeling the noise-induced hearing loss accrued by a population of Sailors exposed to high-level steady-state occupational noise. The model is based on the predictive algorithm described in ANSI S3.44-1996. 'Determination of Occupational Noise Exposure and Estimation of Noise-Induced Hearing Impairment.' For the purpose of developing the model. a specific population of Sailors is described which meets many of the criteria for the application of the S3.44 algorithm. Next, the predicted distributions of hearing threshold levels associated with age and noise for this population are calculated using the S3.44 algorithm, and these predicted distributions are compared with the distributions of actual hearing threshold levels of the group. Connections to the input values of the S3.44 algorithm are proposed based on a maximum likelihood curve-fitting procedure. Finally. recommendations are provided for the purposes of refining the model and improving its generalizability to other noise-exposed populations.
DTIC
Algorithms; Auditory Defects; Estimating; Exposure; Models; Navy; Noise Pollution; Personnel; Populations

20070008713 Naval Medical Research Inst., Portsmouth, VA USA
Personnel Data Congruence Between SAMS and CHCS
Westphal, Richard J; Goodman, William L; Amaya, Robert J; Nov 2005; 9 pp.; In English
Report No.(s): AD-A461442; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461442

This preliminary study was conducted to support development of a shipboard chronic disease condition prevalence study. The purpose of this study was to describe the percent congruence between the personnel records identified by SNAP (Shipboard Non-Tactical ADP Program) Automated Medical System (SAMS) and the Composite Health Care System (CHCS). The reliability of CHCS to link shipboard personnel to their proper command Unit Identification Code (UIC) needed to be established before conducting epidemiological research and disease management interventions.
DTIC
Congruences; Diseases; Medical Personnel; Personnel

20070008821 Virginia Univ., Charlottesville, VA USA
Optical Characteristics of Biological Molecules in the Terahertz Gap
Globus, Tatiana; Parthasarathy, Ramakrishnan; Khromova, Tatyana; Woolard, Dwight; Swami, Nathan; Gatesman, Andrew J; Waldman, Jerry; Jan 2004; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-00-1-0402
Report No.(s): AD-A461590; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461590

Terahertz Spectroscopy has been recently introduced as a promising technique for the collection of signature data in transmission spectra of biological materials including warfare agent simulants. To characterize material rather than sample, it is always desirable to obtain the material's optical properties as functions of frequency. In this work, we present results from parallel measurements of reflection and transmission spectra of biological molecules to enable detailed and direct calculation of refractive index and absorption coefficient spectra in the terahertz gap. DNA samples from herring and salmon as well as samples of Ovalbumin and Bacillus Subtillus spores have been characterized. The technique for simulation is described. Reflection spectra reveal resonance features similar to those demonstrated earlier for transmission, thereby affirming molecular vibrational modes in biological materials. The dispersion of refractive index and absorption coefficient is demonstrated within the Terahertz gap of 10 cm-1 to 25 cm-1.
DTIC
Biochemistry; Molecules; Optical Properties

20070008828 Sir Mortimer B. Davis Jewish General Hospital, Montreal, Quebec Canada
Use of Telemorace Inhibition in Combination with Anti-Cancer Drugs to Induce Cell Death in Tumor Cells
Cerone, Maria A; Aug 2006; 30 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0543
Report No.(s): AD-A461598; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461598

Telomerase is a ribonucleoprotein complex that maintains the stability of chromosome ends the telomeres and regulates cell replicative potential. The enzyme minimally contains a catalytic subunit with reverse transcriptase activity (hTERT) and a RNA subunit (hTR) with a region complementary to the telomeric repeats that is used as template. Telomerase is up-regulated in 05% of breast carcinoma but not in adjacent normal tissues and its activity increases with tumor aggressiveness. Therefore targeting telomerase may represent a promising approach for cancer therapy. Inhibition of telomerase would result in telomere shortening and cell death due to dysfunctional telomeres. The major limitation of this approach is the time necessary for the telomeres to shorten sufficiently to engage cell death. One possibility to overcome this lag phase is to target the telomeres by introducing hTRs with mutations in the template region which results in decreased cell viability and increased apoptosis. The aim of this study is to investigate the feasibility of a new anti-cancer approach based on the combination of telomere disturbances induced by mutant hTR and chemotherapeutic drugs. Our results show that interfering with telomere maintenance in breast cancer cells results in increased susceptibility to anti-cancer drugs independently of initial telomere length and mechanisms of telomere maintenance. These results suggest that this strategy could lead to the development of a general approach for the treatment of all human cancers.
DTIC
Breast; Cancer; Cells (Biology); Drugs; Mammary Glands; Tumors

20070008830 University of Southern California, Los Angeles, CA USA
Androgen Receptor-Mediated Escape Mechanisms from Androgen Ablation Therapy
Coetzee, Gerhard A; Rice, Judd; Jia, Li; Oct 2006; 18 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0823
Report No.(s): AD-A461600; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461600

Too many prostate-cancer treatments, especially those relying on the suppression of androgen, eventually fail to slow the advance of the disease. One explanation for this situation is the absence of any systematic knowledge on the role and function of the androgen receptor (AR) in the course of prostate cancer development. Recent findings indicate that the AR is the key master regulator (transcription factor) that determines disease progression to androgen independence, which ultimately contributes to death from prostate cancer. During the second year of this grant funding, we concentrated our efforts on the understanding of how transcriptional control of the AR at target loci is achieved as the PCa cells escape from androgen ablation therapy to become treatment resistant. We found that androgen-independent PCa cells have evolved three distinctive alterations in AR-mediated transcription. They are increased RNA polymerase initiation and processivity, increased sensitivity to ligand, and locus-wide chromatin remodeling that depended on sustained AR activity. We proposed a link between AR and subsequent polymerase engagements of target loci leading to a memory of transcriptional activity that in turn sustains altered patterns of histone modifications. Armed with such deeper knowledge of the hormonal and receptor requirements as well as mechanisms associated with prostate cancer growth and expansion, we may be able to develop therapies that prolong lives. Understanding the behavior of the AR, as documented above, is a first step in that quest.
DTIC
Ablation; Cancer; Hormones; Males; Prostate Gland; Therapy

20070008831 ITT Industries, Inc., Ashburn, VA USA
Experiments on the Biological Actions of Neutrons Performed in the Former Soviet Union: A Historical Review
Sverdlov, A G; Grachev, A G; Oct 2006; 87 pp.; In English
Contract(s)/Grant(s): DTRA01-03-D-002; Proj-BD
Report No.(s): AD-A461601; DTRA-TR-06-22; No Copyright; Avail.: CASI: A05, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461601

Data on the research of neutron biological effects in the USSR, the organization of this research, and the main results are presented in this review. Particular attention is paid to data that are important for analysis of the underlying mechanisms of the biological effect of neutrons and their dissimilarity from mechanisms of photon effect. Particular emphasis has been placed on elaboration of new methods of recognition and prediction of neutron damage to an organism. Efficacy of chemical protection of an organism against neutron effect is established. These results supplemented essential knowledge on neutron effects by original data that are important for the theory and practice of neutron radiobiology and medicine.
DTIC
Biological Effects; Histories; Neutrons

20070008833 ITT Industries, Inc., Ashburn, VA USA
Medical Effects and Dosimetric Data from Nuclear Tests at Semipalatinsk
Balmukhanov, S B; Oct 2006; 131 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DTRA01-03-D-0022; Proj-BD
Report No.(s): AD-A461603; DTRA-TR-06-23; No Copyright; Avail.: CASI: A07, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461603

In the former Soviet Union, two sites were used for most surface or atmospheric nuclear tests. One of these was at Novaya Zemlya in the arctic, but the earlier and more used of the two was in what is now the Republic of Kazakhstan. The Semipalatinsk Test Site (STS), or Polygon as it was called, was instituted in 1947. Data relating to the radiation levels were declassified in 1992 and are published in the first two tables of this report. Basically, the population was exposed to three sources of radiation: acute external gamma irradiation as the plume from the explosion passed over the areas; external gamma (and probably beta) irradiation from the fallout as it settled on the ground and the people themselves; and internal gamma, beta, and small amounts of alpha irradiation. Medical examinations conducted under this report and compared with data from previous expeditions have shown a significant disparity in health status between inhabitants of villages in the immediate neighborhood of the STS and inhabitants of similar settlements remote from the STS.
DTIC
Dosimeters; Explosions; Gamma Rays; Nuclear Explosions; Nuclear Weapons; Physical Examinations

20070008834 Washington Univ., Seattle, WA USA
Evaluation of Roles of Interferon Gamma Regulated Genes in Inhibition of Androgen-Independent Prostate Cancer
Corey, Eva; Aug 2006; 87 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-04-1-0198
Report No.(s): AD-A461606; No Copyright; Avail.: CASI: A05, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461606

CaP presents its greatest challenge to clinicians when it progresses to the hormone-independent state. Therapeutic methods which are effective regardless of androgen response, or even target androgen-independent CaP specifically, are of special medical and scientific interest. We have shown that estradiol (E2) can inhibit growth of hormone independent CaP in vivo. Among the genes up-regulated by E2 are IFN-regulated genes. The LuCaP 35V xenograft does not grow in vitro; for this reason, this exploratory proposal was design to evaluate the responses of various CaP cell lines to E2 and IFN in vitro. Our results show that E2 did not inhibit growth of 5 prostate cancer cell lines in vitro. It is possible that inhibition by E2 is not a result of direct effects of E2 on tumor cells, and that the interaction with the host environment may be critical for this inhibition. Regarding E2 regulation of expression of IFN-regulated genes, our data suggest that E2 may not activate IFN pathways directly, However our results suggest that IFN-regulated genes may play a role in the growth inhibition caused by E2 in vivo, since DU 145 cells showed similar alterations in expression of these genes following E2 treatment as LuCaP 35V, but smaller in magnitude, and DU 145 growth was weakly inhibited by high doses of E2. In conclusions, the 5 CaP cell lines available to us did not respond to E2 treatment as do LuCaP 35V in vivo. Our results indicate the possibility that the observed effects of E2 on prostate cancer xenografts in vivo might be mediated via indirect effects through interactions of CaP cells with cells of the innate immune system or other indirect effects of E2 requiring interactions with the host environment.
DTIC

Cancer; Genes; Hormones; Interferon; Males; Prostate Gland

20070008836 Pennsylvania State Univ., University Park, PA USA

Unique Proteins Expressed by Blood Vessels in Skeletal Sites Colonized by Breast Cancer Cells

Gay, Carol V; Aug 2006; 10 pp.; In English

Contract(s)/Grant(s): DAMD17-03-1-0583

Report No.(s): AD-A461608; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461608

This study focuses on identifying differences in the vasculature in the ends of long bones where breast cancer cells tend to lodge, as compared to the vasculature of the central marrow cavity. We developed a method to isolate highly pure populations of both cell types. We found differences in mRNA using microarray analysis and confirmed the data by RT-PCR. The bone-derived cells express five messages in greater abundance P2-fold or more) than the marrow-derived cellsR conversely, the marrow-derived cells express higher levels of two other mRNAs. Possible roles may be fostering angiogenesis and cell survival. Using immunocytochemistry, we also found that the bone-derived cells present more of a cell surface adhesive protein, E-selectin. Taken together, the data show that the bone and marrow vasculatures are notably different in ways that could foster tumor growth within the bone compartment. At least one difference, surface presentation of E-selectin, is likely to be a factor in the specificity breast cancer cells have for bone environment.
DTIC

Adhesives; Blood Vessels; Bone Marrow; Bone Mineral Content; Breast; Cancer; Mammary Glands; Musculoskeletal System; Proteins

20070008861 Loma Linda Veterans Association for Research and Education, Loma Linda, CA USA

Molecular Mechanisms of Soft Tissue Regeneration and Bone Formation in Mice: Implications in Fracture Repair and Wound Healing in Humans

Mohan, Subburaman; Apr 2006; 251 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-99-1-9571

Report No.(s): AD-A461637; No Copyright; Avail.: CASI: A12, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461637

The primary goal of the proposed work is to identify genes which play an anabolic role in bone and soft tissue function and to clarify the function of these genes. Three hypotheses have been proposed: 1) The high bone density gene in chromosome 1 in our CAST/B6 congenic mice can be cloned; 2) Genes that regulate soft- and hard-tissue regeneration can be identified by using appropriate mouse strains that exhibit differences in regeneration; and 3) ENU mutagenesis, applied to our mouse model, will lead to the identity of genes that regulate soft and hard tissue function. During the last funding period, we have proposed several specific objectives for each of the above-mentioned hypotheses. As disclosed in the progress report, we have successfully accomplished all of the specific objectives. Our work during the first year of the funding period has resulted in two manuscripts in press, two published manuscripts, and three abstracts. We believe that the successful accomplishment of the proposed studies will provide a better understanding of the molecular mechanisms involved in hard-

and soft-tissue regeneration and will provide a framework for future development of therapies for hard and soft tissue injuries.
DTIC
Bones; Fractures (Materials); Fracturing; Genes; Hardness; Injuries; Wound Healing

20070008966 Department of the Air Force, Washington, DC USA
COHORT: An Integrated Approach to Decision Support for Military Subpopulation Health Care
Demitry, Peter; Jan 2004; 19 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461819; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461819

Overview of presentation: What is COHORT? What is Parallax? Why COHORT is different. Does it Work? A Case Study. How did we do it? Other applications to medical research. COHORT is a series of relevant databases that have been consolidated into a datamart that allow for the continuous monitoring, analysis and early detection of epidemics, disease trends, and health anomalies among and across an infinite selection of cohorts through a variety of data applications. It provides temporal and geographic medical surveillance of every Air Force member from induction through retirement.
DTIC
Armed Forces (United States); Data Bases; Health; Medical Services; Military Personnel

20070009008 ABB Environmental Services, Inc., Wakefield, MA USA
Radiological Survey and Remediation Report DRMO Yard
Nov 1996; 139 pp.; In English
Contract(s)/Grant(s): DACA31-04-D-0061-0003
Report No.(s): AD-A461919; No Copyright; Avail.: CASI: A07, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461919

This Radiological Survey Report has been prepared in accordance with the U.S. Army Environmental Center (USAEC) scope of work for Contract No. DACA31-94-D-0061, Delivery Order No. 0003, Modification 1. The scope of work modification sets forth the requirements for performing a radiological survey at the Defense Reutilization and Marketing Office (DRMO) Yard, Fort Devens, Massachusetts. The DRMO Yard is currently undergoing environmental restoration as Area of Contamination (AOC) 32 in accordance with Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The pavement and surface soils have been contaminated primarily with inorganics and polychlorinated biphenyls (PCBs) from yard operations. In addition to these findings, the U.S. Army Center for Health Promotion and Preventative Medicine (USACHPPM) conducted a preliminary survey to establish the history of radioactive sources at Fort Devens. The locations of sources, the activity of those sources, and the uses, accidents, and leaks that may have contaminated any areas at Fort Devens are presented by USACHPPM in an industrial radiation historical data review report entitled 'Industrial Radiation Historical Data Review No. 27-43-E3QX-95 Fort Devens, Massachusetts' and dated November 7, 1994. One of the outdoor sites identified in the report is the DRMO Yard which is located at the north end of the Main Post on the corner of Cook Street and Market Street in the town of Ayer. The DRMO Yard is comprised of three fenced enclosures. These fenced yards are identified in this report as the west yard, east yard and the tire recycling yard. According to the historical data review report by USACHPPM, there was a potential for radium contamination from jeep crushing activities that occurred within these yards. For an undetermined period of time, jeeps were crushed without removal of speedometer, fuel, temperature, battery and oil pressure gages with radium faces.
DTIC
Contamination; Polychlorinated Biphenyls; Radioactive Materials; Radiology; Radium; Soils; Surveys

20070009012 Florida Univ., Gainesville, FL USA
Evaluation of Physical Capture Efficiency and Disinfection Capability of a Novel Iodinated Filter Medium
Ratnesar, Shanna; Wu, Chang-Yu; Wander, Joe; Lundgren, Dale; Farrah, Sam; Wanakule, Prinda; Blackburn, Matthew; Lan, Mei-Fang; Dec 2006; 32 pp.; In English
Contract(s)/Grant(s): FA8651-05-C-0136; Proj-ARMT
Report No.(s): AD-A461928; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461928

A novel filter medium has been developed that combines the use of filtration and iodine disinfection to provide protection against airborne pathogens. The physical capture efficiency and disinfection capability of this iodinated resin medium were evaluated. Significant capture efficiency (\g97%) was observed for both the iodine-treated and untreated media tested, and

there was no significant difference in capture efficiency between them. The efficiency was greater than 99% in many cases. The pressure drag was less than 10% that of the glass-fiber HEPA filter (0.0054 in H2O/(in/min) vs 0.065 in H2O/(in/min)). Biological disinfection by the medium was evaluated using Micrococcus luteus and Echerichia coli vegetative bacterial cells. High biological deactivation efficiency was observed (99.997%). Viable penetration through the biocidal filters was observed in only 2 of 10 experiments. A near-contact mechanism in which iodine is displaced from a triiodide complex is proposed to explain the higher biological removal efficiency compared to the physical capture efficiency exhibited by the iodinated filters. The results show that an antimicrobially augmented filter medium can provide effective protection against airborne pathogens with a significantly lower pressure drop than that imposed by conventional high-eficiency filtration systems.
DTIC
Antiseptics; Iodine

20070009041 Stollar (R. L.) and Associates, Inc., Denver, CO USA
Health and Safety Plan
Sep 1991; 221 pp.; In English
Contract(s)/Grant(s): DAAA15-90-D-0018-0005
Report No.(s): AD-A460344; No Copyright; Avail.: CASI: A10, Hardcopy

This Health and Safety Plan (HASP) addresses the tasks to be performed during the Environmental Investigation/ Alternatives Analysis (EI/AA) at Fort Douglas, located on the eastern side of Salt Lake City, Utah. The areas of Fort Douglas that are to be investigated for potential contamination include the military museum, chapel, Noncommissioned Officer's (NCO) club, Officer's club, 39 family housing structures (three of which are used as administrative offices), three detached garages, three structures associated with a former service station, a swimming pool with related water treatment and bath house buildings, various pole-mounted transformers located throughout the site, two abandoned underground hydrocarbon storage tanks (USTs) and a location downgradient of a storage yard. The proposed work tasks include: sampling and inspecting the buildings for the presence of asbestos and lead-based paint, sampling the transformers for polychlorinated biphenyls (PCBs), collecting soil and potentially ground-water samples, and installing ground-water monitoring wells if saturated conditions are observed during drilling. The asbestos survey will be conducted as a separate field program prior to the other field work. The purpose of this plan is to provide specific health and safety requirements for the planned scope of work. It contains guidelines and directives which establish minimum standards for chemical monitoring and exposure control, safety criteria, and emergency response procedures. This plan is written in such a manner as to allow the Site Safety Officer the ability to respond to changing conditions and make professional judgments regarding the interpretation of monitoring data and related control measures.
DTIC
Contamination; Health; Safety

20070009042 Indiana Univ., Indianapolis, IN USA
Development and Pre-Clinical Evaluation of a Novel Prostate-Restricted Replication Competent Adenovirus-AD-IU-1
Gardner, Thomas A; May 2006; 82 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-1-0077
Report No.(s): AD-A460368; No Copyright; Avail.: CASI: A05, Hardcopy

Recently we generated a prostate specific chimeric promoter, called PSES, by combining the active prostate specific enhancers from PSA and PSMA genes which are prominently expressed in androgen independent prostate cancers. The goal of this research is to develop a novel therapeutic agent, Ad-IU-1, using PSES to control the replication of adenovirus and the expression of a therapeutic gene, herpes simplex thymidine kinase (TK). AD-IU-1 replicate as efficient as a wild type adenovirus in PSA/PSMA positive cells, but not in PSA/PSMA negative cells. Prodrug GCV augmented Ad-IU-1's killing activity against PSA/PSMA positive cells, but not PSA/PSMA negative cells in vitro. Ad-IU-1 was more effective in inhibit the growth of androgen-independent CWR22rv tumors. Due to recent improvement in our adenoviral vector construction which allows us to insert a bigger transgene into the viral genome, we further investigated a fusing suicide gene, FCYttk, by combining two suicide genes, a yeast cytosine deaminase, FCY, and improved TK, ttk. FCYttk had a better killing activity than TK against prostate cancer cells. We are on the process of constructing FCYttk-armed prostate restricted replicative adenovirus for future clinical investigation.
DTIC
Adenoviruses; Cancer; Enzymes; Genes; Phosphorus; Prostate Gland; Thymidine; Viruses

20070009045 Miami Univ., FL USA

Evaluation of Chemicals for Antimalarial Activity Against Blood and Tissue Stages

Ager, Arba; Jul 2005; 25 pp.; In English

Contract(s)/Grant(s): DAMD17-03-2-0031

Report No.(s): AD-A460755; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Three different test systems were used to detect antimalarial activity of new compounds in mice. The first test (AT Test) detected activity against blood stage parasites (Thompson Test). There were 105 three level tests done plus 3 one level tests performed. 54 compounds exhibited activity against the asexual blood stages. The 2 most active compound were BQ 99377 and BR 01050. The second test (SM Test) detected activity against the sporozoite stages or the exoerythrocytic schizont stages in the liver. There were 66 three level tests done where the drug was given once and 2 tests where the drugs were given for 3 days. The most active compounds were BQ 11373, BQ 93713, BQ 93722, BH 50615, BH 58522 and BR 01069. There were 18 SM tests done to detect synergistic activity between Primaquine and methylene blue, Atovaquone, Proguanil, Dapsone, Quinine, BQ 98852 and Doxycycline. The third test detects activity against the gametocyte stages. There were 121 compounds tested. The one oracle database was used to tabulate and analyze data from both the AT and SM test systems.

DTIC

Blood; Parasites

20070009046 Southwest Research Inst., San Antonio, TX USA

Continuous Pre-Hospital Data as a Predictor of Outcome Following Major Trauma: A Study Using Improved and Expanded Data

Kinkler, Jr, Ernest S; Convertino, Victor A; Gordon, Donald J; Holcomb, John B; Salinas, Jose; Jun 2005; 13 pp.; In English

Contract(s)/Grant(s): W81XWH-04-2-0015

Report No.(s): AD-A460773; No Copyright; Avail.: CASI: A03, Hardcopy

This study is designed to acquire near continuous physiologic measurements, beginning at the earliest practical time after injury, on large numbers of injured patients with several trauma.

DTIC

Data Bases; Hospitals; Injuries

20070009047 Georgetown Univ., Washington, DC USA

Detection of Genetic Alterations in Breast Sentinel Lymph Node by Array-CGH

Cavalli, Luciane R; Oct 2006; 28 pp.; In English

Contract(s)/Grant(s): W81XWH-04-1-0671

Report No.(s): AD-A460808; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The sentinel lymph node (SLN) is the first node in the mammary gland to harbor malignant cells in breast tumors with metastasis, and SLN positivity is an indication for axillary lymph node dissection. The purpose of our study is to identify specific genetic alterations using array-CGH in the metastatic sentinel lymph node lesions, in comparison to the one observed in the corresponding primary tumors from patients with breast cancer. We believe that the characterization of genetic alterations at the SLN site is a logical step to define the cytogenetic evolution of primary tumors to a metastatic state, and my represent the initial genetic events that occur in the early metastatic process, before distant metastasis occur. Ultimately these reduction or elimination of the need for invasive surgical procedures, such as axillary dissection, in the management of breast cancer patients.

DTIC

Breast; Cancer; Dissection; Genetics; Lymphatic System; Mammary Glands; Metastasis; Sentinel System

20070009048 Baylor Coll. of Medicine, Houston, TX USA

The Regulation of Nuclear Receptor Coactivator SRC-3 Activity Through Membrane Receptor Mediated Signaling Pathways

Yi, Ping; May 2005; 39 pp.; In English

Contract(s)/Grant(s): W81XWH-04-1-0552

Report No.(s): AD-A460836; No Copyright; Avail.: CASI: A03, Hardcopy

SRC-3 interacts with steroid receptors in a ligand-dependent manner to activate receptor mediated transcription. A number of signaling pathways initiated by growth factors and hormones induce phosphorylation of SRC-3, regulating its function and contributing to its oncogenic potential. However, the range of mechanisms by which phosphorylation affects coactivator

function remains largely undefined. We demonstrate here that the peptidyl-prolyl isomerase 1 (Pin1), which catalyzes the isomerization of phosphorylated Ser/Thr-Pro peptide bonds to induce conformational changes of its target proteins, interacts selectively and specifically with phosphorylated SRC-3. In addition, Pin1 and SRC-3 activate nuclear receptor regulated transcription synergistically. We present evidence that Pin1 modulates interactions between SRC-3 and CBP/p300. Depletion of Pin1 in NCF-7 human breast cancer cells reduces endogenous estrogen-dependent recruitment of p300 to the promoters of estrogen receptor-dependent genes. Our results suggest that Pin1 functions as a transcriptional coactivator of nuclear receptors by modulating SRC-3 coactivator protein-protein complex formation, and ultimately, by regulating the turnover of the activated SRC-3 oncoprotein.
DTIC
Estrogens; Membranes; Phosphorylation; Proteins; Steroids

20070009103 Pennsylvania Univ., Philadelphia, PA USA
Chemotherapy - Induced Alopecia and Symptom Distress in Younger and Older Women with Breast Cancer: Intergroup Differences and Impact on Functional Status
Stricker, Carrie T; Aug 2006; 13 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-1-0535
Report No.(s): AD-A461944; No Copyright; Avail.: CASI: A03, Hardcopy

The purpose of this training grant is to facilitate development of breast cancer(BC) clinical research skills, particularly related to issues relevant to older women. Scope: The research training program encompasses didactic coursework, secondary analysis, and dissertation research within the doctoral program at the School of Nursing, and intensive mentored clinical research training at the Abramson Cancer Center, both at the University of Pennsylvania. Major findings: A secondary analysis was conducted to longitudinally compare symptom distress and functional status in older (n=26) versus younger (n=163) women receiving 4-8 cycles of adjuvant BC chemotherapy. Older women trended towards greater declines in functional status from baseline to cycle 4. Age, baseline functional status, and coincident change in symptom distress together explained 55.9% of the variance in functional status change between cycle 1 and 4 (p\h0.0001), with age \g60 predicting greater declines in functional status between cycle 1 and 4. Finally, younger women's functional status scores recovered significantly more than those of older women between baseline and 1-3 months post-treatment. Progress: Secondary analysis is complete with final results presented nationally in 11/05. PhD candidacy has been achieved. All 13 required courses for the PhD have been completed, the dissertation research proposal defended, the preliminary exams defended, and ongoing dissertation data collection will be completed by 3rd quarter 2006. As a result of work related to this training grant, the PI is a Co-Investigator on a R01 grant application submitted 6/1/06 to the National Institutes of Health (PI: Kathryn Schmitz, PhD), as well as two submitted foundation grants.
DTIC
Breast; Cancer; Chemotherapy; Females; Mammary Glands; Signs and Symptoms

20070009105 Stanford Univ., Stanford, CA USA
Biomarkers of Selenium Action in Prostate Cancer
Lapointe, Jacques; Mar 2006; 42 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-04-1-0080
Report No.(s): AD-A461946; No Copyright; Avail.: CASI: A03, Hardcopy

This study was designed to identify new, mechanistically relevant biomarkers of selenium responsiveness for use in intervention trials. We have characterized the global transcriptional response of LNCaP prostate cancer cells to selenium by using cDNA microarray. We have identified molecular targets of selenium that are secretory using bioinformatics approaches and datasets of selenium modulated transcripts and membrane bound and secretory proteins. To help prioritizing biomarker candidates, we have cross-referenced the selenium modulated genes list with existing prostate cancer microarray data sets. Using this approach, we have narrowed down the number of biomarker candidates that we are now characterizing in more details.
DTIC
Biomarkers; Cancer; Prostate Gland; Selenium

20070009108 Naval Medical Research Inst., San Diego, CA USA
Bispectral Index Monitoring of Unihemispheric Effects in Dolphins
Howard, Red S; Finneran, James J; Ridgway, Sam H; May 26, 2006; 8 pp.; In English
Report No.(s): AD-A461950; No Copyright; Avail.: CASI: A02, Hardcopy

When dolphins sleep, their electroencephalographic activity may change in only one cerebral hemisphere; i.e., the left and right brain hemispheres can take turns sleeping. We demonstrate that the bispectral index (BIS) monitor can detect interhemispheric asymmetry in the dolphin species Tursiops truncatus. Using two BIS sensors place simultaneously over each side of the dolphin's head, we often, but not always, found significant differences between the two BIS values (e.g., left side 60 and right side 90) in non-medicated animals and in animals given propofol, atropine, and/or diazepam. Observations were each made over a period of approximately 3 h on dolphins resting out of the water. Unihemispheric effects may be inducible pharmacologically in dolphins. The dolphin, with its human-sized brain, may provide an animal model for study of unihemispheric effects in humans.
DTIC
Dolphins; Electroencephalography

20070009111 McMaster Univ., Hamilton, Ontario Canada
Development and Evaluation of Different Versions of the Decision Board for Early Breast Cancer
Whelan, Timothy J; Aug 2006; 11 pp.; In English
Contract(s)/Grant(s): DAMD17-98-1-8100
Report No.(s): AD-A461954; No Copyright; Avail.: CASI: A03, Hardcopy

The main objective of this study is to further enhance information transfer between the doctor and the patient, giving women with early stage breast cancer an opportunity to more fully participate in treatment decision making. To accomplish this, the authors developed a decision aid, called the Decision Board (DB), for women regarding choices in breast cancer with respect to surgical treatment and adjuvant chemotherapy. The study compares three versions of the decision board (DB), all containing the same information but using different forms of media: (1) the standard DB, which is a foam core, poster-sized version with pull-out panels; (2) the computer DB, which uses a Windows-based program that resembles the standard DB and is available on a laptop computer; and (3) the paper DB, which is a small 8.5 x 11-inch paper version of the standard DB that also serves as the take-home brochure for the standard DB. The different versions of the DB were developed to improve the instrument's usefulness and to allow for information to be updated more readily. A total of 310 patients were accrued to the study and were randomly assigned to one of the three versions. The DB presents one of two treatment choices: (1) an adjuvant chemotherapy decision for women with stage I or II moderate risk breast cancer (no chemotherapy vs. CMF [Cyclophosphamide, Methotrexate, and Fluorouracil] vs. AC [Adriamycin and Cyclophosphamide] vs. ACT [Adriamycin, Cyclophosphamide, and Taxol]); and (2) a surgical decision (mastectomy vs. lumpectomy plus radiation). Preliminary analyses show that the three versions of the DB indicate similar levels of patient knowledge, decisional conflict, and satisfaction with decision making among the patients who used them. The three instruments also showed a similar level of usefulness to patients and physicians. The study supports the use of computer-based and paper-based versions of the DB in treatment decision-making.
DTIC
Breast; Cancer; Chemotherapy; Decision Support Systems; Females; Mammary Glands; Patients; Surgery

20070009114 Georgetown Univ., Washington, DC USA
Long Term Outcomes of BRCA1/BRCA2 Mutation Testing
Schwartz, Marc D; Aug 2006; 10 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0553
Report No.(s): AD-A461957; No Copyright; Avail.: CASI: A02, Hardcopy

This project aims to gain a better understanding of the implications of genetic testing for breast-ovarian cancer susceptibility. The primary goal is to evaluate the impact of BRCA1/BRCA2 mutation testing on long term psychosocial (quality of life, distress, social functioning) and prevention/surveillance (mammography, CA125, transvaginal ultrasound, prophylactic mastectomy, prophylactic oophorectomy and chemoprevention) outcomes. To accomplish this we will measure outcomes within a group of women who received BRCA1/BRCA2 test results at least four years ago. We will divide our sample based upon their personal cancer history - evaluating cancer survivors with different measures compared to unaffected individuals. For both survivors and unaffected individuals we will recruit separate comparison samples of women who have never received BRCA1/BRCA2 testing. During this past year we received final approval from the DOD to begin accrual. We have initiated accrual and to date have completed follow-up interviews with xxx women. During the upcoming year we will continue accrual of our genetic testing cohort and will initiate accrual of our comparison groups.
DTIC
Genes; Mutations

20070009117 Jackson (Henry M.) Foundation, Rockville, MD USA

Gynecologic Cancer Center for Racial Disparities

Maxwell, G L; Aug 2006; 20 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-2-0065

Report No.(s): AD-A461962; No Copyright; Avail.: Defense Technical Information Center (DTIC)

There are significant health-related disparities in outcome among women in the USA with different types of gynecologic cancer. The authors hypothesize that a poor outcome among minorities with gynecologic cancer exists because of biological differences in tumors related to race and ethnicity; cultural, social, and psychological barriers to accessing care; less than optimal screening services and prevention strategies; and unequal provision of quality health care and tailored therapeutics. To find out more about these issues, the authors will conduct an analysis of the genomic and proteomic expression of gynecologic cancers to determine if there are molecular differences that partially account for the poor outcome among minority patients with gynecologic cancer. This analysis will be expanded in future years to include larger underserved cohorts. The comprehensive epidemiological data that it generates will facilitate more detailed genetic and epigenetic analysis. Epidemiological surveys will be used to identify demographic and behavioral differences that lead to poor outcomes. An evaluation also will be conducted on the use of psychosocial interventions to decrease morbidity among minorities. The authors also will develop vaccine strategies and specific antibody reagents for the detection of unique targets that are differentially expressed between African Americans and Caucasians with endometrial cancer. The incidence, severity, and overall burden of cancer in the USA vary by race, ethnicity, and other demographic features. This project will focus on identifying the reasons underlying poor outcomes among minority groups with gynecologic malignancy so that education, screening, prevention, and treatment algorithms can be tailored to high-risk populations in an effort to have the greatest impact on reducing morbidity and mortality among the underserved.

DTIC

Cancer; Epidemiology; Ethnic Factors; Females; Health; Minorities; Mortality

20070009118 Marquette Univ., Milwaukee, WI USA

Investigation into the Depth of Cure of Resin-Modified Glass-Ionomer Restorative Materials

Roberts, Howard W; Aug 2006; 221 pp.; In English

Report No.(s): AD-A461963; CI07-0007; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This investigation involved an attempt at delineating the depth of cure of resin-modified glass-ionomer restorative dental materials. Samples of different thicknesses using Vitremer Core Material and Restorative (3M/ESPE), Fuji II LC (GC America), and Photac-Fil Quick (3M/ESPE) were evaluated as to solubility, Knoop hardness, and thermal analysis techniques that included specific heat determination as well as differential scanning calorimetry thermal scans. Specimens were evaluated at time periods that included immediately after fabrication, 24 hours, one week, one month, and at three months. Overall results found that the solubility method chosen for this investigation did not provide the necessary sensitivity for depth of cure analysis of resin-modified glass-ionomer restorative materials. Hardness and thermal analysis provided evidence of a continuing, post-photopolymerization reaction that resulted in increased hardness, specific heat, and thermal requirements over the storage times. Furthermore, the resin-modified glass-ionomer restorative materials demonstrated water storage behavior similar to conventional glass-ionomer materials, in that water gained by the materials became more bound as storage time increased. Individual instances were observed in which the physical properties of 3 mm thick specimens were similar to that observed of 2 mm specimens; however, these findings were not consistent throughout the investigation. Based on the conditions of this study, it is recommended that resin-modified glass-ionomer restorative materials should not be cured in thicknesses greater than two millimeters.

DTIC

Curing; Dentistry; Depth; Glass; Polymers; Resins

20070009129 North Carolina State Univ., Raleigh, NC USA

Mid-Atlantic Microbial Pathogenesis Meeting

Altier, Craig; Wozniak, Daniel; Dec 2005; 111 pp.; In English

Contract(s)/Grant(s): W81XWH-05-1-0132

Report No.(s): AD-A461976; No Copyright; Avail.: CASI: A06, Hardcopy

The Mid-Atlantic Microbial Pathogenesis Meeting was held Feb. 6-8, 2005 at the Wintergreen Ski Resort near Charlottesville, VA. Scientists working in all aspects of microbial pathogenesis attended the meeting and present their work. The meeting consisted of four sessions over two days and had 123 registered participants from 8 states. There were 25 speakers addressing various topics of microbial pathogenesis (4 invited speakers, 5 principal investigators, and 16 post-doctoral fellows

and students). A poster session provided an additional opportunity for participants to present and discuss their work. Sixty-two posters were presented at this session.
DTIC
Bacterial Diseases; Microbiology; Microorganisms; Pathogenesis

20070009130 Creighton Univ., Omaha, NE USA
Prion Transport to Secondary Lymphoreticular System Tissues
Bartz, Jason C; Jun 2006; 11 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0319
Report No.(s): AD-A461977; No Copyright; Avail.: CASI: A03, Hardcopy

The long-term objective of this proposal is to identify mechanisms of prion transport to secondary lymphoreticular system (LRS) tissues. The hypothesis to be tested is that following peripheral exposure to prions; host proteins (e.g. complement) bind prions allowing for trapping by cells in the spleen and enhancing uptake by macrophages, which are cells that are responsible for destruction of foreign proteins. To investigate this hypothesis we will examine the disease development of a prion strain (DY TME) that does not replicate in the spleen of hamsters. We will use this system to provide details into the host factor(s) involved in transport of prions to cells in the LRS, such as spleen. We have shown differences in the susceptibility of HY and DY TME to phagocytosis and degradation by primary adherent peritoneal cells. We have shown differences in the spatial and temporal spread of the HY and DY TME agent in LRS tissues following intraperitoneal inoculation. We are currently investigating what cell types associate with these agents following inoculation and the proportion of each agent that is degraded.
DTIC
Diseases; Macrophages; Proteins

20070009131 Georgetown Univ., Washington, DC USA
Medical Vanguard Diabetes Management Project
Mun, Seong K; Oct 2005; 24 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-94-V-4015
Report No.(s): AD-A461978; No Copyright; Avail.: CASI: A03, Hardcopy

The objective of this research is to exploit the findings of Project Vanguard Phase I and II to produce more robust scientific tools for graded alerting of transnational biological threats using Venezuelan Equine Encephalitis (VEE), a mosquito borne viral disease, as a case study. These new tools will play an essential role in future research and contribute to advancing TATRC s mission in the use of Indications and Warnings (I&Ws) biosurveillance for biodefense. Indications and Warnings (I&Ws) potentially alert U.S. responders of an imminent foreign bioevent weeks to months in advance. I&Ws are markers occurring globally, outside of U.S. borders, before an outbreak can affect U.S. interests, forces or domestic territory, thus allowing the U.S. time to respond. In effect, I&Ws can prime the national response infrastructure by alerting agencies of an evolving threat that could ultimately be highly disruptive or catastrophic. Venezuelan equine encephalitis (VEE) virus is a zoonotic, mosquito-borne, viral disease affecting humans and equines where equines serve as amplifying hosts. It is an RNA alphavirus of the Togaviridae genus that is serologically classified into six antigenic subtypes: I-VI and six varieties: A, AB, C, D, E, F (1). Epizootic/epidemic type IAB and IC are the only subtypes associated with significant human and equine outbreaks (1,2). VEE has caused periodic outbreaks in humans and equines in Latin America since the early 1920s. Considering that epizootic VEE has not been diagnosed or isolated in the USA since 1971, there are concerns that VEE would make an effective bioterrorist agent (1,3,4). VEE is considered an incapacitating agent rather than a lethal agent such as anthrax or plague. Past outbreaks have suggested that a low infective dose is necessary for transmission (4,5).
DTIC
Infectious Diseases; Metabolic Diseases; Vanguard Project; Viral Diseases; Viruses

20070009132 Sir Mortimer B. Davis Jewish General Hospital, Montreal, Quebec Canada
Engineered Autologous Stromal Cells for the Delivery of Kringle 5, a Potent Endothelial Cell Specific Inhibitor for Anti-Angiogenic Breast Cancer Therapy
Perri, Sabrina R; Aug 2006; 27 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-1-0545
Report No.(s): AD-A461979; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The plasminogen kringle 5 (K5) domain - which is distinct from angiostatin - possesses potent anti-angiogenic properties

on its own which can be exploited in cancer therapy. We have previously shown that K5 suppresses cancer growth in tumor xenograft models, its modulation of inflammation in experimental mice with intact immune systems is unknown. To determine whether K5 possesses immune proinflammatory properties, we investigated the effects of K5 in an immune competent model of breast cancer and observed that tumor rejection is substantially reduced in NOD-SCID and BALB/c nude when compared to wild-type BALB/c mice, suggesting an important role for T-lymphoid cells in the anti-tumor effect of K5. Tumor explant analysis demonstrates that K5 enhances tumor recruitment of CD3+ lymphoid cells, in particular the NKT phenotype. We also observed a significant decrease in tumor-associated microvessel length and density consistent with anti-angiogenic activity. Histological analysis of K5 tumors also revealed a robust neutrophilic infiltrate, which may be explained by the neutrophil chemotactic activity of K5 as well as its ability to promote CD64 upregulation within the CD11b+ adhesive neutrophil population. In sum, our findings confirm that the K5 protein acts as a potent angiostatic agent and possesses a novel proinflammatory role via its ability to recruit tumor-associated neutrophils and NKT-lymphocytes, leading to a potent anti-tumor response.
DTIC
Angiogenesis; Antigens; Breast; Cancer; Inhibitors; Mammary Glands; Therapy

20070009133 Rutgers - The State Univ., Piscataway, NJ USA
Use of Epidermolysis Bullosa Biomarkers in Models of Vesicant Injury
Gerecke, Donald R; Sep 2006; 52 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-C-0091
Report No.(s): AD-A461980; No Copyright; Avail.: CASI: A04, Hardcopy

This study consisted of an SM time course study for gene expression of protease and extracellular matrix related genes and an evaluation of potential medical countermeasures for SM-induced injury in the mouse ear vesicant model. The specific aim of the time course study was to determine whether MMP and MMP substrate (laminin-332) gene expression levels are altered over time (6, 12, 24, 72, 168 h) in mouse ear skin topically exposed to liquid SM. The specific aim of the compound evaluation study was to determine the effectiveness of topically delivered synthetic MMP inhibitors, Ilomastat, GM1489, MMP- 2/MMP-9 Inhibitor I, and MMP-2/MMP-9 Inhibitor II, to protect against SM injury. Protection was quantitatively assessed by measuring MMP and MMP substrate gene expression levels with subsequent correlation to histopathological damage in tissues harvested at 24 h, 72 h and 7 days after SM challenge. Pre-treatment with Ilomastat in conjunction with SM exposure significantly decreased laminin- 2 expression at 72 h and significantly increased laminin332- 3A expression at 72 h as compared to SM-only (no drug compound pre-treatment). This coincided with a slightly improved Draize Score at 72 h with Ilomastat pre-treatment as compared to the other compounds. Pre-treatment with GM1489 in conjunction with SM exposure significantly decreased MMP-9 expression at 72 h and decreased MMP-2 expression at 7 days as compared to SM-only.
DTIC
Biomarkers; Epidermis; Injuries

20070009134 Visual Telecomminications Network, Inc., McLean, VA USA
Secure Wireless Military Healthcare Telemedicine Enterprise
Lucas, Kenneth W; Sep 2005; 23 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-2-0048
Report No.(s): AD-A461981; No Copyright; Avail.: CASI: A03, Hardcopy

The primary objective of this research effort is to integrate ViTel Net's MedVizerTM software and Division Tools with cross platform telemedicine systems, inclusive of computer based systems, handheld wireless PDA devices, and miniature computers, to existing DoD legacy and developing healthcare information systems, clinical repositories, and knowledge base systems for application at the point of care. This annual report reflects a number of projects wherein the tasks defined in the SOW are being accomplished. Specific project reports referenced herein detailing the specific application, work progress, and results will be submitted as supplementary reports.
DTIC
Radiotelephones; Telemedicine

20070009158 University of Southern California, Los Angeles, CA USA
Mechanism of Ovarian Epithelial Tumor Predisposition in Individuals Carrying Germline BRCA1 Mutations
Dubeau, Louis; Jan 2006; 25 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-04-1-0125
Report No.(s): AD-A462015; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Women with germline mutations in BRCA1 are strongly predisposed to cancers of the ovary and fallopian tubes. Given the strong link between menstrual activity and risk of ovarian cancer in the general population, we hypothesized that BRCA1 might predispose to ovarian cancer indirectly, by influencing ovarian granulosa cells, which play an important role in controlling menstrual cycle progression. We used the Cre-lox system to inactivate the mouse Brca1 gene in granulosa cells. A truncated form of the FSH receptor promoter was used as Cre driver. Our most recent results show that a majority (40 of 59) of mutant mice develop grossly visible cystic tumors either attached to the ovary or the uterine horns. These tumors resembled human serous cyst adenomas, which are benign tumors made up of the same cell type as ovarian serous carcinomas. We confirmed that these tumors carried only the wild type allele of the floxed Brca1 allele while the mutant form was present in granulosa cells. These findings strongly support our initial hypothesis that Brca1 influences tumor development cell non-autonomously, through an effector secreted by granulosa cells. We developed tools such as long-term cultures of human granulosa cells, which will be used to compare the gene expression patterns of wild type and mutant granulosa cells in the second year. We also obtained preliminary data suggesting that the dynamics of the hormonal changes associated with the estrous cycle are slightly different in mutant mice, suggesting that the influence of granulosa cells on tumor predisposition in this animal model may be mediated through their role in the ovulatory cycle. Finally, we show evidence that the mutant mice show increased proliferative activity in epithelial cells lining the uterus and endometrium and endometrial glands, strongly supporting our view that ovarian epithelial tumors are derived from components of the mullerian tract.
DTIC
Cancer; Genes; Mutations; Ovaries; Tumors

20070009163 Texas Univ., Houston, TX USA
Chemoprevention of Ovarian Cancer
Gershenson, David; Oct 2006; 110 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-99-1-9505
Report No.(s): AD-A462022; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The overarching hypothesis of this program project has been that 4-HPR (a synthetic vitamin A) and oral contraceptives (OCP) induce apoptosis, possibly through induction of TGF production by stromal cells, as well as by direct interaction with the surface epithelial cells, and these two cell types may act synergistically. In Project 1, 19 adult Rhesus monkeys were given 4- HPR, OCP, the combination, or no medication for 3 months. There were consistent differences in the absolute fluorescence intensities and relative contributions noted between pre- and post-drug measurements in each drug group. A second study involving 30 Cynomolgus macaques and using a crossover design has been completed; immunohistochemical analysis of several biomarkers and analysis of the fluorescence spectroscopy data are ongoing. Project 2 was transferred to the University of Arizona with the relocation of Dr. Molly Brewer in 2001. This project was not able to be completed related to multiple regulatory issues and inadequate patient accrual. In Project 3, we have focused on understanding the mechanism of action of 4-HPR in tissue culture using both normal and immortalized epithelial cells. Studies are now complete.
DTIC
Cancer; Health; Ovaries; Retinene

20070009164 Johns Hopkins Univ., Baltimore, MD USA
Corrective 111 In Capromab Pendetide SPECT Image Reconstruction Methods for Improved Detection of Recurrent Prostate Cancer
Tsui, Benjamin M; Jun 2006; 30 pp.; In English; Original contains color illustrations
Report No.(s): AD-A462023; DAMD17-02-1-0112; No Copyright; Avail.: CASI: A03, Hardcopy

It is generally recognized that 111In capromab pendetide (PS) scans are technically challenging to perform and interpret, particularly with regard to pelvic SPECT studies used to detect possible disease in the prostate fossa and pelvic lymph node (LN). The hypothesis of this proposal is that the superior spatial resolution, high image contrast, and much reduced image artifacts that result from the corrective SPECT image reconstruction methods would substantially aid in the detection and diagnosis of prostate cancer. To test our hypothesis, we propose five specific aims: (1) to develop simulation tools and methods that allow efficient generation of accurate iii In PS projection data from the human pelvic area, (2) to study the effects of 3D image degrading factors on iii In PS SPECT images, (3) to develop 3D corrective image reconstruction methods for iii In PS SPECT that provide much improved image quality and quantitative accuracy by incorporating models of the 3D image degrading factors, (4) to evaluate the 3D corrective image reconstruction methods for clinical iii In PS SPECT studies using simulated patient data, and Hotelling and human observer studies, and (5) to evaluate the clinical efficacy of the corrective

image reconstruction methods as applied to iii In PS SPECT using patient data.
DTIC
Cancer; Detection; Image Processing; Image Reconstruction; Prostate Gland

20070009165 Duke Univ., Durham, NC USA
Inducing Apoptosis in Bcr/Abl-Expressing Cells
Kornbluth, Sally; Mar 2006; 6 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0812
Report No.(s): AD-A462025; No Copyright; Avail.: CASI: A02, Hardcopy

With the emergence of CMLs that are resistant to Bcr-Abl tyrosine kinase inhibitors it becomes imperative that we identify other effective agents to eliminate these cells. In recent years it has become evident that most successful chemotherapeutics work by inducing apoptosis. Unfortunately high levels of Bcr-Abl can preclude the successful use of many agents by dampening the apoptotic response. In this proposal we developed a strategy that relies on indeed exploits the high tyrosine kinase activity of Bcr-Abl to induce cell killing. We have designed and engineered constructs to fuse the catalytic domains of caspases (the apoptotic proteases) to either an SH2 domain or to sites well-phosphorylated by Bcr-Abl. We have made variants based on the Ork SH2 domain as well as phosphorylation sites from Stat 5 Bor-AbI and Ork itself (this is the sequence to which the Ork SH2 domain would bind intramolecularly). These have now been used to infect cells. Initial results suggest that the relevant fusion proteins are being produced and that there may be selective killing of Bcr-Abl-expressing cells.
DTIC
Apoptosis; Blood Cells

20070009167 Monell Chemical Senses Center, Philadelphia, PA USA
Odors, Deployment Stress and Health: A Conditioning Analysis of Gulf War Syndrome
Dalton, Pamela; Sep 2006; 60 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0782
Report No.(s): AD-A462027; No Copyright; Avail.: CASI: A04, Hardcopy

Troops deployed in the Persian Gulf War were exposed to an unusually diverse mix of odorous chemicals at the same time as they were exposed to physiological and psychological stressors B a scenario that research in animal models suggests will lead to the development of specific conditioned responses. The goal of this research is to investigate the extent to which people can acquire stress reactions as conditioned responses to odors and exhibit health symptoms as a result of such conditioning episodes. Thus, the paradigm investigated in this project can serve as a model system for examining and understanding the persistent symptom constellations found in GWS and other stress-mediated syndromes. Results from the first three studies strongly suggest that odor-stress conditioning can powerfully mediate elevations in hormonal status (salivary cortisol) self reported stress, health symptoms and judged cognitive effort on memory tests, and that cognitive information about the nature of the chemical odor may enhance the stress and health symptom reports over that which is due to conditioning alone. Current studies are continuing to explore additional parameters of the odor-stress conditioning paradigm.
DTIC
Deployment; Gulfs; Odors; Persian Gulf; Signs and Symptoms; Warfare

20070009169 Naval Health Research Center, San Diego, CA USA
Epidemiology of Stress Fracture and Lower Extremity Overuse Injury in Female Recruits
Rauh, Mitchell J; Macera, Caroline A; Trone, Daniel W; Shaffer, Richard A; Brodine, Stephanie K; Apr 2006; 9 pp.; In English; Original contains color illustrations
Report No.(s): AD-A462029; NHRC-05-25; No Copyright; Avail.: CASI: A02, Hardcopy

Purpose: To examine rates and risk factors for overuse injuries among 824 women during Marine Corps Recruit Depot basic training at Parris Island, SC in 1999. Methods: Data collected included training day exposures (TDEs) baseline performance on a standardized 1,5-mile timed run and a pretraining questionnaire highlighting exercise and health habits. Results: There were 868 injuries for an overall injury rate of 12.6/1000 (TDEs). There were 66 confirmed lower extremity stress fractures among 56 (6.8%) women (1.0/1000 TDEs). Logistic regression modeling indicated that low aerobic fitness (a slower time on the timed run) less than 7 months of lower extremity weight training and no menses for 6 consecutive months during the past year were significantly associated with stress fracture overuse injury. Women who reported fair-poor' baseline fitness were at increased risk for non-stress fracture overuse injury. Conclusions: Stress fractures and other lower extremity overuse injury might be decreased if women entered training with high aerobic fitness and prior participation in lower

extremity strength training. Furthermore, women reporting menstrual irregularity and injury during the previous year may require additional evaluation.
DTIC
Bones; Education; Epidemiology; Females; Fractures (Materials); Fracturing; Health; Injuries; Physical Fitness

20070009170 Miami Univ., FL USA
Does Skeletal Muscle Mass Influence Breast Cancer? Evaluating Mammary Tumorigenesis and Progression Genetically Hyper-Muscular Mice
Zimmers, Teresa; Jul 2006; 9 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-05-1-0424
Report No.(s): AD-A462030; No Copyright; Avail.: CASI: A02, Hardcopy

Epidemiologic evidence demonstrates that caloric restriction and physical activity independently reduce breast cancer. Conversely, obesity and insulin resistance are associated with increased breast cancer incidence, metastasis and mortality. To date, no studies have addressed the role of skeletal muscle in breast cancer. To determine the effect of skeletal muscle mass on breast cancer, we are measuring rates of chemically induced mammary tumorigenesis and progression in genetically hypermuscular mice. Mice lacking the skeletal muscle-specific muscle growth inhibitor myostatin and mice expressing a dominant negative form of the myostatin receptor, Activin Receptor Type IIB, display heightened muscle mass. In order to induce mammary cancer in these mice, we administered a combination of a tumor promoter, medroxyprogesterone acetate, and a carcinogen, dimethylbenz-a-anthracene, using a defined protocol. Unfortunately, we have experienced both high nontumor associated mortality and low fertility, slowing progress of this study and requiring us to seek a no-cost extension of the project. We have resolved the environmental issues leading to high pup mortality and refined the MPA/DMBA model to produce 100% tumor incidence with minimal lethality and are continuing the study. By the completion of this study in 12-18 months, tumor latency, size, stage and burden along with serum hormone/adipokine/myokine levels will be measured. Statistical analyses will be performed to identify relationships among genotypes, hormone/adipokine/myokine levels and rates of breast cancer initiation and progression.
DTIC
Breast; Cancer; Mammary Glands; Mice; Musculoskeletal System

20070009175 Illinois Univ., Urbana-Champaign, IL USA
Prospective Assessment of Neurocognition in Future Gulf-Deployed and Gulf-Nondeployed Military Personnel: A Pilot Study
Vasterling, Jennifer J; Proctor, Susan P; Feb 2006; 21 pp.; In English
Contract(s)/Grant(s): DAMD17-03-2-0020
Report No.(s): AD-A462035; No Copyright; Avail.: CASI: A03, Hardcopy

To examine neuropsychological outcomes associated with OIF deployment among regular Active Duty and activated National Guard Army Soldiers. Secondary objectives include identification of both deployment-related and non-deployment-related risk and resiliency factors for adverse neuropsychological outcomes. Prospective cohort design in which deploying Soldiers are assessed once prior to deployment and twice after redeployment. A comparison group of Soldiers is assessed before and after a period of garrison duty. Methods include administration of performance-based neuropsychological measures and self-report surveys. Data will be linked to environmental monitoring data. Time 1 and Time 2 data were collected on all but one small nondeployed unit. Time 3 data have been collected on 2 brigade-level active duty units. Preliminary analyses indicate that OIF deployment is associated with declines in memory and attentional performance and increased emotional distress but with improvement in simple reaction time.
DTIC
Deployment; Gulfs; Military Personnel; Neurology; Psychology

20070009185 Marquette Univ., Milwaukee, WI USA
Estrogen Receptor Driven Inhibitor Synthesis
Pullela, Phani K; Sep 2006; 48 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-05-1-0476
Report No.(s): AD-A462061; No Copyright; Avail.: CASI: A03, Hardcopy

Purpose: Establish an estrogen receptor (ER) driven inhibitor synthesis procedure and develop a set of building blocks specific for ER-agonist/ER-antagonist interactions. Scope: The ER-binding pocket size is twice the molecular volume of

17-beta-estradiol (E2) giving rise to the tolerance of a diverse class of compounds resulting in poor interpretability of current SAR models. This project is to establish an ER driven ligand synthesis procedure and define a set of building blocks which cause specific agonist/antagonist interactions. Major Findings: 1) Estrone was found to react with most of the thiols to give hemi-thioketals as hypothesized in the proposal. 2) An improved synthetic route for the fluorescence polarization reagent (E2-FITC) for assay of ligands against ER was developed. 3) A database of thiols with agonist/antagonist preference for ER was developed using protein-ligand docking. 4) It was concluded that ER is not suitable protein for STD-NMR experiments due to high hydrophobicity and solubility issues. 5) NMR studies on human-ER-LBD may not be practical and use of ER from model systems like zebrafish might address the solubility issues.
DTIC
Enzyme Inhibitors; Enzymes; Estrogens; Inhibitors; Proteins; Thiols

20070009186 Scripps Research Inst., La Jolla, CA USA
Identifying Early Diagnosis Markers of Prostate Cancer
Huang, Shuang; Jul 2006; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-1-0084
Report No.(s): AD-A462063; No Copyright; Avail.: CASI: A02, Hardcopy

The successful treatment of prostate cancer requires detection of the disease at early stages. Currently the early diagnosis of prostate cancer largely depends on the detection of prostate-specific antigen (PSA) in circulation. However, PSA can only precisely detect 40% of prostate cancer and is not specific for the occurrence of prostate cancer. We reasoned that the success and accuracy in early diagnosis of prostate cancer may be significantly improved if a panel of prostate cancer-specific markers can be identified and used in combination for detecting early stage of prostate cancer. In the first year of the funding period, we constructed cDNA library in our pTRAP1 retroviral plasmid using RNA isolated from human prostate tumor samples. In the second year, we generated human prostate tumor cDNA library in which the signal peptides are enriched. In the third year of this funding, we screened our generated prostrate tumor library and identified 10 either secreted or cell surface proteins overexpressed in prostrate tumors. Currently, we are in the process to validate our findings and hope using these proteins as early diagnosis biomarkers for prostate cancer.
DTIC
Antigens; Cancer; Diagnosis; Identifying; Markers; Prostate Gland; Proteins

20070009187 Northern California Inst. for Research and Education, San Francisco, CA USA
4 Tesla MRI for Neurodegenerative Diseases
Weiner, Michael W; Oct 2005; 14 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-1-0532
Report No.(s): AD-A462064; No Copyright; Avail.: CASI: A03, Hardcopy

During the past year, nine research projects have used the 4Tesla magnet (for a total of 398 scans), and 55 developmental scans had been completed. Since the last progress report, we upgraded the shim currents which substantially improved the quality of imaging and spectroscopy, especially in problematic regions including the hippocampus and prefrontal lobe. The software platform was upgraded to the latest software version VA25 which provides better management and control of image processes. An auto-align software package was installed in order to improve reproducibility of image orientation and angulation using a template brain. Finally a whole body transmit coil and 7 KW transmitters have been ordered to improve uniformity of the B1-field and yield for arterial spinning. Our plans for the coming year are to test the performance of the auto align software on a large range of subjects with a broad range of brain abnormalities, and to complete the installation of the KW transmitters after the manufacturer performance tests are completed. The Center of Excellence funded six projects and five of these projects have the necessary approvals to begin work. We will continue the call for proposals and review and fund new innovative studies.
DTIC
Brain; Diseases; Imaging Techniques; Magnetic Resonance

20070009190 Wake Forest Univ., Winston-Salem, NC USA
Sensitivity of Breast Tumors to Oncolytic Viruses
Ahmed, Maryam; Aug 2006; 13 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0678
Report No.(s): AD-A462069; No Copyright; Avail.: CASI: A03, Hardcopy

The goal of this project is to develop novel therapies for breast cancer based on the oncolytic virus vesicular stomatitis virus (VSV). Studies have shown that matrix (M) protein mutants of VSV such as rM51R-M virus are excellent candidates for anti-tumor therapies due to the ability of these viruses to target and kill tumor cells while sparing normal cells. However not all tumors are amenable to VSV treatments in vivo. In data presented here we determined that normal mammary cells are more resistant to VSV-induced cytopathic effect than breast cancer cells. However in syngeneic breast cancer system in vivo rM51R-M virus is only partially effective at killing breast tumors derived from 4T1 cells. Our results indicate that the immune response may be attenuating the replication and spread of this virus at the tumor site. To enhance the ability of rM51R R-M virus to selectively target and kill tumor cells we carried out a combination treatment together with the anti-tumor cytokine lL-12. Our data indicate that rM51R R-M virus alone was as effective as lL-12 and the combination therapy at inducing an immune response during tumor therapies. Furthermore the combination therapy was as effective as single treatments at partially controlling the growth of the primary tumor. However it appeared to be slightly more effective at treating metastatic tumors. In conclusion although enhancing the immune response delays tumor growth none of these therapies were able to completely eliminate the existing tumor. It is possible that further enhancing the immune system may be helpful in overcoming suppressive tumor mechanisms.
DTIC
Breast; Cancer; Mammary Glands; Neoplasms; Sensitivity; Tumors; Viruses

20070009191 Virginia Commonwealth Univ., Richmond, VA USA
Development of a Cytochrome C Oxidase-Based Sensor for Monitoring Respiration and Metabolism
Hawkridge, Fred M; Jun 2006; 10 pp.; In English
Contract(s)/Grant(s): W81XWH-05-2-0033
Report No.(s): AD-A462070; No Copyright; Avail.: CASI: A02, Hardcopy

Electrodes modified with bilayers that incorporate cytochrome C oxidase (CCO) the terminal enzyme in mammalian respiration will be studied as biosensors for cyanide. This CCO modified electrode has an architecture that exhibits robust response behavior and stability that mimics the in vivo behavior of this enzyme. These CCO modified electrodes remain active on storage in buffer can withstand exposure to temperatures as extreme as 8OoO (I 76oF) and have a functional lifetime exceeding two months. The structure of the CCO modified electrode proposed for study here is uniquely similar to itsin vivo environment in the inner mitochondrial membrane. No other enzyme modified electrodes reported thus far in the literature has this structure. Experiments have shown that the electrochemical response of these GO modified electrodes to the oxidation of reduced cytochrome c (its reductive react partner) is sensitive to cyanide and the response is reversible. Work proposed here will characterize the affect of cyanide on the direct electron transfer reaction of these CCO modified electrode with ambient dioxygeconcentrations (its oxidative reaction partner). Initial experiments testing this hypothesis have been positive. This is a simpler biosensor configuration compared with the cytochrome c system described above (no added component) and it has potential for providing a practical sensors with failure to militaapplications for toxins that inhibit the electron transfer reactions of CCO with lethal consequences.
DTIC
Cytochromes; Metabolism; Oxidase; Respiration

20070009192 Creighton Univ., Omaha, NE USA
Ethnic and Environmental Influences on Vitamin D Requirement in Military Personnel
Heaney, Robert P; Oct 2006; 10 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0818
Report No.(s): AD-A462073; No Copyright; Avail.: CASI: A02, Hardcopy

The purposes of this study are to provide quantitative estimates of 1) the effective amount of vitamin D produced in the skin as a function of skin pigmentation; and 2) the rate of utilization of vitamin D as a function of ethnicity. The outcome will be estimates of the amount of vitamin D that must be given orally to military personnel of different races and in different assigned locations so as to ensure and maintain normal vitamin D status. In the first 39 months' work (the period covered by this report), we have accumulated 80+% of the targeted specimens for both objectives, in a racially diverse sample. In addition we have augmented our findings from naturally sun-exposed individuals to include responses in volunteers receiving controlled doses of UV-B. Analyses are continuing and will be completed within the coming months. No final quantitative results will be available until all the measurements have been made and analyzed as a unit.
DTIC
Calciferol; Ethnic Factors; Military Personnel

20070009193 Wake Forest Coll., Winston-Salem, NC USA

A Treatment Stage Specific Approach to Improving Quality of Life for Women With Ovarian Cancer

Avis, Nancy E; Miller, Brigitte; Oct 2006; 6 pp.; In English

Contract(s)/Grant(s): DAMD17-01-1-0734

Report No.(s): AD-A462076; No Copyright; Avail.: CASI: A02, Hardcopy

Our primary objective is to identify the issues that are of greatest concern to women in each of three treatment stages: newly diagnosed with ovarian cancer, in-treatment, and post-treatment. A longitudinal, repeated measures design will be used to assess changes in problem areas and quality of life from diagnosis to recurrence among women newly diagnosed with ovarian cancer. The CARES-SF and FACT-O questionnaires will be administered to participants following diagnosis and prior to chemotherapy, during chemotherapy, following chemotherapy, and after recurrence. Data collection for the study will last 28 months (patient accrual will last 25 months and follow-up will continue an additional 3 months). Data for the study will be collected through in-person interviews, and mailed questionnaires (with possible telephone follow-up) from women treated at the Wake Forest University Baptist Medical Center (WFUBMC) and Forsyth Medical Center (FMC).

DTIC

Cancer; Females; Ovaries

20070009194 University of Southern California, Los Angeles, CA USA

Prostate Cancer and Pesticide Exposure in Diverse Populations in California's Central Valley

Cockburn, Myles G; Dec 2006; 15 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0081

Report No.(s): AD-A462077; No Copyright; Avail.: CASI: A03, Hardcopy

There is some evidence that pesticide exposure is a risk factor for prostate cancer. Some pesticides classified as endocrine-disrupting chemicals (EDCs) can affect normal hormone function. Variations in hormone levels affect prostate cancer risk since normal growth of the prostate gland is dependent on a critical balance of androgen levels. Pesticides may affect hormone function by mimicking hormones affecting enzyme systems involved in hormone metabolism, or directly affecting the brain regions involved in hormone functioning. A possible involvement of pesticides in prostate carcinogenesis is suggested by findings among farmers in studies of occupation and prostate cancer. The overall association reported by recent meta-analyses of farming and prostate cancer report a summary relative risk of 1.1, but the majority of studies with relatively large numbers of subjects consistently showed excess relative risks of prostate cancer ranging from 1.06 to 5.0. This limited evidence may well be inconclusive because of the difficulty in measuring true pesticide exposure - all these studies relied on self-reported occupational exposure, resulting in bias towards the null, and the omission of non-occupational environmental exposures (e.g. residences downwind of application sites). A large-scale population-based case-control study in California's Central Valley, the nation's leading user of pesticides, simultaneously assessing genetic and environmental risk factors for prostate cancer in an ethnically-diverse population with varying occupational and residential exposures to pesticides would go a long way to further refining knowledge of prostate cancer etiology. However, the complexities of such a study warrant excellent pilot data.

DTIC

Cancer; Exposure; Pesticides; Populations; Prostate Gland; Valleys

20070009197 Mayo Clinic, Rochester, MN USA

Changes in Ovarian Stromal Function in Premenopausal Woman Undergoing Chemotherapy for Breast Cancer

Frost, Marlene H; Loprinzi, Charles L; Kearns, Anne E; Sloan, Jeff A; Barton, Debra L; Aug 2006; 8 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-03-1-0593

Report No.(s): AD-A462081; No Copyright; Avail.: CASI: A02, Hardcopy

The objective of this pilot study is to identify if androgen levels are adversely affected by adjuvant chemotherapy for breast cancer and whether low androgen levels are correlated with the frequency and severity of fatigue, weight gain, psychological symptoms, vasomotor symptoms and libido. A longitudinal, descriptive design will be used with questionnaires completed and blood drawn from 20 pre menopausal women at 4 time periods: baseline(before treatment), mid-treatment, immediate post-treatment and 6 months later. Questionnaires include the Female Sexual Function Index, Greene Climacteric Scale, Profile of Mood States, Schwartz Fatigue Scale and a menaces diary.

DTIC

Breast; Cancer; Chemotherapy; Hormones; Mammary Glands; Ovaries; Signs and Symptoms

20070009198 Stanford Univ., Stanford, CA USA
Oral Contraceptives and Bone Health in Female Runners
Kelsey, Jennifer L; Oct 2006; 76 pp.; In English
Contract(s)/Grant(s): DAMD17-98-1-8518
Report No.(s): AD-A462082; No Copyright; Avail.: CASI: A05, Hardcopy

This was a two-year randomized trial of the effects of oral contraceptives on bone mass and stress fracture incidence among 150 female competitive distance runners of ages 18-26 years. The Coordinating Center is at Stanford University and bone mass was measured at five sites: Massachusetts General Hospital, University of California Los Angeles, University of Michigan, Stanford University/Palo Alto VA Medical Center, and Helen Hayes Hospital in West Haverstraw NY. Two manuscripts have been completed and are about to be submitted for publication. One manuscript, Randomized trial of the effect of oral contraceptives on bone mass and stress fractures in female runners, concludes that oral contraceptives may reduce the risk for stress fracture, but our data are inconclusive. Oligo/amenorrheic athletes with low bone mass should be advised to gain weight, increase dietary calcium, and take steps to resume normal menses; they may benefit from oral contraceptives, but again the evidence is not conclusive. The second manuscript, Risk factors for stress fracture among young female cross-country runners, found that a history of stress fractures, lower bone mass, lower dietary calcium intake, younger chronological age, younger age at menarche, and possibly a history of irregular menstrual periods were associated with an increased risk.
DTIC
Athletes; Bones; Epidemiology; Females; Fractures (Materials); Health; Medical Services; Menstruation; Osteoporosis

20070009203 Library of Congress, Washington, DC USA
Human Cloning
Johnson, Judith A; Williams, Erin D; Jul 20, 2006; 28 pp.; In English
Report No.(s): AD-A462092; CRS-RL31358; No Copyright; Avail.: CASI: A03, Hardcopy

In December 2005, an investigation by Seoul National University, South Korea, found that scientist Hwang Woo Suk had fabricated results on deriving patient matched stem cells from cloned embryos a major setback for the field. In May 2005 Hwang had announced a significant advance in creating human embryos using cloning methods and in isolating human stem cells from cloned embryos. These developments have contributed to the debate in the 109th Congress on the moral and ethical implications of human cloning. Scientists in other labs, including Harvard University and the University of California at San Francisco, intend to produce cloned human embryos in order to derive stem cells for medical research on diabetes, Parkinsons disease, and other diseases. President Bush announced in August 2001 that for the first time federal funds would be used to support research on human embryonic stem cells, but funding would be limited to existing stem cell lines. Federal funds can not be used for the cloning of human embryos for any purpose, including stem cell research. In July 2002 the Presidents Council on Bioethics released its report on human cloning which unanimously recommended a ban on reproductive cloning and, by a vote of 10 to 7, a four-year moratorium on cloning for medical research purposes. The ethical issues surrounding reproductive cloning (commodification, safety, identity), and therapeutic cloning (embryos moral status, relief of suffering), impact various proposals for regulation, restrictions, bans, and uses of federal funding. In January 2002, the National Academies released Scientific and Medical Aspects of Human Reproductive Cloning. It recommended that the U.S. ban human reproductive cloning aimed at creating a child. It suggested the ban be enforceable and carry substantial penalties.
DTIC
Cloning (Biology)

20070009204 Boston Univ., Boston, MA USA
Alkylating Derivatives of Vitamin D Hormone for Prostate Cancer
Ray, Rahul; Oct 2006; 28 pp.; In English
Contract(s)/Grant(s): W81XWH-05-1-0546
Report No.(s): AD-A462093; No Copyright; Avail.: CASI: A03, Hardcopy

The most significant achievement of this period is the development of a synthetic scheme to produce substantial quantity of our target compound i.e. 1,25- dihydroxyvitamin D3-3-bromoacetate. This is extremely important for the current project and for the future development of this compound for prostate cancer. We have also screened this compound against prostate and kidney cancer cells for its antiproloferative activity. In addition we have developed a mouse xenograft model to test the efficacy of this compound in reducing androgen-sensitive and androgen-insensitive prostate tumors in future studies.
DTIC
Alkylation; Calciferol; Cancer; Derivation; Hormones; Prostate Gland

20070009209 Hutchinson (Fred) Cancer Research Center, Seattle, WA USA
Affinity-Based Serum Proteomics for Ovarian Cancer Early Diagnosis
McIntosh, Martin W; Dec 2006; 12 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-08-1-0100
Report No.(s): AD-A462099; No Copyright; Avail.: CASI: A03, Hardcopy

Our research project is intended to exploit unique characteristics of phage and yeast recombinant antibodies as the basis for a serum biomarker discovery platform for ovarian cancer. In brief we select from large recombinant libraries those binding sequences which bind to cancer related material but not to control serum then we evaluate these sub libraries in high throughput using novel recombinant antibody arrays probed with serum from our serum repository. At present we are on track based on our initial proposal. We have (1) selected a well-balanced group of cases (serum and proximal fluid) and controls for our initial discovery (2) identified thousands of unique binding sequences that bind to the cases and not controls (3) printed over 1700 recombinant antibodies on high density arrays and (4) probed those arrays with individual sera from 50 cases (including early and late stage and high and average risk women) and 50 asymptomatic controls. In addition to these tasks we have also undertaken several research tasks to further optimize our experimental protocols. These include a series of shotgun proteomics experiments used to characterize the protein constituents of the clinical materials used in our selection an evaluation of multiple array normalization and processing protocols to tailor data analysis to our array platform and improved methods for high throughput shuffling (yeast library only) and purification of antibodies. At present materials from our project include libraries of binding agents and data including microarrays profiling dozens of specimens and mass spectrometry data characterizing the constituents of ovary tumor proximal fluid. To date the major findings of our proposal include the proof of principle that (based on our data analysis) the panning and array procedures are capable of evaluating thousands of unique antibodies and that (based on the proteomics measurements) the selection material is rich in putative biomarkers.
DTIC
Cancer; Diagnosis; Ovaries; Proteome; Serums

20070009211 Health Research, Inc., Buffalo, NY USA
Mechanism of Selenium Chemoprevention and Therapy in Prostate Cancer
Gao, Allen C; Nov 2006; 15 pp.; In English
Contract(s)/Grant(s): W81XWH-06-1-0006
Report No.(s): AD-A462102; No Copyright; Avail.: CASI: A03, Hardcopy

Prevention trials demonstrated that selenium is a promising chemopreventive agent for prostate cancer. Selenium inhibited human prostate cancer cell growth, blocked cell cycle progression, and induced apoptotic cell death. We have demonstrated a novel mechanism of selenium anticancer action in which selenium markedly reduces androgen receptor (AR) expression and AR-mediated gene expression including prostate-specific antigen (PSA) in human prostate cancer cells in vitro and in vivo. Based on our novel finding that selenium disrupts AR signaling by reducing AR expression, it is conceivable that selenium (reducing AR expression) might improve the efficacy of androgen deprivation therapy. In this application, we will test the effects of selenium on prostate cancer therapy.
DTIC
Cancer; Prostate Gland; Selenium; Therapy

20070009212 Maryland Univ., Baltimore, MD USA
Neurotrophin Therapy of Neurodegenerative Disorders with Mitochondrial Dysfunction
Bambrick, Linda L; Sep 2006; 10 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-1-0745
Report No.(s): AD-A462103; No Copyright; Avail.: CASI: A02, Hardcopy

This research program will determine whether accelerated neuron death due to increased oxidative stress resulting from mitochondrial dysfunction can be compensated or corrected by neurotrophin stimulation. The experiments will be carried out in two models of mitochondrial dysfunction. 1)hippocampal neurons from the trisomy 16 mouse, which undergo increased apoptosis and have a mitochondrial defect, that has now been identified as a decrease in Complex I-mediated respiration and altered mitochondrial protein expression and 2)neurons chronically treated with the neurotoxin rotenone to induce a defect in mitochondrial function. 0.1-0.5 nM rotenone treatment has now been shown to leave hippocampal neurons vulnerable to a second oxidative stress. A unique aspect of this approach is that the neuronal responsiveness to brain derived neurotrophic factor (BDNF) will be enhanced by breeding to a mouse line with altered BDNF receptor expression. Neurons with an

enhanced response to endogenous BDNF may be more resistant to oxidative stress characteristic of Parkinson's disease and other neurodegenerative disorders.
DTIC
Cells (Biology); Diseases; Mitochondria; Nervous System; Therapy

20070009217 Library of Congress, Washington, DC USA
Pandemic Influenza: Appropriations for Public Health Preparedness and Response
Lister, Sarah A; Jan 23, 2007; 7 pp.; In English; Original contains color illustrations
Report No.(s): AD-A462111; CRS-RS22576; No Copyright; Avail.: CASI: A02, Hardcopy

The spread of H5N1 avian influenza ('flu') on three continents, and the human deaths it has caused, raise concern that the virus could morph and cause a global human pandemic. Congress has provided specific funding for pandemic flu preparedness since FY2004, including $6.1 billion in emergency supplemental appropriations for FY2006. These funds bolster related activities to prepare for public health threats, and to control seasonal flu. This report discusses appropriations for pandemic flu, primarily to the Department of Health and Human Services (HHS), and will be updated as needed.
DTIC
Appropriations; Influenza; Public Health; United States

20070009228 Jackson (Henry M.) Foundation, Rockville, MD USA
Computer Assisted Cancer Device - 3D Imaging
Porambo, Albert V; Bronfman, Lee; Worrell, Steve; Woods, Kevin; Liebman, Michael; Oct 2006; 9 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-05-2-0039
Report No.(s): AD-A462126; No Copyright; Avail.: CASI: A02, Hardcopy

The technical objective of the Computer Assisted Cancer Device project is to develop a platform technology that will allow for a significant improvement in the accuracy of interpreting mammograms through the use of Second Generation Computer Assisted Detection (2nd Generation CAD) that is designed for using not only the current year's screening mammograms (as is common in first generation commercial CAD) but also any additional clinically relevant information (e.g. prior mammograms, other sensors like 3D ultrasound/MRI/IR, participant history, etc.). This 2nd Generation CAD platform will be used to provide procedure based' CAD advice to the doctors.
DTIC
Breast; Cancer; Computer Techniques; Detectors; Imaging Techniques; Magnetic Resonance; Mammary Glands

20070009234 Wright State Univ., Dayton, OH USA
Low Level Chemical Toxicity: Relevance to Chemical Agent Defense
Morris, Mariana; Alter, Gerald; Berberich, Steven; Bicknell, Ina; Cool, David; Grubbs, Robert; Lucot, James; McDougal, James; Organisciak, Dan; Paietta, John; Prochaska, Lawrence; Reo, Nicholas; Jul 2005; 171 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-00-C-0020
Report No.(s): AD-A462137; No Copyright; Avail.: CASI: A08, Hardcopy

Wright State University conducted a multidisciplinary project to study the influence of low-level exposure to chemical warfare agents which act via inhibition of acetylcholinesterase (AChE). The problem was covered from the level of the cell to the human subject. Project 1 demonstrated that treatment with AChE inhibitors I (sarin or pyridostigmine, PB) in conjunction with stress produced changes in brain gene and protein expression, autonomic function, muscarinic receptor function and behavior. There was evidence that PB entered the brain to exert its physiological actions. An important finding was that a dose of sarin which produced no effect on blood ChE, caused dramatic changes in autonomic neural function and hypothalamic and cerebral cortical genomic and proteomic expression. Data suggest that it is important not to overlook the importance of low level nerve agent exposure in humans. Project 1 also developed a method for sarin exposure which used pretreatment with a carboxylesterase inhibitor. This method produced an enhancement of sarin's central actions. Project 2 tested the effect of DEET, PB and sarin coupled with stress on brainstem function, brain and muscle metabolism in vivo, and brainstem energy metabolism. DEET/PB/stress caused no significant changes, while the sarin/stress combination antagonized the ability of mitochondria to reoxidize NADH. Project 3 focused on investigation of enzymes involved in chemical metabolism, aldehyde dehydrogenase, chi alcohol dehydrogenase, paraoxonase, and aryl esterase. Results suggest that human chemical sensitivity to formaldehyde and organophosphate correlates well with levels of specific enzyme activities in

particular blood fractions. Project 4 focused on the study of genetic expression in neuronal cultures. Results showed that PB or sarin had no effect on the patterns of gene expression.
DTIC
Acetyl Compounds; Chemical Defense; Chemical Warfare; Cholinesterase; Nervous System; Organic Phosphorus Compounds; Toxicity

20070009235 Massachusetts Univ. Medical Center, Worcester, MA USA
Neuroprotective Ganglioside Derivatives
Ullman, M D; Sep 2006; 19 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0779
Report No.(s): AD-A462139; No Copyright; Avail.: CASI: A03, Hardcopy

TTNatural and semisynthetic gangliosides protect neurons from toxin-induced cell death and salvage neurons after toxin exposure. The hydrophilic property of gangliosides restricts their blood-brain barrier (BBB) permeability, which hinders their use as neuroprotective agents. Gangliosides semisynthetic derivatives with improved cytoprotective properties and BBB permeability can be produced. Even with gangliosides great therapeutic promise, no study has examined ganglioside functional group derivatives that would provide cytoprotection AND effectively cross the BBB; information that would provide a basis for future studies of neuroprotective mechanisms. This study examined the ability of ganglioside derivatives to be cytoprotective in vitro models using the dopaminergic neurotoxin, 1-methyl-4-phenylpyridinium (MPP+) and the SH-SY5Y cell line. Derivatives determined to have therapeutic potential were to be tested in vitro for their ability to cross a brain capillary endothelial cell culture model of the BBB. Finally, derivatives that were both cytoprotective and that effectively crossed the in vitro BBB model were to be tested in vivo for their ability to neuroprotect dopaminergic neurons in both chronic and acute neurotoxicity models using the MPP+ precursor, 1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine (MPTP). The hypothesis is that changes in ganglioside ceramide and/or oligosaccharide functional groups can improve neuroprotection through changes in cytoprotection and BBB transcytosis.
DTIC
Blood; Blood-Brain Barrier; Brain; Derivation; Diseases; In Vitro Methods and Tests; Lipids

20070009237 North Carolina Univ., Chapel Hill, NC USA
P53 Mutation Analysis to Predict Tumor Response in Patients Undergoing Neoadjuvant Treatment for Locally Advanced Breast Cancer
Carey, Lisa A; Dorsey, Kathy C; Dressler, Lynn; Esserman, Laura; Resnick, Michael; Livasy, Chad; Perou, Charles; Schell, Michael; Drouin, Scott; Popko, Brian; Oct 2006; 19 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0521
Report No.(s): AD-A462141; No Copyright; Avail.: CASI: A03, Hardcopy

Studies suggest that p53 mediates responsiveness to chemotherapy . In an ongoing multi institutional prospective trial that is not supported by this award, breast cancer patients receiving neoadjuvant chemotherapy have serial response assessments and tumor sampling for research purposes. The project that is supported by this award involves analyzing the banked tumor specimens for p53 mutations using the GeneChip method, SSCP, and sequencing. We hypothesize that p53 status of the primary tumor will predict response to anthracycline-based and taxane-based chemotherapy given at different times in the same patient. A yeast-based functional assay is examining the impact of specific p53 mutations upon transactivation function. In the early years of the award, we optimized the GeneChip method of p53 mutation analysis for core biopsy specimens, successfully scaled down the DNA requirements allowing evaluation of small tumor biopsy samples, and optimized methods for p53 amplification within 1-2 large fragments so that SSCP and sequencing analysis were feasible despite the small amount of DNA available. P53 mutation analysis upon the study samples is now nearly complete. Implementation of the yeast-based functional assay for assessing the effect of specific p53 mutations has been successful with altered transactivation function found in mutations from neoadjuvantly treated patients.
DTIC
Biomarkers; Breast; Cancer; Chemotherapy; Mammary Glands; Medical Services; Mutations; Patients; Polymorphism; Strands; Tumors

20070009238 Children's Hospital Research Foundation, Cincinnati, OH USA
Driving Neurofibroma Formation in Mice
Ratner, Nancy; Aug 2006; 57 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0679
Report No.(s): AD-A462142; No Copyright; Avail.: CASI: A04, Hardcopy

Benign peripheral nerve tumors called neurofibromas are a major burden for patients with neurofibromatosis type 1 (NF1). No drug therapy is currently available for neurofibromas. Some Schwann cells in neurofibromas aberrantly express the epidermal growth factor receptor, making EGFR a possible therapeutic target. To test this, we used a novel transgenic mouse line in which the human EGFR is expressed in Schwann cells and in which nerve ultrastructure shows features of neurofibroma formation including Schwann cell hyperplasia, nerve hypertrophy, collagen deposition, and axon-glial disruption. We used the mAb Cetuximab (IMC-C225) to block human EGFR function in these mice and assessed nerve hypertrophy, mast cell accumulation, collagen deposition and axon-glial interactions normal at 3 months age. Hot plate sensory tests and electron microscopy confirmed histology data. To ascertain whether EGFR is necessary for malignant tumor formation in NF1, NPCis mice were mated to an EGFR hypomorph. The results of these studies suggest that EGFR acquisition is a key driving force for tumorigenesis in NF1.
DTIC
Cells (Biology); Chemotherapy; Histology; Mice; Neoplasms; Nervous System

20070009239 Massachusetts General Hospital, Boston, MA USA
Mullerian Inhibiting Substances (MIS) Augments IFN-gamma Mediated Inhibition of Breast Cancer Cell Growth
Gupta, Vandana; Jun 2006; 30 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-1-0407
Report No.(s): AD-A462143; No Copyright; Avail.: Defense Technical Information Center (DTIC)

MIS is a member of the TGF family. The purpose of this study is to test the hypothesis that MIS and IFN-gamma might be more effective in the inhibition of breast cancer cell growth than either agent alone. We observed MIS and IFN-gamma costimulate IRF1 expression through NFkB and STAT pathways, respectively with a synergistic induction of CEACAM1 and MHCII mRNA expression, benisons of IRF1. In concordance with this observation, treatment of MDA-MB-468 cells with either MIS or IFN-gamma inhibited growth and the presence of both inhibited growth better. We observed that MIS promotes IFN-gamma-induced apoptosis demonstrating a functional interaction between these two classes of signaling molecules in regulation of breast cancer cell growth. To evaluate whether MIS and IFN-gmay be useful in breast cancer therapy, we determined whether the growth inhibitory effect of MIS and IFN-gamma observed in vitro would berecapitulated in vivo. Both MIS and IFN-gamma decreased the gain in tumor volume of MDAMB468 xenografts established in SCID mice. C3(1)Tag transgenic mouse model carries the SV40 large T antigen targeted to the epithelium of the mammary and prostate glands and progression of disease in these animals correlates well with progressive stages of human breast cancer. Mammary tumors arising in the C3(1) T antigen mouse model expressed the MIS type II receptor. Administration of MIS to mice was associated with a lower number of palpable mammary tumors and the mean mammary tumor weight as compared with the control group (p=0.029). Different doses of mIFN-gwere injected into 10 week old C3(1)Tag transgenic mice for 5 weeks intraperitoneally. Both 10ng and 100ng mIFN-gamma significantly reduced the tumor volumes and tumor weights in this mouse model. Analysis of PCNA expression and caspase-3 cleavage in tumors revealed that exposure to MIS or mIFN-gamma was associated with decreased proliferation and increased apoptosis, respectively.
DTIC
Augmentation; Breast; Cancer; Cell Division; Mammary Glands

20070009240 Fox Chase Cancer Center, Philadelphia, PA USA
Radioimmunotherapeutic Targeting of Breast Cancer Stroma
Cheng, Jonathan D; Sep 2006; 25 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0709
Report No.(s): AD-A462144; No Copyright; Avail.: CASI: A03, Hardcopy

The objective of this proposal is to determine the effectiveness of tumor stromal targeting using radio labeled antibodies to deliver cytotoxic payloads to breast cancer stromal fibroblasts. The central hypothesis to be tested is that targeting the breast cancer stroma will result in enhanced tumor cytotoxicity compared to targeting the breast cancer cells themselves. Fibroblasts activation protein (FAP) is a cell surface glycoprotein selectively expressed by tumor stromal fibroblasts in breast tumors, but not significantly expressed by breast cancer cells, normal fibroblasts, or other normal tissues. We have identified an appropriate animal model that allows for evaluation of both stromal and epithelial targeting using BT-474 xenografts. In multiple biodistribution experiments using I(exp 125) radiolabeled antibodies targeting either HER2 or FAP, epithelial targeting was accomplished. However, stromal targeting of FAP remains suboptimal, most likely due to the relatively low copy number of FAP in the tumor stroma compared to tumor antigens. Although targeting the tumor stroma was challenging utilizing the antibody reagents tested in this proposal, additional antibody reagents are under development including higher affinity antibodies to overcome the challenges encountered. The biodistribution experiments conducted can inform future therapeutic

studies to investigate a radioimmunotherapeutic strategy for treatment of breast cancers.
DTIC
Breast; Cancer; Fibroblasts; Mammary Glands; Radioactive Isotopes

20070009251 Rush Univ., Chicago, IL USA
Mechanism for Prenatal LPS-Induced DA Neuron Loss
Carvey, Paul M; Sep 2006; 142 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-04-1-0365
Report No.(s): AD-A462158; No Copyright; Avail.: CASI: A07, Hardcopy

In nonfamilial Parkinson's Disease (PD) the etiologies of the majority of patients are still unknown. However, recent advances by the authors suggest that prenatal exposure to the bacterial toxin lipopolysaccharide (LPS) could be an important etiology for some PD patients. A key finding is that animals exposed to LPS prenatally display fewer than the normal number of dopamine (DA) neurons in the midbrain, the hallmark of PD pathology in human patients. The mechanism for this DA neuron loss is unknown, but preliminary data suggest that prenatal LPS exposure may interfere with the migration of DA neuron precursor cells (progenitor cells) to the substantia nigra or with DA neuron process outgrowth, thereby reducing the number of DA neurons in the midbrain. The authors proposed to use both in vivo and in vitro approaches to investigate these possibilities. Significant progress has been made in the last 11 months. Implementation of this proposal has resulted in three major findings: (1) prenatal bacterial LPS exposure induces the loss of BrdU positive cells in the midbrain; (2) the toxicity of prenatal LPS exposure results in the removal of mitotic signal(s) to the dividing progenitor (stem) cells; and (3) prenatal LPS exposure reduces dopamine neuron process outgrowth, preventing dopamine neurons from reaching trophic-rich striatal tissues, a mechanism underlying the dopamine neuron loss in the prenatal LPS model.
DTIC
Bacteria; Cells (Biology); Diseases; Etiology; Exposure; Losses; Nervous System; Neurons; Toxins and Antitoxins

20070009256 Georgia Inst. of Tech., Atlanta, GA USA
Novel Pathways of Nitroaromatic Metabolism: Hydroxylamine Formation, Reactivity and Potential for Ring Fission for Destruction of TNT-CU1214
Hughes, Joseph B; Aug 15, 2005; 381 pp.; In English; Original contains color illustrations
Report No.(s): AD-A462163; No Copyright; Avail.: CASI: A17, Hardcopy

Bioremediation has come into favor as the treatment of choice for munitions contamination because of the prohibitively high cost of the treatment alternative, incineration. To this end, this research was designed to provide information required for development of bioremediation systems to treat TNT contamination. This research investigated biological transformation of TNT with the primary goal of furthering the understanding of the fundamental biochemical mechanisms responsible for transformation of TNT and its fate in the environment. This research explored the products of novel TNT transformation pathways and determined the mechanisms of TNT transformation and identified the enzymes responsible.
DTIC
Amines; Biodegradation; Contamination; Destruction; Fission; Hydroxyl Compounds; Reactivity

20070009263 Yale Univ., New Haven, CT USA
Role of Rad51-Mediated Interactions in Recombination
Raynard, Steven; Aug 2006; 13 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-1-0586
Report No.(s): AD-A462173; No Copyright; Avail.: CASI: A03, Hardcopy

Mutations in the BRCA2 gene are linked to familial and sporadic breast cancer, yet the molecular function of BRCA2 protein remains largely obscure. BRCA2 protein physically interacts with the Rad51 recombinase, a member of the RAD52 epistasis group of proteins that mediate homologous recombination (HR), a major mechanism that repairs chromosomes damaged by ionizing radiation and genotoxic agents. Accordingly, BRCA2 deficient cell lines exhibit impaired HR and sensitivity to genotoxic agents. To help define the molecular function of human BRCA2, we have expressed and purified a polypeptide that harbors the BRC3 and BRC4 repeat and also the DNA binding domain of this tumor suppressor. The BRC3/4-DBD polypeptide interacts with hRad51 and binds DNA with a distinct preference for ssDNA. Importantly, we have demonstrated by biochemical means and electron microscopy that BRC3/4-DBD nucleates hRad51 onto ssDNA and acts as a recombination mediator in enabling Rad51 to utilize replication protein A-coated ssDNA as recombination substrate. In isolation neither the BRC3-BRC4 repeats nor the DNA binding domain of BRCA2 performs these mediator functions. The

biochemical system described in this study should be valuable for systematically dissecting the HR functions of BRCA2 and its associated proteins such as DSS1. Comprehending the manner in which BRCA2 modulates Rad51 activity and the functional integrity of the homologous recombination machinery could very well pave the way for devising new strategies in breast cancer diagnosis, prevention, and treatment.
DTIC
Breast; Cancer; Deoxyribonucleic Acid; Genes; Mammary Glands; Mutations; Proteins; Recombination Reactions

20070009264 Cold Spring Harbor Lab., New York, NY USA
Functional Analysis of Human NF1 in Drosophia
Zhong, Yi; Jan 2006; 21 pp.; In English
Contract(s)/Grant(s): W81XWH-05-1-0142
Report No.(s): AD-A462174; No Copyright; Avail.: CASI: A03, Hardcopy

Neurofibromatosis type 1 (NF1) is characterized by benign but disfiguring skin tumors, pigmentation defects and learning disabilities, as well as increased risk of brain tumors. The NF1 tumor suppressor protein (neurofibromin) inhibits Ras, a protein that is overactive in a wide variety of human cancers. NF1 also controls levels of cyclic AMP, an important intracellular messenger involved in cell growth and learning. Over last year, we continue to examine the structural basis for its role in controlling multiple signal transduction pathways and roles in learning and memory formation. In addition to previously identified GAP related domain, we showed that the C-terminal is critical in mediating G protein dependent activation of adenylyl cyclase. We are now examining the functional roles of these two domains in learning and memory.
DTIC
Brain; Cancer; Computer Storage Devices; Drosophila; Functional Analysis; Learning

20070009278 Dana Farber Cancer Inst., Boston, MA USA
Does Combination Immunotherapy With Human Monoclonal Antibodies Against HER2 and CXCR4 Augment Breast Cancer Killing in Vitro and Vivo?
Marasco, Wayne A; Aug 2006; 8 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-05-1-0417
Report No.(s): AD-A462194; No Copyright; Avail.: CASI: A02, Hardcopy

The chemokine receptor CXCR4 and its ligand CXCL12 (SDF1) have been proposed to regulate the directional migration and invasion of breast cancer cells to sites of metastasizes. The CXCR4 molecule could be a potential target to control breast cancer. Human epidermal growth factor receptor-2 (HER2) overexpression contributes to tumor progression and metastasis. A humanized monoclonal antibody Herceptin (Trastuzumab) is currently in clinical use. Thus, both of CXCR4 and HER2 play important roles in breast cancer progress, the linkage between CXCR4 and HER2 has also been reported. HER2 upregulates the expression of CXCR4, which is required for HER2-mediated lung invasion and metastasis. Therefore, we aimed to assess the anti-tumor effects of combinational immunotherapy by targeting both CXCR4 and HER2 in vitro and in a nude mice breast cancer model. The result from this study should provide pre-clinical data that may ultimately aid in testing the hypothesis that additive or synergistic effects of combinational treatment with anti-CXCR4 and anti-HER2 human Mabs may lead to an additive or synergistic effect in human clinical trials of breast cancer. We have produced enough antibodies for the entire study, and established the necessary cell lines for both in vitro and in vivo studies. We have evaluated the effects of CXCR4 Mabs in combination of Herceptin or alone on inhibition of chemotaxis, invasion and proliferation on breast cancer cells. The results and experience we have obtained through these studies will lead us to answer the question we have proposed and guide us to perform the in vivo studies which will be started in the next year.
DTIC
Antibodies; Breast; Cancer; In Vitro Methods and Tests; Mammary Glands

20070009280 Massachusetts General Hospital, Boston, MA USA
Caffeine, Adenosine Receptors and Estrogen in Toxin Models of Parkinson's Disease
Schwarzshild, Michael A; Oct 2006; 36 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-04-1-0881
Report No.(s): AD-A462198; No Copyright; Avail.: CASI: A03, Hardcopy

Identifying the mechanisnms by which caffeine and more specific A2A antagonists protect dopaminergic neurons in

muttiple toxin models of Parkinson's disease (PD) will advance our knowledge of the pathophysiology epidemiology and therapeutics of PD.
DTIC
Adenosines; Caffeine; Diseases; Estrogens; Toxins and Antitoxins

20070009281 Harvard Univ., Cambridge, MA USA
The Role of TSC1 in the Formation and Maintenance of Excitatory Synapses
Sabatini, Bernardo L; Mar 2006; 18 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-04-1-0309
Report No.(s): AD-A462199; No Copyright; Avail.: CASI: A03, Hardcopy

Tuberous Sclerosis (TSC) is an autosomal dominant genetic disorder characterized by benign tumors of many organs. The majority of TSC patients are identified as children and most have neurological symptoms including mental retardation and epilepsy. Although it is known that TSC results from mutations in either the TSC1 or TSC2 genes, the pathogenesis of the neurological disorder is unclear. One possibility, inspired by gross pathological findings, is that the presence of benign growths in the brain leads to disorganized and compressed brain tissue and perturbed neural circuits. However, it is equally possible that loss of TSC1 or TSC2 disrupts neuronal function in a cell-autonomous manner. Our hypothesis is that TSC1 is necessary in mature, differentiated neurons for the establishment of proper neuronal morphology and synaptic function. This hypothesis is being testing by examining cell-autonomous defects in TSC1 null neurons located within otherwise normal brain tissue. The approaches used to examine the perturbed cells are immunostaining of activated proteins in the TSC signaling cascade, optical microscopy of neuronal structure, and electrophysiological analysis of electrical properties.
DTIC
Arteriosclerosis; Diseases; Genetics; Maintenance; Synapses; Tuberculosis

20070009283 National Research Council of Canada, Montreal, Quebec Canada
Environmental Fate and Transport of a New Energetic Material, CL-20
Hawari, Jalal; Balakrishnan, Vimal; Bardai, Ghalib; Bhushan, Bharat; Dodard, Sabine; Fournier, Diane; Groom, Carl; Halasz, Annamaria; Monteil-Rivera, Fanny; Robidoux, Pierre Y; Rocheleau, Sylvie; Sarrazin, Manon; Savard, Kathleen; Sunahara, Geoffrey; Mar 2006; 350 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DACA72-02-C-0007; Proj-W74RDV-2080-0240
Report No.(s): AD-A462206; No Copyright; Avail.: CASI: A15, Hardcopy

CL-20 is an emerging munition compound that may replace RDX and HMX, but little information is available on its environmental fate and ecological impact. Therefore the present report first describes the development and validation of an analytical method to analyze CL-20 in soil and water and the determination of key physicochemical parameters such as Kow (82.6), solubility (3.87 mg/L) and sorption/desorption parameters (Kd, Koc) of the chemical under various conditions of aging, T, and pH. CL-20 is found to sorb strongly onto the organic fraction of soils, and that sorption is reversible and governed by the type of organic matter. Degradation of CL-20 was determined in different soil/water systems and degradation products, reaction kinetics and stoichiometry were determined using LC/MS and [15N]-CL-20. We found that initial denitration caused by either Fe(0), light, hydrolysis, bacteria, fungi and enzymes lead to the decomposition of CL-20 to give nitrite, ammonia, nitrous oxide, glyoxal and formic acid. Finally, CL-20 was found to be non toxic to algae, higher plants, and soil micro flora, but toxic to earthworms and quails.
DTIC
Ammunition; Degradation; Ecology; Environmental Transport; RDX; Reaction Kinetics

20070009286 Conceptual MindWorks, Inc., San Antonio, TX USA
Advances in Biotechnology and the Biosciences for Warfighter Performance and Protection: Anti-Aptamers for Revenom
Irving, George W; Tijerina, Amanda J; Sloan, Mark; Oct 2006; 43 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8650-05-C-6520; Proj-7757
Report No.(s): AD-A462209; No Copyright; Avail.: CASI: A03, Hardcopy

This effort was focused on developing a novel, aptamer-based antivenin for treatment of envenomation by the Kurdistan Viper (Vipera raddei kurdistanica). The research was conducted to provide evidence to prove whether a synthetic, aptamer-based antivenin could be developed to treat snake envenomations in humans. Using PLA2 from Crotalus durissus terrificus venom as a simulant of the Kurdistan viper venom, two tissue culture cell lines were examined and developed for

in vitro cell culture models. For each cell line, an LD50 value was determined post PLA2 exposure at various concentrations. Cytotoxicity activity was determined by utilizing an XTT colorimetric assay. DNA aptamers developed against the PLA2 were tested in these in vitro models, along with known PLA2 inhibitors. Inhibitors were tested for their effectiveness against these LD50 values for each cell line. However, in these assays, known LD50 values for PLA2 did not prove to be toxic to the cells themselves. Higher concentrations of PLA2, were also ineffective in killing cells the effectiveness of the inhibitor's ability to decrease PLA2 activity, thereby preventing toxicity to cells, could not be determined. Additionally, no determination was able to be made on the efficacy of the aptamers.
DTIC
Biotechnology; Deoxyribonucleic Acid

20070009287 Army Center for Health Promotion and Preventive Medicine (Provisional), Aberdeen Proving Ground, MD USA
Injuries and Injury Prevention in the US Army Band
Knapik, Joseph J; Jones, Sarah B; Ohlin, Doug W; Canham-Chervak, Michelle; Darakjy, Salima S; Goddard, Donald E; Hauret, Keith G; Hadley, Jeffrey A; Twombly, Gregory; Harkins, Deanna K; Dec 30, 2006; 231 pp.; In English; Original contains color illustrations
Report No.(s): AD-A462210; USACHPPM-12-HF-01Q2A-06; No Copyright; Avail.: CASI: A11, Hardcopy

Injury rates and potential risk factors were examined in the 284 members of the US Army Band in response to a request from the Band Commander. Collected data included 1) information obtained directly from the Band (fitness test scores, height, weight, etc.), 2) medical data from the Defense Medical Surveillance System, 3) audiograms of Band member from the Defense Occupational and Environmental Health Readiness System-Hearing Conservation database, 4) focus group interviews of Band members, 5) questionnaire responses from all Band members and, 6) observations on Band activities. Results led to 10 recommendations including: increase physical activity and physical fitness of low fit Band members, provide enhanced hearing protection, conduct annual hearing tests, reduce environmental heat exposures, provide ergonomic devices, provide functional movement and pain management training, reduce standing and marching, provide appropriate shoes, provide uniforms for hot and humid conditions, and change chairs. Implementing some or all of the suggested interventions is likely to reduce injuries and musculoskeletal symptoms.
DTIC
Health; Injuries; Medical Services; Military Personnel; Prevention

20070009295 Mount Sinai School of Medicine, New York, NY USA
Inflammatory Response and Oxidate Stress in the Degeneration of Dopamine Neurons in Parkinson's Disease
Olanow, C W; Aug 2003; 65 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-99-1-9557
Report No.(s): AD-A462230; No Copyright; Avail.: CASI: A04, Hardcopy

Parkinson's disease is characterized by the depletion of glutathione (GSH) in, the substantia nigra and the degeneration of nigral dopamine neurons. In our stud: we examined the relationship between cellular GSH depletion and neuronal degeneration. Using rat mesencephalic cultures as a model, we found that GSH depletion results in phospholipase A, (PLA(sub 2))-dependent release of arachidonic acid and increase in lipoxygenase (LOX-dependent arachidonic acid metabolism. These events generate reactive oxygen species, which accumulate in the cells and result in oxidative stress and cell death. Cell death can be prevented by interrupting different steps of this process, including replenishment of GSH, inhibition of PLA_ activity, inhibition of LOX activity and increase in the antioxidant defenses of the cells (up-regulation of superoxide dismutase, addition of ascorbic acid). Our studies provide information, which may be important in the understanding of the etiology of Parkinson's disease and could offer insights for the design of medication to prevent the progress of the disorder in Parkinson's patients.
DTIC
Cells (Biology); Degeneration; Diseases; Dopamine; Glutathione; Nervous System; Neurons; Oxidation

20070009323 Naval Health Research Center, San Diego, CA USA
Test and Evaluation of the Medical Common Operational Picture (MedCOP)
Olson, Cheryl; Bohannan, Britt; Peel, Ray; Jeschonek, Robert; Leap, Tom; Oct 31, 2003; 43 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-09162
Report No.(s): AD-A462281; NHRC-TD-06-3C; No Copyright; Avail.: CASI: A03, Hardcopy

This report summarizes the test and evaluation (T&E) of the Medical Common Operational Picture (MedCOP) software, commissioned as a tool to facilitate resource management by medical facilities and to track disease trends and patient movement. The present work was conducted at the Naval Health Research Center (NHRC) by a T&E team independent of MedCOP's developers to provide formal feedback on MedCOP's advertised functional claims. Survey results indicated that users found MedCOP appropriate for use as a tool by medical planners and preventive medical personnel. Testers stated that it represented an improvement over the status quo. Limitations noted included dependence on the accuracy and availability of Joint Medical Work Station (JMeWS) data and the MDSS. Users also noted that the manual needed to be updated to include all current functions, and that on-line help should be available to aid in taking advantage of all features. MedCOP performed well in meeting advertised claims. Developers should address users concerns about updating the user's guide and providing help functions. They should also consider refining user profile capability to let users with different roles customize reports to view information more efficiently and to ensure that reports on individual patient information are limited to authorized users. DTIC

Evaluation; Health; Images; Resources Management; Software Development Tools; System Effectiveness

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AEROSPACE MEDICINE

Includes the biological and physiological effects of atmospheric and space flight (weightlessness, space radiation, acceleration, and altitude stress) on the human being; and the prevention of adverse effects on those environments. For psychological and behavioral effects of aerospace environments, see *53 Behavioral Sciences*. For the effects of space on animals and plants see *51 Life Sciences*.

20070006839 NASA Johnson Space Center, Houston, TX, USA

Assessment of Nutrient Stability in Space

Zwart, S. R.; Perchonok, M.; Braby, L. A.; Kloeris, V. A.; Smith, Scott M.; [2007]; 1 pp.; In English; Human Research Program Investigators' Workshop, 12-14 Feb. 2007, League City, TX, USA; Copyright; Avail.: Other Sources; Abstract Only

Maintaining an intact nutrient supply in the food system flown on spacecraft is a critical issue for mission success and crew health and safety. Early polar expeditions and exploration expeditions by sailing vessels have taught us that a deficiency, or excess, of even a single vitamin in the food supply can be catastrophic. Evidence from ground-based research indicates that many vitamins are destroyed and fatty acids are oxidized (and therefore rendered dangerous or useless) by different types of radiation and by conditions of long-term storage. We hypothesize that radiation and long-term storage in the space-flight environment will affect the stability of vitamins, amino acids, and fatty acids in the space food system. The research objectives of our ongoing stability studies are to determine the stability of water- and fat-soluble vitamins, fatty acids, and amino acids in the space food supply before and after space flight on the International Space Station (ISS). Ground-based controls matched for humidity, time, light, and temperature will be analyzed along with the space-flown foods. These flight studies will complement ground-based studies of the effects of radiation on vitamins, amino acids, and fatty acids. Because a model based on ground-based data cannot predict all of the effects of the space-flight environment, flight studies will provide a more accurate test system to determine the effects on these nutrients of the humidity, temperature, and radiation conditions in the space-flight environment. In addition to providing information on nutrient stability in space, the results of these studies will help NASA determine if a need exists to develop special packaging that can ensure stability of foods and nutrients in space, or if further studies of nutrient metabolism or nutrient requirements are needed.
Author

Spacecrews; Vitamins; Amino Acids; Health; Radiation Effects; Aerospace Environments; Aerospace Medicine

20070006845 NASA Johnson Space Center, Houston, TX, USA

Risk Reduction and Measures of Injury for EVA Associated Upper Extremity Medical Issues: Extended Vent Tube Study

Jones, Jeffrey A.; Hoffman, Ronald B.; Harvey, C. M.; Bowen, C. K.; Hudy, C. E.; Gernhardt, M. L.; [2007]; 1 pp.; In English; Humans om Space, 20-24 May 2007, Beijing, China; Copyright; Avail.: Other Sources; Abstract Only

During Neutral Buoyancy Lab (NBL) training sessions, a large amount of moisture accumulates in the EVA gloves. The glove design restricts the extension of the EVA suit s ventilation/cooling system to the hand. Subungual redness and fingernail pain develops for many astronauts following their NBL training sessions with subsequent oncholysis occurring over succeeding weeks. Various attempts have been made to reduce or avoid this problem. The causal role of moisture has yet to be defined. Methods: To determine the contribution that moisture plays in the injury to the fingers and fingernails during EVA

training operations in NBL, the current Extravehicular Mobility Unit (EMU), with a Portable Life Support System (PLSS) was configured with a ventilation tube that extended down a single arm of the crewmember during the test and compared with the unventilated contralateral arm; with the ventilated hand serving as the experimental condition (E) and the opposite arm as the control (C). A cross-over design was used with opposite handedness for the vent tube on a subsequent NBL training run. Moisture content measures were conducted at six points on each hand with three types of moisture meters. A questionnaire was administered to determine subjective thermal hand discomfort, skin moisture perception, and hand and nail discomfort. Photographs and video were recorded. Measures were applied to six astronauts pre- and post-run in the NBL. Results: The consistent trends in relative hydration ratios at the dorsum, from 3.34 for C to 2.11 for E, and first ring finger joint locations, from 2.46 for C to 1.96 for E, indicated the extended vent tube promoted skin drying. The experimental treatment appeared to be more effective on the left hand versus the right hand, implying an interaction with hand anthropometry and glove fit. Video analyses differentiated fine and gross motor training tasks during runs and will be discussed. Conclusions: This potential countermeasure was effective in reducing the risks of hand and nail discomfort symptoms from moderate to low in two of six subjects. Improved design in the ventilation pattern of such a countermeasure is expected to improve the countermeasure s efficiency.
Author
Risk; Extravehicular Activity; Moisture Content; Hand (Anatomy); Fingers; Injuries; Gloves; Psychomotor Performance; Hydration; Anthropometry

20070006846 NASA Johnson Space Center, Houston, TX, USA
Space Medicine Planning for Exploration
Duncan, James M.; Fogarty, Jennifer A.; Laurini, Kathy; Davis, Jeffrey R.; [2007]; 1 pp.; In English; Humans in Space, 20-24 May 2007, Beijing, China; Copyright; Avail.: CASI: A01, Hardcopy

Standards and the requirements will play a vital role in the success of exploration missions and are therefore based on the best available scientific and clinical evidence, as well as operational experience from the Apollo, Skylab, Shuttle, Shuttle/Mir, and the International Space Station missions. In addition, they will be reviewed and assessed regularly and informed by new evidence gathered through the Human Research Program (including flight, ground, and analog studies) and terrestrial data sources (ex. Clinical trials, NIH research, etc.). This continuous monitoring of the evidence base and assessment of the health and performance standards will allow for appropriate health and performance risk identification, assessment, and mitigation strategy development as needed for the exploration mission architectures. The standards are designed to optimize crewmember health and performance and prevent negative long-term health consequences associated with space flight. Specifically, the standards have been established to provide agency level technical requirements for an appropriate habitation environment, certification of human participants, threshold performance levels, and the necessary levels of medical care. These standards also guide and focus the development of program level health and medical requirements which inform research and the development of risk mitigation strategies designed to manage deleterious effects of space flight. Risk identification, the basis of the standards and requirements, informs mitigation development (ex. enhanced screening criteria, more robust countermeasures, flight rules, etc.) with the end goal being operational implementation. Thus far this process has been used to develop the EVA pre-breathe protocol, assess cost and benefits of bisphosphonate use, and addressed the appropriateness of flight medical hardware such as the automated external defibrillator to name a few. Maintaining human health and performance during explorations missions will be challenging and complex for the Space Medicine Division and NASA as an agency. Evidence based risk identification and assessment is necessary to develop standards, requirements, and the appropriate and adequate risk mitigation strategies needed to optimize crewmember health and performance.
Author
Human Performance; Health; Aerospace Medicine; Risk; Extravehicular Activity

20070007299 NASA Johnson Space Center, Houston, TX, USA
Noninvasive Sensor for Measuring Muscle Metabolism During Exercise
Soller, B. R.; Yang, Y.; Lee, S. M. C.; Soyemi, O. O.; Wilson, C.; Hagan, R. D.; [2007]; 1 pp.; In English; HRP Investigators' Workshop, 12-14 Feb. 2007, League City, TX, USA
Contract(s)/Grant(s): NCC9-58; Copyright; Avail.: CASI: A01, Hardcopy

The measurement of oxygen uptake (VO2) and lactate threshold (LT) are utilized to assess changes in aerobic capacity and the efficacy of exercise countermeasures in astronauts. During extravehicular activity (EVA), real-time knowledge of VO2 and relative work intensity can be used to monitor crew activity levels and organize tasks to reduce the cumulative effects of fatigue. Currently VO2 and LT are determined with complicated measurement techniques that require sampling of expired ventilatory gases, which may not be accurate in enclosed, oxygen-rich environments such as the EVA suit. The UMMS team

has developed a novel near infrared spectroscopic (NIRS) system which noninvasively, simultaneously and continuously measures muscle oxygen tension, oxygen saturation, pH (pHm), and hematocrit from a small sensor placed on the leg. This system is unique in that it allows accurate, absolute measurement of these parameters in the thigh muscle by correcting spectra for the interference from skin pigment and fat. These parameters can be used to estimate VO2 and LT. A preliminary evaluation of the system s capabilities was performed in the NASA JSC Exercise Physiology Lab.
Derived from text
Exercise Physiology; Metabolism; Sensors; Aerospace Medicine; Muscles

20070007300 California Univ., San Diego, CA, USA
WISE-2005: Lower Body Negative Pressure Treadmill Exercise and Resistive Exercise Countermeasures Maintain Physiologic Parameters in Women during 60-days of Bed Rest
Hargens, A. R.; Macias, B. R.; Guinet, P.; Lee, S. M. C.; Meuche, S.; Trappe, S.; Trappe, T.; Hughson, R. L.; Arbeille, P.; Shoemaker, J. K.; Smith, Scott M.; Zwart, S. R.; Heer, M.; Levine, B. D.; Dorfman, T. A.; Watenpaugh, D. E.; Tullet, R. B.; Banerjee, T.; Schneider, S. M.; [2007]; 1 pp.; In English; Human Research Program Investigators' Workshop, 12-14 Feb. 2007, League City, TX, USA
Contract(s)/Grant(s): NNJ04HF71G; Copyright; Avail.: CASI: A01, Hardcopy

Current exercise systems for space, which attempt to maintain physiologic structure and function, are unable to achieve loads similar to those on Earth. We hypothesized that supine LBNP treadmill exercise combined with Flywheel resistive exercise maintains upright physiologic responses and tissue structure following 60-days of head-down tilt (HDT) bed rest (BR). Sixteen healthy women (age 25-40 years) took part in the study. Subjects were housed in the MEDES facility in Toulouse, France. The study was approved by the Comit consultatif de protection des personnes dans la recherche biomedical de Toulouse, NASA-JSC and UCSD and informed, written consent was obtained. Subjects underwent extensive medical screening prior to selection. A 20-day baseline period was followed by 60-days continuous HDT BR (-6 degrees) and then by recovery for an additional 20-days. Women were assigned to either a control group (CON, n=8) who performed no exercise or to an exercise group (EX, n=8). EX subjects performed a 40-min interval (40-80% pre-BR VO2pk) LBNP exercise protocol at foot-ward forces between 1.0-1.1 times body weight, plus 10 min of resting LBNP 3-4 days/week. Resistive exercise of maximal concentric and eccentric supine leg press and heel raise exercises were performed on different days using a gravity-independent Flywheel ergometer 2-3 days/week. Post-BR orthostatic tolerance (time to pre-syncope) was significantly better in the EX group than in the CON group (p less than 0.05). Heart mass decreased significantly in CON, but increased significantly in EX. Upright VO2pk, muscle strength, and endurance decreased significantly in CON, but were preserved in EX post-BR. Post-BR bone resorption was greater than pre-BR in both groups. Helical peptide and N-telopeptide excretions increased in both CON and EX. However, bone-specific alkaline phosphatase, a bone formation marker, tended to be higher in EX than in CON.
Derived from text
Lower Body Negative Pressure; Physical Exercise; Physiology; Treadmills; Bed Rest; Females

20070007302 NASA Johnson Space Center, Houston, TX, USA
Gender Consideration in Experiment Design for Airbrake in Prebreathe
Conkin, Johnny; Gernhardt, Michael I.; Dervay, Joseph P.; [2007]; 1 pp.; In English; NASA Human Research Program Investigators' Workshop, 12-14 Feb. 2007, League City, TX, USA
Contract(s)/Grant(s): NNJ06HG25A; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070007302

If gender is a confounder of the decompression sickness (DCS) or venous gas emboli (VGE) outcomes of a proposed air break in oxygen prebreathe (PB) project, then decisions about the final experiment design must be made. We evaluated if the incidence of DCS and VGE from tests in altitude chambers over 20 years were different between men and women after resting and exercise prebreathe protocols. Nitrogen washout during PB is our primary risk mitigation strategy to prevent subsequent DCS and VGE in subjects. Bubbles in the pulmonary artery (venous blood) were detected from the precordial position using Doppler ultrasound bubble detectors. The subjects were monitored for VGE for four min at about 15 min intervals for the duration of the altitude exposure, with maximum bubble grade assigned a Spencer Grade of IV. There was no difference in DCS incidence between men and women in either PB protocol. The incidence of VGE and Grade IV VGE is statistically lower in women compared to men after resting PB. Even when 10 tests were compared with Mantel-Haenszel 2 where both men (n = 168) and women (n = 92) appeared, the p-value for VGE incidence was still significant at 0.03. The incidence of VGE and Grade IV VGE is not statistically lower in women compared to men after exercise PB. Even when six tests were compared with Mantel-Haenszel x2 where both men (n = 165) and women (n = 49) appeared, the p-value for VGE incidence was still

not significant at 0.90. Our goal is to understand the risk of brief air breaks during PB without other confounding variables invalidating our conclusions. The cost to additionally account for the confounding role of gender on VGE outcome after resting PB is judged excessive. Our decision is to only evaluate air breaks in the exercise PB protocol. So there is no restriction to recruiting women as test subjects.
Author
Experiment Design; Females; Oxygen Breathing; Aeroembolism; Males

20070007303 NASA Johnson Space Center, Houston, TX, USA
Pharmacotherapeutics of Intranasal Scopolamine: FDA Regulations and Procedures for Clinical Applications
Das, H.; Daniels, V. R.; Vaksman, Z.; Boyd, J. L.; Buckey, J. C.; Locke, J. P.; Putcha, L.; [2007]; 1 pp.; In English; NASA Human Research Program Investigators' Workshop, 12-14 Feb. 2007, Houston, TX, USA; Copyright; Avail.: CASI: A01, Hardcopy

Space Motion Sickness (SMS) is commonly experienced by astronauts and often requires treatment with medications during the early flight days of a space mission. Bioavailability of oral (PO) SMS medications is often low and highly variable; additionally, physiological changes in a microgravity environment exacerbate variability and decrease bioavailability. These factors prompted NASA to develop an intranasal dosage form of scopolamine (INSCOP) suitable for the treatment of SMS. However, to assure safety and efficacy of treatment in space, NASA physicians prescribe commercially available pharmaceutical products only. Development of a pharmaceutical preparation for clinical use must follow distinct clinical phases of testing, phase I through IV to be exact, before it can be approved by the FDA for approval for clinical use. After a physician sponsored Investigative New Drug (IND) application was approved by the FDA, a phase I clinical trial of INSCOP formulation was completed in normal human subjects and results published. The current project includes three phase II clinical protocols for the assessment of pharmacokinetics and pharmacodynamics (PK/PD), efficacy, and safety of INSCOP. Three clinical protocols that were submitted to FDA to accomplish the project objectives: 1) 002-A, a FDA Phase II dose ranging study with four dose levels between 0.1 and 0.4 mg in 12 subjects to assess PK/PD, 2) 002-B, a phase II clinical efficacy study in eighteen healthy subjects to compare efficacy of 0.2 (low dose) and 0.4 mg (high dose) INSCOP for prophylactic treatment of motion-induces (off-axis vertical rotation) symptoms, and (3) 002-C, a phase II clinical study with twelve subjects to determine bioavailability and pharmacodynamics of two doses (0.2 and 0.4 mg) of INSCOP in simulated microgravity, antiorthostatic bedrest. All regulatory procedures were competed that include certification for Good laboratory Procedures by Theradex , clinical documentation, personnel training, selection of clinical research operations contractor, data capturing and management, and annual reporting of results to FDA were successfully completed. Protocol 002-A was completed and sample and data analysis is currently in progress. Protocol 002-B is currently in progress at Dartmouth Hitchcock Medical Center and Protocol 002-C has been submitted to the FDA and will be implemented at the same contractor site as 002-A. An annual report was filed as required by FDA on the results of Protocol 002-A. Once all the three Phase II protocols are completed, a New Drug Administration application will be filed with FDA for Phase III clinical assessment and approval for marketing of the formulation. A commercial vendor will be identified for this phase. This is critical for making this available for treatment of SMS in astronauts and military personnel on duty. Once approved by FDA, INSCOP can be also used by civilian population for motion sickness associated with recreational travel and other ailments that require treatment with anticholinergic drugs.
Author
Aerospace Medicine; Pharmacology; Nose (Anatomy); Amines; Motion Sickness; Anticholinergics; Regulations; Therapy

20070007305 NASA Johnson Space Center, Houston, TX, USA
Stroboscopic Vision as a Treatment for Space Motion Sickness
Reschke, Millard F.; Somers, Jeffrey T.; Ford, George; Krnavek, Jody M.; [2007]; 1 pp.; In English; NASA Human Research Program Investigators' Workshop, 12-14 Feb. 2007, League City, TX, USA; Copyright; Avail.: CASI: A01, Hardcopy

Results obtained from space flight indicate that most space crews will experience some symptoms of motion sickness causing significant impact on the operational objectives that must be accomplished to assure mission success. Based on the initial work of Melvill Jones we have evaluated stroboscopic vision as a method of preventing motion sickness. Given that the data presented by professor Melvill Jones were primarily post hoc results following a study not designed to investigate motion sickness, it is unclear how motion sickness results were actually determined. Building on these original results, we undertook a three part study that was designed to investigate the effect of stroboscopic vision (either with a strobe light or LCD shutter glasses) on motion sickness using: (1) visual field reversal, (2) Reading while riding in a car (with or without external vision present), and (3) making large pitch head movements during parabolic flight.
Derived from text
Aerospace Medicine; Motion Sickness; Vision; Stroboscopes; Manned Space Flight; Illumination

20070007343 Army Research Inst. of Environmental Medicine, Natick, MA USA

Carbohydrate Supplementation and Endurance Performance of Moderate Altitude Residents at 4300 m

Fulco, C S; Zupan, M; Muza, S R; Rock, P B; Kambis, K; Payn, T; Hannon, M; Glickman, E; Cymerman, A; Jan 2006; 8 pp.; In English

Report No.(s): AD-A459463; USARIEM-M05-50; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA459463

Recent work from our laboratory demonstrated that carbohydrate supplementation (CHOS) during exercise improved prolonged time-trial (TT) performance of sea-level residents (SLR) living at 4300 m while they were in daily negative energy balance (-1250 kcal/day). The purposes of the current study were to determine during initial exposure to 4300 m: 1) whether CHOS also improves TT performance of moderate altitude residents (MAR) who are in energy balance and 2) if acclimatization to moderate elevations benefits TT performance. Fifteen Air Force Academy (AFA) active duty members (age: 30 + or - 1 yrs; mean + or - SE), who had been living at approx. 2000 m for 21 + or - 3 months performed a maximal-effort 720-kJ cycle TT at the AFA and at Pikes Peak (PP), CO (4300 m) on days 1 (PP1) and 3 (PP3). Daily energy intake and expenditure were maintained similarly at the AFA and PP. At the start of the TTs at PP, and then every 15 min thereafter, 9 subjects drank a 10% CHO solution (0.175 g/kg body weight) and 6 subjects drank a placebo (PLA) solution. All subjects were allowed to freely adjust the power output of the cycle ergometer and drank water ad libitum. Performance time did not differ between groups on PP1 (CHOS vs. PLA; 101 + or - 8 vs. 116 + or - 10 min) or PP3 (95 + or - 8 vs. 107 + or - 12 min). For both groups, cycle times on PP1 and PP3 were longer compared to the AFA (p\h0.01) and were improved from PP1 to PP3 (p\h0.05). Exercise intensity (i.e. % peak oxygen uptake) was maintained similarly at approx 62% during the TTs at the AFA and PP. Blood glucose was 1.5 to 2.0 mmol/L higher for the CHOS vs. PLA (p\h0.01). It was concluded that CHOS provided no TT performance benefit for MAR at 4300 m when energy balance was maintained. However, the decrements in TT performance and exercise intensity were attenuated at 4300 m in MAR compared to those of SLR as a result of acclimatization attained while living for nearly 2 years at approx. 2000 m.

DTIC

Altitude Acclimatization; Carbohydrates

20070007413 Naval Postgraduate School, Monterey, CA USA

Modeling Cognitive and Tactical Aspects in Hunter - Killer Missions

Berman, Ohad; Dec 2006; 119 pp.; In English; Original contains color illustrations

Report No.(s): AD-A460445; No Copyright; Avail.: CASI: A06, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460445

In this thesis, we present a Markov-based probability model for a human operated system of aerial hunter-killers attacking time-sensitive targets. We explore the effect of two resources time and supply of munitions and some cognitive aspects of the human operator on the performance of the system in different operational scenarios. We model the combat mission as a sequence of engagements; each of which includes a classification process, followed by a firing decision, and a shooting process. The model of the classification process addresses possible effects of stress on the operator's behavior and performance. Two shooting tactics are considered. The random shooting tactic, which is memory-less and with no fire control, BDA capability or mission support systems, sets a benchmark for more effective shoot-look-shoot tactic, where resources are utilized more efficiently. The model represents various tactical parameters regarding rules of engagement and various mixes of resources. Applying the model on some real-world scenarios, we identify mixes of resources and tactical engagement rules that enhance the effectiveness and efficiency of the combat mission.

DTIC

Cognition; Fire Control; Warfare

20070008018 Army Research Inst. of Environmental Medicine, Natick, MA USA

Hypohydration and Prior Heat Stress Exacerbates Decreases in Cerebral Blood Flow Velocity During Standing

Carter III, Robert; Cheuvront, Samuel N; Vernieuw, Carrie R; Sawka, Michael N; Aug 17, 2006; 8 pp.; In English

Report No.(s): AD-A459014; USARIEM-M06-15; No Copyright; Avail.: CASI: A02, Hardcopy

Hypohydration and prior heat stress exacerbates decreases in cerebral blood flow velocity during standing. J Appl Physiolo 101: 1744-1750, 2006. Hypohydration is associated with orthostatic intolerance; however, little is known about cerebrovascular mechanisms responsible. This study examined whether hypohydration reduces cerebral blood flow velocity (CBFV) in response to an orthostatic challenge.

DTIC

Blood Flow; Brain Circulation; Flow Velocity; Heat Tolerance; Hydration

20070008024 Army Research Inst. of Environmental Medicine, Natick, MA USA

Effect of Acetazolamide on Leg Endurance Exercise at Sea Level and Simulated Altitude

Fulco, Charles S; Muza, Steven R; Ditzler, Dan; Lammi, Eric; Lewis, Steven F; Cymerman, Allen; Jan 2006; 11 pp.; In English

Report No.(s): AD-A459470; No Copyright; Avail.: CASI: A03, Hardcopy

Acetazolamide can be taken at sea level to prevent acute mountain sickness during subsequent altitude exposure. Acetazolamide causes metabolic acidosis at sea level and altitude, and increase Sao2 (arterial oxygen saturation) at altitude. The aim of the present study was to determine whether acetazolamide impairs muscle endurance at sea level but not simulated altitude (4300 m for \h3 h).

DTIC

Acetazolamide; Altitude; Altitude Simulation; Physical Exercise; Sea Level

20070008088 NASA Johnson Space Center, Houston, TX, USA

Exploiting Aerobic Fitness to Reduce Risk of Hypobaric Decompression Sickness

Conkin, J.; Gernhardt, M. L.; Wessel, J. H.; [2007]; 1 pp.; In English; Undersea and Hyperbaric Medical Society annual meeting, 14-16 Jun. 2007, Maui, HI, USA

Contract(s)/Grant(s): NNJ06HG25A; Copyright; Avail.: CASI: A01, Hardcopy

Decompression sickness (DCS) is multivariable. But we hypothesize an aerobically fit person is less likely to experience hypobaric DCS than an unfit person given that fitness is exploited as part of the denitrogenation (prebreathe, PB) process prior to an altitude exposure. Aerobic fitness is peak oxygen uptake (VO2pk, ml/kg/min). Treadmill or cycle protocols were used over 15 years to determine VO2pks. We evaluated dichotomous DCS outcome and venous gas emboli (VGE) outcome detected in the pulmonary artery with Doppler ultrasound associated with VO2pk for two classes of experiments: 1) those with no PB or PB under resting conditions prior to ascent in an altitude chamber, and 2) PB that included exercise for some part of the PB. There were 165 exposures (mean VO2pk 40.5 plus or minus 7.6 SD) with 25 cases of DCS in the first protocol class and 172 exposures (mean VO2pk 41.4 plus or minus 7.2 SD) with 25 cases of DCS in the second. Similar incidence of the DCS (15.2% vs. 14.5%) and VGE (45.5% vs. 44.8%) between the two classes indicates that decompression stress was similar. The strength of association between outcome and VO2pk was evaluated using univariate logistic regression. An inverse relationship between the DCS outcome and VO2pk was evident, but the relationship was strongest when exercise was done as part of the PB (exercise PB, coef. = -0.058, p = 0.07; rest or no PB, coef. = -0.005, p = 0.86). There was no relationship between VGE outcome and VO2pk (exercise PB, coef. = -0.003, p = 0.89; rest or no PB, coef. = 0.014, p = 0.50). A significant change in probability of DCS was associated with fitness only when exercise was included in the denitrogenation process. We believe a fit person that exercises during PB efficiently eliminates dissolved nitrogen from tissues.

Author

Decompression Sickness; Physical Exercise; Physical Fitness; Risk; Hypobaric Atmospheres

20070008090 NASA Johnson Space Center, Houston, TX, USA

Role for Lower Extremity Interstitial Fluid Volume Changes in the Development of Orthostasis after Simulated Microgravity

Platts, Steven H.; Summers, Richard L.; Martin, David S.; Meck, Janice V.; Coleman, Thomas G.; [2007]; 2 pp.; In English; IAA Humans in Space, 20-24 May 2007, Beijing, China; Copyright; Avail.: CASI: A01, Hardcopy

Reentry orthostasis after exposure to the conditions of spaceflight is a persistent problem among astronauts. In a previous study, a computer model systems analysis was used to examine the physiologic mechanisms involved in this phenomenon. In this analysis, it was determined that an augmented capacitance of lower extremity veins due to a fluid volume contracture of the surrounding interstitial spaces during spaceflight results in an increase in sequestered blood volume upon standing and appears to be the initiating mechanism responsible for reentry orthostasis. In this study, we attempt to validate the central premise of this hypothesis using a ground-based spaceflight analog. 10 healthy subjects were placed at bed rest in a 6 head down tilt position for 60 days of bed rest. The impact of adaptations in interstitial fluid volume and venous capacitance in the lower extremities were then observed during a standard tilt test protocol performed before and after the confinement period. The interstitial thickness superficial to the calcaneous immediately below the lateral malleolus was measured using ultrasound with a 17-5 MHz linear array transducer. Measurements of the changes in anterior tibial vein diameter during tilt were obtained by similar methods. The measurements were taken while the subjects were supine and then during upright tilt (80') for thirty minutes, or until the subject had signs of presyncope. Additional measurements of the superficial left tibia interstitial thickness and stroke volume by standard echocardiographic methods were also recorded. In addition, calf compliance was measured over a pressure range of 10-60 mmHg, using plethysmography, in a subset of these subjects (n = 5). There was a average of

6% diminution in the size of the lower extremity interstitial space as compared to measurements acquired prior to bed rest. This contracture of the interstitial space coincided with a subsequent relative increase in the percentage change in tibial vein diameter and stroke volume upon tilting in contrast to the observations made before bed rest (54 vs 23% respectively). Compliance in the calf increased by an average of 36% by day 27 of bedrest. A systems analysis using a computer model of cardiovascular physiology suggests that microgravity induced interstitial volume depletion results in an accentuation of venous blood volume sequestration and is the initiating event in reentry orthostasis. This hypothesis was tested in volunteer subjects using a ground-based spaceflight analog model that simulated the body fluid redistribution induced by microgravity exposure. Measurements of changes in the interstitial spaces and observed responses of the anterior tibial vein with tilt, together with the increase in calf compliance, were consistent with our proposed mechanism for the initiation of postflight orthostasis often seen in astronauts.
Author
Interstitials; Microgravity; Simulation; Computerized Simulation; Fluids; Orthostatic Tolerance; Musculoskeletal System

20070008213 NASA Johnson Space Center, Houston, TX, USA
Renal Stone Risk During Space Flight: Assessment and Countermeasure Validation
Whitson, P. A.; Sams, C. F.; Jones, J. A.; Pietrzke, R. A.; Nelman-Gonzalez, M. A.; Hudson, E. K.; [2007]; 1 pp.; In English; NASA Human Research Program Investigators' Meeting, 12-14 Feb. 2007, League City, TX, USA; Copyright; Avail.: CASI: A01, Hardcopy

NASA has focused its future on exploration class missions including the goal of returning to the moon and landing on Mars. With these objectives, humans will experience an extended exposure to the harsh environment of microgravity and the associated negative effects on all the physiological systems of the body. Exposure to microgravity affects human physiology and results in changes to the urinary chemical composition during and after space flight. These changes are associated with an increased risk of renal stone formation. The development of a renal stone would have health consequences for the crewmember and negatively impact the success of the mission. As of January 2007, 15 known symptomatic medical events consistent with urinary calculi have been experienced by 13 U.S. astronauts and Russian cosmonauts. Previous results from both MIR and Shuttle missions have demonstrated an increased risk for renal stone formation. These data have shown decreased urine volume, urinary pH and citrate levels and increased urinary calcium. Citrate, an important urinary inhibitor of calcium-containing renal stones binds with calcium in the urine, thereby reducing the amount of calcium available to form calcium oxalate stones. Urinary citrate also prevents calcium oxalate crystals from aggregating into larger crystals and into renal stones. In addition, citrate makes the urine less acidic which inhibits the development of uric acid stones. Potassium citrate supplementation has been successfully used to treat patients who have formed renal stones. The evaluation of potassium citrate as a countermeasure has been performed during the ISS Expeditions 3-6, 8, 11-13 and is currently in progress during the ISS Expedition 14 mission. Together with the assessment of stone risk and the evaluation of a countermeasure, this investigation provides an educational opportunity to all crewmembers. Individual urinary biochemical profiles are generated and the risk of stone formation is estimated. Increasing fluid intake is recommended to all crewmembers. These results can be used to lower the risk for stone formation through lifestyle, diet changes or therapeutic administration to minimize the risk for stone development. With human presence in microgravity a continuing presence and exploration class missions being planned, maintaining the health and welfare of all crewmembers is critical to the exploration of space.
Author
Space Exploration; Exposure; Microgravity; Countermeasures; Physiology; Urology; Renal Function; Biochemistry; Chemical Composition

20070008310 NASA Johnson Space Center, Houston, TX, USA
Gender Consideration in Experiment Design for Air Break in Prebreathe
Conkin, Johnny; Dervay, Joseph P.; Gernhardt, Michael L.; [2007]; 1 pp.; In English; 2007 Bioastronautics Investigators' Workshop, 12-14 Feb. 2007, League City, TX, USA
Contract(s)/Grant(s): NNJ06HG25A; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070008310

If gender is a confounder of the decompression sickness (DCS) or venous gas emboli (VGE) outcomes of a proposed air break in oxygen prebreathe (PB) project, then decisions about the final experiment design must be made. We evaluated if the incidence of DCS and VGE from tests in altitude chambers over 20 years were different between men and women after resting and exercise PB protocols. Nitrogen washout during PB is our primary risk mitigation strategy to prevent subsequent DCS and VGE in subjects. Bubbles in the pulmonary artery (venous blood) were detected from the precordial position using Doppler ultrasound bubble detectors. The subjects were monitored for VGE for four min at about 15 min intervals for the duration of

the altitude exposure, with maximum bubble grade assigned a Spencer Grade of IV.
Derived from text
Aeroembolism; Experiment Design; Females; Oxygen Breathing; Males; Decompression Sickness

20070008433 NASA Johnson Space Center, Houston, TX, USA
Pharmacovigilance in Space: Stability Payload Compliance Procedures
Daniels, Vernie R.; Putcha, Lakshmi; [2007]; 26 pp.; In English; NASA - HRP Investigator's Workshop, 12-14 Feb. 2007, TX, USA; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Pharmacovigilance is the science of, and activities relating to the detection, assessment, understanding, and prevention of drug-related problems. Over the lase decade, pharmacovigilance activities have contributed to the development of numerous technological and conventional advances focused on medication safety and regulatory intervention. The topics discussed include: 1) Proactive Pharmacovigilance; 2) A New Frontier; 3) Research Activities; 4) Project Purpose; 5) Methods; 6) Flight Stability Kit Components; 7) Experimental Conditions; 8) Research Project Logistics; 9) Research Plan; 10) Pharmaceutical Stability Research Project Pharmacovigilance Aspects; 11) Security / Control; 12) Packaging/Containment Actions; 13) Shelf-Life Assessments; 14) Stability Assessment Parameters; 15) Chemical Content Analysis; 16) Preliminary Results; 17) Temperature/Humidity; 18) Changes in PHysical and Chemical Assessment Parameters; 19) Observations; and 20) Conclusions.
CASI
Aerodynamic Stability; Payloads; Pharmacology; Regulations

20070008851 Air Force Research Lab., Brooks AFB, TX USA
Communication and Decisionmaking in C4ISR Sustained Operations: An Experimental Approach
Harville, Donald L; Elliott, Linda R; Barnes, Christopher; Miller, James C; Jan 2003; 14 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461627; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461627

This report describes the approach and initial results of a systematic investigation of individual and team C4ISR communication and performance in complex time-critical targeting scenarios over a sustained period of time. To date, there have been few systematic and experimental programs of research on the effects of fatigue on complex decision making, team communication, coordination, shared awareness, or performance. In this report, the authors focus their efforts on aspects of C4ISR communication and coordination, and how one can assess the impact of fatigue on complex team communication and performance over time. Research participants were drawn from a pool of USAF officers awaiting Air Battle Management Training at Tyndall AFB, FL. Subjects were grouped into six 3-member teams. Each participant participated in a 40-hour training session occurring during a 1-week period. The training included administrative processing (1 hr), training on cognitive test battery (9 hrs.), and training on C4ISR assets, capabilities, and tactics, along with AEDGE interface functions (30 hrs). The experimental session began at 6 pm on the last day of training and ended at 11 am the following morning. They participated as 3-person teams, every other hour, in 8 40-minute team-based C4ISR decision making scenarios, with 20 additional minutes for each session for debriefing, data collection, and mission planning for the next session. Every other hour, between each scenario session, they performed on a standard cognitive test battery that assesses reaction time, working memory, and multitasking. They also provided physiological (e.g. temperature, etc.), mood-state, and sleepiness data. All e-mail and audio communications were digitally captured for transcription. This resulted in extensive cognitive performance and simulation-based performance. Data collection is still underway.
DTIC
Command and Control; Decision Making; Human Performance; Sleep Deprivation; Teams

20070009166 Air Force Research Lab., Wright-Patterson AFB, OH USA
Vibration Transmissibility Characteristics of Occupied Suspension Seats
Smith, Suzanne D; Smith, Jeanne A; Newman, Raymond J; Sep 2006; 63 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8650-04-D-6472; Proj-7184
Report No.(s): AD-A462026; No Copyright; Avail.: CASI: A04, Hardcopy

A study was conducted to evaluate the transmissibility characteristics of occupied suspension seats in multi-axis vibration environments using locomotive seats. Exposures included a flat acceleration spectrum and two signals extracted from locomotive floor data. The multiple input/single output system transfer matrix and overall transmission were calculated at the

seat and several anatomical sites. While the transmissibilities showed minimal off-axis contributions to the seat responses, off-axis contributions were evidenced at the chest and head for the flat spectrum exposure. Off-axis vibration and other factors contributed to the seat, chest, and head motions during exposure to the locomotive vibrations. Significantly higher overall transmissions were observed in the vertical direction at the seat and head, and in the fore-and-aft and vertical directions at the chest using the suspension seat with shocks removed. The relatively large, low frequency multi-axis motions observed at the chest may be a contributor to discomfort in locomotive engineers. Seat Effective Amplitude Transmissibility values were determined for estimating the overall seat pan acceleration from monitored locomotive floor accelerations for targeting potentially harmful vibration exposures at the cab seat (ISO 2631-1: 1997).
DTIC
Locomotives; Seats; Vibration

20070009220 Naval Health Research Center, San Diego, CA USA
A Comparison of Three Models of Ellipticdal Trainer
Vickers, Jr , Ross R; Griswold, Lisa; Hodgon, James A; Aug 31, 2006; 19 pp.; In English; Original contains color illustrations
Report No.(s): AD-A462116; NHRC-06-31; No Copyright; Avail.: CASI: A03, Hardcopy

Elliptical trainers provide strenuous exercise for large muscle groups with less ground force reaction than running. The reduced ground force makes an elliptical trainer bout a potential alternative to the 1.5-mi run in the U.S. Navy Physical Readiness Test (PRT). This alternative could reduce the risks associated with testing, particularly for individuals who otherwise might receive a medical waiver for that portion of the PRT. Previous investigations established the feasibility of elliptical trainer testing for Life Fitness CT 9500HR machines. The present investigation examined two additional machines, Precor EFX 556 and Nautilus E916, because Lifestyle Fitness machines are not available at all potential test sites. The Lifestyle Fitness investigations indicated that calorie reports from the elliptical trainers predicted 1.5-mi run time after allowing for a positive bias in the reports. An algorithm to convert elliptical trainer performance to equivalent run time was developed. The present investigation compared Precor and Nautilus machines to the Lifestyle Fitness machine. These machines provide biased estimates of calorie expenditure. The size of the bias was the only difference between machines. The test algorithm developed for the Life Fitness machine should accurately convert Nautilus and Precor calorie reports to run times after adjusting for bias differences.
DTIC
Cardiovascular System; Physical Fitness; Training Devices

53
BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

20070006746 NASA Johnson Space Center, Houston, TX, USA
Development of a Human Behavior and Performance Training Curriculum for ISS Astronauts
VanderArk, Steve; Tomi, Leena; Vassin, Alexander; Inoue, Natsuhiko; Bessone, Lorendana; OConnor, Sharon; Mukai, Chiaki; Coffee, Emily; Sipes, Walter; Salnitskiy, Vyecheslav; Ren, Victor; Spychalski, Annette; [2007]; 1 pp.; In English; 2007 Human in Space Symposium, 21-25 May 2007, Beijing, China
Contract(s)/Grant(s): NAS9-02078; Copyright; Avail.: CASI: A01, Hardcopy

The paper will describe the DACUM process and summarize the core competencies that were agreed upon, internationally, as important for ISS astronauts. The paper will further discuss the ongoing work being completed by the subgroup, Human Behaviour and Performance Training Working Group, including defining the competencies and behavioural markers. Finally, an overview of remaining work will be provided, including determining which competencies require formal training and which require no formal training, developing training objectives, sequencing the training, and establishing how to assess training effectiveness. DISCUSSION: Designing a common set of goals for behavioural training has been the desire of the SHBP WG since its inception in 1998. This group, along with training specialists and astronauts, are making great strides toward defining these competencies. The road ahead will be exceedingly challenging as training objectives are defined and a training flow is proposed to the MCOP; with proposed ISS crews increasing to six people in the near future, such enhanced behavioural training may be all the more essential for mission success.
Author
Human Performance; Astronauts; Human Behavior; Education; Sequencing

54
MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human factors engineering, bionics, man-machine systems, life support, space suits and protective clothing. For related information see also *16 Space Transportation and Safety* and *52 Aerospace Medicine*.

20070006843 NASA Johnson Space Center, Houston, TX, USA
Possible Applications of Photoautotrophic Biotechnologies at Lunar Settlements
McKay, David S.; Allen, Carl; Jones, J. A.; Bayless, D.; Brown, I.; Sarkisova, S.; Garrison, D.; [2007]; 1 pp.; In English; Rutgers SYmposium on Lunar Settlements, 5-7 Jun. 2007, Rutgers, NJ, USA; Copyright; Avail.: Other Sources; Abstract Only

The most ambitious goal of the Vision of Space Exploration is to extend human presence across the solar system. Today, however, missions would have to bring all of the propellant, air, food, water, habitable volumes and shielding needed to sustain settlers beyond Earth. That is why resources for propellants, life support and construction of support systems and habitats must be found in space and utilized if humans hope to ever explore and colonize the solar system. The life support, fuel production and material processing systems currently proposed for spaceflight are essentially disconnected. Only traditional crop production has been proposed as a segment for bioregenerative life support systems, although the efficiency of higher plants for air regeneration is generally low. Thus, the investigation of air bioregeneration techniques based on the activity of photosynthetic organisms with higher rates of CO2 scrubbing and O2 release is very timely and important. Future systems for organic waste utilization in space may also benefit from the use of specific microorganisms. This janitorial job is efficiently carried out by microbes on Earth, which drive and connect different elemental cycles. It is likely that environmental control and life support systems based on bioregeneration will be capable of converting both organic and inorganic components of the waste at lunar settlements into edible biomass. The most challenging technologies for future lunar settlements are the extraction of elements (e.g. Fe, O, Si, etc) from local rocks for industrial feedstocks and the production of propellants. While such extraction can be accomplished by purely inorganic processes, the high energy requirements of such processes motivates the search for alternative technologies with lower energy requirements and appropriate efficiency. Well-developed terrestrial industrial biotechnologies for metals extraction and conversion could therefore be the prototypes for extraterrestrial biometallurgy.
Author
Biotechnology; Life Support Systems; Space Exploration; Habitats; Environmental Control; Fuel Production; Waste Utilization

20070007304 NASA Johnson Space Center, Houston, TX, USA, NASA Ames Research Center, Moffett Field, CA, USA
Space Human Factors Engineering Gap Analysis Project Final Report
Hudy, Cynthia; Woolford, Barbara; June 30, 2006; 65 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): NAS9-02078; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070007304

Humans perform critical functions throughout each phase of every space mission, beginning with the mission concept and continuing to post-mission analysis (Life Sciences Division, 1996). Space missions present humans with many challenges - the microgravity environment, relative isolation, and inherent dangers of the mission all present unique issues. As mission duration and distance from Earth increases, in-flight crew autonomy will increase along with increased complexity. As efforts for exploring the moon and Mars advance, there is a need for space human factors research and technology development to play a significant role in both on-orbit human-system interaction, as well as the development of mission requirements and needs before and after the mission. As part of the Space Human Factors Engineering (SHFE) Project within the Human Research Program (HRP), a six-month Gap Analysis Project (GAP) was funded to identify any human factors research gaps or knowledge needs. The overall aim of the project was to review the current state of human factors topic areas and requirements to determine what data, processes, or tools are needed to aid in the planning and development of future exploration missions, and also to prioritize proposals for future research and technology development.
Derived from text
Human Factors Engineering; Space Missions; Systems Integration; Data Processing

20070007484 Massachusetts Inst. of Tech., Cambridge, MA USA

PEGASUS: A Spoken Language Interface for On-Line Air Travel Planning

Zue, Victor; Seneff, Stephanie; Polifroni, Joseph; Phillips, Michael; Pao, Christine; Goddeau, David; Glass, James; Brill, Eric; Jan 1994; 7 pp.; In English

Contract(s)/Grant(s): N00014-89-J-1332

Report No.(s): AD-A460588; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460588

This paper describes PEGASUS, a spoken language interface for on-line air travel planning that we have recently developed. PEGASUS leverages off our spoken language technology development in the ATIS domain, and enables users to book flights using the American Airlines EAASY SABRE system. The input query is transformed by the speech understanding system to a frame representation that captures its meaning. The tasks of the System Manager include transforming the semantic representation into an EAASY SABRE command, transmitting it to the application backend, formatting and interpreting the resulting information, and managing the dialogue. Preliminary evaluation results suggest that users can learn to mike productive use of PEGASUS for travel planning, although much work remains to be done.

DTIC

Air Transportation; Human-Computer Interface; Natural Language (Computers); On-Line Systems; Speech

20070007618 Civil Aeromedical Inst., Oklahoma City, OK USA

Reliability of the Gas Supply in the Air Force Emergency Passenger Oxygen System

Garner, Joseph P; Mandella, Jr, Joseph G; Oct 2005; 13 pp.; In English

Report No.(s): AD-A460831; DOT-FAA-AM-05-18; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460831

The protective breathing equipment (PBE) procured by the U.S. Air Force as Emergency Passenger Oxygen System (EPOS; Fig. 1) was alleged to have significant numbers of inadequate oxygen cylinders. In theory, this could prevent the PBE from providing the required time of protection for the user. The Civil Aerospace Medical Institute was requested to participate in the testing for the possibility of inadequate oxygen cylinders through the U.S. Air Force Office of Special Investigations. To test for any potential leakage and therefore an inadequate quantity of oxygen, EPOS units were collected from Air Force bases and submitted by the manufacturer for a series of tests. The primary indicator in the testing was the mass (weight) of oxygen in the cylinder. A total of 92 oxygen cylinders that were manufactured for assembly into EPOS or similar models of PBE were evaluated. Estimated dates of manufacture were between January 1989 and November of 2003. Four tests were conducted. The first measurement was the oxygen concentration in the vacuum-packaged PBE. The oxygen cylinders were then removed from the PBE and any difference between the current cylinder weight and the cylinder weight at manufacture was recorded. The cylinders were then exposed to 40,000 feet altitude in a hypobaric chamber for 4 hours. Weights before and after the chamber exposure were recorded. Finally, the cylinders were emptied of oxygen and the empty cylinder weight recorded. Two oxygen cylinders had large oxygen deficits (\g11 grams). Based on the results of the altitude testing, the loss did not appear to be related to diffusion out of the cylinder. Therefore, other explanations need to be examined as to why these two cylinder shortages existed.

DTIC

Breathing Apparatus; Emergencies; Gases; Military Air Facilities; Oxygen; Oxygen Supply Equipment; Passengers; Protectors; Reliability; Smoke

20070007674 Army Tank-Automotive Research and Development Command, Warren, MI USA

The Bekker Model Analysis for Small Robotic Vehicles

Gerhart, Grant R; Oct 1, 2004; 10 pp.; In English

Report No.(s): AD-A460934; AMSTA-TR-R/MS-263; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460934

This paper uses the Bekker model for land locomotion analysis to compare ground vehicle vehicles with different running gear configurations. The Bekker model is inherently phenomenological in nature and requires empirical data to both calibrate and validate the methodology for realistic soil/terrain conditions. This formalism consists or two fundamental equations. The ii ret uses the Coulomb-Mohr law and a linear, one degree or freedom spring/mass/damper model to predict terrain shear rates from maximum vehicle tractive effort. The second empirically predicts soil sinkage as a function of ground pressure loading. The latter contains no phenomenological link to the continuum mechanics of terrain materials and conditions.

DTIC

Navigation; Robotics

20070008097 NASA Johnson Space Center, Houston, TX, USA

Eva Physiology, Systems, and Performance (EPSP) Project Overview

Gernhardt, Michael L.; [2007]; 1 pp.; In English; HRP Investigators' Workshop, 12-14 Feb. 2007, League City, TX, USA; No Copyright; Avail.: Other Sources; Abstract Only

Extravehicular activity (EVA) is any activity performed by astronauts outside their space vehicle or habitat. EVA may be performed on orbit, such as outside the Space Shuttle or the International Space Station, or on a planetary surface such as Mars or on the moon. Astronauts wear a pressurized suit that provides environmental protection, mobility, life support, and communications while they work in the harsh conditions of a microgravity environment. Exploration missions to the moon and Mars may last many days and will include many types of EVAs; exploration, science, construction and maintenance. The effectiveness and success of these EVA-filled missions is dependent on the ability to perform tasks efficiently. The EVA Physiology, Systems and Performance (EPSP) project will conduct a number of studies to understand human performance during EVA, from a molecular level to full-scale equipment and suit design aspects, with the aim of developing safe and efficient systems for Exploration missions and the Constellation Program. The EPSP project will 1) develop Exploration Mission EVA suit requirements for metabolic and thermal loading, optional center of gravity location, biomedical sensors, hydration, nutrition, and human biomedical interactions; 2) develop validated EVA prebreathe protocols that meet medical, vehicle, and habitat constraints while minimizing crew time and thus increasing EVA work efficiency; and 3) define exploration decompression sickness (DCS) risks, policy, and mission success statistics and develop a DCS risk definition report.

Author

Extravehicular Activity; Human Performance; International Space Station; Planetary Surfaces; Space Shuttles; Life Support Systems; Astronauts

20070008231 NASA Ames Research Center, Moffett Field, CA, USA

List Models of Procedure Learning

Matessa, Michael P.; Polson, Peter G.; October 2005; 26 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): 711-60-01; WU 457280.02.07.01

Report No.(s): NASA/TM-2005-213465; A-0514345; Copyright; Avail.: CASI: A03, Hardcopy

This paper presents a new theory of the initial stages of skill acquisition and then employs the theory to model current and future training programs for fight management systems (FMSs) in modern commercial airliners like the Boeing 777 and the Airbus A320. The theoretical foundations for the theory are a new synthesis of the literature on human memory and the latest version of the ACT-R theory of skill acquisition.

Author

Education; Management Systems; Boeing 777 Aircraft; Commercial Aircraft; European Airbus

20070008299 Westat Research, Inc., Rockville, MD, USA

Human Factors Guidance for Intelligent Transportation Systems at the Highway-Rail Intersection

Jenness, J. W.; Lerner, N. D.; Llaneras, R. E.; Singer, J. P.; Huey, R. W.; Dec. 2006; 202 pp.; In English

Report No.(s): PB2007-105133; No Copyright; Avail.: National Technical Information Service (NTIS)

This document provides guidance recommendations and supporting material to assist designers and implementers of intelligent transportation system (ITS) applications related to highway-rail intersections (HRI). The guidance focuses specifically on roadway user human factors requirements associated with ITS as applied to HRIs. The guidance is intended to be of immediate help to practitioners but also to serve as a resource and impetus toward the development of consensus standards and other more formal guidance or specification. Part 1 describes the purpose and scope and provides a human factors conceptualization of the roadway user. Part 2 provides an overview of ITS applications that have been implemented at HRIs. Part 3 presents general human factors guidance that cuts across various specific HRI applications, for topics such as message factors, roadside displays, in-vehicle displays, and displays for pedestrians. Part 4 presents guidance for specific HRI applications, including train arrival warnings, advance information about the HRI, enforcement and control of vehicles, and light rail transit. Each guidance chapter provides background on the topic, an explicit statement of the major human factors issues, and a set of guidance recommendations (with accompanying rationale for each). This report includes over 130 guidance recommendations.

NTIS

Crossings; Highways; Human Factors Engineering; Intersections; Rail Transportation; Rails; Transportation

20070008300 Foster-Miller Associates, Inc., Waltham, MA, USA
Work Schedules and Sleep Patterns of Railroad Maintenance of Way Workers
Gertler, J.; Viale, A.; Dec. 2006; 87 pp.; In English
Contract(s)/Grant(s): DFRA-010350-002
Report No.(s): PB2007-105119; No Copyright; Avail.: CASI: A05, Hardcopy

This report presents the results of a study designed to characterize the work/rest schedules and sleep patterns of U.S. railroad maintenance of way (MOW) employees and to examine the relationship between these schedules and levels of alertness of the individuals working the schedules. The study methodology was a survey of a random sample of currently working U.S. MOW employees who completed a background survey and kept a daily log for 2 weeks. MOW workers are a predominantly healthy middle-aged male population. They work either production (construction) or non-production (maintenance) jobs and focus on either track or bridge and building infrastructure. A majority of non-production jobs have a 5-day work week, but nearly half of production jobs work a 4-day week and 20 percent work 8-on 6-off. Overall, 24 percent of MOW workers traveled on their own time to an out-of-town worksite during the studys 2-week period. Both groups get the same amount of sleep, but it is significantly less than U.S. adult norms. Several work schedule characteristics, including time without a break, total hours worked, weeknight emergency calls, and commute time, were related to daytime alertness, but their relationship was weak.
NTIS
Alertness; Maintenance; Personnel; Rail Transportation; Schedules; Sleep

20070008478 Lockheed Martin Corp., Camden, NJ USA
Listen-Communicate-Show (LCS): Spoken Language Command of Agent-Based Remote Information Access
Daniels, Jody J; Bell, Benjamin; Jan 2001; 5 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N66001-98-D-8507; N47406-99-C-7033
Report No.(s): AD-A460994; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460994

Listen-Communicate-Show (LCS) is a new paradigm for human interaction with data sources. We integrate a spoken language understanding system with intelligent mobile agents that mediate between users and information sources. We have built and will demonstrate an application of this approach called LCS-Marine. Using LCS-Marine, tactical personnel can converse with their logistics system to place a supply or information request. The request is passed to a mobile, intelligent agent for execution at the appropriate database. Requestors can also instruct the system to notify them when the status of a request changes or when a request is complete. We have demonstrated this capability in several field exercises with Marines and are currently developing applications of this technology in new domains.
DTIC
Man Machine Systems; Speech

20070008602 Rensselaer Polytechnic Inst., Troy, NY USA
Soft Constraints in Interactive Behavior: The Case of Ignoring Perfect Knowledge In-The-World for Imperfect Knowledge In-The-Head
Gray, Wayne D; Fu, Wai-Tat; Dec 15, 2003; 25 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F49620-97-1-0353; F49620-03-1-0143
Report No.(s): AD-A461208; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461208

Constraints and dependencies among the elements of embodied cognition form patterns or microstrategies of interactive behavior. Hard constraints determine which microstrategies are possible. Soft constraints determine which of the possible microstrategies are most likely to be selected. When selection is non-deliberate or automatic the least effort microstrategy is chosen. In calculating the effort required to execute a microstrategy each of the three types of operations, memory retrieval, perception, and action, are given equal weight; that is, perceptual-motor activity does not have a privileged status with respect to memory. Soft constraints can work contrary to the designer's intentions by making the access of perfect knowledge in-the-world more effortful than the access of imperfect knowledge in-the-head. These implications of soft constraints are tested in two experiments. In experiment 1 we varied the perceptual-motor effort of accessing knowledge in-the-world as well as the effort of retrieving items from memory. In experiment 2 we replicated one of the experiment 1 conditions to collect eye movement data. The results suggest that milliseconds matter. Soft constraints lead to a reliance on knowledge in-the-head even when the absolute difference in perceptual-motor versus memory retrieval effort is small, and even when relying on memory

leads to a higher error rate and lower performance. We discuss the implications of soft constraints for routine interactive behavior, accounts of embodied cognition, and tool and interface design.
DTIC
Cognition; Computer Storage Devices; Eye Movements; Human-Computer Interface; Information Retrieval

20070008843 Space and Naval Warfare Systems Center, San Diego, CA USA
Human-Centered Shipboard Systems and Operations
Osga, Glenn A; Jan 2003; 56 pp.; In English
Report No.(s): AD-A461615; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461615

This chapter presents a conceptual design process based on the experience with the Multimodal Watchstation (MMWS) project. A significant part of this process lies in the definition of tasks and establishment of key requirements. An HCD focus characterizes tasks in an information system work space according to task qualities and dynamic properties. This task-centered approach drives design thinking toward solving users' needs across a broader spectrum of task types and dynamics than is typically considered by systems designers.
DTIC
Human Factors Engineering; Systems Engineering; Systems Integration

20070008862 SRI International Corp., Menlo Park, CA USA
TEAM: An Experiment in the Design of Transportable Natural-Language Interfaces
Grosz, Barbara J; Appelt, Douglas E; Martin, Paul; Pereira, Fernando; Oct 20, 1986; 92 pp.; In English
Contract(s)/Grant(s): N00039-80-C-0645; N00039-83-C-0109
Report No.(s): AD-A461638; TN-356R; No Copyright; Avail.: CASI: A05, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461638

This article describe TEAM, a transportable natural-language interface system. TEAM was constructed to test the feasibility of building a natural-language system that could be adapted to interface with new databases by users who are not experts in natural-language processing. An overview of the system design is presented, emphasizing those choices that were imposed by the demands of transportability. Several general problems of natural-language processing that were faced in constructing the system are discussed, including quantifier scoping, various pragmatic issues, and verb acquisition. TEAM is compared with several other transportable systems; this comparison includes a discussion of the range of natural language handled by each as well as a description of the approach taken to achieving transportability in each system.
DTIC
Experiment Design; Human-Computer Interface; Natural Language (Computers)

20070009253 Illinois Univ., Urbana-Champaign, IL USA
Building Predictive Human Performance Models of Skill Acquisition in a Data Entry Task
Fu, Wai-Tat; Gonzalez, Cleotilde; Healy, Alice F; Kole, James A; Bourne, Jr , Lyle E; Jan 2006; 6 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W911NF-05-1-0153
Report No.(s): AD-A462160; No Copyright; Avail.: CASI: A02, Hardcopy

This paper presents a predictive model of a simple, but important, data entry task. The task requires participants to perceive and encode information on the screen, locate the corresponding keys for the information on different layouts of the keyboard, and enter the information. Since data entry is a central component in most human-machine interaction, a predictive model of performance will provide useful information that informs interface design and effectiveness of training. We created a cognitive model of the data entry task based on the ACT-R 5.0 architecture. The same model provided good fits to three existing data sets, which demonstrated the effects of fatigue with prolonged work, repetition priming, depth of processing, and the suppression of subvocal rehearsal. The model also makes predictions on how performance deteriorates with different delays after training, how different amounts of rehearsal during training affect retention, and how re-training helps retention of skills.
DTIC
Human Performance; Man Machine Systems; Models; Predictions

59
MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

Includes general topics and overviews related to mathematics and computer science. For specific topics in these areas see *categories 60 through 67*.

20070006594 Sandia National Labs., Livermore, CA, USA, College of William and Mary, Williamsburg, VA, USA
Asynchronous Parallel Generating Set Search for Linearly-Constrained Optimization
Griffin, J. D.; Kolda, T. G.; Lewis, R. M.; Aug. 2006; 56 pp.; In English
Report No.(s): DE2006-891372; SAND2006-4621; No Copyright; Avail.: National Technical Information Service (NTIS)

Generating set search (GSS) is a family of direct search methods that encompasses generalized pattern search and related methods. We describe an algorithm for asynchronous linearly-constrained GSS, which has some complexities that make it different from both the asynchronous bound-constrained case as well as the synchronous linearly-constrained case. The algorithm has been implemented in the APPSPACK software framework and we present results from an extensive numerical study using CUTEr test problems. We discuss the results, both positive and negative, and conclude that GSS is a reliable method for solving small-to-medium sized linearly-constrained optimization problems without derivatives.
NTIS
Algorithms; Set Theory; Synchronism

20070006646 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Cryptography for Secure Dynamic Group Communications
Bresson, E.; Chevassut, O.; Pointcheval, D.; 30 Nov 04; 14 pp.; In English
Contract(s)/Grant(s): DE-AC03-76SF00098
Patent Info.: Filed Filed 30 Nov 04; US-Patent-Appl-SN-11-001 251
Report No.(s): PB2007-102768; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention relates to provably secure communications, and more particularly relates to secure communications among dynamic groups.
NTIS
Computers; Cryptography; Security

20070006706 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Interactive Analysis of Large Network Data Collections Using Query-Driven Visualization
Bethel, E. W.; Campbell, S.; Dart, E.; Lee, J.; Smith, S. A.; January 2006; 9 pp.; In English
Report No.(s): DE2006-891627; LBNL-59166; No Copyright; Avail.: Department of Energy Information Bridge

Realizing operational analytics solutions where large and complex data must be analyzed in a time-critical fashion entails integrating many different types of technology. Considering the extreme scale of contemporary datasets, one significant challenge is to reduce the duty cycle in the analytics discourse process. This paper focuses on an interdisciplinary combination of scientific data management and visualization/analysis technologies targeted at reducing the duty cyclein hypothesis testing and knowledge discovery. We present an application of such a combination in the problem domain of network traffic data analysis. Our performance experiment results, including both serial and parallel scalability tests, show that the combination can dramatically decrease the analytics duty cycle for this particular application. The combination is effectively applied to the analysis of network traffic data to detect slow and distributed scans, which is a difficult-to-detect form of cyber attack. Our approach is sufficiently general to be applied to a diverse set of data understanding problems as well as used in conjunction with a diverse set of analysis and visualization tools.
NTIS
Scientific Visualization; Data Base Management Systems

20070007276 National Academy of Sciences - National Research Council, Washington, DC, USA
Catalyzing Inquiry at the Interface of Computing and Biology
Wooley, J. C.; Lin, H. S.; January 2006; 468 pp.; In English
Report No.(s): DE2006-882212; No Copyright; Avail.: National Technical Information Service (NTIS)

This study is the first comprehensive NRC study that suggests a high-level intellectual structure for Federal agencies for supporting work at the biology/computing interface. The report seeks to establish the intellectual legitimacy of a fundamentally cross-disciplinary collaboration between biologists and computer scientists. That is, while some universities are

increasingly favorable to research at the intersection, life science researchers at other universities are strongly impeded in their efforts to collaborate. This report addresses these impediments and describes proven strategies for overcoming them. An important feature of the report is the use of well-documented examples that describe clearly to individuals not trained in computer science the value and usage of computing across the biological sciences, from genes and proteins to networks and pathways, from organelles to cells, and from individual organisms to populations and ecosystems. It is hoped that these examples will be useful to students in the life sciences to motivate (continued) study in computer science that will enable them to be more facile users of computing in their future biological studies.
NTIS
Biology; Computer Techniques; Artificial Intelligence

20070008250 Sandia National Labs., Albuquerque, NM USA, Cornell Univ., Ithaca, NY, USA
Reliability of Dynamic Systems Under Limited Information
Field, R. V.; Grigoriu, M. D.; Sep. 2006; 46 pp.; In English
Report No.(s): DE2006-893552; SAND2006-5580; No Copyright; Avail.: National Technical Information Service (NTIS)

A method is developed for reliability analysis of dynamic systems under limited information. The available information includes one or more samples of the system output; any known information on features of the output can be used if available. The method is based on the theory of non-Gaussian translation processes and is shown to be particularly suitable for problems of practical interest. For illustration, we apply the proposed method to a series of simple example problems and compare with results given by traditional statistical estimators in order to establish the accuracy of the method. It is demonstrated that the method delivers accurate results for the case of linear and nonlinear dynamic systems, and can be applied to analyze experimental data and/or mathematical model outputs. Two complex applications of direct interest to Sandia are also considered. First, we apply the proposed method to assess design reliability of a MEMS inertial switch. Second, we consider re-entry body (RB) component vibration response during normal re-entry, where the objective is to estimate the time-dependent probability of component failure. This last application is directly relevant to re-entry random vibration analysis at Sandia, and may provide insights on test-based and/or model-based qualification of weapon components for random vibration environments.
NTIS
Reliability; Dynamical Systems

20070008252 Sandia National Labs., Albuquerque, NM USA
Evaluation of Risk from Acts of Terrorism: The Adversary/Defender Model Using Belief and Fuzzy Sets
Darby, J. L.; Sep. 2006; 140 pp.; In English
Report No.(s): DE2006-893554; SAND2006-5777; No Copyright; Avail.: National Technical Information Service (NTIS)

Risk from an act of terrorism is a combination of the likelihood of an attack, the likelihood of success of the attack, and the consequences of the attack. The considerable epistemic uncertainty in each of these three factors can be addressed using the belief/plausibility measure of uncertainty from the Dempster/Shafer theory of evidence. The adversary determines the likelihood of the attack. The success of the attack and the consequences of the attack are determined by the security system and mitigation measures put in place by the defender. This report documents a process for evaluating risk of terrorist acts using an adversary/ defender model with belief/plausibility as the measure of uncertainty. Also, the adversary model is a linguistic model that applies belief/plausibility to fuzzy sets used in an approximate reasoning rule base.
NTIS
Fuzzy Sets; Risk; Security; Terrorism

20070008285 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA, National Energy Research Scientific Computing Center, Berkeley, CA, USA
NERSC (National Energy Research Scientific Computing Center) 2005 Annual Report
January 2006; 68 pp.; In English
Report No.(s): DE2006-892946; LBNL-60296; No Copyright; Avail.: National Technical Information Service (NTIS)

The National Energy Research Scientific Computing Center (NERSC) is the premier computational resource for scientific research funded by the DOE Office of Science. The Annual Report includes summaries of recent significant and representative computational science projects conducted on NERSC systems as well as information about NERSC's current and planned systems and services.
NTIS
Computers; Energy Technology

20070008292 Tiffany and Bosco, Phoenix, AZ, USA

Three-Dimensional Digital Library System

Razdan, A.; Rowe, J.; Collins, D.; McCartney, P.; Nielson, G. M.; 4 Apr 03; 85 pp.; In English

Contract(s)/Grant(s): DARPA-MDA972-00-1-0027; NSF-ILS9980166

Patent Info.: Filed Filed 4 Apr 03; US-Patent-Appl-SN-10-510 326

Report No.(s): PB2007-102952; No Copyright; Avail.: CASI: A05, Hardcopy

A computer system (100) and method for the storage, archiving, query and retrieval of information relating to 3D objects is provided. The systme includes data acquisition (130) means for requiring point coordinate data about a three-dimensional object, a database component (105), a processor (103) and a user interface (110). The processor (103) is operable to generate modeled data (105) from the point coordinate data and to segment the modeled data (124) into feature data (122) representing a plurality of features of the object (118). The data is organized so that features of the 3D objects can be automatically extracted for online query and retrieval. The processor (103) is operable to store the modeled data (124) and the feature data (122) in the database component (105) and retrieve modeled data (124) and feature data (122) from the database component (105) using search criteria representing object features of interest. The user interface (110) is operative with the processor (103) to allow a user input search criteria to processor (103) and to display data retrieved by the processor as a representation of an object feature.

NTIS

Computers; Digital Systems; Libraries; On-Line Systems; Three Dimensional Models

20070008346 Sandia National Labs., Livermore, CA, USA, College of William and Mary, Williamsburg, VA, USA

Generating Set Direct Search Augmented Lagrangian Algorithm for Optimization with a Combination of General and Linear Constraints

Kolda, T. G.; Lewis, R. M.; Torczon, V.; Aug. 01, 2006; 45 pp.; In English

Report No.(s): DE2006-893121; SAND2006-5315; No Copyright; Avail.: Department of Energy Information Bridge

We consider the solution of nonlinear programs in the case where derivatives of the objective function and nonlinear constraints are unavailable. To solve such problems, we propose an adaptation of a method due to Conn, Gould, Sartenaer, and Toint that proceeds by approximately minimizing a succession of linearly constrained augmented Lagrangians. Our modification is to use a derivative-free generating set direct search algorithm to solve the linearly constrained subproblems. The stopping criterion proposed by Conn, Gould, Sartenaer and Toint for the approximate solution of the subproblems requires explicit knowledge of derivatives. Such information is presumed absent in the generating set search method we employ. Instead, we show that stationarity results for linearly constrained generating set search methods provide a derivative-free stopping criterion, based on a step-length control parameter, that is sufficient to preserve the convergence properties of the original augmented Lagrangian algorithm.

NTIS

Algorithms; Lagrangian Function; Nonlinearity; Optimization

20070008350 Sandia National Labs., Albuquerque, NM USA

ChISELS 1.0: Theory and User Manual

Musson, L. C.; Schmidt, R. C.; Ho, P.; Plimpton, S. J.; Sep. 2006; 57 pp.; In English

Report No.(s): DE2006-893127; SAND2006-5483; No Copyright; Avail.: National Technical Information Service (NTIS)

Chemically Induced Surface Evolution with Level-Sets--ChISELS--is a parallel code for modeling 2D and 3D material depositions and etches at feature scales on patterned wafers at low pressures. Designed for efficient use on a variety of computer architectures ranging from single-processor workstations to advanced massively parallel computers running MPI, ChISELS is a platform on which to build and improve upon previous feature-scale modeling tools while taking advantage of the most recent advances in load balancing and scalable solution algorithms. Evolving interfaces are represented using the level-set method and the evolution equations time integrated using a Semi-Lagrangian approach (1). The computational meshes used are quad-trees (2D) and oct-trees (3D), constructed such that grid refinement is localized to regions near the surface interfaces. As the interface evolves, the mesh is dynamically reconstructed as needed for the grid to remain fine only around the interface. For parallel computation, a domain decomposition scheme with dynamic load balancing is used to distribute the computational work across processors. A ballistic transport model is employed to solve for the fluxes incident on each of the surface elements. Surface chemistry is computed by either coupling to the CHEMKIN software (2) or by providing user defined subroutines. This report describes the theoretical underpinnings, methods, and practical use instruction of the ChISELS 1.0 computer code.

NTIS

Algorithms; Deposition; User Manuals (Computer Programs)

20070008718 Sataas and Halsey, LLP, Washington, DC, USA
Computer System with Dual Operating Modes
Dolin, P. J.; Raymond, M.; 15 Mar 05; 25 pp.; In English
Contract(s)/Grant(s): GS-35F-0091K; RFP-HS-02002
Patent Info.: Filed Filed 15 Mar 05; US-Patent-Appl-SN-11-079-409
Report No.(s): PB2007-101417; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention is a system that switches between non-secure and secure modes by making processes, applications and data for the non-active mode unavailable to the active mode. That is, non-secure processes, applications and data are not accessible when in the secure mode and visa versa. This is accomplished by creating dual hash tables where one table is used for secure processes and one for non-secure processes. A hash table pointer is changed to point to the table corresponding to the mode. The path-name look-up function that traverses the path name tree to obtain a device or file pointer is also restricted to allow traversal to only secure devices and file pointers when in the secure mode and only to non-secure devices and files in the non-secure mode. The process thread run queue is modified to include a state flag for each process that indicates whether the process is a secure or non-secure process. A process scheduler traverses the queue and only allocates time to processes that have a state flag that matches the current mode. Running processes are marked to be idled and are flagged as unrunnable, depending on the security mode, when the process reaches an intercept point. The switch operation validates the switch process and pauses the system for a period of time to allow all running processes to reach an intercept point and be marked as unrunnable. After all the processes are idled, the hash table pointer is changed, the look-up control is changed to allow traversal of the corresponding security mode branch of the file name path tree, and the scheduler is switched to allow only threads that have a flag that corresponds to the security mode to run. The switch process is then put to sleep and a master process, either secure or non-secure, depending on the mode, is then awakened.
NTIS
Computers; Computer Systems Design; Operating Systems (Computers); Modes

60
COMPUTER OPERATIONS AND HARDWARE

Includes hardware for computer graphics, firmware and data processing. For components see *33 Electronics and Electrical Engineering*. For computer vision see *63 Cybernetics, Artificial Intelligence and Robotics*.

20070007686 551st Electronic Systems Group, Hanscom AFB, MA USA
Proof of Concept Trade Study For Type-1 Operator Training
Jarrel, Debbie; Zaharee, Marcie; Mar 15, 2005; 53 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460951; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460951

The Virtual University (VU) is described as a computer-based, on-line environment enabling real-time interaction between students and instructors. To leverage the most suitable software for this project LM conducted a two-level proof of concept trade study. For Level I a vendor fly-off was conducted to solicit potential candidates for a virtual classroom solution and of those candidates a down-select process was engaged to determine the two most suitable software products. For Level II informal and formal demonstrations were conducted using a participant forum consisting of instructors, students, and observers. In Level I a request for quote was provided to each of the potential vendor candidates along with a formalized Requirements Matrix. The Requirements Matrix was based on a set of factors considered to be essential to the function of a VU. These factors included the ability to function as a live classroom, be employed over a network or the WWW using existing military infrastructure, enable hands-on use of TBMCS software and the ability to operate in a secure internet environment (https). Of the eight vendor recipients four responded with a completed Requirements Matrix form. The four respondents were Centra, Click2learn, Intranet U, and iLinc/NS (Nelson Stiltner) Software. A weighted criteria set, based on the TBMCS Engineering Notebook, established the mechanism to collect responses for analysis and to select the two most suitable candidates.
DTIC
Education; Instructors; On-Line Systems; Proving; Real Time Operation; Students; Virtual Reality

20070008504 Carnegie-Mellon Univ., Pittsburgh, PA USA

A Feasibility Study of the HLA Bridge

Dingel, Juergen; Garlan, David; Damon, Craig A; Mar 15, 2001; 42 pp.; In English

Contract(s)/Grant(s): F30602-00-2-0616; N66001-99-2-8918

Report No.(s): AD-A461048; CMU-CS-01-103; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461048

The High-Level Architecture (HLA) provides a common architecture for distributed modeling and simulation. In its original form the HLA allows a number of simulations to be joined together into a federation using a single run time infrastructure. Recently there has been an interest in joining multiple such federations together using a mediating unit, called an HLA bridge. This document presents an in-depth study of the feasibility of an HLA bridge in the context of the current HLA interface specification. The results are summarized on two levels. First, we identify general classes of problems and solutions. Second, we provide a detailed discussion of the desired behavior of selected service protocols in the presence of a bridge federate.

DTIC

Feasibility

20070008531 Carnegie-Mellon Univ., Pittsburgh, PA USA

Decentralized Recovery for Survivable Storage Systems

Wong, Theodore M; May 2004; 96 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-01-1-0485; F30602-99-2-0539

Report No.(s): AD-A461097; CMU-CS-04-119; No Copyright; Avail.: CASI: A05, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461097

Modern society has produced a wealth of data to preserve for the long term. Some data we keep for cultural benefit, in order to make it available to future generations, while other data we keep because of legal imperatives. One way to preserve such data is to store it using survivable storage systems. Survivable storage is distinct from reliable storage in that it tolerates confidentiality failures in which unauthorized users compromise component storage servers, as well as crash failures of servers. Thus, a survivable storage system can guarantee both the availability and the confidentiality of stored data. Research into survivable storage systems investigates the use of m-of-n threshold sharing schemes to distribute data to servers, in which each server receives a share of the data. Any m shares can be used to reconstruct the data, but any m - 1 shares reveal no information about the data. The central thesis of this dissertation is that to truly preserve data for the long term, a system that uses threshold schemes must incorporate recovery protocols able to overcome server failures, adapt to changing, availability or confidentiality requirements, and operate in a decentralized manner. To support the thesis, I present the design and experimental performance analysis of a verifiable secret redistribution protocol for threshold sharing schemes. The protocol redistributes shares of data from old to new, possibly disjoint, sets of servers, such that new shares generated by redistribution cannot be combined with old shares to reconstruct the original data. The protocol is decentralized, and does not require intermediate reconstruction of the data; thus, one does not create a central point of failure or risk the exposure of the data during protocol execution. The protocol incorporates a verification capability that enables new servers to confirm that their shares can be used to reconstruct the original data.

DTIC

Computer Storage Devices; Data Storage

20070008548 Carnegie-Mellon Univ., Pittsburgh, PA USA

Understanding Customer Dissatisfaction with Underutilized Distributed File Servers

Riedel, Erik; Gibson, Garth; Jul 1996; 20 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00174-96-0002; ARPA ORDER-D306

Report No.(s): AD-A461115; CMU-CS-96-158; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461115

Modern distributed file systems very successfully cache file data on client machines. While this ensures that average response time is low, it also ensures large variance in response time because operations that must contact remote servers are much slower. Direct measurement of these remote servers show that their overall utilization can be quite low, 3% in our data, while users are simultaneously sufficiently dissatisfied with performance to pay for a faster server. This study shows that the faster server is in fact needed because, although 97% idle overall, these file servers can be intensely overloaded during bursts of activity, leading to periods of poor response time long enough to disgruntle users. In addition to focusing our attention on burst server loads, our analysis shows that the distribution of operation types during bursts is different from overall

distributions. Servers should be optimized for workloads with much more data transfer than the overall distribution suggests. These results confirm our intuition that network-attached storage, if it can re-route most data transfer directly to storage devices, has the potential to reduce customer response time in two ways - (1) it avoids the copying steps at the server; and (2) it off-loads the work of data transfer from the server, reducing the chance of a burst of overutilization. Our future work, then, is to evaluate the client performance on such network-attached storage architectures and demonstrate the implications on distributed file system design.
DTIC
Client Server Systems; Distributed Processing; Tasks

20070008587 Army Tank-Automotive Research and Development Command, Warren, MI USA
Compare and Contrast Military Vs. Commercial Ground Vehicle Supportability
Morlitoris, Heather J; Pong, Russell; Lubeckyj, Melissa; Jan 10, 2005; 8 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461181; TARDEC-TR-2005-01-0597; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461181

The Army is actively and forcefully engaged in over 80 countries with approximately 180,000 soldiers operating in various environments with diverse equipment. Approximately 135,000 soldiers are currently operating in Iraq and that number will be sustained through 2005. In order for our soldiers to be effective in their missions, equipment must operate effectively and accurately. However, with current operations our fleets are at a pace ten times that of normal operations (causing entire fleets of trucks and aircrafts need for replacement). The question becomes how does the Army keep up with the demand? The current supply network, although it is operating at 70% of capacity due to attacks on convoys in Iraq, is keeping pace with the demand. General Kern stated, 'We're meeting the requirements but we don't have a lot of slack. If you're in the supply business, you'd like to say you have six months of supplies on the shelf. Right now, we are delivering to meet demands. We are not building any significant reserves. The focus should be how to improve our network to account for the increase demand. This issues falls within the supportability aspect of military operations. Supportability consists of the reliability, training, logistics, and the 'Pit Stop Mentality' of a system. This is comparable to the commercial industry that includes manufacturing requirements, training, logistics and ease of maintenance. The following paper will compare and contrast the military and commercial aspects of supportability, concentrating on the logistic side of supplying parts with respect to contractors and subcontractors. A case study of an M1A2SEP road arms will be evaluated to determine the effectiveness of the current supply system and suggestions for future improvements.
DTIC
Iraq; Logistics; Maintenance; Military Operations

20070008647 Carnegie-Mellon Univ., Pittsburgh, PA USA
Data Mining Meets Performance Evaluation: Fast Algorithms for Modeling Bursty Traffic
Wang, Mengzhi; Madhyastha, Tara; Chan, Ngai H; Paradimitriou, Spiros; Faloutsos, Christos; Apr 2001; 18 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N66001-97-C-8517; N66001-00-1-8936
Report No.(s): AD-A461275; CMU-CS-01-101; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461275

Network, web, and disk I/O traffic are usually bursty, self-similar [9, 3, 5, 6] and therefore can not be modeled adequately with Poisson arrivals[9]. However, we do want to model these types of traffic and to generate realistic traces, because of obvious applications for disk scheduling, network management, web server design. Previous models (like fractional Brownian motion, ARFIMA etc) tried to capture the burstiness . However the proposed models either require too many parameters to fit and/or require prohibitively large (quadratic) time to generate large traces. We propose a simple, parsimonious method, the b-model , which solves both problems: It requires just one parameter (b), and it can easily generate large traces. In addition, it has many more attractive properties: (a)With our proposed estimation algorithm, it requires just a single pass over the actual trace to estimate b. For example, a one-day-long disk trace in milliseconds contains about 86Mb data points and requires about 3 minutes for model fitting and 5 minutes for generation. (b) The resulting synthetic traces are very realistic: our experiments on real disk and web traces show that our synthetic traces match the real ones very well in terms of queuing behavior.
DTIC
Algorithms; Data Mining; Information Retrieval; Traffic

20070008766 Michigan Univ., Ann Arbor, MI USA
Code Compression for DSP
Lefurgy, Charles; Mudge, Trevor; Dec 1998; 7 pp.; In English
Contract(s)/Grant(s): DABT63-97-C-0047
Report No.(s): AD-A461522; CSE-TR-380-98; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461522

Previous works have proposed adding compression techniques to a variety of architectural styles to reduce instruction memory requirements. It is not immediately clear how these results apply to DSP architectures. DSP instructions are longer and have potentially greater variation which can decrease compression ratio. Our results demonstrate that DSP programs do provide sufficient repetition for compression algorithms. We propose a compression method and apply it to SHARC, a popular DSP architecture. Even using a very simple compression algorithm, it is possible to halve the size of the instruction memory requirements.
DTIC
Compression Ratio; Digital Systems; Signal Processing

20070008918 California Univ., Santa Cruz, CA USA
A Comparison of Known Classes of Reliable Multicast Protocols
Levine, Brian N; Jun 1996; 49 pp.; In English
Contract(s)/Grant(s): N00014-94-1-0688
Report No.(s): AD-A461735; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461735

This thesis addresses the question of whether a reliable multicast protocol can be designed that enjoys all the scaling properties of receiver-initiated protocols while still being able to operate correctly with finite memory. To answer this question, we analyze the maximum throughput of the known classes of reliable multicast protocols that have been proposed to solve the acknowledgment (ACK) implosion problem of sender-initiated reliable multicast protocols. We introduce a new taxonomy of reliable multicast protocols, based on the premise that the mechanisms used to release data at the source after correct delivery should be decoupled from the mechanisms used to pace the transmission of data and to effect error recovery. Receiver- initiated protocols, which are based entirely on negative acknowledgments (NAKs) sent from the receivers to the sender are shown to require infinite buffers in order to prevent deadlocks. Two other solutions to the ACK-implosion problem are tree-based protocols and ring-based protocols. The first organize the receivers in a tree and send ACKs along the tree; the latter send ACKs to the sender along a ring of receivers. These two classes of protocols are shown to operate correctly with finite buffers. We show that the tree-based protocols constitute the most scalable class of all reliable multicast protocols proposed to date.
DTIC
Computer Storage Devices; Parallel Processing (Computers); Protocol (Computers); Taxonomy

20070008955 Mitre Corp., McLean, VA USA
Realtime Initialization of Planning and Analysis Simulations Based on C4ISR System Data
Furness, Zach; Isensee, Ernie; Fitzpatrick, Mike; Jan 2002; 18 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461797; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461797

Simulations have been used during exercises within analysis and planning cells for much of the past decade. However, the usefulness of such simulations is dependent on the ability to rapidly enter data from the tactical picture into the simulation, for use as a starting point for running analyses. Current methods for pulling in such C4ISR data rely on manual data entry that can introduce errors and take significant time to accomplish. This paper discusses an approach that allows automated initialization of simulations that takes advantage of an existing High Level Architecture (HLA) Runtime Infrastructure (RTI) interface within the Global Command and Control System (GCCS). During the Navy's Global 2001 wargaming exercise, this approach was used to rapidly initialize the Naval Simulation System (NSS) for use in performing Course of Action (COA) analysis in the Naval Forces (NAVFOR) cell. The introduction of an automated feed from GCCS not only reduced the initialization time required for NSS, but also allowed analysts to evaluate more complex scenarios with larger track groups. A similar approach using the same GCCS HLA interface was successfully demonstrated with the Integrated Theater Engagement Model (ITEM) as part of exercise RSOI in April 02 for USA Forces Korea (USFK).
DTIC
Artificial Intelligence; Command and Control; Real Time Operation; Simulation

20070009075 Yale Univ., New Haven, CT USA

Towards a Theory of Data Entanglement

Aspnes, James; Feigenbaum, Joan; Yampolskiy, Aleksandr; Zhong, Sheng; Mar 26, 2004; 30 pp.; In English

Contract(s)/Grant(s): N00014-01-1-0795

Report No.(s): AD-A461823; YALEU/DCS/TR-1277; No Copyright; Avail.: CASI: A03, Hardcopy

We propose a formal model for data entanglement as used in storage systems like Dagster [25] and Tangler [26]. These systems split data into blocks in such a way that a single block becomes a part of several documents; these documents are said to be entangled. Dagster and Tangler use entanglement in conjunction with other techniques to deter a censor from tampering with unpopular data. In this paper, we assume that entanglement is a goal in itself. We measure the strength of a system by how thoroughly documents are entangled with one another and how attempting to remove a document affects the other documents in the system. We argue that while Dagster and Tangler achieve their stated goals, they do not achieve ours. In particular, we prove that deleting a typical document in Dagster affects, on average, only a constant number of other documents; in Tangler, it affects virtually no other documents. This motivates us to propose two stronger notions of entanglement, called dependency and all-or-nothing integrity. All-or-nothing integrity binds the users data so that it is hard to delete or modify the data of any one user without damaging the data of all users. We study these notions in six submodels, differentiated by the choice of users recovery algorithms and restrictions placed on the adversary. In each of these models, we not only provide mechanisms for limiting the damage done by the adversary, but also argue, under reasonable cryptographic assumptions, that no stronger mechanisms are possible.

DTIC

Computer Information Security; Computer Storage Devices; Data Storage

20070009119 Naval Research Lab., Washington, DC USA

C4I-Simulation Interoperability Using the DII COE and HLA

Layman, Gene; Furness, Zach; Daly, John; Womble, Jennie; May 2001; 9 pp.; In English

Report No.(s): AD-A461964; No Copyright; Avail.: CASI: A02, Hardcopy

Technologies and methods have been developed within C4I systems that permit them to function as federates using the High Level Architecture (HLA). The HLA Runtime Infrastructure (RTI) has been shown to run successfully on C4I system hardware that is based on the Defense Information Infrastructure Common Operational Environment (DII COE). The most prominent example to date has been the operation of the RTI with the Global Command and Control System (GCCS) and GCCS/Maritime that both utilize the DII COE. The GCCS HLA interface has been used successfully with simulations such as the Joint Theater Level Simulation (JTLS), the Navy Simulation System (NSS), and the Pegasus Federation. These federations span the range of potential military applications from training, to experimentation, planning, and course of action (COA) analysis. This paper provides an overview of the various federation applications in which GCCS has been used to date, and also discusses the benefits of using HLA and the DII COE to improve C4I-Simulation interoperability.

DTIC

Command and Control; Interoperability; Simulation

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COMPUTER PROGRAMMING AND SOFTWARE

Includes software engineering, computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM. For computer software applied to specific applications, see also the associated category.

20070007336 Science Applications International Corp., USA

Assurance of Complex Electronics. What Path Do We Take?

FROM; Plastow, Richard A.; [2007]; 23 pp.; In English; Southeastern Software Systems and Engineering Conference, 12-15 Mar. 2007, Huntsville, Al, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): NAS3-03140; WBS 981155.03.03.01; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070007336

Many of the methods used to develop software bare a close resemblance to Complex Electronics (CE) development. CE are now programmed to perform tasks that were previously handled in software, such as communication protocols. For instance, Field Programmable Gate Arrays (FPGAs) can have over a million logic gates while system-on-chip (SOC) devices can combine a microprocessor, input and output channels, and sometimes an FPGA for programmability. With this increased intricacy, the possibility of 'software-like' bugs such as incorrect design, logic, and unexpected interactions within the logic

is great. Since CE devices are obscuring the hardware/software boundary, we propose that mature software methodologies may be utilized with slight modifications to develop these devices. By using standardized S/W Engineering methods such as checklists, missing requirements and 'bugs' can be detected earlier in the development cycle, thus creating a development process for CE that will be easily maintained and configurable based on the device used.
Author
Gates (Circuits); Protocol (Computers); Computer Programs; Field-Programmable Gate Arrays; Microprocessors; Chips

20070007347 Michigan State Univ., East Lansing, MI USA
Infuse: A TDMA Based Data Dissemination Protocol for Sensor Networks
Kulkarni, Sandeep S; Arumugam, Mahesh; Nov 2004; 9 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-01-1-0744; OSURS01-C-1901
Report No.(s): AD-A460202; MSU-CSE-04-046; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460202

Reliable dissemination of bulk data is one of the important problems in sensor networks. For example, programming or upgrading the software in sensors at run-time requires reliable dissemination of a new program across the network. In this paper, we present Infuse, a reliable data dissemination protocol based on time division multiple access (TDMA) based medium access layer. Although TDMA guarantees collision-freedom, unexpected channel errors (e.g., message corruption, varying signal strengths, etc) can cause random message losses. To deal with this problem, we consider two recovery schemes that use implicit acknowledgments. We also present a scheme to reduce the number of message receptions further. With this approach, sensors typically do not receive a given message multiple times. We also demonstrate that our algorithms can handle failure of sensors.
DTIC
Communication Networks; Protocol (Computers); Time Division Multiple Access

20070007348 Mitre Corp., Colorado Springs, CO USA
Applying Rule Markup Language in the Military Space Domain
Stoutenburg, Suzette; Sep 2003; 20 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460203; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460203

The new Strategic Technical Plan drafted by the Air Force Electronic Systems Center (ESC) states that 'the objective future is one in which systems are made interoperable by adoption of network centric, web-enabling and open architecture technology.' To realize this future vision, it is imperative that exploration of emerging technology continue, with the goal of determining the value and applicability of each new advance to critical government missions. To that end, the Strategic and Nuclear Deterrence Command and Control System Program Office within ESC established the Web Way Ahead effort in 2000. This is a multi-year effort to support research and experimentation with new advances in technology to evolve existing mission systems toward interoperability and network centric processing. The focus to date has been on applications of eXtensible Markup Language (XML) and web-based security. As part of the 2003 Web Way Ahead effort, a study was commissioned to investigate Rule Markup Language (RuleML) to determine its applicability to interoperability in the military space domain. The purpose of this paper is to document the results of this study.
DTIC
Document Markup Languages; High Level Languages; Interoperability

20070007352 Mitre Corp., Bedford, MA USA
Collaborative Data Collection during Strong Angel and RIMPAC 2000
Sep 2000; 71 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAB07-99-C-C201
Report No.(s): AD-A460208; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460208

This is the final report for Data Capture During Strong Angel (DARPA contract DAAB07-99-C-C201), describing MITRE's evaluation of the CommandNet collaborative groupware tool used during RIMPAC-2000, a Third Fleet multinational exercise that included Strong Angel, a humanitarian aid and disaster relief (HA/DR) scenario involving both military and non-government organizations (NGO). During this effort, MITRE worked in partnership with researchers at the Center for the Management of Information at the University of Arizona who developed CommandNet, and with the US Navy

Third Fleet. CommandNet is a web-based electronic logbook used to capture data and observations that were shared within and across command centers afloat on the USS Coronado and ashore at a simulated refugee camp on the island of Hawaii. Users during Strong Angel included military personnel and members of a United Nations team involved with management of the refugee camp. The exercise provided an opportunity to collect data across groups of users collaborating over time in an operational environment, analyze the technological, social and organizational processes characterizing such collaborative interactions, and evaluate effectiveness of a collaborative tool in an operational civil-military scenario. CommandNet was instrumented for automatic capture of usage patterns, and in addition, a participant observer collected qualitative data on-board the Coronado and at the refugee site. The analysis of both quantitative and qualitative data on CommandNet usage collected during a month of RIMPAC, including the five days of Strong Angel, is presented in this final report.
DTIC
Angels (Radar); Data Acquisition; Data Management

20070007355 Columbia Univ., New York, NY USA
An Object Oriented Approach to Content Planning for Text Generation
Wolz, Ursula; Jan 1990; 11 pp.; In English
Contract(s)/Grant(s): N00014-82-K-0256; IST-84-51438
Report No.(s): AD-A460211; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460211

This paper describes GENIE, an object-oriented architecture that generates text with the intent of extending user expertise in interactive environments. Such environments present three interesting goals. First, to provide information within the task at hand. Second to both respond to a user's task related question and simultaneously extend their knowledge. Third, to do this in a manner that is concise, clear and cohesive. Instead of generating text based solely on either discourse goals, intentions, or the domain, we found a need to combine techniques from each. We have developed an object oriented architecture in which the concepts about which we talk (domain entities), the goals that may be accomplished with them (intentions), end the rhetorical acts through which we express them (discourse goals) are represented as objects with localized knowledge end methods. This paper describes how current text planning methods were insufficient for our needs, and presents our object-oriented method as an alternative.
DTIC
Object-Oriented Programming; Texts

20070007382 SRI International Corp., Menlo Park, CA USA
Machine Learning for Information Management
Haas, Norman; Hendrix, Gary G; Jul 28, 1981; 33 pp.; In English
Contract(s)/Grant(s): N00039-79-C-0118; N00039-80-C-0575
Report No.(s): AD-A460270; TN-252; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460270

This paper discusses machine learning in the context of information management. The core idea is that of a compiler system that can hold a conversation with a user in English about his specific domain of interest, subsequently retrieve and display information conveyed by the user, and apply various types of external software systems to solve user problems. The specific learning problem discussed is how to enable computer systems to acquire information about domains with which they are unfamiliar from people who are expert in those domains, but have little or no training in computer science. The information to be acquired is that needed to support question-answering or fact retrieval tasks, and the type of learning to be employed is learning by being told. Reflecting the intimate connection between language and reasoning, this paper is largely concerned with the problems of learning concepts and language simultaneously.
DTIC
Data Management; Information Management; Machine Learning

20070007394 Naval Postgraduate School, Monterey, CA USA
Extending Orthogonal and Nearly Orthogonal Latin Hypercube Designs for Computer Simulation and Experimentation
Joshua, Ang Keng-Ern; Dec 2006; 71 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460403; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460403

Computational experimentation is an important tool of the military. It provides useful insights at a lower cost of time and money when compared to physical experiments. Consequently computational experiments are used to evaluate weapon systems for technology acquisibon examine tactics and to help select among alternatives for military operations and war plans. Experiments often consist of a large number of factors. Advancements in computing power and design of experiments (DOE) for simulation allow for the investigation of more of these factors through computational experiments achieved with less expense in time effort and money. Within the framework of DOE this thesis investigates Orthogonal Latin Hypercube (OLH) and Nearly Orthogonal Latin Hypercube (NOLH) designs. These designs are often used for computational experiments. This research greatly expands upon the size (in terms of runs and especially variables) of the available OLH and NOLH designs. Previously the largest catalogued OLH and NOLH designs were a maximum of 29 variables and 257 runs. OLH and good space-filling NOLH designs for up to 512 variables in 1025 runs are now available. This thesis also develops an algorithm for handling discrete factors with the designs. Finally the effects of stacking multiple OLH designs into one larger design are quantified. All of the designs developed in this research are available at the Simulation Experiments & Efficient Designs (SEED) Center website (htto://harvest.nos.edu).
DTIC
Computerized Simulation; Hypercube Multiprocessors; Military Operations; Simulation

20070007404 Carnegie-Mellon Univ., Pittsburgh, PA USA
Quantitative Methods for Software Selection and Evaluation
Bandor, Michael S; Sep 2006; 23 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8721-05-C-0003
Report No.(s): AD-A460422; CMU/SEI-2006-TN-026; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460422

When performing a buy analysis and selecting a product as part of a software acquisition strategy, most organizations will consider primarily the requirements (the ability of the product to meet the need) and the cost. The method used for the analysis and selection activities can range from the use of basic intuition to counting the number of requirements fulfilled, or something in between. The selection and evaluation of the product must be done in a consistent, quantifiable manner to be effective. By using a formal method, it is possible to mix very different criteria into a cohesive decision; the justification for the selection decision is not just based on technical, intuitive, or political factors. This report describes various methods for selecting candidate commercial off-the-shelf packages for further evaluation, possible methods for evaluation, and other factors besides requirements to be considered. It also describes the use of a decision analysis spreadsheet as one possible tool for use in the evaluation process.
DTIC
Computer Programming; Computer Programs; Software Engineering; Spreadsheets

20070007447 Rome Univ., Rome, Italy
Distributed Space-Time Coding for Cooperative Networks
Barbarossa, Sergio; Dec 5, 2006; 54 pp.; In English
Contract(s)/Grant(s): N62558-03-M-0814
Report No.(s): AD-A460503; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460503

In this report we show how proper cooperation among radio nodes may provide diversity gain, also for single antenna systems. We consider first the connectivity of a wireless network and show how it can benefit from cooperation. Then, we consider some specific forms of cooperations, based on distributed space-time coding, in both single and multi-user contexts. Finally, we pay a special attention to the case where the final destination has a multi-antenna receiver. In such a case, we may establish a virtual MIMO link between the relays and the final destination, which makes possible to benefit also from the MIMO spatial multiplexing gain.
DTIC
Coding; Communication Networks

20070007449 General Electric Co., Schenectady, NY USA
Building Effective Queries in Natural Language Information Retrieval
Strzalkowski, Tomek; Lin, Fang; Perez-Carballo, Jose; Wang, Jin; Jan 1997; 9 pp.; In English
Contract(s)/Grant(s): 94-FI57900-000; 97-FI56800-000
Report No.(s): AD-A460509; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460509

In this paper we report on our natural language information retrieval (NLIR) project as related to the recently concluded 5th Text Retrieval Conference (TREC-5). The main thrust of this project is to use natural language processing techniques to enhance the effectiveness of full-text document retrieval. One of our goals was to demonstrate that robust if relatively shallow NLP can help to derive a better representation of text documents for statistical search. Recently, we have turned our attention away from text representation issues and more towards query development problems. While our NLIR system still performs extensive natural language processing in order to extract phrasal and other indexing terms, our focus has shifted to the problems of building effective search queries. Specifically, we are interested in query construction that uses words, sentences, and entire passages to expand initial topic specifications in an attempt to cover their various angles, aspects and contexts. Based on our earlier results indicating that NLP is more effective with long, descriptive queries, we allowed for long passages from related documents to be liberally imported into the queries. This method appears to have produced a dramatic improvement in the performance of two different statistical search engines that we tested (Cornell's SMART and NIST's Prise) boosting the average precision by at least 40%. In this paper we discuss both manual and automatic procedures for query expansion within a new stream-based information retrieval model.
DTIC
Data Processing; Information Retrieval; Natural Language (Computers)

20070007454 Naval Research Lab., Washington, DC USA
Basing a Modeling Environment on a General Purpose Theorem Prover
Archer, Myla; Dec 29, 2006; 24 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-06-W-X20708
Report No.(s): AD-A460524; NRL/MR/5546--06-8952; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460524

A general purpose theorem prover can be thought of as an extremely flexible modeling environment in which one can define and analyze almost any kind of model. A disadvantage to the full flexibility of a general purpose theorem prover is the lack of any guidance on how to construct a model and how then to apply the theorem prover to analyzing the model. In the general environment supplied by the prover, much time can be consumed in deciding how to specify a model and in interacting with and understanding feedback from the prover. However, specification templates, together with proof strategies whose design follows certain principles, can be used in many general purpose provers to create specialized modeling environments that address these difficulties. A specialized modeling environment created in this way can be further extended and/or further specialized by drawing on the underlying theorem prover for additional capabilities, and provides a means of integrating powerful theorem proving capabilities into existing software development environments by way of appropriate translation schemes. This paper will use TAME (Timed Automata Modeling Environment) to illustrate the creation, extension, and specialization of a modeling environment based on PVS, and its integration into several software development environments.
DTIC
Models; Theorems

20070007458 Versatile Information Systems, Inc., Framingham, MA USA
BaseVISor: A Triples-Based Inference Engine Outfitted to Process RuleML and R-Entailment Rules
Matheus, C J; Baclawski, K; Kokar, M M; Jan 2006; 8 pp.; In English
Contract(s)/Grant(s): N00014-05-C-0367
Report No.(s): AD-A460530; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA460530

BaseVISor is a forward-chaining inference engine based on a Rete network optimized for the processing of RDF triples. A clause within the body and head of a rule either represents an RDF triple or invokes a procedural attachment (either built-in or user defined). This paper describes how BaseVISor has been outfitted to process RuleML and R-Entailment rules. In the case of RuleML, n-ary predicates are automatically translated into binary predicates and reified statements that encapsulate the n-ary predicate's arguments. For R-Entailment rules, the appropriate R-Entailment axioms, axiomatic triples and consistency rules are automatically imported into the engine and then used to derive all triples entailed by any set of triples asserted into the fact base. Operation of the system is illustrated using sample rule sets for both RuleML and R-Entailment and instructions are provided on how to obtain the BaseVISor beta release and process the examples.
DTIC
Inference

20070007481 SRI International Corp., Menlo Park, CA USA

Domain-Independent Task Specification in the TACITUS Natural Language System

Tyson, Mabry; Hobbs, Jerry R; May 1990; 17 pp.; In English

Contract(s)/Grant(s): N00014-85-C-0013

Report No.(s): AD-A460583; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460583

Many seemingly very different application tasks for natural language systems can be viewed as a matter of inferring the instance of a prespecified schema from the information in the text and the knowledge base. We have defined and implemented a schema specification and recognition language for the TACITUS natural language system. This effort entailed adding operators sensitive to resource bounds to the first-order predicate calculus accepted by a theorem-prover. We give examples of the use of this schema language in a diagnostic task, an application involving data base entry from messages, and a script recognition task, and we consider further possible developments.

DTIC

Computer Programs; Data Processing; Knowledge Based Systems; Natural Language (Computers)

20070007553 Quantum Leap Innovations, Inc., Newark, DE USA

Integrated Biological Warfare Technology Platform (IBWTP). Intelligent Software Supporting Situation Awareness, Response, and Operations

Abbott, Frank T; Johnson, Apperson H; Prior, Stephen D; Steiner, Donald D; Jan 2007; 95 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-02-C-0320

Report No.(s): AD-A460731; QLI-TR-2007-01; No Copyright; Avail.: CASI: A05, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460731

Within the context of the Integrated Biological Warfare Technology Platform (IBWTP) program, Quantum Leap Innovations, Inc. (QLI) was tasked by the Office of Naval Research to develop, evaluate, and demonstrate novel technology supporting early detection of and rapid response to biological or chemical threats. This report provides an overview of the challenges QLI faced, the approach it took to creating the technologies, and some of the specific technological solutions in the areas of Situational Awareness, Course of Action Planning, Command & Control, and Data & Process Integration. It also presents the applicability of the developed technologies to areas other than biological response, such as Department of Homeland Security applications in emergency management, and Department of Defense applications in force transformation, especially regarding Future Naval Capability (FNC) Knowledge Superiority and Assurance (KSA).

DTIC

Biological Weapons; Biotechnology; Chemical Warfare; Decision Support Systems; Early Warning Systems; Warfare

20070007625 ITT Industries, Inc., Alexandria, VA USA

Infosphere Concept Exploration and Development (ICED)

Maciolek, Michael; Nov 2006; 51 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8750-05-C-0271; Proj-ICED

Report No.(s): AD-A460853; No Copyright; Avail.: CASI: A04, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460853

The Infosphere Concept Exploration and Development (ICED) project conducted by ITT Corporation under contract to AFRL Information Directorate provides concepts methods and a prototype software system presenting a Community of Interest (COI) infosphere with a consistent vocabulary definition capability. As information management systems become more widely used by COI. capabilities are increasingly needed to easily configure such systems to reflect COI needs and vocabularies, instead of those of a single predefined organization. High operation tempos demand equally responsive information systems that can be composed, dissolved and reconfigured to much the changing nature of the information Battlespace.

DTIC

Data Management; Information Management; Information Systems; Management Systems

20070007628 University of Southern California, Marina del Rey, CA USA
KOJAK: Scalable Semantic Link Discovery Via Integrated Knowledge-Based and Statistical Reasoning
Chalupsky, Hans; Nov 2006; 53 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-01-2-0583; Proj-EELD
Report No.(s): AD-A460860; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460860

Link discovery (LD) is a new challenge in data mining whose primary concern is to identify strong links and discover hidden relationships among entities and organizations based on low-level, incomplete and noisy evidence data. Within this effort, USC/ISI addressed this challenge by developing a hybrid link discovery system called KOJAK that combines state-of-the-art knowledge representation and reasoning (KR&R) technology with statistical clustering analysis techniques from the area of data mining.
DTIC
Data Mining; Detection; Information Retrieval; Knowledge Based Systems

20070007639 Army Tank-Automotive Research and Development Command, Warren, MI USA
Software Wrappers for Rapid Prototyping JAUS-Based Systems
Smuda, Bill; Mar 1, 2005; 10 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460877; TARDEC-TR-14730; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460877

Recent experiences with robots in Iraq have proven that robotic technology is useful to the warfighter but tools are needed to rapidly respond to evolving missions. This paper details a methodology for automatic generation of software wrappers using JAUS to simplify prototyping and development of robotic systems (distributed embedded and real-time system software modules). Software wrappers will allow insertion of modules into a visual prototyping environment. The wrappers will intercept module functions and bind them with functions needed to exercise the modules outside of the native environment. Automatic generation of JAUS wrappers will enhance the development environment by reducing rote work and producing consistently behaving module interfaces. The resulting methodology will provide a rapid prototyping environment for use in sensor integration, Operator Control Unit (OCU) development and autonomous vehicle control.
DTIC
Computer Programming; Prototypes; Rapid Prototyping; Software Engineering

20070007644 Civil Aeromedical Inst., Oklahoma City, OK USA
Color and Visual Factors in ATC Displays
Xing, Jing; Jun 2006; 22 pp.; In English
Report No.(s): AD-A460886; DOT-FAA-AM-06-15; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460886

Computer displays are one of the major sources of information for air traffic controllers to control traffic. Because the existing display technologies make it so easy to render color on computer monitors, color is being extensively used in air traffic control (ATC) displays. At present, the Federal Aviation Administration has no requirement for how color should be used in ATC displays. While the advantages of color may be apparent, many display designs suggest that ATC technology developers have not used basic human factors and color principles to optimize the advantages of color use in complex scenes such as those in the ATC environment. In addition, technology developers create their own unique color schemes. The lack of consistency in color use can be confusing. Moreover, little attention has been devoted to the potential negative effects of color use on controllers' task performance. In this study, we investigated color use in ATC facilities to understand the ways color is being used, the associated benefits, and its influence on task performance. We found that, while color use has some advantages for information processing, such as reducing workload and saving time, it also has disadvantages and may introduce negative effects on task performance. We identified the benefits of color use and provided rationales for how to use color properly to optimize those benefits. We also analyzed the negative effects of color use with respect to associated cognitive factors. Finally, we derived two checklists that evaluate advantages and negative effects of color use in ATC displays. These checklists can be used for design prototypes and acquisition evaluation.
DTIC
Air Traffic Control; Air Traffic Controllers (Personnel); Color Vision; Display Devices; Human Factors Engineering; Software Development Tools

20070007672 Army Tank-Automotive and Armaments Command, Warren, MI USA
Terrain Validation and Enhancements for a Virtual Proving Ground
Lamb, David; Reid, Alexander; Truong, Nancy; Weller, John; Oct 2003; 11 pp.; In English
Report No.(s): AD-A460932; AMSTA-TR-N157; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460932

Recently engineers and scientists from the Ground Vehicle Simulation Laboratory (GVSL) located at the U.S. Army Tank-Automotive Research, Development and Engineering Center's (TARDEC) National Automotive Center (NAC) have validated a virtual graphical terrain for use in the real-time warfighter/hardware-in-the-loop motion base simulators. This was accomplished by comparing and analyzing the profile data acquired from the virtual environment of Aberdeen Proving Ground's (APG) Churchville B course with the real data collected over the actual course. To obtain the data from the virtual terrain, complex mathematical equations developed by scientists at GVSL were utilized. The MATLAB analysis tool was used to analyze the data and help verify the terrain. The paper will discuss the processes that we incorporated to validate the database, new techniques being developed to improve our validation and methodologies to give the virtual terrain higher frequency terrain characteristics. Verification of the virtual terrain is important since engineers need to confirm that the profile of the terrain that they are driving the Ride Motion Simulator over corresponds to the real terrain.
DTIC
Augmentation; Computerized Simulation; Terrain

20070007679 Texas Univ., Austin, TX USA
Weak Dirichlet Boundary Conditions for Wall-Bounded Turbulent Flows
Bazilevs, Y; Michler, C; Calo, V M; Hughes, T J; Jan 2007; 20 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-03-C-0263
Report No.(s): AD-A460940; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460940

In turbulence applications, strongly imposed no-slip conditions often lead to inaccurate mean flow quantities for coarse boundary-layer meshes. To circumvent this shortcoming, weakly imposed Dirichlet boundary conditions for fluid dynamics were recently introduced. In the present work, the authors propose a modification of the original weak boundary condition formulation that consistently incorporates the well-known 'law of the wall.' To compare the different methods, they conduct numerical experiments for turbulent channel flow at Reynolds number 395 and 950. In the limit of vanishing mesh size in the wall-normal direction, the weak boundary condition acts like a strong boundary condition. Accordingly, strong and weak boundary conditions give essentially identical results on meshes that are stretched to better capture boundary layers. However, on uniform meshes that are incapable of resolving boundary layers, weakly imposed boundary conditions deliver significantly more accurate mean flow quantities than their strong counterparts. Hence, weakly imposed boundary conditions present a robust technique for flows of industrial interest, where optimal mesh design is usually not feasible and resolving boundary layers is prohibitively expensive. The numerical results show that the formulation that incorporates the law of the wall yields an improvement over the original method.
DTIC
Boundary Conditions; Boundary Layers; Channel Flow; Dirichlet Problem; Navier-Stokes Equation; Reynolds Number; Turbulent Flow; Wall Flow; Walls

20070007685 Science Applications International Corp., San Diego, CA USA
Global Command and Control System - Maritime (GCCS-M) Segments and SkyCAP Assured IP Software
Mitchell, Alfred; Gooding, Charles; Jun 13, 2005; 24 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460949; XB-PEO-C4ISCA; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460949

SkyCAP is a software solution to provide netted I/P access over half duplex LDR satellite (also LOS) links. It is the integration of the proposed MIL-STD-188-184A with an I/P interface. the original goal was to only pass TCP for mail, web browsing, ftp, etc. but has since been expanded to support all I/P types. SkyCAP has demonstrated use on other tactical Line-of-Sight (LOS) VHF/UHF radio networks and shows potential for Over-the-Horizon (OTH) HF radio modes. DoD does not have a UHF SATCOM I/P network waveform.
DTIC
Command and Control; Industries; Software Development Tools

20070007706 Mission Research Corp., Newington, VA USA
Magic User's Manual 2006
Ludeking, Larry; Dec 2006; 22 pp.; In English
Contract(s)/Grant(s): F49620-03-C-0030
Report No.(s): AD-A461029; MRC/WDC-R-556; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461029

This is the Help File for the Magic Tool Suite for Windows. It uses the standard Windows Help so it is pretty self-explanatory. You can use the panel to the left to scan through the table of contents. To select a part, chapter, or section click on it. To use the index, click on the index tab and type your search query into the text field. Make a selection from the list and press the 'Display' button. If there are more than one pages linked to the keyword you selected then a dialog box will appear prompting you to choose which page you would like to view. Within the pages there are many links which will take you to a related page.
DTIC
Manuals; Software Development Tools; User Manuals (Computer Programs)

20070008043 Army Cold Regions Research and Engineering Lab., Hanover, NH USA
Object-Oriented Approach to Manipulating Acoustic and Seismic Spectra
Wilson, D K; Torrey, Jacob I; Dec 2006; 42 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460716; ERDC/CRREL-TR-06-20; No Copyright; Avail.: CASI: A03, Hardcopy

The software design and underlying mathematics for an object-oriented, Java-based approach to creating and manipulating frequency-dependent functions, such as power spectral densities, is described. The frequency dependence is modeled as a series of power-law bands, which provides a high degree of flexibility and efficiency for representing common spectral models such as evenly spaced bands, octave bands, narrow spectral lines, broadband noise, and power laws. Conversions between the various spectral models are easily performed. Many common operations on spectra, such as filtering, incoherent addition, application of transfer functions, and calculation of signal-to-noise ratios, can be conveniently applied. While this capability was developed to serve as a basis for future development of tactical decision aids and mission planning tools for battlefield seismics and acoustics, many other applications involving spectra are possible.
DTIC
Object-Oriented Programming; Signal Processing; Sound Detecting and Ranging

20070008136 Naval Postgraduate School, Monterey, CA USA
Open Architecture as an Enabler for FORCEnet
Deerin, Viviane; Grates, Patrick; Hedge, Tom; Kung, Sein; Martinez, Maria; Mcarthy, Percival; Pugh, Kevin; Radojkovic, Sasha; Sep 2006; 145 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460889; NPS-SE-06-002; No Copyright; Avail.: CASI: A07, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460889

This project concentrates on implementing network centric military operations with specific threat engagement scenarios using legacy and future warfare systems based on open architecture concepts. These systems may be based at sea, on land or in the air, and provide fire control solutions that match sensed threats to available weapons throughout the battle space. Using a unique methodology, the project provides the following: 1) characterization of the battle space 2) description of the design principles applied and 3) a conceptual design. The conceptual design is then modeled using ARENA simulation software in an attempt to validate the proposed architecture. The project concentrates on implementing three very specific scenarios: Engage on Remote (EOR), Forward Pass (FP), and Remote Fire (RF). These concepts are applied to the FORCEnet Open Architecture Domain Model using legacy and future Naval systems such as AEGIS Cruisers and Destroyers, DD(x), CG(x), Littoral Combat Ship (LCS), and Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System (JLENS). As a part of the above scenarios, the presentation will address specifics on best shooter selection. The resulting functional architecture and data flows transform concepts into real engagement methods. These methods will match the Detect-Control-Engage (DCE) sequence with Observe-Orient-Decide and Act (OODA), and employ current methods of data fusion from various platforms to provide a true integrated fire control solution. Combat identified threats on the network can then be matched to any available weapons on the network, and the preferred shooter selected can efficiently engage the threat. Thus, the effective and efficient use of all sensors and weapons available in the battle space becomes possible.
DTIC
Communication Networks; Military Operations

20070008143 Naval Research Lab., Bay Saint Louis, MS USA
Software Development for Producing Standard Navy Surf Output from Delft3D
Hsu, Y L; Dykes, James D; Allard, Richard A; Dec 29, 2006; 23 pp.; In English
Report No.(s): AD-A460526; NRL/MR/7320--06-8990; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460526

The Delft3D modeling system, developed by Delft Hydraulics, is a comprehensive coastal hydrodynamic modeling system, capable of simulating hydrodynamic processes due to waves, tides, rivers, winds and coastal currents. Delft3D produces two-dimensional time-dependent forecasting output for many nearshore wave and flow parameters. But it does not produce the operational surf forecasting parameters as specified in the Joint Surf Manual. The standard surf parameters include maximum and significant breaker heights, breaker type statistics, percent of breaking, surf zone width, number of surf lines and modified surf index (MSI). Subroutines from Navy Standard Surf Model (SURF 3.2) are adapted and refined to compute these surf parameters from Delft3D output. This report describes input and output files and the software structure.
DTIC
Computer Programming; Forecasting; Height; Models; Navy; Software Engineering; Tides

20070008147 Naval Academy, Annapolis, MD USA
Midshipmen Blue Force Tracking
Evans, Paul K; Stahl, David J; Dec 13, 2005; 21 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460523; USNA-CS-TR-2005-08; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460523

This project explores the feasibility of networking Windows CE based handheld devices using inexpensive off-the-shelf hardware and software systems to provide Midshipmen with a tactical training system simulating the FBCB2 system - Force XXI Battle Command, Brigade and Below ('Blue Force Tracking'). In conjunction with the YP Tactical Data Simulator, 'Midshipman Blue Force Tracking' is intended to be used as a pedagogical tool for educating midshipmen in the concepts of Network Centric Warfare and operations.
DTIC
Color; Command and Control; Computer Programs; Computers; Education; Warfare

20070008467 SRI International Corp., Menlo Park, CA USA
The Phoenix Image Segmentation System: Description and Evaluation
Laws, Kenneth I; Shafer, Steven; Kanade, Takeo; Williams, Duane; Dec 1982; 89 pp.; In English
Contract(s)/Grant(s): MDA903-79-C-0588
Report No.(s): AD-A460981; SRI-TN-289; No Copyright; Avail.: CASI: A05, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460981

PHOENIX is a computer program for segmenting images into homogeneous closed regions. It uses histogram analysis, thresholding and connected-components analysis to produce a partial segmentation, then resegments each region until various stopping criteria are satisfied. Its major contributions over other recursive segmenters are a sophisticated control interface, optional use of more than one histogram-dependent intensity threshold during tentative segmentation of each region. and spatial analysis of resulting subregions as a form of 'look-ahead' for choosing between promising spectral features at each step. PHOENIX was contributed to the DARPA Image Understanding Testbed at SRI by Carnegie-Mellon University. This report summarizes application for which PHOENIX is suited, the history and nature of the algorithm, details of the Testbed implementation, the manner in which PHOENIX is invoked and controlled, the type of results that can be expected, and suggestions for further development. Baseline parameter sets are given for producing reasonable segmentations of typical imagery.
DTIC
Computer Programs; Image Processing; Imaging Techniques

20070008470 Army Communications-Electronics Command, Fort Monmouth, NJ USA
Towards Smart Intelligent Agents in the Command and Control Environment
Dawidowicz, Edward; Jan 2000; 5 pp.; In English
Report No.(s): AD-A460984; XA-AMSEL-RD-C2; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460984

Successful implementation of Software Agents (SAs) depends on modeling the problem space and user needs and

requirements. By partitioning large problem spaces, like the Problem Space of the Battlefield, into a smaller domain the modeling complexity is greatly reduced. This approach works well with SAs since they are responsible for smaller problem domains. The complexity and efficiency of a system model depends on the number of SAs employed, and the degree of interdependence between them. The larger the number of SAs and the more interdependent they are, the higher the complexity and the lower the efficiency. A supervisory control mechanism must be implemented to insure SA effectiveness when modeling large complex problem spaces. The Virtual Associative Network (VAN) (Yufik Y., U.S. Patent 5586219) is a good candidate for such a supervisory mechanism. This paper offers a rationale for incorporating the VAN as a critical element in the Intelligent Agent (IA) architecture.
DTIC
Combat; Command and Control; Expert Systems; Personnel Management; Problem Solving; Simulation

20070008471 Carnegie-Mellon Univ., Pittsburgh, PA USA
Planning for Communication Resources
Browning, Brett; Veloso, Manuela; May 2003; 12 pp.; In English
Contract(s)/Grant(s): F30602-00-2-0549
Report No.(s): AD-A460985; CMU-CS-03-120; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460985

For many human team activities, ranging from military operations through to emergency rescue or large entertainment events, communications resources must be assigned to different teams or team members. These assignments must reflect the capabilities of the available communication devices and avoid conflicting use of communications channels already in use in the local environment. In general, finding and assigning available communication channels for short-term use is a task performed manually by human operators. Operators, using generic tools, such as spreadsheets and database manipulation programs, access government databases to obtain information on frequency usage and then manually attempt to locate suitable unused channels. This process is time intensive, prone to error, and 'mechanistic' in nature. In this paper, we describe the CommPlanner, a new fully implemented system developed to automate this assignment procedure and thereby speed up and make more reliable the process. We describe the algorithms used by the CommPlanner, and the underlying issues that, while not always obvious, must be addressed in the processes of assigning frequency usage.
DTIC
Computer Programs; Frequencies; Planning; Telecommunication

20070008486 Carnegie-Mellon Univ., Pittsburgh, PA USA
Predicate Abstraction of ANSI-C Programs using SAT
Clarke, Edmund; Kroening, Daniel; Sharygina, Natasha; Yorav, Karen; Sep 23, 2003; 26 pp.; In English
Contract(s)/Grant(s): CCR-9803774; N00014-01-1-0796
Report No.(s): AD-A461006; CMU-CS-03-186; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461006

Predicate abstraction is a major method for verification of software. However, the generation of the abstract Boolean program from the set of predicates and the original program suffers from an exponential number of theorem prover calls as well as from soundness issues. This paper presents a novel technique that uses an efficient SAT solver for generating the abstract transition relation of ANSI-C programs. The SATbased approach computes a more precise and safe abstraction compared to existing predicate abstraction techniques.
DTIC
Computer Programming; Software Engineering

20070008494 SRI International Corp., Menlo Park, CA USA
The Ghough Generalized Hough Transform Package: Description and Evaluation
Laws, Kenneth I; Dec 1982; 50 pp.; In English
Contract(s)/Grant(s): MDA903-79-C-0588
Report No.(s): AD-A461024; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461024

GHOUGH is a computer program for detecting instances of a given shape within an image. It may be used for cueing, counting, or mensuration. GHOUGH can find instances that are displaced, rescaled rotated, or incomplete relative to the shape template. They are detected by computing a 'generalized Hough transform' of the image edge elements. Each edge element

votes for all those instances of the shape that could contain it; the votes are tallied and the best supported instances are reported as likely matches. GHOUGH was contributed to the DARPA Image Understanding Testbed at SRI by the University of Rochester. This report summarizes applications for which GHOUGH is suited, the history and nature of the algorithm, details of the Testbed implementation the manner in which GHOUGH is invoked and controlled, the types of results that can be expected and suggestions for further development. The scientific contributions of this technical note are the analysis of GHOUGH's parameter settings and performance characteristics.
DTIC
Computer Programs; Image Processing; Transformations (Mathematics)

20070008500 SRI International Corp., Menlo Park, CA USA
Applying an AI Planner to Military Operations Planning
Wilkins, David E; Desimone, Roberto V; Jan 12, 1993; 35 pp.; In English
Contract(s)/Grant(s): F30602-91-C-0039; F30602-90-C-0086
Report No.(s): AD-A461043; SRI-TN-534; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461043

This paper describes a prototype system for quickly developing joint military courses of action. The system, SOCAP (System for Operations Crisis Action Planning), combines a newly extended version of an AI planning system, SIPE-2 (System for Interactive Planning and Execution), with a color map display and applies this technology to military operations planning. This paper describes the Socap problem domain, how SIPE-2 was used to address this problem, and the strengths and weaknesses of our approach.
DTIC
Artificial Intelligence; Military Operations; Planning

20070008502 Army Tank-Automotive Research and Development Command, Warren, MI USA
Using 3D Multi-Body Simulation to Evaluate Future Truck Technologies
Gunter, Dave; Bylsma, Wes; Letherwood, Mike; Dennis, Stacey; Argeropoulos, Kris; Teschendorf, Dan; Gorsich, Dave; Jun 1, 2004; 10 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461045; TARDEC-14131; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461045

This document presents the results of computer-based, vehicle dynamics performance assessments of Future Truck concepts with such features as a vanable height, hydraulic, trailing arm suspension, skid steering, and in-hub electric drive motors. Fully three-dimensional Future Truck models were created using a commercially available modeling and simulation methodology and limited validation studies were performed by comparing model predictions with baseline, validated model predictions from another vehicle in the same size and class as the Future Truck concept vehicles. The models were considered accurate enough to predict various aspects of ride quality and stability performance, critical to US Army Objective Force mission needs. One-to-one comparisons of the Future Truck concepts and a standard, solid-axle, Heavy Tactical Vehicle (HTV) operating in various terrain and obstacle negotiation conditions were performed.
DTIC
Combat; Riding Quality; Simulation; Trucks

20070008506 Carnegie-Mellon Univ., Pittsburgh, PA USA
Convergence Testing in Term-Level Bounded Model Checking
Bryant, Randal E; Lahiri, Shuvendu K; Seshia, Sanjit A; Jun 2003; 22 pp.; In English
Contract(s)/Grant(s): DAAD19-01-1-0485
Report No.(s): AD-A461050; CMU-CS-03-156; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461050

We consider the problem of bounded model checking of systems expressed in a decidable fragment of first-order logic. While model checking is not guaranteed to terminate for an arbitrary system, it converges for many practical examples, including pipelined processors. We give a new formal definition of convergence that generalizes previously stated criteria. We also give a sound semi-decision procedure to check this criterion based on a translation to quantified separation logic. Preliminary results on simple pipeline processor models are presented.
DTIC
Convergence; Data Processing Equipment; Models

20070008508 Carnegie-Mellon Univ., Pittsburgh, PA USA

Behavioral Consistency of C and Verilog Programs Using Bounded Model Checking

Clarke, Edmund; Kroening, Daniel; Yorav, Karen; May 2003; 35 pp.; In English

Contract(s)/Grant(s): N00014-01-1-0796; DAAD19-01-1-0485

Report No.(s): AD-A461052; CMU-CS-03-126; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA461052

We present an algorithm that checks behavioral consistency between an ANSI-C program and a circuit given in Verilog using Bounded Model Checking. Both the circuit and the program are unwound and translated into a formula that is satisfiable if and only if the circuit and the code disagree. The formula is then checked using a SAT solver. We are able to translate C programs that make use of side effects, pointers, dynamic memory allocation, and loops with conditions that cannot be evaluated statically. We describe experimental results on various reactive present an algorithm that checks behavioral consistency between an ANSI-C program and a circuit given in Verilog using Bounded Model Checking. Both the circuit and the program are unwound and translated into a formula that is satisfiable if and only if the circuit and the code disagree. The formula is then checked using a SAT solver. We are able to translate C programs that make use of side effects, pointers, dynamic memory allocation, and loops with conditions that cannot be evaluated statically. We describe experimental results on various reactive circuits and programs, including a small processor given in Verilog and its Instruction Set Architecture given in ANSI-C.

DTIC

C (Programming Language); Coding; Consistency; Models

20070008517 Space and Naval Warfare Systems Command, San Diego, CA USA

The Design, Implementation and Use of Web-Technologies to Facilitate Knowledge Sharing: A 'Real-World' Application

Rogers, Janel H; Ooak, Heather M; Moorre, Ronald A; Averett, M G; Morrison, Jeffrey G; Jan 2002; 17 pp.; In English; Original contains color illustrations

Report No.(s): AD-A461065; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461065

Space and Naval Warfare Systems Center, San Diego s (SSC-SD) Command 21 project, sponsored by ONR, is addressing how information technology can be designed to best facilitate information production, consumption, and management. For the past several years, the focus of the Command 21 effort has been the development of Knowledge Web (K-Web), which utilizes Web technologies to share operationally relevant information. In K-Web, data is processed and stored by producers in a way that represents meaningful knowledge to consumers. Use and utility of K-Web at the Global 2000 war game, were reported at last year s CCRTS. K-Web was implemented on USS Carl Vinson in May 2001, for use during deployment. Upon the ship s return, interviews of users were conducted, focusing on use and utility of K-Web tools, products, business rules and training materials. The interview data indicate K-Web as invaluable for asynchronous, distributed dissemination of operational information. Additionally, automaticallycollected data were analyzed for patterns of use. Quantitative and qualitative data enabled assessment of how the current K-Web concept and technologies support users requirements within operational environments. These analyses were also compared to analyses from the war game environment.

DTIC

Internets; Knowledge Based Systems

20070008518 Space and Naval Warfare Systems Command, San Diego, CA USA

Training the Crisis Action Planning Process Using the DSSCO Toolset

Quinn, Michael L; Heacox, Naiicy J; Gwynne, John W; Jensen, Jens; Smillie, Robert J; Jan 2002; 17 pp.; In English; Original contains color illustrations

Report No.(s): AD-A461068; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA461068

The primary purpose of ONR-funded project, Decision Support System for Coalition Operations (DSSCO), was to develop software tools to assist CINC-level crisis action planners in formulating effective plans for coalition operations involving military and civilian organizations. The DSSCO tools consist of a Planning Tool, a Task Visualization Module, and a Resource Database. The first two components incorporate detailed task protocols to guide mission planning and execution, while the Resource Database contains socio-cultural information about coalition participants that can assist planners in making appropriate task assignments. Together, these three DSSCO tools can facilitate developing crisis action plans for coalition operations. However, effective training in the use of the tools is a prerequisite for their most effective use. Because the DSSCO

toolset is based on traditional Joint Operation Planning and Execution System (JOPES) Crisis Action Planning (CAP) doctrine, learning to use the toolset also provides instruction in the CAP process. Thus, the training program discussed here encompasses the concepts and procedures of crisis action planning as well as the specific components of the DSSCO toolset.
DTIC
Education; Emergencies; Management Methods; Military Operations; Organizations; Software Development Tools

20070008523 Carnegie-Mellon Univ., Pittsburgh, PA USA
Metadata Efficiency in a Comprehensive Versioning File System
Soules, Craig A; Goodson, Garth R; Strunk, John D; Ganger, Gregory R; May 2002; 34 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F49620-01-1-0433; F30602-99-2-0539
Report No.(s): AD-A461077; CMU-CS-02-145; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461077

A comprehensive versioning file system creates and retains a new file version for every WRITE or other modification request. The resulting history of file modifications provides a detailed view to tools and administrators seeking to investigate a suspect system state. Conventional versioning systems do not efficiently record the many prior versions that result. In particular, the versioned metadata they keep consumes almost as much space as the versioned data. This paper examines two space-efficient metadata structures for versioning file systems and describes their integration into the Comprehensive Versioning File System (CVFS). Journal-based metadata encodes each metadata version into a single journal entry; CVFS uses this structure for inodes and indirect blocks, reducing the associated space requirements by 80%. Multiversion b-trees extend the per-entry key with a timestamp and keep current and historical entries in a single tree; CVFS uses this structure for directories, reducing the associated space requirements by 99%. Experiments with CVFS verify that its current-version performance is similar to that of non-versioning file systems. Although access to historical versions is slower than conventional versioning systems, checkpointing is shown to mitigate this effect.
DTIC
Computer Storage Devices; Metadata

20070008524 Carnegie-Mellon Univ., Pittsburgh, PA USA
A Programmer-Oriented Approach to Safe Concurrency
Greenhouse, Aaron; May 2003; 238 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-99-2-0522
Report No.(s): AD-A461080; CMU-CS-03-135; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461080

Assuring and evolving concurrent programs requires understanding the concurrency-related design decisions used in their implementation. In Java-style shared-memory programs, these decisions include which state is shared, how access to it is regulated, and the policy that distinguishes desired concurrency from race conditions. Source code often does not reveal these design decisions because they rarely have purely local manifestations or because they cannot be inferred from code. Many programmers believe it is too difficult to explicate the models in ordinary practice. As a result, this design intent is usually not expressed, and it is therefore generally infeasible to assure that concurrent programs are free of race conditions. This thesis is about a practicable approach to capturing and expressing design intent, and, through the use of annotations and composable static analyses, assuring consistency of code and intent as both evolve. We use case studies to explore the costs and benefits of a new annotation-based approach for expressing design intent. Our annotations express mechanical properties that programmers must already be considering, such as lock state associations. Our analyses reveal race conditions in a variety of case study samples. We developed a prototype tool that embodies static analysis techniques for assuring consistency between code and models (expressed as code annotations). The novel technical features of this approach include (1) regions as flexible aggregations of state that can cross object boundaries, (2) a region-based object-oriented effects system; (3) analysis to track the association of locks with regions, (4) policy descriptions for allowable method interleavings, and (5) an incremental process for inserting, validating, and exploiting annotations.
DTIC
Computer Programming; Programmers; Software Engineering

20070008528 SRI International Corp., Menlo Park, CA USA

The Grasper-CL (Trademark) Graph Management System

Karp, Peter D; Lowrance, John D; Strat Sr ,, Thomas M; Wilkins Sr , David E; Jan 20, 1993; 36 pp.; In English

Contract(s)/Grant(s): F30602-91-C-0039; F30602-90-C-0086

Report No.(s): AD-A461086; SRI-TN-521; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461086

Graphs are virtually ubiquitous in programming applications. Moreover, graph-structured information is especially prevalent in AI applications, and in the COMMON LISP system itself. We can enhance programs that manipulate graph-structured information by providing these programs with graphical user interfaces that draw graphs, and that allow users to interact with drawings of graph nodes and edges. Therefore, it follows that a programming tool that supports the construction of graph-based user interfaces is a desirable component of a modern COMMON LISP programming environment. Grasper-CL is a COMMON LISP system for manipulating and displaying graphs, and for building graph-based user interfaces for application programs. The system represents a significant advance over previous COMMON LISP graphers because each level of the Grasper-CL architecture - from the core graph data structures to the interactive display module - has been fully developed and articulated, and is accessible to application programmers. We call this system organization an open architecture. In our experience, several different classes of graph-based user interfaces exist. For example, one class produces static drawings of graphs, whereas another class requires extensive user interaction with graph drawings. The open architecture of Grasper-CL supports the development of all classes of interfaces, whereas previous graphers support only one or two classes of interfaces. Grasper-CL graphics operations are implemented using CLIM, the COMMON LISP Interface Manager. Section of this paper elaborates on the motivations for wanting a system that supports the development of graph-based user interfaces within the COMMON LISP programming environment. Section 3 introduces the architecture of Grasper-CL. Section 4 presents the different classes of graph-based user interfaces. Sections 5 through 8 provide more detailed descriptions of the five levels of the Grasper-CL architecture.

DTIC

Computer Programming; High Level Languages; LISP (Programming Language); Management Systems

20070008529 Carnegie-Mellon Univ., Pittsburgh, PA USA

Generalized Aliasing as a Basis for Program Analysis Tools

O'Callahan, Robert; Nov 2000; 295 pp.; In English

Contract(s)/Grant(s): F33615-03-1-1330; F30602-97-2-0031

Report No.(s): AD-A461095; CMU-CS-01-124; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA461095

Tools for automatic program analysis promise to improve programmer productivity by searching and summarizing large bodies of code. However, the phenomenon of aliasing different names being used to refer to the same data reduces the effectiveness of simple textual analyses. This dissertation describes the design of a system, Ajax, that addresses this problem by using semantics-based program analysis as the basis for a number of different tools to aid Java programmers. To enable the construction of many tools, Ajax imposes a clean separation between analysis engines that produce alias information and tools that consume it. Analyses are treated as 'black boxes' satisfying a simple, formal specification given in terms of the semantics of Java bytecode. Knowing only this specification, one can build many different tools with only a small amount of code. The thesis explores the flexibility and efficiency of the design by describing the construction and evaluation of several different tools: tools to find dead code, resolve Java virtual method calls, statically check Java downcasts, search for accesses to objects, and build object models. To support these tools, Ajax includes a novel static analysis engine for Java called SEMI, based on type inference with polymorphic recursion. SEMI provides fully context sensitive analysis of large programs. Using SEMI with the downcast checking tool, Ajax can prove the safety of more than 50% of the downcast instructions in some real-life Java programs, such as Sun's bytecode disassembler and the JavaCC parser generator. Ajax is the first system to address this particular task. One of the key goals of this thesis is to study issues bearing on the practical utility of static analysis tools for programmers. This document describes some of the challenges involved in building an analysis system for off-the-shelf Java applications, and suggests some possible avenues for future research.

DTIC

Commercial Off-the-Shelf Products; Computer Programming; Java (Programming Language); Object-Oriented Programming; Semantics; Software Engineering

20070008537 Carnegie-Mellon Univ., Pittsburgh, PA USA

Locating Internet Bottlenecks: Algorithms, Measurements, and Implications

Hu, Ningning; Li, Li E; Mao, Zhuoqing M; Steenkiste, Peter; Wang, Jia; Apr 27, 2004; 31 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F30602-99-1-0518; F30602-96-1-0287

Report No.(s): AD-A461104; CMU-CS-04-123; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461104

The ability to locate network bottlenecks along end-to-end paths on the Internet is of great interest to both network operators and researchers. For example, knowing where bottleneck links are, network operators can apply traffic engineering either at the interdomain or intradomain level to improve routing. Existing bandwidth measurement tools fail to identify the location of bottle-neck links. In addition, they often require access to both end points and generate huge amount of probing packets. These drawbacks make them impractical. In this paper, we present a novel light-weight, single-end active probing tool - Pathneck - based a novel probing technique called Recursive Packet Train (RPT), which allows end users to efficiently and accurately locate bottleneck points to destinations on the Internet. We evaluate Pathneck using trace-driven emulations and wide area Internet experiments. In addition, we conduct extensive measurements on the Internet among carefully selected, geographically diverse probing sources and destinations to study Internet bottleneck properties. We find that Pathneck can successfully detect bottlenecks for over 70% of paths, and most of the bottlenecks are fairly stable. We also report our success on bottleneck inference, using multihoming and overlay routing to avoid bottlenecks based on the bottleneck link location and bandwidth estimation provided by Pathneck.

DTIC

Algorithms; Internets; Packet Switching; Position (Location)

20070008546 Metron, Inc., Solana Beach, CA USA

Use of Modeling and Simulation (M&S) in Support of Joint Command and Control Experimentation: Naval Simulation System (NSS) Support to Fleet Battle Experiments

Gagnon, Colleen M; Stevens, William K; Jan 1999; 12 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-97-D-2016

Report No.(s): AD-A461113; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461113

The US Department of Defense (DoD) has embraced the concept of Joint Experimentation to help identify future joint requirements and potential capabilities that may meet those requirements. Experimentation is viewed as a means to spur key DoD innovation, to help determine DoD priorities, and to transition potential 21st century technology and process improvements into the US military. Despite the high level of visibility that first generation Joint and Service-specific experimentation programs have attracted, surprisingly little attention has been paid to how to best leverage scientific design of experiments and M&S practices to maximize the information that can be learned from such experiments. The application of scientific methods to DoD experimentation programs is, in the view of the authors, required in order to obtain the full benefit possible from operational experimentation. This paper presents lessons learned from the application of the Naval Simulation System (NSS) and general design of experiment practices to US Navy Fleet Battle Experiments Alpha through Echo. NSS has been involved in many aspects of the Navy Experimentation process since its inception. These applications are described, and potential future applications of M&S to the Experiment process are recommended.

DTIC

Command and Control; Computerized Simulation; Control Simulation; Simulation

20070008550 Carnegie-Mellon Univ., Pittsburgh, PA USA

Private and Threshold Set-Intersection

Kissner, Lea; Song, Dawn; Nov 2004; 44 pp.; In English

Contract(s)/Grant(s): DAAD19-02-1-0389

Report No.(s): AD-A461119; CMU-CS-04-182; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA461119

In this paper we consider the problem of privately computing the intersection of sets (set-intersection), as well as several variations on this problem: cardinality set-intersection, threshold set-intersection, and over-threshold set-intersection. Cardinality set-intersection is the problem of determining the size of the intersection set, without revealing the actual threshold number t times in the players' private inputs are revealed. Over-threshold set-intersection is a variation on threshold

set-intersection in which not only the threshold set is revealed, but also the number of times each element in the threshold set appeared in the private inputs.
DTIC
Computer Programs; Protocol (Computers); Security

20070008563 Carnegie-Mellon Univ., Pittsburgh, PA USA
RPT: A Low Overhead Single-End Probing Tool for Detecting Network Congestion Positions
Hu, Ningning; Steenkiste, Peter; Dec 20, 2003; 20 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-99-1-0518; F30602-96-1-0287
Report No.(s): AD-A461141; CMU-CS-03-218; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461141

Detecting the points of network congestion is an intriguing research problem, because this information can benefit both regular network users and Internet Service Providers. This is also a highly challenging problem, because the Internet is designed to provide only end-to-end services, and its internals are in principal invisible to end users. Current techniques used to detect bottleneck positions have problems such as high probing overhead and low measurement accuracy. In this paper, we propose using Recursive Packet Trains (RPT) to detect the network congestion position. RPT combines two types of probing packets - measurement packets and load packets - in a single probing packet train. The idea is to let load packets generate a packet queue on the router, and to use the measurement packets at the beginning and the end of the train to measure the packet train length. By detecting the changes in the packet train length, we can derive the congestion points of the network path. RPT has the advantages that it only needs single-end control and that it has relatively low overhead. In this paper, we present the algorithm and evaluate it using both testbed experiments and Internet experiments.
DTIC
Computer Networks; Congestion; Detection

20070008564 Carnegie-Mellon Univ., Pittsburgh, PA USA
Storage-based Intrusion Detection: Watching storage activity for suspicious behavior
Pennington, Adam G; Strunk, John D; Griffin, John L; Soules, Craig A; Goodson, Garth R; Ganger, Gregory R; Oct 2002; 23 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F49620-01-1-0433; F30602-99-2-0539
Report No.(s): AD-A461142; CMU-CS-02-179; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461142

Storage-based intrusion detection allows storage systems to transparently watch for suspicious activity. Storage systems are well-positioned to spot several common intruder actions, such as adding backdoors, inserting Trojan horses, and tampering with audit logs. Further, an intrusion detection system (IDS) embedded in a storage device continues to operate even after client systems are compromised. This paper describes a number of specific warning signs visible at the storage interface. It describes and evaluates a storage IDS, embedded in an NFS server, demonstrating both feasibility and efficiency of storage-based intrusion detection. In particular, both the performance overhead and memory required (40 KB for a reasonable set of rules) are minimal. With small extensions, storage IDSs can also be embedded in block-based storage devices.
DTIC
Client Server Systems; Computer Information Security; Intrusion

20070008568 Space and Naval Warfare Systems Command, Charleston, SC USA
The Data Warehouse in Service Oriented Architectures and Network Centric Warfare
Lenahan, Jack; Jan 2005; 12 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461151; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461151

Since Network Centric Warfare (NCW) theory stresses shared understanding, command dispersal, and improved situational awareness does it not follow then, that data availability, mining, and superior analytics must be available at all policy and command levels to support superior decision making? Analyzing the anticipated massive amount of GIG data will almost certainly require data warehouses and federated data warehouses. The central question being addressed here is: Will a new Data Warehouse Paradigm be required for Network Centric Warfare Service Oriented Architectures (SOA)? This research attempts to answer this question by analyzing Service Oriented Architecture (SOA) based Virtual Data Warehouses , Corporate Information Factories, and SOA based federated data warehouses. The research concludes that Composeable Data

Warehouse Services offer the best methodology for supporting decision making at all levels of dispersed command. On Demand - Composeable Data Warehouse Capabilities , based upon web services, should be implemented and registered on the GIG for testing and deployment if successful. These new paradigms will require that adaptive and agile Extract, Transform, and Load (ETL) services, dynamic report creation services, composeable mining engines, robust Meta data tagging for discovery and analysis, and more sophisticated analytics services be developed to fully exploit the vast amounts of Global Information GRID data which is expected to accumulate.
DTIC
Data Processing; Decision Making; Mining; Warfare

20070008571 Army Tank-Automotive Research and Development Command, Warren, MI USA
Future Combat Systems (FCS) Networked Fires Integration with Lead Systems Integrator's (LSI) Unmanned Combat Demonstration (UCD)in RDE Command First Application (1st App)
Paul, Bounker; Tackett, Greg; Jul 23, 2003; 8 pp.; In English
Report No.(s): AD-A461155; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461155

The Virtual Distributed Laboratory for Modeling and Simulation (VDLMS) Science and Technology Objective (STO) initiated a First Application (1st App) effort in 2003 to baseline the use of legacy distributed simulations within the RDE Command to support Future Combat Systems (FSC) and Objective Force experimentation. This paper discusses the lessons learned in connecting the Soldier-In-The-Loop (SITL) crew stations developed as part of the LSI's UCD with the Networked Fires experiment. The goal is to examine the feasibility of using Armed Reconnaissance Vehicles (ARVs) as forward observers for Networked Fires. Performance data will be measured identifying the ability to remotely manage the role of forward observer for Networked Fires from ARVs. While the 1st App event itself is classified, including specific results regarding the performance of Networked Fires, this paper will be an unclassified discussion, focusing on a small FCS tactical and technical performance thread for a proposed design.
DTIC
Combat; Computer Networks; Computerized Simulation; Fires; Integrators; Large Scale Integration; Systems Integration

20070008574 Massachusetts Univ., Amherst, MA USA
Dynamic Visualization of Battle Simulations
Cohen, Paul R; Davis, James A; Warwick, John L; Jan 2000; 8 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-97-1-0289; F30602-99-C-0061
Report No.(s): AD-A461163; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461163

We present a case study of visualization in understanding encounters between multiple agents in an adversarial environment. The information visualized consists of time series of attributes and relations such as mass, velocity and distance, which we preprocess with a Bayesian clustering algorithm. We differentiate between the encounters based on their outcomes, and generate two and three-dimensional maps that can be used to determine good courses of action from different points in the agents' environments.
DTIC
Combat; Simulation; War Games

20070008575 Carnegie-Mellon Univ., Pittsburgh, PA USA
Exploring Congestion Control
Akella, Aditya; Seshan, Srinivasan; Shenker, Scott; Stoica, Ion; May 2002; 24 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-99-1-0518
Report No.(s): AD-A461164; CMU-CS-02-139; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461164

From the early days of modern congestion control, ushered in by the development of TCP's and DECbit's congestion control algorithm and by the pioneering theoretical analysis of Chiu and Jain, there has been widespread agreement that linear additive-increase-multiplicative-decrease (AIMD) control algorithms should be used. However, the early congestion control design decisions were made in a context where loss recovery was fairly primitive (e.g. TCP Reno) and often timed-out when more than a few losses occurred and routers were FIFO drop-tail. In subsequent years, there has been significant improvement

in TCP's loss recovery algorithms. For instance, TCP SACK can recover from many losses without timing out. In addition, there have been many proposals for improved router queueing behavior. For example, RED active queue management and Explicit Congestion Notification (ECN) can tolerate bursty flow behavior. Per-flow packet scheduling (DRR and Fair Queueing) can provide explicit fairness. In view of these developments, we seek to answer the following fundamental question in this paper: Does AIMD remain the sole choice for congestion avoidance and control even in these modern settings? If not, can other mechanism(s) provide better performance? We evaluate the four linear congestion control styles - AIMD, AIAD, MIMD, MIAD - in the context of these various loss recovery and router algorithms. We show that while AIMD is an unambiguous choice for the traditional setting of Reno-style loss recovery and FIFO drop-tail routers, it fails to provide the best goodput performance in the more modern settings. Where AIMD fails, AIAD proves to be a reasonable alternative.
DTIC
Algorithms; Congestion; Data Management

20070008579 Carnegie-Mellon Univ., Pittsburgh, PA USA
The Effect of Profile Choice and Profile Gathering Methods on Profile-Driven Optimization Systems
Langdale, Geoff; Oct 2003; 139 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-96-1-0287
Report No.(s): AD-A461168; CMU-CS-03-195; No Copyright; Avail.: CASI: A07, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461168

Profile-driven optimization can produce substantial improvements in the quality of code produced by a compiler or link-time optimizer. In this work, we analyze several important aspects of profile-driven optimization. We examine the effectiveness of profile-driven optimization in two commercial-quality optimizers (Digital's GEM compiler and the link-time optimizer 'alto'). We perform analyses to determine how much variability in profile-driven optimization performance results from choosing different training profiles, and to determine how much optimization benefit results from choosing more 'accurate' profiles (that is, profiles that better predict the way that a program is actually run). We examine low-overhead profiling methods such as static estimation (estimating profiles using static heuristics) and statistical sampling (gathering profiles by sampling only a small number of basic block executions). We analyze some profile-driven optimization results in great detail, and show a methodology for accounting for the profile-driven optimization effects of profile data associated with individual functions. Our results show that profile-driven optimization is effective on average, but unreliable when considering any individual benchmark. Using more accurate profiles is only weakly connected to improved profile-driven optimization performance for most benchmarks. However, low-overhead profiling techniques result in substantial degradations in the reliability and average performance of profile-driven optimization, often to the point of rendering the entire profile-driven optimization process useless. Our analysis also shows that the effects of profile-driven optimization are highly concentrated in the profile data associated with a few functions. Whether profile data improves or worsens the performance of optimized code, it is often possible to attribute the vast majority of this effect to the profile data associated with just a few functions.
DTIC
Optimization; Selection

20070008591 Carnegie-Mellon Univ., Pittsburgh, PA USA
The Aura Software Architecture: an Infrastructure for Ubiquitous Computing
Sousa, Joao P; Garlan, David; Aug 2003; 48 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DASA0001
Report No.(s): AD-A461186; CMU-CS-03-183; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461186

Computing environments of the future should enable mobile users to take full advantage of the computing capabilities available at each location, while allowing them to focus on their real tasks, rather than being distracted by dealing with the configuration and reconfiguration of computer systems to support those tasks. The Aura infrastructure performs automatic configuration and reconfiguration of Ubicomp environments, according to the user's task and intent. This report describes the software architecture of the Aura infrastructure, and discusses the underlying rational. It describes the architecture from a layered perspective, detailing the partition of responsibility and shared assumptions, as well as from a component-connector perspective, detailing the protocols of interaction between the components (APIs and sequencing). The contents and format of the exchanged messages is extensively discussed, as well as the details pertaining service interconnection and decomposition. This report proposes a utility-based approach for modeling user preferences, and details how such models can

be exploited for both coarse-grain automatic (re)configuration, and fine-grain adaptation to resource change.
DTIC
Adaptation; Computer Networks; Configuration Management

20070008594 Defense Contract Audit Agency, Fort Belvoir, VA USA
An Integrated Contextual Information Service for Pervasive Computing Applications
Judd, Glenn; Steenkiste, Peter; Jan 2003; 26 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N66001-99-2-8918
Report No.(s): AD-A461190; CMU-CS-03-100; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461190

Pervasive computing applications are increasingly leveraging contextual information from several sources to provide users with behavior appropriate to the environment in which they reside. If these sources of contextual information are used and deployed in an ad hoc manner, however, they may provide overlapping functionality, fail to provide needed functionality, and require the use of inconsistent interfaces by applications. To overcome these problems, we introduce a Contextual Information Service that provides applications with contextual information via a virtual database. Unlike previous efforts, our service provides applications a consistent, lightweight, and powerful mechanism for obtaining contextual information, and includes explicit support for the on demand computation of contextual information. We show, using a Contextual Information Service prototype and example applications that we have implemented, how this approach can be used by proactive applications to adapt their behavior to match a user's current environment.
DTIC
Human-Computer Interface; Interprocessor Communication

20070008595 Santa Clara Univ., CA USA
Efficient Group Coordination in Multicast Trees
Dommel, Hans-Peter; Garcia-Luna-Aceves, J J; Jan 2001; 14 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F19628-96-C-0038
Report No.(s): AD-A461195; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461195

The majority of today's Internet applications relies on point-to-point communication. In recent years, however, multipoint communication support has become the foundation for such applications as multiparty video conferencing, distributed interactive simulations, and collaborative systems. We describe a novel protocol to coordinate multipoint groupwork within the IP-multicast framework. The protocol supports Internet-wide coordination for large and highly-interactive groupwork, relying on the dissemination of coordination directives among group members across a shared end-to-end multicast tree. We also describe how addressing extensions to IP multicast can be used for our multisite coordination mechanism.
DTIC
Coordination; Internets; Protocol (Computers)

20070008596 California Univ., Santa Cruz, CA USA
Floor Control for Activity Coordination in Networked Multimedia Applications
Dommel, Hans-Peter; Garcia-Luna-Aceves, J J; Jan 1995; 6 pp.; In English
Contract(s)/Grant(s): N00014-92-J-1807
Report No.(s): AD-A461198; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461198

Collaboration in networked multimedia applications requires means to coordinate the activities of a dynamically aggregating set of distributed users, working with various multimedia data on heterogeneous platforms. A floor denotes a control right over a shared resource within a collaborative workspace. Floor control, similar to concurrency control for databases, is gradually being integrated into shared applications to orchestrate the access and dynamic process of joint work on shared data, supporting or substituting a human conference chair. This paper presents a comprehensive view on floor control, analyzing requirements for protocols with respect to the variety of shared tools, describing an architecture to meet these requirements, and finally placing our work in the context of previous efforts.
DTIC
Coordination; Floors; Multimedia; Protocol (Computers); Resources

20070008598 California Univ., Santa Cruz, CA USA

The Case for Reliable Concurrent Multicasting Using Shared Ack Trees

Levine, Brian N; Lavo, David B; Garcia-Luna-Aceves, J J; Jan 1997; 13 pp.; In English

Contract(s)/Grant(s): N00014-94-1-0688; F19628-96-C-0038

Report No.(s): AD-A461200; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461200

Such interactive, distributed multimedia applications as shared whiteboards, group editors, and simulations require reliable concurrent multicast services, i.e., the reliable dissemination of information from multiple sources to all the members of a group. Furthermore, it makes sense to offer that service on top of the increasingly available IP multicast service, which offers unreliable multicasting. This paper establishes that concurrent reliable multicasting over the Internet should be based on reliable multicast protocols based on a shared acknowledgment tree. First, we show that organizing the receivers of a reliable multicast group into an acknowledgment tree and using NAK-avoidance with periodic polling in local groups inside such a tree provides the highest maximum throughput among all classes of reliable multicast protocols proposed to date. Second, we introduce Lorax, which demonstrates the viability of implementing a reliable multicasting approach in the Internet based on acknowledgment trees in a scalable manner. Lorax is the first known protocol that constructs and maintains a single acknowledgment tree for reliable concurrent multicasting, eliminates the need to maintain an acknowledgment tree for each source of a reliable multicast group, and can be used in combination with any of several tree-based reliable multicast protocols proposed to date.

DTIC

Internets; Protocol (Computers)

20070008599 Colorado Univ., Boulder, CO USA

BIGMAC II: A FORTRAN Language Augmentation Tool

Myers, Jr , Eugene W; Osterweil, Leon J; Jul 1980; 61 pp.; In English

Contract(s)/Grant(s): DAAG29-80-C-0094; MCS77-02194

Report No.(s): AD-A461204; CU-CS-179-80; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA461204

This paper describes the motivation, design, implementation, and some preliminary performance characteristics of BIGMAC, a macro definition capability for creating language enhancors and translators. BIGMAC enables the user to specify transformations through STREX, a FORTRAN-like language, which enables the specification of macros which are then used to interpretively alter incoming programs. BIGMAC is specially adapted to the processing of FORTRAN programs. This paper shows how it can be used as a deprocedurizer (or flattener), a dialect-to- dialect translator, a portability and version control aid, and a device for creating language enhancements as sophisticated as new control structures and abstract data types

DTIC

Augmentation; Computer Aided Design; Computer Programs; FORTRAN; Programming Languages

20070008605 University of Southern California, Marina del Rey, CA USA

Image-Based Techniques for Digitizing Environments and Artifacts

Debevec, Paul; Jan 2003; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F49620-93-C-0014; DAAD19-99-D-0046

Report No.(s): AD-A461213; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461213

This paper presents an overview of techniques for generating photoreal computer graphics models of real-world places and objects. Our group's early efforts in modeling scenes involved the development of Facade, an interactive photogrammetric modeling system that uses geometric primitives to model the scene, and projective texture mapping to produce the scene appearance properties. Subsequent work has produced techniques to model the incident illumination within scenes, which we have shown to be useful for realistically adding computer-generated objects to image-based models. More recently, our work has focussed on recovering lighting-independent models of scenes and objects, capturing how each point on an object reflects light. Our latest work combines three-dimensional range scans, digital photographs, and incident illumination measurements to produce lighting-independent models of complex objects and environments.

DTIC

Computer Graphics; Digital Systems; Image Analysis

20070008608 Army Research Lab., Aberdeen Proving Ground, MD USA
An Experimental Testbed for Battle Planning
Bodt, Barry; Forester, Joan; Hansen, Charles; Heilman, Eric; Kaste, Richard; O'May, Janet; Jan 2000; 18 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461218; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461218

This paper describes a modular evaluation testbed for Army Course Of Action (COA) Analysis (COAA), with emphasis on research into assessing the feasibility of COAs developed using a simplistic wargaming mechanism. Central to the project is the use of a realistic combat simulation to produce detailed COA evaluation. Components of the testbed include the COA generator Fox-GA (developed under the auspices of ARL's Federated Laboratory and based on genetic algorithm technology) and the evaluation platform Modular Semi-Automated Forces (ModSAF), a widely used modular combat simulation. Emphasis is placed on COA elements, transformation of Fox-GA COAs to ModSAF scenarios, experimental challenges, and statistical approaches to assessing the execution results.
DTIC
Combat; Simulation; War Games

20070008618 Colorado Univ., Boulder, CO USA
Parallel Computers: Current Systems and Capabilities
McBryan, Oliver A; Dec 1992; 51 pp.; In English
Contract(s)/Grant(s): AFOSR-89-0422; ASC-9217394
Report No.(s): AD-A461232; CU-CS-635-92; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461232

The needs of scientific and engineering grand challenge computations are driving the design of current high performance computing systems. We review the background for this development and the essential role played by massively parallel computers (section 1). We describe the various major classifications of massively parallel systems and describe the advantages of each approach (section 2). Finally we survey in detail most of the recent advanced systems, discussing both their hardware and software (sections 3-6).
DTIC
Computer Programs; Parallel Processing (Computers)

20070008623 Carnegie-Mellon Univ., Pittsburgh, PA USA
The Wizard of TILT: Efficient?, Convenient, and Abstract Type Representations
Murphy, Tom; Mar 2002; 23 pp.; In English
Contract(s)/Grant(s): F19628-95-C-0050; NSF-CCR-9984812
Report No.(s): AD-A461241; CMU-CS-02-120; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461241

TILT is a certifying compiler for Standard ML [1]. Its major distinguishing feature is the use of Typed Intermediate Languages throughout the phases of compilation. Because each of the code transformations that the compiler performs also transforms the types, we preserve type information that is normally discarded after typechecking the source language in traditional compilers. This allows us to typecheck the results of these transformations (catching compiler bugs), perform data representation optimizations, and do nearly tag-free garbage collection. We eventually intend for TILT to generate proof-carrying code [2]. Unfortunately, storing and processing types at compile-time imposes a performance penalty on the compiler. With type-checking enabled after each transformation and optimization, TILT is slow. This paper recounts our experience in attempting to implement a more e cient type representation strategy into the substantial existing code base. Though the abstraction and optimizations are successful, in the end we are overwhelmed by the overhead necessary to implement them.
DTIC
Coding; Compilers; Data Processing

20070008629 Carnegie-Mellon Univ., Pittsburgh, PA USA
Automating the Modeling and Optimization of the Performance of Signal Processing Algorithms
Singer, Bryan W; Dec 2001; 212 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DABT63-98-1-0004
Report No.(s): AD-A461254; CMU-CS-01-156; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461254

Many applications require fast implementations of signal processing algorithms to analyze data in real time or to effectively process many large data sets. Fast implementations of a signal transform need to take advantage of structure in the transformation matrix to factor the transform into a product of structured matrices. These factorizations compute the transform with fewer operations than the naive implementation of matrix multiplication. Signal transforms can have a vast number of factorizations, with each factorization of a single transform represented by a unique but mathematically equivalent formula. Interestingly, when implemented in code, these formulas can have significantly different runtimes on the same processor, sometimes differing by an order of magnitude. Further, the optimal implementations differ significantly between processors. Therefore, determining which formula is the most efficient for a particular processor is of great interest. This thesis contributes methods for automating the modeling and optimization of performance across a variety of signal processing algorithms. Modeling and understanding performance can greatly aid in intelligently pruning the huge search space when optimizing performance. Automation is vital considering the size of the search space, the variety of signal processing algorithms, and the constantly changing computer platform market. To automate the optimization of signal transforms, we have developed and implemented a number of different search methods in the SPIRAL system. These search methods are capable of optimizing a variety of different signal transforms, including new user-specified transforms. We have developed a new search method for this domain, STEER, which uses an evolutionary stochastic algorithm to find fast implementations. To enable computer modeling of signal processing performance, we have developed and analyzed a number of feature sets to describe formulas representing specific transforms.
DTIC
Algorithms; Artificial Intelligence; Mathematical Models; Optimization; Performance Prediction; Signal Processing

20070008633 Naval Ship Research and Development Center, Bethesda, MD USA
DEFINIT - A New Element Definition Capability for NASTRAN: User's Manual
Golden, Michael E; Hurwitz, Myles M; Dec 1973; 203 pp.; In English
Report No.(s): AD-A461260; DTNSRDC-4250; No Copyright; Avail.: CASI: A10, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461260
To relieve the user of NASTRAN-the National Aeronautics and Space Administration's general purpose, finite element, structural analysis computer program- from the necessity of becoming involved with internal aspects of NASTRAN when he adds a new element, a new element definition capability has been developed. This capability takes the form of a preprocessor which will generate, according to user specifications, the FORTRAN routines and tables required by NASTRAN for a new element. This manual contains details and instructions on the use of the preprocessor, and provides numerous examples.
DTIC
Computer Programs; Manuals; User Manuals (Computer Programs)

20070008634 Colorado Univ., Boulder, CO USA
Managing Change in Software Development Through Process Programming
Sutton ,Jr , Staneley M; Heimbigner, Dennis; Osterweil, Leon J; Jun 1991; 33 pp.; In English
Contract(s)/Grant(s): CCR-87-5162
Report No.(s): AD-A461261; CU-CS-531-91; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461261
Change is pervasive during software development. Change management can be facilitated by software-process programming, which formalizes software products and processes in software-process programs. Toward this end process-programming languages (PPLs) should include constructs that address specific change-management problems. These include lack of explicit representation for relationships, weak or inflexible constraints on objects and relationships, visibility of implementations, lack of formal representation of processes, and dependence on manual practices. APPL/A is a prototype PPL that addresses these problems. APPL/A is an extension to Ada, APPL/A includes abstract, persistent relations with programmable implementations, relation attributes that may be composite and derived, triggers that react to relation operations, optionally-enforcible predicates on relations, and five composite statements that provide flexible transaction-related capabilities. Relations enable relationships to be represented explicitly and derivation dependencies to be maintained automatically. Relation bodies may implement alternative storage and computation strategies without affecting users of relation specifications. Triggers can automatically propagate data, invoke tools, and perform other change-management tasks. Predicates and the transaction-related statements can be used to support change management in the face of concurrent processes and evolving standards of consistency. Together, these features mitigate many of the problems that complicate change management in software development.
DTIC
Ada (Programming Language); Computer Programming; Computer Programs; Software Engineering

20070008637 Colorado Univ., Boulder, CO USA
FCM: A Flexible Consistency Model for Software Processes
Sutton ,Jr, Stanley M; Mar 1990; 67 pp.; In English
Contract(s)/Grant(s): CCR-8705162
Report No.(s): AD-A461264; CU-CS-462-90; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461264

This paper presents a flexible model of consistency for software processes and products. The model is motivated by the difficulty of defining and maintaining the consistency of software products during software development. Software development can be viewed as the process of creating a consistent software product. However, software processes are lengthy and complex, the criteria for consistency are often dynamic and relative to specific processes, and inconsistency is often inescapable. (A detailed examples is presented in Section 2.) The goal of the flexible consistency model presented here is not to attempt to suppress these problems. Rather it is to accommodate the problems of representing arid maintaining consistency in a way that facilitates tile modeling of software processes and the development of software products. A consistency model for software products has several aspects. It must minimally include some notion of consistency for those products and some mechanism for evaluating that consistency. In practice the criteria for consistency may be implicit or explicit, and the mechanism for evaluating and enforcing consistency may be manual or automatic (for example, see [8,19,11,12,10]). The model may also include some view, either implicit or explicit, of how the criteria for consistency evolve in time (if at all). A practical consistency model must also be integrated with a model for operations on the data, and it must include rules about the consequences of consistency (or inconsistency) for those operations. Operations on data are typically addressed in 'transaction models', which may also include operational criteria for consistency i.e., serializability and atomicity [13,14,18,12]. In the conception of this paper a general consistency model subsumes a transaction model. The capabilities in each area complement one another, and flexibility in both is regarded as essential for software processes.
DTIC
Computer Programming; Computer Programs; Consistency; Software Development Tools

20070008649 Stanford Univ., Stanford, CA USA
Decomposing, Transforming and Composing Diagrams: The Joys of Modular Verification
de Alfaro, Luca; Manna, Zohar; Sipma, Henny; Jan 1998; 15 pp.; In English
Contract(s)/Grant(s): DAAH04-95-1-0317; DAAH04-96-1-0341
Report No.(s): AD-A461279; STAN-C-98-1614; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461279

The paper proposes a modular framework for the verification of temporal logic properties of systems based on the deductive transformation and composition of diagrams The diagrams represent abstractions of the modules composing the system, together with information about the environment of the modules The proof of a temporal specification is constructed with the help of diagram transformation and composition rules, which enable the gradual decomposition of the system into manageable modules, the study of the modules, and the final combination of the diagrams into a proof of the specification. We illustrate our methodology with the modular verification of a database demarcation protocol.
DTIC
Artificial Intelligence; Data Bases; Decomposition

20070008660 Naval Postgraduate School, Monterey, CA USA
Software Evolution Approach for the Development of Command and Control Systems
Luqi,; Berzins, V; Shing, M; Nada, N; Eagle, C; Jun 2000; 14 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461297; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461297

This paper addresses the problem of how to produce reliable software that is also flexible and cost effective for the DoD distributed software domain. DoD software systems fall into two categories: information systems and war fighter systems. Both types of systems can be distributed, heterogeneous and network-based, consisting of a set of components running on different platforms and working together via multiple communication links and protocols. We propose to tackle the problem using prototyping and a wrapper and glue technology for interoperability and integration. This paper describes a distributed development environment, CAPS (Computer-Aided Prototyping System), to support rapid prototyping and automatic generation of wrapper and glue software based on designer specifications. The CAPS system uses a fifth-generation prototyping language to model the communication structure, timing constraints, I/O control, and data buffering that comprise the requirements for an embedded software system. The language supports the specification of hard real-time systems with

reusable components from domain specific component libraries. CAPS has been used successfully as a research tool in prototyping large war-fighter control systems (e.g. the command-and-control station, cruise missile flight control system, missile defense systems) and demonstrated its capability to support the development of large complex embedded software.
DTIC

Command and Control; Computer Programming; Computer Techniques; Control Systems Design; Evolution (Development); Glues; Interoperability; Prototypes; Software Engineering

20070008664 Idaho Univ., Moscow, ID USA

Robust Control of a Platoon of Underwater Autonomous Vehicles

Okamoto, A; Feeley, J J; Edwards, D B; Jan 2004; 7 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-03-1-0634

Report No.(s): AD-A461304; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA461304

Effective control systems for a variety of underwater autonomous vehicles have been developed and are in use. These systems generally assume the vehicle is operating independently of other nearby vehicles. However, there is recent and growing interest in the coordinated control of a platoon of vehicles acting cooperatively to achieve an objective that a single vehicle operating alone cannot achieve. This paper presents the design of a robust multivariable controller for decentralized leader-follower control of a platoon of autonomous underwater vehicles. A three degree-of-freedom model of the REMUS underwater vehicle is used as an example case for control in a plane. The design is based on Linear Quadratic Gaussian Regulator theory with Loop Transfer Recovery. A way point guidance system is used for lead vehicle navigation. Follower vehicles maintain specified range and bearing to adjacent vehicles. The resulting control system is used in a computer simulated search for randomly distributed mines. A three vehicle fleet is used to demonstrate superiority, in terms of area coverage and elapsed time, over a single vehicle search. Simulations are performed both with and without ocean current disturbances. A unique formation swap maneuver is introduced to make an efficient 180 degree turn in a mow-the-lawn type multi-vehicle search.
DTIC

Autonomous Navigation; Autonomy; Computerized Simulation; Control; Controllers; Linear Quadratic Gaussian Control; Loop Transfer Recovery; Underwater Vehicles

20070008672 Naval Postgraduate School, Monterey, CA USA

Computer Aided Prototyping System (CAPS) for Heterogeneous Systems Development and Integration

Luqi,; Berzins, V; Shing, M; Nada, N; Eagle, C; Jan 2000; 14 pp.; In English; Original contains color illustrations

Report No.(s): AD-A461315; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA461315

This paper addresses the problem of how to produce reliable software that is also flexible and cost-effective for the Department of Defense (DoD) distributed software domain. DoD software systems fall into two categories: information systems and war fighter systems. Both types of systems can be distributed, heterogeneous, and network-based, consisting of a set of components running on different platforms and working together via multiple communications links and protocols. The authors propose to tackle the problem using prototyping and a wrapper and glue technology for interoperability and integration. This paper describes a distributed development environment, CAPS (Computer-Aided Prototyping System), to support rapid prototyping and automatic generation of wrapper and glue software based on designer specifications. The CAPS system uses a fifth-generation prototyping language to model the communication structure, timing constraints, I/O control, and data buffering that constitute the requirements for an embedded software system. The language supports the specification of hard real-time systems with reusable components from domain-specific component libraries. CAPS has been used successfully as a research tool in prototyping large warfighter control systems, and has demonstrated its capability to support the development of large complex embedded software.
DTIC

Commercial Off-the-Shelf Products; Computer Programming; Computer Techniques; Defense Program; Heterogeneity; Interoperability; Prototypes; Software Engineering; Software Reliability; Systems Engineering

20070008673 Naval Postgraduate School, Monterey, CA USA

Object-Oriented Modular Architecture for Ground Combat Simulation

Luqi,; Berzins, V; Shing, M; Saluto, M; Williams, J; Jan 2000; 17 pp.; In English; Original contains color illustrations

Report No.(s): AD-A461316; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461316

This paper addresses the need to modernize the software of the Janus(A) systems into a maintainable and evolvable structure. It describes the effective use of computer-aided prototyping techniques for re-engineering the legacy software to develop an object-oriented modular architecture for the Janus combat simulation system. Janus(A) is a software-based war game that simulates ground battles between up to six adversaries. It is an interactive, closed, stochastic, ground combat simulation with color graphics. Janus is 'interactive' in that command and control functions are entered by military analysts who decide what to do in crucial situations during simulated combat. The current version of Janus operates on a Hewlett Packard workstation and consists of a large number of FORTRAN modules (1918 FORTRAN routines, 115 C routines, and a total of 393,000 lines of source code). The FORTRAN modules are organized as a flat structure and interconnected with one another via 129 FORTRAN COMMON blocks, resulting in a software structure that makes modification to Janus very costly and error-prone. The Software Engineering group at the Naval Postgraduate School was tasked to extract the existing functionality through reverse engineering and to create a base-line object-oriented architecture that supports existing and required enhancements to Janus functionality. The object models produced in this project have proven invaluable to the contractors during the code implementation phase of the U.S. Army TRAC HLA Warrior project.
DTIC
Combat; Computer Programming; Computer Techniques; Object-Oriented Programming; Prototypes; Simulation; Software Engineering; Warfare

20070008685 California Univ., Santa Cruz, CA USA
Interface-Based Design
de Alfaro, Luca; Henzinger, Thomas A; Jan 2004; 26 pp.; In English
Contract(s)/Grant(s): N00014-02-1-0671
Report No.(s): AD-A461347; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461347

We motivate and introduce the theory behind formalizing rich interfaces for software and hardware components. Rich interfaces specify the protocol aspects of component interaction. Their formalization, called interface automata, permits a compiler to check the compatibility of component interaction protocols. Interface automata support incremental design and independent implementability. Incremental design means that the compatibility checking of interfaces can proceed for partial system descriptions, without knowing the interfaces of all components. Independent implementability means that compatible interfaces can be refined separately, while still maintaining compatibility.
DTIC
Computer Programs; Design Analysis

20070008692 Army Engineer Research and Development Center, Vicksburg, MS USA
Extensible Model Data Format (XMDF)
Butler, Cary D; Richards, David R; Wallace, Robert M; Jones, Norman L; Jones, Russell; Jan 2007; 99 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461368; ERDC SR-07-1; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461368

The U.S. Army Engineer Research and Development Center in conjunction with the Environmental Modeling Research Laboratory (EMRL) at Brigham Young University (BYU) is developing an efficient Application Programming Interface (API) for handling multi-dimensional data produced for water resource computational modeling. This API, in conjunction with a corresponding data standard. is being implemented within ERDC computational models to facilitate rapid data access, enhanced data compression and data sharing, and cross-platform independence. The API and data standard are known as the eXtensible Model Data Format (XMDF). and version 1.0 is available for public use and free dissemination. This report presents the purpose and architecture of the XMDF API and data format.
DTIC
Application Programming Interface; Format; FORTRAN; Models

20070008702 University of Southern California, Marina del Rey, CA USA
STELLA - A Lisp-Like Language for Symbolic Programming with Delivery in Common Lisp, C++, and Java
Chalupsky, Hans; MacGregor, Robert M; Jan 1999; 9 pp.; In English
Contract(s)/Grant(s): N00014-94-C-0245
Report No.(s): AD-A461405; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461405

We describe STELLA,1 a strongly typed, object-oriented, Lisp-like language, designed to facilitate symbolic programming tasks in artificial intelligence applications. STELLA preserves those features of Common Lisp deemed essential for symbolic programming such as built-in support for dynamic data structures, heterogeneous collections, first-class symbols, powerful iteration constructs, name spaces, an object-oriented type system with a meta-object protocol, exception handling, and language extensibility through macros, but without compromising execution speed, interoperability with non-STELLA programs, and platform independence. STELLA programs are translated into a target language such as C++, Common Lisp, or Java, and then compiled with the native target language compiler to generate executable code. The language constructs of STELLA are restricted to those that can be translated directly into native constructs of the intended target languages, thus enabling the generation of highly efficient as well as readable code.
DTIC
C++ (Programming Language); Language Programming; LISP (Programming Language); Object-Oriented Programming; Symbolic Programming

20070008725 Carnegie-Mellon Univ., Pittsburgh, PA USA
Case Study of the NENE Code Project
Kendall, Richard; Post, Douglass; Mark, Andrew; Jan 2007; 24 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8721-05-C-0003
Report No.(s): AD-A461460; CMU/SEI-2006-TN-044; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461460

The Defense Advanced Research Projects Agency (DARPA) High Productivity Computing Systems (HPCS) Program is sponsoring a series of case studies to identify the life cycles, workflows, and technical challenges of computational science and engineering code development that are representative of the program's participants. A secondary goal is to characterize how software development tools are used and what enhancements would increase the productivity of scientific-application programmers. These studies also seek to identify lessons learned that can be transferred to the general computational science and engineering community to improve the code development process. The NENE code is the fifth science-based code project to be analyzed by the Existing Codes subteam of the DARPA HPCS Productivity Team. The NENE code is an application code for analyzing scientific phenomena and predicting the complex behavior and interaction of individual physical systems and individual particles in the systems. The core NENE development team is expert, agile, and of moderate size, consisting of a professor and another permanent staff member, five post docs, and 11 graduate students. NENE is an example of a distributed development project; the core team is anchored at a university, but as many as 250 individual researchers have made contributions from other locations.
DTIC
Computer Programming; Project Management; Software Engineering

20070008728 Connecticut Univ., Storrs, CT USA
A Software Environment for the Design of Organizational Structures
Shlapak, Yuriy; Luo, Jie; Levchuk, Georgiy M; Tu, Fang; Pattipati, Krishna R; Jan 2000; 16 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-00-1-0101; N00014-93-1-0793
Report No.(s): AD-A461468; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461468

This paper presents a software environment for adaptive organizational design, with focus on synthesizing Joint Task Force (JTF) C2 architectures subject to organizational constraints (e.g., the availability of resources and/or DMs, the distribution of DMs expertise, etc.). Currently, the design environment includes software modules for: (1) mission modeling to extract task dependency graphs; (2) mission planning to allocate resources to tasks; (3) hierarchical clustering algorithms for grouping resources into decision-maker (DM) nodes, and (4) building an organizational hierarchy. In addition, basic modules for dynamic adaptation of organizational strategies and structures in the face of changing mission environment and/or resources are being added. The organizational design environment presented in this paper enables an analyst to synthesize robust organizational structures and evaluate their performances. The software tool allows an analyst to decompose the process of organizational design into a sequence of stages and visualize the design process. The software also allows a user to input parameters and constraints in a natural way at various stages of the design process, making it possible to design organizational

structures with desired attributes (e.g., speed of command, workload, team coordination).
DTIC
Command and Control; Software Development Tools

20070008743 Space and Naval Warfare Systems Center, San Diego, CA USA
U.S. Navy Standards and Interfaces Study: FY 2002 Results
Fletcher, Barbara; Feb 12, 2003; 8 pp.; In English
Report No.(s): AD-A461487; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461487

The US Navy's Unmanned Undersea Vehicle (UUV) Master Plan (April 2000) calls for adopting a more modular design philosophy and the establishment of standards for better integration of future UUV systems. In early 2002, a study team was formed with representatives from 5 Navy laboratories. Existing standards and systems have been examined, as well as soliciting industry input. Six draft standards were generated from this year's effort: 1) UUV Control Architecture and Software. 2) Propulsion and Hotel Power Bus. 3) Communications Protocols. 4) Data Storage. 5) UUV CPU backbone Architecture. 6) Electrical Connectors. Future efforts may include establishing standards for UUV modules and the development of guidelines for a modular common mission planner. Further industry and academic input is being sought for the further development of these and other standards.
DTIC
Communication Networks; Data Storage; Navy; Protocol (Computers); Underwater Vehicles

20070008748 California Univ., Berkeley, CA USA
MOCHA: Exploiting Modularity in Model Checking
de Alfaro, L; Alur, R; Grosu, R; Henzinger, T; Kang, M; Majumdar, R; Mang, F; Meyer-Kirsch, C; Wang, B Y; Aug 2, 2000; 17 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): NAG2-1214
Report No.(s): AD-A461494; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461494

MOCHA is a growing interactive software environment for specification, simulation and verification of concurrent systems. The main objective MOCHA is to exploit the modularity in the design structure during model checking. It is intended as a vehicle for development of new verification algorithms and approaches. MOCHA is available in two versions, cMOCHA (Version 1.0.1) and jMOCHA (Version 2.0). This paper describes jMOCHA (for an introduction to cMOCHA, see [2]). Like its predecessor, jMOCHA offers the following capabilities: * System specification in the language of ReaCTIVE MODULES. Reactive modules allow the formal specification of heterogeneous systems with synchronous and asynchronous components. Reactive Modules support modular and hierarchical structuring and reasoning * System executive by randomized or manual trace generation. In the manual mode, the user may choose at each step one of the possible next state of the system. * Requirement verification by invariant checking. MOCHA supports both symbolic and enumerative search. The symbolic model checker is based on BDD engines developed by the UC Berkeley VIS project. * Implementation verification by checking trace containment between implementation and specification modules. The check can be performed automatically if the specification module has no private variables, and otherwise, the user has to supply a witness module defining the refinement mapping. For decomposing proofs, MOCHA supports an assume-guarantee principle.
DTIC
Computer Programs; Computers; Mathematical Models; Modularity; Systems Analysis

20070008755 Naval Research Lab., Washington, DC USA
A Virtual Collaboration Testbed for C2
Gardner, Sheldon; Jan 2000; 11 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461506; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461506

Next generation information warfare will require seamless architecture and systems integration to effectively integrate and improve interoperability with allied and coalition mission planning partners. Collaboration of experts from different domains has always posed logistical and knowledge management challenges to managers and members of the collaboration. Responsive information collection, processing and dissemination require a common operational picture, precise battlespace knowledge, and enhanced command and control (C2) systems. To be effective in future Network Centric Warfare (NCW),

mission planners will need to operate in a virtual environment with seamless sharing and collaboration among participants and the resources they use to do work. Advances in information technology have made it easier to communicate to solve, or at least mitigate, some of these problems using e-mail, audio conferencing, and database management software, but a great deal of human intervention is still required to make these collaborations operate smoothly. Over the past ten years enterprises have come to require more than just total asset visibility and human communication capabilities. To plan more effectively and for less cost more human creativity and energy must be focused on the planning products and less on the operation of the planning collaboration. The collaborative environment solutions of the future must not only provide the communication and knowledge management that exists today, but also provide seamless access to resources and information, product and process modeling and the advanced decision support that results from the availability of necessary resources and information. In this paper we discuss a collaboration framework, called Collaborative Enterprise Environment (CEE) which is being implemented in several facilities including the Air Force Research Lab (AFRL) and the Naval Research Laboratory (NRL).
DTIC
Architecture (Computers); Systems Integration; Virtual Reality

20070008762 Colorado Univ., Boulder, CO USA
Language Interoperability Issues in the Integration of Heterogeneous Systems
Sutton ,Jr , Stanley M; Tarr, Peri; Sep 1993; 22 pp.; In English
Contract(s)/Grant(s): MDA972-91-J-1009; MDA927-91-J-1012
Report No.(s): AD-A461518; CU-CS-675-93; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461518

Heterogeneity and consequently interoperability, has become fundamental to large system development and integration. We investigated language interoperability issues in an attempt to integrate two tools written in different languages. We required capabilities such as access to data in both languages, coordination of transactions between languages, and the signaling of events between the languages, among others. These kinds of functionality are typical of advanced heterogeneous applications. We found, however, that current interoperability mechanisms did not provide sufficient support because they tend to focus on a particular domain, e.g., types, events, or transactions. Interoperability between languages depends on the resolution of semantic differences and coordination of functionality in many different domains, such as data, persistence, events and triggers, consistency, and transactions. Interoperability is further complicated by semantic and functional interdependencies within languages.
DTIC
Heterogeneity; Interoperability; Programming Languages

20070008763 Michigan Univ., Ann Arbor, MI USA
The Need for Large Register Files in Integer Codes
Postiff, Matthew; Greene, David; Mudge, Trevor; Jan 2000; 29 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DABT63-97-C-0047
Report No.(s): AD-A461519; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461519

Register allocation is an important optimization for high performance microprocessors but there is no consensus in the architecture or compiler communities as to the best number of registers to provide in an instruction set architecture. This paper discusses reasons why this situation has occurred and shows from a compiler perspective that, compared to the conventional 32-register file, 64 or more registers enables performance improvements from 5% to 20%. This is demonstrated with existing advanced compiler optimizations on the SPECint95 and SPEC2000 benchmarks. This work also documents that the optimizations eliminate cache hit operations, converting common-case cache hits to faster register accesses. Finally, this work provides additional measurements for the proper number of registers in a high-performance instruction set and shows that most programs can easily use 100 to 200 registers when multiple active functions are considered for simultaneous allocation to the register file.
DTIC
Computer Storage Devices; Integers

20070008765 Colorado Univ., Boulder, CO USA
Five Performance Enhancements for Hybrid Hash Join
Graefe, Goetz; Jul 1992; 32 pp.; In English
Contract(s)/Grant(s): IRI-8996270; IRI-8912618
Report No.(s): AD-A461521; CU-CS-606-92; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461521

In this paper, we focus on set matching algorithms such as intersection, difference, union, and relational join, using join as a representative for all these matching problems. We discuss five performance enhancements for hybrid hash join algorithms, namely data compression, large cluster sizes and multi-level recursion, role reversal of build and probe inputs, histogram methods to exploit non-uniform data and hash value distributions (skew), and join algorithms for multiple inputs. While each of the enhancements is fairly simple, the most surprising result is that hash value skew can be exploited and improve performance rather than being a danger to hybrid hash join performance as conventionally thought. Our design for hash-based N-way matching algorithms is a dual to pipelining data without intermediate sorting between multiple merge-joins on the same attribute (interesting orderings), and exceeds its performance advantages. Each of the performance enhancements can be used by itself or they can be combined with each other as well as with parallel query execution techniques. The cumulative effect of the optimizations is that hybrid hash join will almost always be the set matching algorithm of choice, even in situations for which earlier research had recommended sorting and merge-join. DATABASE QUERY PROCESSING, SET MATCHING, HYBRID HASH JOIN, TUNING, DATA COMPRESSION, I/O SPEED, FAN-OUT, RECURSION DEPTH, ROLE REVERSAL, NON-UNIFORMITY, HISTOGRAMS, INTERESTING ORDERINGS, N-WAY PARTITIONING,
DTIC

Algorithms; Augmentation; Data Bases; Data Compression; Recursive Functions

20070008788 New Mexico Inst. of Mining and Technology, Socorro, NM USA
Engineering Overview of the Conceptual Design and Hardware/Software Implementation Proposed for the Magdalena Ridge Observatory Interferometer
Parameswariah, Chethan; Bakker, Eric; Buscher, David; Coleman, Tom; Creech-Eakman, Michelle; Haniff, Chris; Jurgensen, Colby; Klinglesmith, Dan; Young, John; Jan 2006; 13 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00173-01-2-C902
Report No.(s): AD-A461550; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461550

Magdalena Ridge Observatory (MRO) Interferometer is a ten telescope optical interferometer array being built on the Magdalena Mountains 20 miles west of Socorro, New Mexico. The interferometer is being designed by collaboration between New Mexico Institute of Mining and Technology and the University of Cambridge. The science mission and requirements have been finalized which has helped to begin engineering design and development culminating in detailed conceptual designs. Some of the proposed hardware and software implementations are currently being tested in the lab. We present an engineering overview of the conceptual design and the proposed hardware and software implementations.
DTIC

Computer Programs; Computers; Interferometers; Observatories; Optical Measurement

20070008800 California Univ., Santa Cruz, CA USA
Efficient Security Mechanisms for the Border Gateway Routing Protocol
Smith, Bradley R; Garcia-Luna-Aceves, J J; Aug 22, 1997; 19 pp.; In English
Contract(s)/Grant(s): F19628-96-C-0038
Report No.(s): AD-A461568; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461568

We analyze the security of the BGP routing protocol and identify a number of vulnerabilities in its design and the corresponding threats. We then present modifications to the protocol that minimize or eliminate the most significant threats. The innovation we introduce is the protection of the second-to-last hop information contained in the AS_PATH attributes by digital signatures, and the use of this predecessor information to verify the path of the selected route. With these techniques, we are able to secure complete path information in near constant space, avoiding the recursive protection mechanisms proposed for BGP in the past.
DTIC

Internets; Protocol (Computers); Security

20070008801 Colorado Univ., Boulder, CO USA
A Process-Object Centered View of Software Environment Architecture
Osterweil, Leon; Mar 1988; 29 pp.; In English
Contract(s)/Grant(s): DCR-8745444; DCR-8403341
Report No.(s): AD-A461569; CU-CS-332-86; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461569

The essential purpose of a software environment is to provide strong, complete and readily accessible support for such key software processes as development and maintenance. The basis of such support must be a diverse and powerful set of functional capabilities supplied by what has previously been referred to as 'software tools'. Increasingly, however, it is becoming clear that the most challenging part of creating an effective software environment is not the creation of the software tools themselves, but rather the effective integration of those tools and presentation of their capabilities to the user.
DTIC
Architecture (Computers); Software Development Tools

20070008806 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Improving Maintenance Data Collection Via Point-of- Maintenance (POMX) Implementation
Cone, William D; Mar 2006; 92 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461574; AFIT/ENS/GLM/06-03; No Copyright; Avail.: CASI: A05, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461574

Maintenance data collection is an integral part of flightline aircraft maintenance. Historically, this data was input via traditional keyboard data entry methods at a computer terminal. These terminals are typically located in the aircraft maintenance unit (AMU) facility, away from where the actual maintenance is being performed. In contrast to the traditional approach, the Point-of-Maintenance system (POMX) seeks to reduce the data entry burden while increasing data accuracy through the use of E-Tools such as ruggedized laptop computers and handheld portable maintenance aids (PMAs). POMX enables data entry at the aircraft or other maintenance location via wireless local area network or batch storage, and seeks to capture data as the maintenance is performed. This research analyzes the impact of a POMX system on maintenance data error rates. This research takes a careful look at the implementation of POMX at Randolph AFB to enable current designers and system engineers to gain insight into what to expect as the next generation of POMX comes on-line. Initial results indicate no significant improvement in data quality and no reduction in the number of data errors recorded with POMX systems. Follow-up interviews with POMX users and experts revealed that the Air Force still has a number of managerial, technical and organizational constraints which must be overcome before a POMX system can add to the effectiveness of Air Force maintenance operations.
DTIC
Data Acquisition; Data Management; Maintenance; Military Operations

20070008807 University of Southern California, Marina del Rey, CA USA
Pedagogically Structured Game-Based Training: Development of the Elect BiLAT Simulation
Hill, Jr , Randall W; Belanich, James; Lane, H C; Core, Mark; Dixon, Melissa; Forbell, Eric; Kim, Julia; Hart, John; Jan 2006; 9 pp.; In English
Report No.(s): AD-A461575; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461575

ELECT BiLAT is a prototype game-based simulation for Soldiers to practice conducting bilateral engagements in a cultural context. The prototype provides students with the experience of preparing for a meeting including familiarization with the cultural context, gathering intelligence, conducting a meeting and negotiating when possible, and following up on meeting agreements as appropriate. The ELECT BiLAT architecture is based on a commercial game engine that is integrated with research technologies to enable the use of virtual human characters, scenario customization, as well as coaching, feedback and tutoring. Because the prototype application is intended to be a learning environment, pedagogy has been central throughout development. The project followed a five-phase process: (1) analyze the training domain; (2) develop a story board prototype; (3) implement a computer version of the training prototype; (4) refine training objectives and link their conditions and standards to game activities; and (5) develop training support content for students, instructors, and training developers. The goal is an authorable game-based environment that uses the pedagogy of guided discovery for training Soldiers in the conduct of bilateral engagements within a specific cultural context.
DTIC
Computer Assisted Instruction; Computerized Simulation; Education; Simulation

20070008812 Colorado Univ., Boulder, CO USA

Scientific Programming Languages for Distributed Memory Multiprocessors: Paradigms and Research Issues

Rosing, Matthew; Schnabel, Robert B; Weaver, Robert P; Jul 1991; 38 pp.; In English

Contract(s)/Grant(s): AFOSR-90-0109; CDA-8922510

Report No.(s): AD-A461580; CU-CS-537-91; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461580

This paper attempts to identify some of the central concepts, issues, and challenges that are emerging in the development of imperative, data parallel programming languages for distributed memory multiprocessors. It first describes a common paradigm for such languages that appears to be emerging. The key elements of this paradigm are the specification of distributed data structures, the specification of a virtual parallel computer, and the use of some model of parallel computation and communication. The paper illustrates these concepts briefly with the DINO programming language. Then it discusses some key research issues associated with each element of the paradigm. The most interesting aspect is the model of parallel computation and communication, where there is a considerable diversity of approaches. The paper proposes a new categorization for these approaches, and discusses the relative advantages of disadvantages of the different models.

DTIC

Computer Programming; Distributed Memory; Multiprocessing (Computers); Programming Languages

20070008822 Oregon Graduate Inst. of Science and Technology, Portland, OR USA

QuickSet: Multimodal Interaction for Simulation Set-up and Control

Cohen, Philip R; Johnston, Michael; McGee, David; Oviatt, Sharon; Pittman, Jay; Smith, Ira; Chen, Liang; Clow, Josh; Jan 1997; 6 pp.; In English

Contract(s)/Grant(s): N00014-95-1-1164

Report No.(s): AD-A461591; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461591

This paper presents a novel multimodal system applied to the setup and control of distributed interactive simulations. We have developed the QuickSet prototype, a pen/voice system running on a hand-held PC, communicating through a distributed agent architecture to NRaD's LeatherNet system, a distributed interactive training simulator built for the US Marine Corps (USMC). The paper briefly describes the system and illustrates its use in multimodal simulation setup.

DTIC

Distributed Interactive Simulation; Microcomputers; Portable Equipment; Simulation

20070008829 Colorado Univ., Boulder, CO USA

Triton Reference Manual, Version 0.7.3

Heimbigner, Dennis; Jan 31, 1991; 31 pp.; In English

Contract(s)/Grant(s): MDA972-91-J-1012

Report No.(s): AD-A461599; CU-CS-483-91; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461599

Triton is a program for providing access to persistent typed objects. It provides an interface by which other programs may dynamically create new types, new methods (in the behavioral object oriented sense), and new instances of the types. These instances are persistent, which means that they exist when the program that created them terminates, unless that program deliberately destroys the objects. These objects can also persist over instantiations of Triton, with each new instantiation having access to the objects that existed at the termination of the previous instantiation. Triton is often referred to as an 'object manager,' but is more appropriately termed an 'object manager shell.' The term shell is used to indicate that while the Triton interface provides many of the services available through object managers, Triton itself is wrapped around an existing object manager, with the intent that Triton can provide some services not provided by the underlying object manager. in this case, that object manager is Exodus, which comes from the University of Wisconsin. Exodus provides a low level storage manager to manage storage objects. A storage object is a contiguous sequence of bytes with all associated unique identity. These objects are kept on disk and cached ill buffers in main memory as required. Exodus also provides a persistent programming language called E, and which is derived from C++. Thus the data model provided by E consists of the normal C type system (int, char, struct, array, etc.) plus classes, which encapsulate data and methods (procedures) that operate on that data. Classes may be arranged in a subclass tree and methods may be inherited down that tree. Multiple inheritance is not provided in this version of E, since it is based on C ++ version 1.2.

DTIC

Computer Storage Devices; Data Management; Manuals; Programming Languages; Tritons

20070008845 Naval Research Lab., Washington, DC USA
Exploitation of Web Technologies for C2
Gardner, Sheldon; Callihan, Hubert D; Balash, John A; Saverino, Michael A; Jan 1999; 10 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461617; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461617

The family of Web Technologies presents a number of new opportunities for applications. These technologies include the variety of machines from hand-held PCs to large systems and the software to give them web accessibility. Without question, the Web has captured the interest and support of the commercial software communities. The authors present some ideas based on findings from ongoing work that show the opportunity that exists for Command and Control (C2) applications, important technology considerations, and a viable approach for incorporating and integrating web technologies. They address some major issues related to the use and relevance of these technologies for C2 such as Scalability, Multi-Site Collaboration, Software Migration, Legacy Integration, Obsolescence, and Extensibility. Web links to sites containing further information are provided.
DTIC
Command and Control; Exploitation; Internets; Military Technology; Technology Assessment

20070008854 SRI International Corp., Menlo Park, CA USA
Parallel Guessing: A Strategy for High-Speed Computation
Fischler, Martin A; Firschein, Oscar; Sep 19, 1984; 14 pp.; In English
Contract(s)/Grant(s): MDA903-83-C-0027
Report No.(s): AD-A461630; SRI-TN-338; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461630

Attempts have been made to speed up image-understanding computation involving conventional serial algorithms by decomposing these algorithms into portions that can be computed in parallel. Because many classes of algorithms do not readily decompose, one seeks some other basis for parallelism (i.e., for using additional hardware to obtain higher processing speed). In this paper we argue that 'parallel guessing' for image analysis is a useful approach, and that several recent IU algorithms are based on this concept. Problems suitable for this approach have the characteristic that either 'distance' from a true solution, or the correctness of a guess, can be readily checked. We review image-analysis algorithms having a parallel guessing or randomness flavor. We envision a parallel set of computers, each of which carries out a computation on a data set using some random or guessing process, and communicates the 'goodness' of its result to its co-workers through a 'blackboard' mechanism.
DTIC
Algorithms; Computation; High Speed; Image Analysis; Image Processing; Parallel Processing (Computers)

20070008859 Naval Research Advisory Committee, Arlington, VA USA
Software Intensive Systems
Winston, Patrick L; Smith, Teresa B; Jun 23, 2006; 28 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461635; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461635

TERMS of REFERENCE: (1) Review relevant DOD and government programs; (2) Review industry tools, practices, and standards (3) Identify potential benefits of best practices (4) Recommend changes in Naval acquisition management, systems engineering, training, education, and business practices; (5) Suggest S&T investment; (6) As appropriate, evaluate emerging tools for specifying, bidding, and engineering software-intensive systems and suggest strategies for use across multiple organizations.
DTIC
Computer Programs; Military Operations; Software Development Tools; Software Engineering

20070008860 SRI International Corp., Menlo Park, CA USA
Criteria for Designing Computer Facilities for Linguistic Analysis
Shieber, Stuart; Apr 1985; 29 pp.; In English
Contract(s)/Grant(s): N00039-84-K-0078
Report No.(s): AD-A461636; TN-354; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461636

In the natural-language-processing research community, the usefulness of computer tools for testing linguistic analyses is often taken for granted. Linguists, on the other hand, have generally been unaware of or ambivalent about such devices. We discuss several aspects of computer use that are preeminent in establishing the utility for linguistic research of computer tools and describe a several factors that must be considered in designing such computer tools to aid in testing linguistic analyses of grammatical phenomena. A series of design alternatives, some theoretically and some practically motivated, is then based on the resultant criteria. We present one way of pinning down these choices which culminates in a description of a particular grammar formalism for use in computer linguistic tools. The PATR-II formalism thus serves to exemplify our general perspective.
DTIC
Computers; Linguistics; Software Development Tools

20070008879 SRI International Corp., Menlo Park, CA USA
Rex Programmer's Manual
Pack Kaelbling, Leslie; Wilson, Nathan J; Jul 1, 1988; 44 pp.; In English
Report No.(s): AD-A461661; TN-381R; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461661

This manual describes Rex, a programming language for specifying machines by dedara tively describing their behavior. The Rex language consists of a set of LISP functions that define primitive Rex machines and provides methods for building complex machines out of simpler components. A Rex machine is a synchronous abstract device that has inputs, local state, and outputs, all of which are storage locations. Storage locations may be thought of as wires that can be set to certain values and whose values can be read by Rex machines. The value of a storage location is determined by its constraint, some function of the values of a set (possibly empty) of storage locations. A Rex machine operates by repeatedly computing a mapping from its inputs and current state into its outputs and next state. By hierarchically dividing a large state into small components and specifying their state transitions, we can 'make the combinatorial explosion work for us' [3]. The size of the smallest component may vary from implementation to implementation; it could be a bit, an integer, or a small enumerated type. The state transitions are described by functions that map tuples of elements of the primitive data types into other tuples. The new value of any given component could, in principle, depend on all of the inputs and the entire current state of the machine, but, in practices, the dependencies are usually local.
DTIC
Programming Languages; User Manuals (Computer Programs)

20070008881 Colorado Univ., Boulder, CO USA
Computer Understanding of Conventional Metaphoric Language
Martin, James H; Jan 1990; 43 pp.; In English
Contract(s)/Grant(s): N00039-84-C-0089
Report No.(s): AD-A461663; CU-CS-473-90; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461663

Metaphor is a conventional and ordinary part of language. An approach to metaphor, based on the explicit representation of knowledge about metaphors, has ca developed. This approach asserts that the interpretation of conventional metaphoric language should proceed through the direct application of specific knowledge about the metaphors in the language. MIDAS(Metaphor Interpretation, Denotation, and Acquisition System) is a computer program that has been developed based upon this approach. MIDAS can he used to represent knowledge about conventional metaphors, interpret metaphoric language by applying this knowledge, and dynamically learn new metaphors as they are encountered during normal processing.
DTIC
C (Programming Language); Computer Programs; Data Processing

20070008914 SRI International Corp., Menlo Park, CA USA
Specification and Analysis of a Reliable Broadcasting Protocol in Maude
Denker, Grit; Garcia-Luna-Aceves, J J; Meseguer, Jose; Oelveczky, Peter C; Raju, Jyoti; Smith, Brad; Talcott, II, Carolyn L; Jan 1999; 11 pp.; In English
Contract(s)/Grant(s): N00014-96-C-0114; F30602-97-C-0312
Report No.(s): AD-A461729; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461729

The increasing importance, criticality, and complexity of communications software makes very desirable the application of formal methods to gain high assurance about its correctness. These needs are even greater in the context of active networks, because the difficulties involved in ensuring critical properties such as security and safety for dynamically adaptive software are substantially higher than for more static software approaches. There are in fact many obstacles to the insertion of formal methods in this area, and yet there is a real need to find adequate ways to increase the quality and reliability of critical communication systems. As a consequence, in spite of the existence of good research contributions in formal approaches to areas such as distributed algorithms and cryptographic protocols, in practice new systems are developed for the most part in a traditional engineering way, using informal techniques, and without much to go by before detailed simulations or an actual implementation except for pseudocode and informal specifications. The present work reports on an ongoing case study in which a new reliable broadcasting protocol (RBP) currently under development at the University of California at Santa Cruz (UCSC) has been formally specified and analyzed, leading to many corrections and improvements to the original design. Indeed, the process of formally specifying the protocol, and of symbolically executing and formally analyzing the resulting specifications, has revealed many bugs and inconsistencies very early in the design process, before the protocol was implemented. RBP performs reliable broadcasting of information in networks with dynamic topology. Reliable broadcasting is not trivial when the topology of the network can change due to failure and mobility. The aim is to ensure that all nodes that satisfy certain connectedness criteria receive the information within finite time, and that the source is notified about it.
DTIC
Broadcasting; Computer Networks; Computer Programs; Data Processing; Protocol (Computers)

20070008930 California Univ., Santa Cruz, CA USA
Adding Adaptive Flow Control to Swift/RAID
Fullmer, Chane L; Long, Darrell D; Cabrera, Luis-Felipe; Jan 12, 1995; 8 pp.; In English
Contract(s)/Grant(s): N00014-92-J-1807
Report No.(s): AD-A461752; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461752

We discuss an adaptive flow control mechanism for the Swift/RAID distributed file system. Our goal is to achieve near-optimal performance on heterogeneous networks where available load capacity varies due to other network traffic. The original Swift/RAID prototype used synchronous communication, achieving throughput considerably less than available network capacity. We designed and implemented an adaptive flow control mechanism that provides greatly improved performance. Our design uses a simple automatic repeat request (ARQ) go back N protocol coupled with the congestion avoidance and control mechanism developed for the Transmission Control Protocol (TCP). The Swift/RAID implementation contains a transfer plan executor to isolate all of the communications code from the rest of Swift. The adaptive flow control design was implemented entirely in this module. Results from experimental data show the adaptive design achieving an increase in throughput for reads from 671 KB/s for the original synchronous implementation to 927 KB/s (a 38% increase) for the adaptive prototype, and an increase from 375 KB/s to 559 KB/s (a 49% increase) in write throughput.
DTIC
Adaptive Control; Data Transmission; Rates (Per Time)

20070008936 SRI International Corp., Menlo Park, CA USA
A Morphological Recognizer with Syntactic and Phonological Rules
Bear, John; Sep 25, 1986; 18 pp.; In English
Contract(s)/Grant(s): N00039-84-K-0078; N00039-84-C-0524
Report No.(s): AD-A461767; SRI-TR-396; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461767

This paper describes a morphological analyzer which, when parsing a word, uses two sets of rules: rules describing the syntax of words, and rules describing facts about orthography.
DTIC
Morphology

20070008958 George Mason Univ., Fairfax, VA USA
A Task Process Pre-Experimental Model
Handley, Holly A; Levis, Alexander H; Jan 2002; 14 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-00-1-0267
Report No.(s): AD-A461801; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461801

The Adaptive Architectures for Command and Control (A2C2) program is a multidisciplinary program that employs a scientific basis for designing and analyzing adaptive and reconfigurable organizational structures at the Joint Task Force level. As part of its unique model-driven experimentation method, a pre-experimental model is created to support the formulation of hypotheses, the determination of key variables and parameter values, and the prediction of organizational performance. The pre experimental model is used to explore the parameters of the experimental design in order to determine the appropriate region to conduct officer-in-the-loop experiments at the Naval Postgraduate School. A pre-experimental model based on the task process was created for an upcoming A2C2 subject experiment, which will examine the congruence between organizational structure and mission requirements. The pre-experimental model is a dynamic model created with Colored Petri nets, which can represent the changes in the task environment over time by implementing the stages of the tasks (i.e., detection, identification, attack, destroy, and disappear). The simulator used in the subject experiments, Distributed Dynamic Decision-Making (DDD), records timing information over the life of each task. Therefore, timing information regarding the tasks can be extracted from the output files of the trial experimental runs and included in the model before the final experimental simulations. In this way the model can be validated at the pre-experimental stage.
DTIC
Adaptation; Decision Making; Experiment Design; Models

20070008976 Army Tank-Automotive Research and Development Command, Warren, MI USA
Virtual Design Reviews and Tours -- Connecting with the User and Capturing Timely Feedback
Birch, FloAnn; Shutes, Suzanne; Ciarelli, Kenneth; Nov 10, 2003; 7 pp.; In English
Report No.(s): AD-A461845; 03TB-110; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461845
Virtual reality is more than a novelty at one's local gaming center; it is a critical component for the military's development of weapon systems. For the past 3 years, the U.S. Army has been using state-of-the-art virtual technology to accelerate the acquisition process. The National Automotive Center's (NAC) Advanced Collaborative Environment (ACE) Group has been working with the Stryker Brigade Combat Team (SBCT) and Future Combat Systems (FCS) program to conduct systems integration events, where the end-user is involved from the very beginning. Virtual design reviews enable engineers to display their system designs to the warfighting community. The results of such reviews include critical and relevant feedback from the ultimate consumer of the system.
DTIC
Combat; Computer Aided Design; Connectors; Digital Systems; Display Devices; Feedback; Government Procurement; Prototypes; Simulation; Virtual Reality

20070008977 Army Tank-Automotive Research and Development Command, Warren, MI USA
The Future Tactical Truck System Advanced Collaboration Environment -- Description and Benefits
Archer, Michael; Cadieux, Michael; Nov 10, 2003; 5 pp.; In English
Report No.(s): AD-A461846; 03TB-109; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461846
The U.S. Army National Automotive Center's Advanced Collaborative Environment laboratory is providing a critical collaboration framework to support the design and development of the Future Tactical Truck System (FTTS). This paper describes how the Advanced Collaborative Environment (ACE) is being used today to intelligently connect program managers, war fighters, technology developers, platform integrators, and other communities with relevant information using a highly interactive, stimulating, and distributed environment. This paper also describes the enabling technologies of the ACE framework, as well as the tools and processes necessary to support the FTTS program.
DTIC
Computer Aided Design; Government Procurement; Management Information Systems; Prototypes; Trucks

20070008993 Army Research Lab., Aberdeen Proving Ground, MD USA
Implementation of an Enterprise Identifier Seed Server for Joint and Coalition Systems
Chamberlain, Sam; Jan 2002; 15 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461882; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461882
In any information system, a critical feature is the ability to link together disparate pieces of data and information via relationships. One way to greatly facilitate this task is to provide a common technique for identifying the pieces so that they

can be conveniently referenced. Arbitrary linking of data can be accomplished by standardizing one field across disparate data sources. This is the objective of enterprise identifiers (EID). If data can be globally identified using a common scheme, then one can spontaneously reference and retrieve arbitrary pieces of information with minimal prior coordination. A strategy for accomplishing this task was described by the author in a paper at last year's 6th International Command & Control Research & Technology Symposium. This paper describes the implementation of an EID seed server and some of the ongoing issues encountered and being addressed.
DTIC
Interoperability; Multisensor Fusion; Seeds

20070009043 California State Univ., Long Beach, CA USA
Multi-Modal Terminal Model Documentation
Mallon, Lawrence G; Jan 10, 2006; 25 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-06-C-0060
Report No.(s): AD-A460376; CSU-0014; No Copyright; Avail.: CASI: A03, Hardcopy

This manual documents the Strategic Mobility 21 (SM21) Multi-Modal Terminal Model capabilities and functions. SM21 is an operational level concept that merges planning and execution of both commercial freight operations and the deployment and sustainment of joint military forces within a single construct of a Joint Power Projection Support Platform (JPPSP). The JPPSP can be described as a single transportation node that will be developed to seamlessly integrate with and support the end-to-end military and commercial distribution network. The inland multi-modal transfer facility, a key component of the JPPSP, can be described as a central node on a dual use regional agile distribution network. The JPPSP multi-modal transfer facility presents a capability to achieve rapid military deployment and responsive commercial support and will be designed for replication in other geographic regions of the U.S. The model includes four sub models: the Highway Activity Sub-model, the Airlift Activity Sub model, the Rail Activity Sub model, and the Storage Activity Sub model.
DTIC
Computer Programs; Military Operations; Models

20070009051 Carnegie-Mellon Univ., Pittsburgh, PA USA
Spatial Computation
Budiu, Mihai; Dec 2003; 225 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DABT63-96-C-0083
Report No.(s): AD-A461132; CMU-CS-03-217; No Copyright; Avail.: CASI: A10, Hardcopy

This thesis presents a compilation framework for translating ANSI C programs into hardware dataflow machines. The framework is embodied in the CASH compiler, a Compiler for Application-Specific Hardware. This style of computation is dubbed Spatial Computation. The first part of this document describes Pegasus, the internal representation of CASH. The most notable of these are a new optimal register-promotion algorithm and partial redundancy elimination for memory accesses based on predicate manipulation. The second part of this document evaluates the performance of the generated circuits using simulation. Using media processing benchmarks, we show that for the domain of embedded computation, the circuits generated by CASH can sustain high levels of instruction level parallelism. A comparison of Spatial Computation and superscalar processors highlights some of the weaknesses of our model of computation, such as the lack of branch prediction and register renaming. The results presented in this document can be applied in several domains: (1) most of the compiler optimizations are applicable to traditional compilers for high-level languages; (2) CASH itself can be used as a hardware synthesis tool directly from C sources; (3) the compilation framework we describe can be applied to the translation of imperative languages; (4) we have extended the dataflow machine model to encompass predication, data-speculation and control-speculation; and (5) the tool-chain described can be used for synthesis and optimization of asynchronous hardware.
DTIC
Compilers; Computation; Spatial Distribution

20070009061 Space and Naval Warfare Systems Center, San Diego, CA USA
Concepts of Composable FORCEnet
Waters, Jeff; Stelmach, Michael; Ceruti, Marion; Sep 17, 2005; 9 pp.; In English
Report No.(s): AD-A461531; No Copyright; Avail.: CASI: A02, Hardcopy

This paper describes key concepts of composable FORCEnet, which is the US Navy's operational construct architectural framework for naval warfare in the information age. It describes the concepts and architecture, in several categories: (1)

systems and general software engineering; (2) networks; (3) intelligent software; and (4) network security. The engineering approach to implement FORCEnet is an example of rapid prototyping in which the requirements of the users are reviewed periodically and frequently with considerable user input. This method, which captures and implements changes in user requirements, strongly supports the development of relevant and useful systems with up-to-date technology that will be responsive to the users' rapidly changing needs.
DTIC
Architecture (Computers); Computer Programming; Navy; Software Engineering; Warfare

20070009135 Michigan Univ., Ann Arbor, MI USA
Faster SAT and Smaller BDDs via Common Function Structure
Aloul, Fadi A; Markov, Igor L; Sakallah, Karem A; Dec 12, 2001; 23 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461982; No Copyright; Avail.: CASI: A03, Hardcopy

The increasing popularity of SAT and BDD techniques in verification and synthesis encourages the search for additional speed-ups. Since typical SAT and BDD algorithms are exponential in the worst-case, the structure of real-world instances is a natural source of improvements. While SAT and BDD techniques are often presented as mutually exclusive alternatives, our work points out that both can be improved via the use of the same structural properties of instances. Our proposed methods are based on efficient problem partitioning and can be easily applied as pre-processing with arbitrary SAT solvers and BDD packages without source code modifications. Finding a better variable-ordering is a well recognized problem for both SAT solvers and BDD packages. Currently, all leading edge variable-ordering algorithms are dynamic, in the sense that they are invoked many times in the course of the host algorithm that solves SAT or manipulates BDDs. Examples include the DLCS ordering for SAT solvers and variable-sifting during BDD manipulations. In this work we propose a universal variable-ordering MINCE (MIN Cut Etc.) that pre-processes a given Boolean formula in CNF. MINCE is completely independent from target algorithms and outperforms both DLCS for SAT and variable sifting for BDDs. We argue that MINCE tends to capture structural properties of Boolean functions arising from real-world applications. Our contribution is validated on the ISCAS circuits and the DIMACS benchmarks. Empirically, our technique often outperforms existing techniques by a factor of two or more. Our results motivate search for stronger dynamic ordering heuristics and combined static/dynamic techniques.
DTIC
Algorithms; Arithmetic; Binary Digits; Boolean Algebra; Computer Aided Design; Decision Theory; Problem Solving

20070009141 Colorado Univ., Boulder, CO USA
A Performance Evaluation of the Hemingway DSM System on a Network of SMPs
Aggarwal, Anshu; Grumwald, Dirk; Jan 1997; 19 pp.; In English
Contract(s)/Grant(s): DABT63-94-C-0029
Report No.(s): AD-A461990; CU-CS-837-97; No Copyright; Avail.: CASI: A03, Hardcopy

Numerous designs for software distributed shared memory systems have been proposed. Most designs use uniprocessor workstations as the building blocks. In recent years there has been an increase in commodity multiprocessor workstations, with hardware-maintained internal memory coherence mechanisms. In this paper we investigate the performance of a software distributed shared memory system, Hemingway, which is built out of such multiprocessor workstations, utilizing off-the-shelf communication networks. The effectiveness of this system can be evaluated by studying performance as a function of both the total number of processors in the system and the degree of clustering (size of multiprocessor workstations). We evaluated the performance of Hemingway with systems of up to 8 processors, with different levels of clustering. We also compared the performance of our protocol with a similar, established protocol, the Munin protocol. Our results describe a system that scales well both with the number of processors and with clustering. Moreover, our studies indicate that the Hemingway protocol requires lower intra-workstation and inter- workstation network bandwidths than other protocols. Overall we have found that clustering is very effective in increasing performance in software DSM systems built with multiwriter, write-through memory consistency policies.
DTIC
Computer Programming; Distributed Memory; Evaluation; Memory (Computers); Performance Tests; Software Engineering

20070009143 Colorado Univ., Boulder, CO USA
Software Maintenance as a Programmable Process
Gamalel-Din, Shehab A; Osterweil, Leon J; Mar 1988; 48 pp.; In English
Contract(s)/Grant(s): CCR-8705162; DCR-0403341
Report No.(s): AD-A461992; CU-CS-390-88; No Copyright; Avail.: CASI: A03, Hardcopy

The software maintenance process is a particularly complex part of the software life cycle. It can be viewed from a number of different perspectives and dimensions. The policies and philosophies of the maintenance organization and its management, the techniques available for carrying out maintenance, the types of changes attempted, the points in the development process at which maintenance is attempted, and the nature of the subject product are among the factors playing important roles in shaping and designing a maintenance process. No single fixed maintenance process seems able to meet all software maintenance needs emerging from the different perspectives and dimensions, and nobody has yet consolidated all of those views in a single framework. We believe that consolidating the maintenance activity around the notion of 'Process Programming' provides such a common framework for all software maintenance processes. It provides the conceptual structure for creating processes and support environments in which users are free to alter both tools and process to achieve effective support for the full range of maintenance needs and approaches. 'Process environments' environments which support process programming seem to us to meet the minimum requirements for an ideal environment. They focus on both describing and aiding the process itself in a customizable (programmable), user-tailorable, dynamically adaptable, and incrementally implementable fashion.
DTIC
Computer Programs; Maintenance

20070009148 Navy Personnel Research Studies and Technology, Millington, TN USA
Investigation of Item-Pair Presentation and Construct Validity of the Navy Computer Adaptive Personality Scales (NCAPS)
Underhill, Christina M; Oct 2006; 36 pp.; In English
Report No.(s): AD-A462003; NPRST-TN-06-9; No Copyright; Avail.: CASI: A03, Hardcopy

This report documents one of the steps in our development of the Navy Computer Adaptive Personality Scales (NCAPS). NCAPS is a computer adaptive personality measure being developed and validated for use in the selection and classification of Sailors for entry level Navy enlisted jobs. This is an important component of our research program to overhaul and improve the Navy's enlisted selection and classification process. The over program, Whole Person Assessment, is designed to replace the current classification algorithm with a more flexible and accurate one that will also allow us to de-emphasize the almost exclusive focus on mental ability by including personality and interest measures in making classification decisions. NCAPS uses a cutting-edge technological approach to personality measurement which is designed to mitigate many problems that plague traditional instruments. Specifically, traditional instruments use Likert rating scales, and therefore are subject to both directed faking and socially desirable responding. To minimize these problems, NCAPS is developing a paired forced-choice item format, which uses a complex item response theory (IRT) adaptive selection and scoring algorithm. The complexity and novelty of the design constraints requires a series of interrelated research projects. This report is one in the series and fulfills the need to further explore the adaptive components and construct validity of NCAPS.
DTIC
Computer Programs; Military Personnel; Navy; Personality; Personality Tests; Personnel

20070009156 Naval Research Lab., Washington, DC USA
Integration of Two SPAWAR PEOC4I NetCentric Technologies: Tactical Environmental Database Services (TEDServices) with the Extensible Tactical C4I Framework (XTCF)
Bowers, Timothy H; Jan 12, 2007; 27 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-06-WX-20076
Report No.(s): AD-A462012; NRL/MR/7210--07-9022; XB-NRL/MR/5510; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper outlines work that was completed to assist the warfighter during the critical mission planning process. This was accomplished by delivering current weather data from Tactical Environmental Data Services (TEDServices), an API used to request meterological, oceanographic, and environmental information, through the Extensible Tactical C4I Framework (XTCF), which is a prototype extensible data management framework implemented in Java. It includes discussion of relevant technologies, such as XML and JMS.
DTIC
Data Bases; Data Systems

20070009173 Northrop Grumman, Inc., Rome, NY USA

Information Operations Innovation Network (IOIN) Demonstration

Choo, Vic; Scheiderich, Louis; Dec 2006; 23 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8750-05-D-0260-0002; Proj-CIAC

Report No.(s): AD-A462033; No Copyright; Avail.: CASI: A03, Hardcopy

The NetD COP/Situational Awareness effort demonstrates the application of AFRL technology to providing enhanced situational awareness and visualization techniques for network defense. In particular, the program illustrates the following key points: Provide an operational view of the network security information; Move from intrusion detection to attack detection; Relate the impact of network defense to the larger mission; and Supplement existing/future network defense tools with additional capabilities. The actual software packages used for this effort include VIAasst, VisAlert, Flexviewer, Event Correlation for Cyber Attack Recognition (ECCARS) and the SQL Correlator. The results of the effort show that the system is capable of providing and enhanced situational awareness on live network discs.

DTIC

Computer Networks; Security; Software Development Tools

20070009181 Space and Naval Warfare Systems Center, San Diego, CA USA

Analyzing Quality of Service Specification through System Event Trace

Drummond, John; Jun 2002; 13 pp.; In English

Report No.(s): AD-A462045; No Copyright; Avail.: CASI: A03, Hardcopy

Distributed systems present an enigmatic set of requirements to the software engineer. The added complexity of command and control constraints can coalesce into an environment that will soon overwhelm many distributed command and control software development efforts. These conditions are especially acute when multiple competing applications must share the system's resources. Software development efforts that have been targeted at distributed command and control environments have focused on providing adequate quality-of-service to the requesting applications. Providing efficient resource utilization can satisfy many quality-of-service issues that present difficulties in resource sharing. However, the quality-of-service analysis methods currently in place to determine efficient resource utilization are either too narrowly focused on specific resource managers/controllers or are not sufficiently equipped to provide a detailed dynamic examination during application/system execution. Therefore, this paper presents a comprehensive method of resource utilization analysis based upon specific dynamic quality-of-service events.

DTIC

Command and Control; Computer Programming; Detection; Distributed Processing; Failure; Resources Management; Software Engineering; Total Quality Management

20070009188 General Electric Global Research, Niksayuna, NY USA

Quantum Computing and High Performance Computing

Aggour, Kareem S; Mattheyses, Robert M; Shultz, Joseph; Allen, Brent H; Lapinski, Michael; Dec 2006; 71 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8750-05-C-0058; Proj-NBGQ

Report No.(s): AD-A462065; No Copyright; Avail.: Defense Technical Information Center (DTIC)

GE Global Research has enhanced a previously developed general-purpose quantum computer simulator, improving its efficiency and increasing its functionality. Matrix multiplication operations in the simulator were optimized by taking advantage of the particular structure of the matrices, significantly reducing the number of operations and memory overhead. The remaining operations were then distributed over a cluster, allowing feasible compute times for large quantum systems. The simulator was augmented to evaluate a step-by-step comparison of a quantum algorithm's ideal execution to its real-world performance, including errors. To facilitate the study of error propagation in a quantum system, the simulator s graphical user interface was enhanced to visualize the differences at each step in the algorithm s execution. To verify the simulator s accuracy, three ion trap-based experiments were simulated. The simulator output closely matches experimentalist s results, indicating that the simulator can accurately model such devices. Finally, alternative hardware platforms were researched to further improve the simulator performance. An FPGA-based accelerator was designed and simulated, resulting in substantial performance improvements over the original simulator. Together, this research produced a highly efficient quantum computer simulator capable of accurately modeling arbitrary algorithms on any hardware device.

DTIC

Algorithms; Computerized Simulation; Quantum Computation; Quantum Theory

20070009199 Michigan Univ., Ann Arbor, MI USA

Sprint-and-Halt Scheduling for Energy Reduction in Real-Time Systems with Software Power-Down

Pillai, Padmanabhan; Shin, Kang G; Jan 2003; 21 pp.; In English

Contract(s)/Grant(s): F49620-01-1-0120

Report No.(s): AD-A462083; No Copyright; Avail.: CASI: A03, Hardcopy

Mobile computing platforms are performing increasingly complex and computationally intensive tasks. To help lengthen useful battery life, these platforms often incorporate some form of hardware power-down that is controlled by the system software. Unfortunately, these often incur substantial transition latencies when switching between power-down and active states, making them difficult to use in time-critical embedded systems. This paper introduces a class of sprint-and-halt schedulers that attempt to maximize the energy savings of software-controlled power-down mechanisms, while simultaneously maintaining hard real-time deadline guarantees. Several different algorithms are proposed to reclaim unused processing time, defer processing, and extend power-down intervals while respecting task deadlines. Sprint-and-halt schedulers are shown to reduce energy consumption by 40-70% over typical operating parameters. For very large or small state transition latencies, simple approaches work very close to theoretical limits, but over a critical range of latencies, advanced schedulers show 10-20% energy reduction over simpler methods.

DTIC

Algorithms; Computer Programs; Energy Conservation; Microprocessors; Real Time Operation; Scheduling; Shutdowns

20070009224 Colorado Univ., Boulder, CO USA

Next Generation Software Environments: Principles, Problems, and Research Directions

Taylor, Richard N; Baker, Deborah A; Belz, Frank C; Boehm, Barry W; Clarke, Lori A; Fischer, David A; Osterweil, Leon; Selby, Richard W; Wileden, Jack C; Wolf, Alexander L; Jul 1987; 45 pp.; In English

Contract(s)/Grant(s): N00039-85-C-0126; ARPA ORDER-5057

Report No.(s): AD-A462122; CU-CS-370-87; No Copyright; Avail.: CASI: A03, Hardcopy

The past decade has seen a burgeoning of research and development in software environments. Conferences have been devoted to the topic of practical environments, journal papers produced, and commercial systems sold. Given all the activity, one might expect a great deal of consensus on issues, approaches, and techniques. This is not the case, however; indeed, the term 'environment' is still used in a variety of conflicting ways. Nevertheless, substantial progress has been made and we are at least nearing consensus on many critical issues. The purpose of this paper is to characterize environments, describe several important principles that have emerged in the last decade or so, note current open problems, and describe some approaches to these problems, with particular emphasis on the activities of one large-scale research program, the Arcadia project. Consideration is also given to two related topics: empirical evaluation and technology transition. That is, how can environments and their constituents be evaluated, and how can new developments be moved effectively into the production sector?

DTIC

Computer Programming; Computer Programs; Programming Environments; Software Engineering

20070009225 Colorado Univ., Boulder, CO USA

Constrained Design Processes: Steps Towards Convivial Computing

Fischer, Gerhard; Lemke, Andreas C; Jun 1987; 50 pp.; In English

Contract(s)/Grant(s): N00014-85-K-0842

Report No.(s): AD-A462123; CS-CU-369-87; No Copyright; Avail.: CASI: A03, Hardcopy

Our goal is to construct components of convivial computer systems which give people who use them the greatest opportunity to enrich their environments with the fruits of their vision. Constrained design processes are a means of resolving the conflict between the generality, power and rich functionality of modern computer systems, and the limited time and effort which casual and intermediate users want to spend to solve their problems without becoming computer experts. Intelligent support systems are components which make it less difficult to learn and use complex computer systems. We have constructed a variety of design kits as instances of intelligent user support systems which allow users to carry out constrained design processes and give them control over their environment. Our experience in building and using these design kits will be described.

DTIC

Computer Programming; Computers; Design Analysis; Software Engineering

20070009226 Colorado Univ., Boulder, CO USA

Construction and Design Kits: Human Problem-Domain Communication

Fischer, Gerhard; Lemke, Andreas C; Jun 1987; 43 pp.; In English

Contract(s)/Grant(s): N00014-85-K-0842

Report No.(s): AD-A462124; CU-CS-366-87; No Copyright; Avail.: CASI: A03, Hardcopy

Our goal is to build cooperative computer systems to augment human intelligence. In these systems the communication between the user and the computer plays a crucial role. Knowledge-based systems make special demands on human-computer communication, but they also provide new unique opportunities to enhance this communication. To provide the user with the appropriate level of control and a better understanding, we have to replace human-computer communication with human problem-domain communication, which allows users to concentrate on the problems of their domain and to ignore the fact that they are using a computer tool. Construction and design Kits are system components that represent steps towards human problem-domain communication. A construction kit is a set of building blocks that models a problem domain. The building blocks define a design space (the set of all possible designs that can be created by combining these blocks). Design kits go beyond construction kits in that they bring to bear general knowledge about design (e.g., which meaningful artifacts can be constructed, how and which blocks can be combined with each other) that is useful for the designer. Prototypical examples of these systems (especially in the area of user interface design) are described in detail and the feasibility of this approach is evaluated.

DTIC

Design Analysis; Fabrication; Human Factors Engineering; Human-Computer Interface; Interprocessor Communication

20070009227 Colorado Univ., Boulder, CO USA

Neural and Conceptual Interpretations of Parallel Distributed Processing Models

Smolensky, Paul; Mar 1986; 48 pp.; In English

Contract(s)/Grant(s): N00014-85-K-0450

Report No.(s): AD-A462125; CU-CS-322-86; No Copyright; Avail.: CASI: A03, Hardcopy

Mind and brain provide two quite different perspectives for viewing cognition. Yet both perspectives are informed by the study of parallel distributed processing. This duality creates a certain ambiguity about the interpretation of a particular PDP model of a cognitive process: Is each processing unit to be interpreted as a neuron? Is the model supposed to relate to the neural implementation of the process in some less direct way? A closely related set of questions arises when it is observed that PDP models of cognitive processing divide broadly into two classes. In local models, the activity of a single unit represents the degree of participation in the processing of a known conceptual entity a word, a word sense, a phoneme, a motor program. In distributed models, the strength of patterns of activity over many units determine the degree of participation of these conceptual entities. In some models, these patterns are chosen in a deliberately arbitrary way, so that the activity of a single unit has no apparent 'meaning' whatever -- no discernible relation to the conceptual entities involved in the cognitive process. On the surface, at least, these two types of models seem quite different. Are they as different as they seem? How are they related? This chapter begins with a brief consideration of the neural interpretation of PDP models of cognition. These considerations serve mostly to lay out a certain perspective on the PDP modeling world, to make some distinctions I have found to be valuable, to introduce some terminology and to lead into the main question of this chapter: How are distributed and local PDP models related? The chapter ends with a discussion of how, using the framework of PDP models, we might forge a mathematical relationship between the principles of mind and brain.

DTIC

Cognition; Distributed Processing; Human-Computer Interface; Parallel Processing (Computers)

20070009241 North Carolina State Univ., Raleigh, NC USA

An Approach to Visual Interaction in Mixed-Initiative Planning

Pegram, David A; St Amant, Robert; Riedl, Mark; Jan 1999; 10 pp.; In English

Contract(s)/Grant(s): F30602-97-1-0289

Report No.(s): AD-A462145; No Copyright; Avail.: CASI: A02, Hardcopy

Researchers in mixed-initiative problem-solving have generally viewed interaction between the user and the system as a form of dialog, which provides an effective unifying framework for multimodal systems. For mixed-initiative interaction through a visual medium, however, an approach that exploits our visual perceptual abilities and the benefits of direct manipulation mechanisms is equally compelling. This paper explores the possibility of communication between human planners and intelligent planning systems via shared control of a three-dimensional graphical user interface. We are currently testing our early development efforts in the Visual Interaction Dialog (VID) system, which supports agent and user

manipulation of camera placement for communicating plan structure and domain information.
DTIC
Graphical User Interface; Problem Solving; Visual Perception

20070009248 Naval Research Lab., Washington, DC USA
Specifying and Proving Properties of Timed I/O Automata in the TIOA Toolkit
Archer, Myla; Lim, HongPing; Lynch, Nancy; Mitra, Sayan; Umeno, Shinya; Jan 2006; 11 pp.; In English
Report No.(s): AD-A462155; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Timed I/O Automata (TIOA) is a mathematical framework for modeling and verification of distributed systems that involve discrete and continuous dynamics. TIOA can be used, for example, to model a real-time software component controlling a physical process. The TIOA model is sufficiently general to subsume other models in use for timed systems. The TIOA toolkit, currently under development, is aimed at supporting system development based on TIOA specifications. The TIOA toolkit is an extension of the IOA toolkit, which provides a specification simulator, a code generator, and both model checking and theorem proving support for analyzing specifications. This paper focuses on modeling of timed systems with TIOA and the TAME-based theorem proving support provided in the toolkit for proving system properties, including timing properties. Several examples are provided by way of illustration.
DTIC
Automata Theory; Timing Devices

20070009252 Science Applications International Corp., San Diego, CA USA
Using Time-Phased Casualty Estimates to Determine Medical Resupply Requirements
Daly, Tim; Onofrio, Kathleen; Konoske, Paula; Sep 18, 2006; 24 pp.; In English; Original contains color illustrations
Report No.(s): AD-A462159; NHRC-TR 06-4D; No Copyright; Avail.: CASI: A03, Hardcopy

The means of supplying and resupplying medical materiel needs to be efficiently managed. In order to achieve objectives like greater battlefield mobility, increased speed, and force flexibility for a wide variety of operations, it is especially important that supplies are not only directly related to those missions but also that appropriate quantities are available. Resupply of medical materiel has come of age. It needs to follow in the footsteps of initial supply requirements and become part of the process that models sustainment on real-time casualty data. Because planning and outfitting medical missions require predicting a future as yet unrealized, the resupply process can be more automated and precise by aligning it with real casualty data. The US Marine Corps (USMC) missions set the guidelines for configuring supply modules that determine the scope of care provided at individual treatment facilities, and this drives the decisions concerning how best to equip medical personnel in theater so they can respond most efficiently to warfighter needs. Adequately equipping these facilities is a challenge that requires knowledge of planning factors like expected casualty rates and potential illnesses and injuries. In this study, the Naval Health Research Center (NHRC) modeling programs focused first on the capability, on the clinical services performed at the treatment facility, using clinical requirements to indicate tasks performed and supplies necessary to fulfill that facility's mission. The clinical requirements were then tied to actual patient conditions, creating a logical methodology for establishing initial requirements. Subsequently, NHRC researchers used their underlying data to tackle the resupply process. They also used the data to ensure that the proper assets are always available, not just at the outset of an operation, but as time proceeds and the mission requires medical sustainment.
DTIC
Casualties; Estimates; Injuries; Models; Replenishment; Supplying

20070009254 Naval Postgraduate School, Monterey, CA USA
Surfing the Edge of Chaos: Applications to Software Engineering
Nogueira, Juan C; Jones, Carl; Jan 2000; 14 pp.; In English
Report No.(s): AD-A462161; No Copyright; Avail.: CASI: A03, Hardcopy

This paper discusses the problems of software engineering as the weakest link in the development of systems capable of achieving information superiority. Fast changes in technology introduce additional difficulties in terms of strategic planning, organizational structure, and engineering of software development projects. In such complex environment, a new way of thinking is required. We analyze the introduction of complex adaptive systems as an alternative for planning and change. The strategy of 'competing on the edge' is analyzed showing the risks and the skills required navigating on the edge. We discuss the feasibility of using this theory in software engineering as an alternative to bureaucratic software development processes.

We present also some recommendations that could help to acquire competitive advantage in software development, hence achieve information superiority.
DTIC
Applications Programs (Computers); Computer Programming; Software Engineering

20070009255 Naval Research Lab., Washington, DC USA
Can We Build an Automatic Program Verifier? Invariant Proofs and Other Challenges
Archer, Myla; Oct 2005; 11 pp.; In English
Report No.(s): AD-A462162; No Copyright; Avail.: CASI: A03, Hardcopy

This paper reviews some common knowledge about establishing correctness of programs and the current status of program specification and verification. While doing so, it identifies several challenges related to the grand challenge of building a verifying compiler. The paper argues that invariants are central to establishing correctness of programs and that thus, a major part of an automatic program verifier must be automated support for verifying invariants, a significant problem in itself. The paper discusses where the invariants come from, what can be involved in establishing that they hold, and the extent to which the process of finding and proving invariants can be automated. The paper also discusses several of the related challenges identified, argues that addressing them would make the significance to global program behavior of feedback from a verifying compiler clearer, and recommends that many of them should be included within the scope of the grand challenge.
DTIC
Program Verification (Computers); Proving; Software Development Tools

20070009271 Naval Research Lab., Washington, DC USA
The Pump: A Decade of Covert Fun
Kang, Myong H; Moskowitz, Ira S; Chincheck, Stanley; Dec 2005; 8 pp.; In English; Original contains color illustrations
Report No.(s): AD-A462184; XB-NRL/MR/5540; No Copyright; Avail.: CASI: A02, Hardcopy

This paper traces the ten plus year history of the Naval Research Laboratory's Pump idea. The Pump was theorized, designed, and built at the Naval Research Laboratory's Center for High Assurance Computer Systems. The reason for the Pump is the need to send messages from a 'Low' enclave to a 'High' enclave, in a secure and reliable manner. In particular, the Pump was designed to minimize the covert channel threat from the necessary message acknowledgements, without penalizing system performance and reliability. We review the need for the Pump, the design of the Pump, the variants of the Pump, and the current status of the Pump, along with manufacturing and certification difficulties.
DTIC
Data Transmission; Security

20070009293 Simpson Weather Associates, Inc., Charlottesville, VA USA
In-flight Integrated Mission Management System (I-LIMMS)
Emmitt, George D; Greco, Steven; Wood, Sidney; Dec 2006; 12 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00244-06-P-1900
Report No.(s): AD-A462225; No Copyright; Avail.: CASI: A03, Hardcopy

The goal of this Phase I SBIR effort was to determine the feasibility and preliminary design of I-LIMMS, an In-flight Lidar Integrated Mission Management System for the processing and visualization of lidar and in-situ data aboard an aircraft. This proposed effort included tasks for defining all interfaces, defining the necessary hardware requirements, defining and/or selecting the existing software to carry out the task, and developing proto-type architecture for the future I-LIMMS.
DTIC
Aircraft; Computer Programs; Management Systems; Systems Integration

20070009310 Massachusetts Univ., Amherst, MA USA
Maps for Verbs
Cohen, Paul; Jan 1998; 14 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F499620-97-1-0485
Report No.(s): AD-A462257; No Copyright; Avail.: CASI: A03, Hardcopy

This paper describes a representation of the meanings of verbs based on the dynamics of interactions between two agents or objects. The representation treats interactions as having three phases, before, during and after contact. Maps for these phases are constructed. Trajectories through these maps correspond to different types of interactions and are denoted by different

verbs. We summarize the results of experiments on learning and reasoning with maps.
DTIC
Learning; Linguistics; Markov Processes; Mental Performance; Trajectories

20070009319 Air Force Research Lab., Rome, NY USA
Technology for Rapidly Adaptable Command & Control (C2) Systems
Dziegiel, Jr , Roger J; Clough, Jonathan C; Jan 1999; 14 pp.; In English; Original contains color illustrations
Report No.(s): AD-A462275; No Copyright; Avail.: CASI: A03, Hardcopy

Future Coalition Forces Commanders in forward-deployed locations will need robust, flexible, and intelligent command and control infrastructure to effectively employ aerospace power rapidly with fewer resources and a smaller footprint. With the ever-widening scope of operational environments in which air power is being employed, Air Force C2 nodes must provide commanders with the appropriate functionality to support a variety of operational scenarios from Major Regional Conflicts (MRC) to Operations Other Than War (OOTW). Given the mandate for rapid expeditionary deployments into these evolving crisis environments, the C2 infrastructure must be one that is able to adapt dynamically to the unfolding scenario without system downtime or the need for large contingents of system administrators to reengineer the computing or communication architectures. The limited resources available early in a deployment must be able to support a considerable variety of application tools and permit non-discontinuous transitions among them as the situation dictates. This dynamic system reconfigurability should encompass both the physical and functional realms. Hardware footprint must be variable-sized based on what equipment can be airlifted into theater in a given amount of time, and the functionality provided by the application software must be able to evolve seamlessly to respond to changing operational needs. Hardware, software, and communications infrastructures need to adapt and evolve to the changing nature of the mission without breaking the stride of the battle rhythm. Intelligent, scaleable resource-aware distributed architectures are necessary to make this vision a C2 reality.
DTIC
Adaptation; Command and Control; Computer Programs; Systems Engineering

20070009600 Naval Undersea Warfare Center, Newport, RI USA
Method for Parametric Design of Three-Dimensional Shapes
Dick, James L, Inventor; Jul 17, 2006; 28 pp.; In English
Report No.(s): AD-D020276; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention relates to computer-aided design of three-dimensional shapes and more particularly, relates to a system and method for parametric design of three-dimensional hydrodynamic shapes. One object of the present invention is design and analyze three-dimensional shapes other than propellor shapes. Another object of the present invention is to extract parameters from any three-dimensional shape and relate those parameters with hydrodynamic performance. In accordance with the present invention, a computer aided design method is used for designing three-dimensional shapes. The method comprises receiving an initial design file, which is a computerized representation of a three-dimensional shape. Parametric features are extracted from the initial design file.
DTIC
Computer Aided Design; Patent Applications; Shapes

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COMPUTER SYSTEMS

Includes computer networks and distributed processing systems. For information systems see *82 Documentation and Information Science*. For computer systems applied to specific applications, see the associated category.

20070007350 Mitre Corp., Bedford, MA USA
Data Reorganization and Future Embedded HPC Middleware
Cain, Ken; Skjellum, Anthony; Lebak, James; Sep 20, 2000; 15 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F19628-00-C-0002
Report No.(s): AD-A460205; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460205

The Data Reorganization Forum: (1) Broad community participation includes: * FFRDCs and Government/Defense

Laboratories; * Defense integrators; * Commercial embedded multicomputer vendors; * Commercial HPC tool vendors; (2) Examining APIs, algorithms, and application requirements.
DTIC
Applications Programs (Computers); Data Management; Embedding

20070007351 Mitre Corp., Bedford, MA USA
Compendium of Anomaly Detection and Reaction Tools and Projects
LaPadula, Leonard J; May 17, 2000; 131 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-039974820T; Proj-300749900
Report No.(s): AD-A460206; MITRE-MP-99-B0000018-R1; No Copyright; Avail.: CASI: A07, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460206

This document is a compendium of anomaly detection and reaction (ADR) automated tools and research projects. In the first appendix to this document you will find an explanation of what we mean by anomaly detection and reaction. In the second appendix you will find a description of the attributes used to describe the tools and projects. In the descriptions of tools and projects, we have used the unverified claims of the vendors and projects, paraphrasing what they have written to ensure a uniform style of presentation. In some cases, some other source of information was used; these cases are noted individually. A compendium of this type cannot cover all ADR tools and projects: there are too many of them and the population changes rapidly. For the commercial off-the-shelf (COTS) products, we started this compendium in the latter half of 1998 by focusing on major vendors and tools. At that time we included products from vendors in three groups - primary, secondary, and other. These groups were defined on the basis of information provided in a Hurwitz Group white paper. Primary providers were those vendors with the highest revenues as reported in the white paper. Secondary providers were those with comparable, competitive tools or systems, as identified in the same paper. Other providers were added to the compendium as we discovered additional tools from searching available sources of information. See the first version of this compendium for fuller discussion of these points and identification of the primary, secondary, and other providers. We now add to this compendium without regard to current revenues of providers. Rather, we include any commercial products of any vendor that appear to be released, fully supported offerings relevant to anomaly detection and reaction.
DTIC
Anomalies; Change Detection; Software Development Tools

20070007379 Mitre Corp., Bedford, MA USA
The Shapes of Bundles
Doghmi, Shaddin F; Guttman, Joshua D; Thayer, F J; Aug 31, 2004; 21 pp.; In English
Report No.(s): AD-A460267; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA460267

When analyzing cryptographic protocols, one often finds that there is really only one thing that can happen in a run of the protocol, or at worst a small number of different things. For instance, every execution of the familiar Needham-Schroeder-Lowe protocol consists of a matching pair consisting of a run of the initiator and one of the responder; no other interaction is possible. We call such a collection of local executions by honest principals a shape. In this paper, we use the strand space theory to develop a framework for explaining observations such as this one, that most protocols allow very few shapes, and frequently only one. We view protocol analysis as a process of assembling different instances of the roles of the protocol. Perhaps one starts with a single execution of a single role. This execution provides the 'point of view' of the analysis: Suppose the initiator has sent and received the following messages; what other principals must have had runs? Having started with a single run, one would like to add instances of the roles of the protocol, suitably instantiated, to explore what explanations are possible for the experience of the original principal. If in this process there are very rarely essentially different choices to make, then there will be very few shapes to be found at the leaves of the exploration. In carrying out this program, we have taken an algebraic view. We define a notion of homomorphism, and the exploration consists of applying homomorphisms of a special kind we call augmentations. The algebraic framework has turned out to be highly suggestive for the development of our theory.
DTIC
Bundles; Protocol (Computers); Shapes

20070007380 Mitre Corp., Bedford, MA USA
The Diffie-Hellman Key-Agreement Scheme in the Strand-Space Model
Herzog, Jonathan C; Jun 2003; 15 pp.; In English
Report No.(s): AD-A460268; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460268

The Diffie-Hellman key exchange scheme is a standard component of cryptographic protocols. In this paper, we propose a way in which protocols that use this computational primitive can be verified using formal methods. In particular, we separate the computational aspects of such an analysis from the formal aspects. First, we use Strand Space terminology to define a security condition that summarizes the security guarantees of Diffie-Hellman. Once this property is assumed, the analysis of a protocol is a purely formal enterprise. (We demonstrate the applicability and usefulness of this property by analyzing a sample protocol.) Furthermore, we show that this property is sound in the computational setting by mapping formal attacks to computational algorithms. We demonstrate that if there exists a formal attack that violates the formal security condition, then it maps to a computational algorithm that solves the Diffie-Hellman problem. Hence, if the Diffie-Hellman problem is hard, the security condition holds globally.
DTIC
Cryptography; Protocol (Computers); Security; Strands

20070007384 SRI International Corp., Menlo Park, CA USA
Subject-Based Evaluation Measures for Interactive Spoken Language Systems
Price, Patti; Hirschman, Lynette; Shrlberg, Elizabeth; Wade, Elizabeth; Jan 1992; 7 pp.; In English
Contract(s)/Grant(s): N00014-90-C-0085; N00014-89-J-1332
Report No.(s): AD-A460272; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460272

The DARPA Spoken Language effort has profited greatly from its emphasis on tasks and common evaluation metrics. Common, standardized evaluation procedures have helped the community to focus research effort, to measure progress, and to encourage communication among participating sites. The task and the evaluation metrics, however, must be consistent with the goals of the Spoken Language program, namely interactive problem solving. Our evaluation methods have evolved with the technology, moving from evaluation of read speech from a fixed corpus through evaluation of isolated canned sentences to evaluation of spontaneous speech in context in a canned corpus. A key component missed in current evaluations is the role of subject interaction with the system. Because of the great variability across subjects, however, it is necessary to use either a large number of subjects or a within-subject design. This paper proposes a within-subject design comparing the results of a software-sharing exercise carried out jointly by MIT and SRI.
DTIC
Interprocessor Communication; Problem Solving; Speech; Speech Recognition

20070007401 Carnegie-Mellon Univ., Pittsburgh, PA USA
Technology Foundations for Computational Evaluation of Software Security Attributes
Walton, Gwendolyn H; Longstaff, Thomas A; Linger, Richard C; Dec 2006; 50 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8721-05-C-0003
Report No.(s): AD-A460415; CMU/SEI-2006-TR-021; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460415

In the current state of practice, analysis of the security attributes of software systems is typically carried out through subjective evaluations by security experts who accumulate system knowledge in bits and pieces from architectures, specifications, designs, code, and tests. In contrast, this report describes foundations for a new computational security attributes (CSA) technology. This innovative approach provides precise computational methods for defining and analyzing security attributes based solely on the data and transformations of data found within programs. CSA permits security attributes to be evaluated through automatable analysis of the functional behavior of programs. The technology can support specification of security attributes of systems before they are built; specification and evaluation of security attributes of acquired software; verification of the as-built security attributes of systems; and real-time evaluation of security attributes during system operation.
DTIC
Computer Information Security; Computer Programs; Security

20070007409 European Research Office (US Army), London, UK
Laboratory Information Analysis within the Russian Center for Technological Diagnostics
Masuch, J M; Mar 15, 2004; 193 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N62558-02-C-9041
Report No.(s): AD-A460436; No Copyright; Avail.: CASI: A09, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460436

In this report, we examine the technical parameters for the design and implementation of a Laboratory Information Management System (LIMS) within the Center for Technological Diagnostics (CTD) in St. Petersburg Russia. The LIMS is composed of two main databases. The first database is used to store, archive, retrieve, and manage materials information as it is placed within the StarLIMS software. The StarLIMS interface uses the Sybase Relational Database Manager (RDBMS) as the main archive tool; however, all information is distributed across the Ministry of Defense (MOD) network. The second database contains the archived information (materials data) within the Oracle RDBMS. This data is stored within the CTD main server system. The main server is a Compaq ML-530 array with eight independent disks. Two identical Compaq ML-530 systems are used to archive the technical information and serve all information that is required for the fixed and mobile laboratories. The disks are partitioned for data security, and organized by technical requirements for LIMS access and materials archive. The LIMS is designed to assist MOD in their certification requirements, and provide chain-of-custody tools that are necessary to maintain proper authorization and control of information as it enters (and exits) the laboratory complex. The LIMS is also required to assist DTRA in examination requirements for monitoring the proper use of all equipment in the functional laboratory. For certification requirements, the LIMS produces specialized reports from each testing sequence. The reports include documented headers that are authorized by the 12th Main Directorate, as well as, specialized data structures and attestations that are required by the Russian State Standards (RSS) and Gosgorteknadzor oversight bureaus.
DTIC
Data Management; Diagnosis; Information Analysis; Information Management; Information Systems; Management Systems

20070007422 Naval Postgraduate School, Monterey, CA USA
System Support/Sustainment Plan Platform for the Defense Enterprise Accounting Management System (DEAMS)
Baker, Jarvis R; Dec 2006; 89 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460466; No Copyright; Avail.: CASI: A05, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460466

Secretary of Defense Donald Rumsfeld, in a memo dated 19 July 2001, indicated that one of his highest priorities in transforming the Department of Defense (DoD) is to have reliable, accurate and timely financial management information. To facilitate this, Secretary Rumsfeld established the Business Management Modernization Program (BMMP). The BMMP is an implementation program charged with transforming the DoD's framework. One of the initiatives of the BMMP is to provide a modern financial management system that transforms business operations to achieve improved warfighter support while enabling financial accountability. The tool, the Defense Enterprise Accounting Management System (DEAMS) is a modified Commercial Off the Shelf (COTS) financial management system. DEAMS is expected to transform DoD financial management so that timely and accurate information supports effective decision-making. According to DoD guidance, to effectively develop, acquire, test, and support DEAMS it is critical that system resources are identified, tracked and evaluated. Through out this document, this process will be referred to as a support/sustainment plan. To date, a viable system support/sustainment plan has not been developed for DEAMS. The focus of this MBA project is to create a platform for a support/sustainment plan. The support plan is a living management tool. Its purpose is to ensure the system performs to warfighters requirements and identifies system performance short-comings over its life cycle.
DTIC
Accounting; Defense Program; Financial Management; Life (Durability); Management Systems; Planning

20070007440 Advanced Brain Monitoring, Inc., Carlsbad, CA USA
EEG Indices Distinguish Spatial and Verbal Working Memory Processing: Implications for Real-Time Monitoring in a Closed-Loop Tactical Tomahawk Weapons Simulation
Berka, Chris; Levendowski, Daniel J; Davis, Gene; Lumicao, Michelle N; Ramsey, Caitlin K; Stanney, Kay; Reeves, Leah; Tremoulet, Patrice D; Regli, Susan H; Jul 2005; 10 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460494; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460494

This effort focused on developing EEG-derived indicators of verbal versus spatial working memory load. A wireless EEG headset acquired data during execution of both simple and complex tasks associated with a Tactical Tomahawk Weapons Control System (TTWCS). The results established the feasibility of characterizing EEG correlates specific to verbal and spatial working memory. The next goal is to leverage these real-time working memory indices as a feedback loop to direct closed-loop human-system interaction. Specifically, if the preliminary EEG indices derived in this study, in combination with other physiological or behavioral inputs, are shown to relate to the degree of working memory overload in the TTWCS or similar

tasks, they could provide a valuable contribution to real-time adaptive aiding of human-system interaction.
DTIC
Cognition; Data Acquisition; Earphones; Electroencephalography; Feedback Control; Memory; Real Time Operation; Simulation; Tasks; Verbal Communication

20070007507 Yale Univ., New Haven, CT USA
Robustness of Class-Based Path-Vector Systems
Jaggard, Aaron D; Ramachandran, Vijay; Dec 2004; 19 pp.; In English
Contract(s)/Grant(s): DMS-023996; N00014-01-1-0795
Report No.(s): AD-A460628; YALE/DCS/TR/-1296; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460628

Griffin, Jaggard, and Ramachandran [5] introduced a framework for studying design principles for path-vector protocols, such as the Border Gateway Protocol (BGP) used for inter-domain routing in the Internet. They outlined how their framework could describe Hierarchical- BGP-like systems in which routing at a node is determined by the relationship with the next-hop node on a path (e.g., an ISP-peering relationship) and some additional scoping rules (e.g., the use of backup routes). The robustness of these class-based path-vector systems depends on the presence of a global constraint on the system, but an adequate constraint has not yet been given in general. In this paper, we give the best-known sufficient constraint that guarantees robust convergence. We show how to generate this constraint from the design specification of the path-vector system. We also give centralized and distributed algorithms to enforce this constraint, discuss applications of these algorithms, and compare them to algorithms given in previous work on path-vector protocol design.
DTIC
Hierarchies; Internets; Protocol (Computers); Robustness (Mathematics)

20070007537 University of Southern California, Marina del Rey, CA USA
Coercive Narratives, Motivation and Role Playing in Virtual Worlds
Morie, Jacquelyn F; Jan 2002; 8 pp.; In English
Contract(s)/Grant(s): DAAD19-99-D-0046
Report No.(s): AD-A460689; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460689

The leap from a constrained linear story line to a complete world where participants have free will is substantial with many associated possibilities and questions. The concept of interactive narrative has been explored for the past twenty years yet we seem no closer to formulating a cohesive grammar for such works. Open-ended virtual worlds are the most challenging of the new media in this respect Can constrained authorship and free-will experience coexist? How does personal motivation fit in with the story and the role that participants are expected to fill? At the University of Southern California's Institute for Creative Technologies (ICT), I am exploring design techniques to create worlds that take advantage of expectations interest and natural world interactions to help structure a 'narrative' both within and after participation in an open-ended Virtual Environment (VE). I intend to take advantage of a participants natural tendency to prefer interaction when possible resulting in worlds that form their meaning out of intention and interaction - of the author as well as the participant - in a mutual form of authorship I hope this work will expand the potential of experience within virtual worlds.
DTIC
Coercivity; Grammars; Motivation; Virtual Reality

20070007673 Swedish Defence Research Establishment, Stockholm, Sweden
Evaluating a Swedish Airborne Combat Capability using Computer Supported Morphological Analysis
Ritchey, Tom; Kaunitz, Carin; Jun 2005; 12 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460933; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460933

General morphological analysis (MA) is a method for structuring and analysing the total set of relationships contained in multi-dimensional, non-quantifiable problem complexes, and for synthesising solution spaces. During the past ten years, MA has been extended, computerised and applied by FOI for scenario development, long-term strategy management and organisational structuring. This article outlines the fundamentals of the morphological approach and describes its use in a study carried out by the Swedish Army Command concerning the development of an airborne combat capability. The study was to evaluate how such a capability can enhance armed forces' operations in a fifteen-year perspective. Morphological analysis

(MA) was utilised for the initial structuring and analysis of the relationships between the variables involved, among these tactical, organisational, economic, and command and control.
DTIC
Combat; Computer Techniques; Military Operations; Morphology

20070007678 Mitre Corp., McLean, VA USA
An End-to-End Modeling and Simulation Testbed (EMAST) to Support Detailed Quantitative Evaluations of GIG Transport Services
Comparetto, G; Schult, N; Mirhakkak, M; Chen, L; Wade, R; Duffalo, S; Jun 14, 2005; 28 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460939; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460939

The future DoD transport vision is for the Global Information Grid (GIG) to provide an internet-like capability that meets the mobility, security, and reliability needs of a wide spectrum of DoD users. A variety of services must be provided to the users including management of resources to support QoS, a transition path from IPv4 to IPv6, and efficient networking across heterogeneous networks (i.e., wired/wireless, fixed/mobile, GND/Air/Space, etc.). Due to the complexity of the issues involved with the integrated GIG, it is only possible to quantify end-to-end GIG performance via modeling and simulation (M&S) techniques using component models having adequate fidelity. The purpose of this paper is to describe the End-to-End M&S Testbed (EMAST) that has been developed to address these issues.
DTIC
Communication Networks; Simulation; Test Stands

20070008015 California Univ., Santa Cruz, CA USA
Loop-Free Internet Routing Using Hierarchical Routing Trees
Murthy, Shree; Garcia-Luna-Aceves, J J; Jan 1997; 9 pp.; In English
Contract(s)/Grant(s): DAAB07-95-C-D157
Report No.(s): AD-A457721; No Copyright; Avail.: CASI: A02, Hardcopy

The authors present a new hierarchical routing algorithm that combines the loop-free path-finding algorithm (LPA) with the area-based hierarchical routing scheme first proposed by McQuillan for distance-vector algorithms. The new algorithm, which they call the Hierarchical Information Path-based Routing (HIPR) algorithm, accommodates an arbitrary number of aggregation levels and can be viewed as a distributed version of Dijkstra's algorithm running over a hierarchical graph. HIPR is verified to be loop-free and correct. Simulations are used to show that HIPR is much more efficient than OSPF in terms of speed and the communication and processing overhead required to converge to correct routing tables. HIPR constitutes the basis for future Internet routing protocols that are as simple as RIPv2, but with no looping and better performance than protocols based on link states.
DTIC
Algorithms; Hierarchies; Internets; Packet Switching; Protocol (Computers); Topology; Wireless Communication

20070008021 California Univ., Santa Cruz, CA USA
Multicasting along Meshes in Ad-Hoc Networks
Madruga, Ewerton L; Garcia-Luna-Aceves, J J; Jan 1999; 6 pp.; In English
Contract(s)/Grant(s): F30602-97-2-0338
Report No.(s): AD-A459241; No Copyright; Avail.: CASI: A02, Hardcopy

The Core-Assisted Mesh Protocol (CAMP) is introduced for multicast routing in ad-hoc networks. CAMP generalizes the notion of core-based trees introduced for internet multicasting into multicast meshes that have much richer connectivity than trees. A shared multicast mesh is defined for each multicast group. The main goal of using such meshes is to maintain the connectivity of multicast groups even while network routers move frequently. CAMP consists of the maintenance of multicast meshes and loop-free packet forwarding over such meshes. Within the multicast mesh of a group, packets from any source in the group are forwarded along the reverse shortest path to the source, just as in traditional multicast protocols based on source-based trees. CAMP guarantees that, within a finite time, every receiver of a multicast group has a reverse shortest path to each source of the multicast group. It uses cores only to limit the traffic needed for a router to join a multicast group. The

failure of cores does not stop packet forwarding or the process of maintaining the multicast meshes.
DTIC
Computer Networks; Group Dynamics; Packet Switching; Protocol (Computers); Wireless Communication

20070008025 California Univ., Santa Cruz, CA USA
Collision Avoidance and Resolution Multiple Access with Transmission Groups
Garces, Rodrigo; Garcia-Luna-Aceves, J J; Jan 1997; 10 pp.; In English
Contract(s)/Grant(s): DAAB07-95-C-D157; DAAH04-96-1-0210
Report No.(s): AD-A459702; No Copyright; Avail.: CASI: A02, Hardcopy

The Collision Avoidance and Resolution Multiple Access protocol with nonpersistent trees and transmission groups (CARMA-NTG) is presented and analyzed. CARMA-NTG dynamically divides the channel into cycles of variable length; each cycle consists of a contention period and a group-transmission period. During the contention period, a station with one or more packets to send competes for the right to be added to the group of stations allowed to transmit data without collisions. This is done using a collision resolution splitting algorithm based on a request-to-send/clear-to-send (RTS/CTS) message exchange with non-persistent carrier sensing. CARMA-NTG ensures that one station is added to the group transmission period if one or more stations send requests to be added in the previous contention period. The group-transmission period is a variable-length train of packets that are transmitted by stations that have been added to the group by successfully completing an RTS/CTS message exchange in previous contention periods. As long as a station maintains its position in the group, it is able to transmit data packets without collision. An upper bound is derived for the average costs of obtaining the first success in the splitting algorithm. This bound is then applied to the computation of the average channel utilization in a fully connected network with a large number of stations. These results indicate that collision resolution is a powerful mechanism in combination with floor acquisition and group allocation multiple access.
DTIC
Collision Avoidance; Computer Networks; Group Dynamics; Multiple Access; Packet Switching; Protocol (Computers); Wireless Communication

20070008150 Naval Academy, Annapolis, MD USA
IPv6 Testing
Landis, Christopher B; May 8, 2006; 11 pp.; In English
Report No.(s): AD-A460472; USNA-CS-TR-2006-02; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460472

The DoD is committed to transitioning to Internet Protocol version 6 (IPv6) by 2008. Transitional working groups are underway to develop plans to implement IPv6 on Government networks. The DoD is also forming working relationships to conduct testing and share information. IPv6 was developed to resolve the issues of IPv4, mainly the limited amount of addresses and lack of security. The IPv6 address space has expanded from 32 bits (IPv4) to 128 bits (IPv6) creating 2(to the 128th power) unique addresses. It also provides end-to-end security using IPSec, adds mobility features and easier address management. The IPv6 testing team will have the opportunity to gain hands-on experience working with IPv6 heterogeneous networks and other teams enabling us to share resource and equipment. This IPv6 testing is necessary to evaluate interoperability and security issues that will arise in the transition, support and evaluations of IPv6, and dual-stack IPv6 and IPv4 networks.
DTIC
Internets; Protocol (Computers)

20070008160 Mitre Corp., Bedford, MA USA
Comparing DCE and CORBA
Brando, Thomas J; Mar 1995; 20 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460207; MITRE-MP-95B-93; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460207

Many people perceive DCE and CORBA as competing technologies. Indeed, both support the construction and integration of client-server applications in heterogeneous distributed environments. Comparisons typically focus on differences between individual capabilities or on differences between the maturity of specifications and products that conform to them. There is a fundamental difference between DCE and CORBA, however, that we feel far overshadows either of these criteria as a basis for selecting a distributed computing platform. This document summarizes the main features of DCE and CORBA, presents

what we feel is the most important difference between them, discusses differences between individual capabilities and the maturity of both specifications and products, and concludes with our view of how an organization should select the technology most appropriate to its distributed computing goals.
DTIC
Architecture (Computers); Data Processing

20070008163 Stanford Univ., Stanford, CA USA
Hybrid Control Models and Tools for Biological Regulatory Networks
Tomlin, C J; Axelrod, J D; Sastry, S S; Sep 30, 2003; 9 pp.; In English
Contract(s)/Grant(s): DAAD19-03-1-0373
Report No.(s): AD-A460925; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460925

This report describes the research completed under Research Agreement DAAD19-03-1-0373 awarded to Stanford University as part of DARPAs BioComputation Program. The overall goal of this research is to design mathematical models and analysis techniques based on control theory and hybrid systems to help understand intra- and inter-cellular biological regulatory networks. One of the products of this research was integrated into the BioSPICE tool developed by SRI and providing a common framework for the different methods developed as part of the BioComputation program. The research performed under this agreement produced: (i) a procedure based on deterministic and stochastic hybrid system reachability tools, for identifying parameters of different biological systems; (ii) a technique for identifying parameters for continuous state models of protein regulatory networks; (iii) new insights provided by these tools into the operation of the mechanisms behind Planar Cell Polarity in Drosophila wings and into the survival analysis of Bacillus subtilis.
DTIC
Computer Networks; Biology; Mathematical Models; Control Theory

20070008234 Industrial Coll. of the Armed Forces, Washington, DC USA
Network Centric Railroading Utilizing Intelligent Railroad Systems
Ditmeyer, Steven R; Jun 2005; 28 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460948; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460948

Network Centric Railroading: Use digital data communications, sensors, and computers on railroads to: Improve safety and security; Raise effective capacity; Improve asset utilization; Improve customer satisfaction; Measure and control costs; Reduce energy consumption and emissions; Increase economic viability and profits; Manage the unexpected.
DTIC
Rail Transportation; Computer Networks

20070008239 Research and Technology Organization, Neuilly-sur-Seine, France
Information Operations: Analysis Support and Capability Requirements
October 2006; 54 pp.; In English
Report No.(s): RTO-TR-SAS-057; AC/323(SAS-057)TP/49; Copyright; Avail.: CASI: C01, CD-ROM: A04, Hardcopy

The focus of the study Information Operations Analysis Support and Capability Requirements undertaken by the RTO Task Group SAS-057 was to provide recommendations to improve analysis support to information operations (Info Ops). First, the study team obtained an overview of the current understanding of Info Ops, of the current practice of documenting and assessing Info Ops, and of existing methods and tools available to support Info Ops analysis to identify gaps and needs. The results of the study indicate that in the future, Info Ops as an essential contribution to operations following an effects-based approach should benefit from increased analysis support in multiple ways, from a thorough improvement of lessons learned processes to the application of knowledge from a variety of physical, human, and information science disciplines.
Author
Information Analysis; Systems Analysis; Requirements; Knowledge Based Systems; Operations Research

20070008472 California Univ., Santa Cruz, CA USA
Throughput and Fairness in A Hybrid Channel Access Scheme for Ad Hoc Networks
Wang, Yu; Garcia-Luna-Aceves, J J; Jan 2003; 7 pp.; In English
Contract(s)/Grant(s): F49620-00-1-0330
Report No.(s): AD-A460986; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460986

A novel hybrid channel access scheme that combines sender-initiated and receiver-initiated collision-avoidance handshakes is proposed for multi-hop ad hoc networks. The scheme is based on the observation that a receiver-initiated scheme is more appropriate when receivers are more knowledgeable of the contention around themselves and can compete for the channel more effectively. By adaptively sharing the burden of initiating the collision-avoidance handshake between the nodes that experience different levels of contention, better fairness may be achieved with almost no degradation in throughput. An attractive feature of the new scheme is that it is a simple extension to the existing IEEE 802.11 MAC protocol, and it maintains compatibility with the standard. The new scheme involves adding very simple queue management and book-keeping work mechanisms. Simulation experiments of the IEEE 802.11 MAC protocol and the new scheme show that, although the proposed hybrid scheme does not solve the fairness problem conclusively, it does alleviate the fairness problem in some cases without sacrificing much throughput and simplicity. The difficulty of improving fairness for TCP-based flows is demonstrated. A promising topic for future work consists of combining the new hybrid scheme with some proposed mechanisms that try to approximate fair queueing for ad hoc networks to achieve some QoS assurances. Without explicit information exchange among nodes, the fairness problem cannot be solved conclusively.
DTIC
Collision Avoidance; Computer Networks; Packet Switching; Protocol (Computers); Wireless Communication

20070008474 California Univ., Santa Cruz, CA USA
MDVA: A Distance-Vector Multipath Routing Protocol
Vutukury, Srinivas; Garcia-Luna-Aceves, J J; Jan 2001; 9 pp.; In English
Contract(s)/Grant(s): F30602-97-1-0291; N66001-00-1-8942
Report No.(s): AD-A460988; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460988

Routing protocols using the Distributed Bellman-Ford (DBF) algorithm converge very slowly to the correct routes when link costs increase, and in the case where a set of link failures results in a network partition, DBF simply fails to converge, a problem that is commonly referred to as the count-to-infinity problem. In this paper, the authors present the first distance vector routing algorithm, the Multipath Distance-Vector Algorithm (MDVA), that uses a set of loop-free invariants to prevent the count-to-infinity problem. In addition, MDVA computes multipaths that are loop-free at every instant. In their earlier work, the authors showed how such loop-free multipaths can be used in traffic load-balancing and delay minimization, which otherwise are impossible to perform in current single-path routing algorithms.
DTIC
Algorithms; Computer Networks; Convergence; Multipath Transmission; Packet Switching; Protocol (Computers); Wireless Communication

20070008475 Colorado Univ., Boulder, CO USA
University of Colorado Dialog Systems for Travel and Navigation
Pellom, B; Ward, W; Hansen, J; Cole, R; Hacioglu, K; Zhang, J; Yu, X; Pradhan, S; Jan 2001; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N66001-002-8906
Report No.(s): AD-A460989; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460989

This paper presents recent improvements in the development of the University of Colorado 'CU Communicator' and 'CU-Move' spoken dialog systems. First, we describe the CU Communicator system that integrates speech recognition, synthesis and natural language understanding technologies using the DARPA Hub Architecture. Users are able to converse with an automated travel agent over the phone to retrieve up-to-date travel information such as flight schedules, pricing, along with hotel and rental car availability. The CU Communicator has been under development since April of 1999 and represents our test-bed system for developing robust human-computer interactions where reusability and dialogue system portability serve as two main goals of our work. Next, we describe our more recent work on the CU Move dialog system for in-vehicle route planning and guidance. This work is in joint collaboration with HRL and is sponsored as part of the DARPA Communicator program. Specifically, we will provide an overview of the task, describe the data collection environment for in-vehicle systems development, and describe our initial dialog system constructed for route planning.
DTIC
Architecture (Computers); Navigation

20070008481 Carnegie-Mellon Univ., Pittsburgh, PA USA

A Comparison of Overlay Routing and Multihoming Route Control

Akella, Aditya; Pang, Jeffrey; Shaikh, Anees; Maggs, Bruce; Seshan, Srinivasan; Aug 2004; 25 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-02-1-0389

Report No.(s): AD-A460999; CMU-CS-04-158; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460999

The limitations of BGP routing in the Internet are often blamed for poor end-to-end performance and prolonged connectivity interruptions. Recent work advocates using overlays to effectively bypass BGP's path selection in order to improve performance and fault tolerance. In this paper, we explore the possibility that intelligent control of BGP routes, coupled with ISP multihoming, can provide competitive end-to-end performance and reliability. Using extensive measurements of paths between nodes in a large content distribution network, we compare the relative benefits of overlay routing and multihoming route control in terms of round-trip latency, TCP connection throughput, and path availability. We observe that the performance achieved by route control together with multihoming to three ISPs (3-multihoming), is within 3 12% of overlay routing employed in conjunction 3-multihoming, in terms of both end-to-end RTT and throughput. We also show that while multihoming cannot offer the nearly perfect resilience of overlays, it can eliminate almost all failures experienced by a singly-homed end-network. Our results demonstrate that, by leveraging the capability of multihoming route control, it is not necessary to circumvent BGP routing to extract good wide-area performance and availability from the existing routing system.

DTIC

Computer Networks; Routes

20070008493 California Univ., Santa Cruz, CA USA

Network Support for Turn-Taking in Multimedia Collaboration

Dommel, Hans-Peter; Garcia-Luna-Aceves, J J; Jan 1997; 13 pp.; In English

Contract(s)/Grant(s): N00014-92-J-1807

Report No.(s): AD-A461021; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461021

The effectiveness of collaborative multimedia systems depends on the regulation of access to their shared resources, such as continuous media or instruments used concurrently by multiple parties. Existing applications use only simple protocols to mediate such resource contention. Their cooperative rules follow a strict agenda and are largely application-specific. The inherent problem of floor control lacks a systematic methodology This paper presents a general model on floor control for correct, scalable, fine-grained and fair resource sharing that integrates user interaction with network conditions (Quality-of-Service), and adaptation to various media types. The notion of turn-taking known from psycholinguistics in studies on discourse structure is adapted for this framework. Viewed as a computational analogy to speech communication, online collaboration revolves around dynamically allocated access permissions called floors. The control semantics of floors derives from concurrency control methodology. An explicit specification and verification of a novel distributed Floor Control Protocol (FCP) are presented. Hosts assume sharing roles that allow for efficient dissemination of control information, agreeing on a floor holder which is granted mutually exclusive access to a resource. Performance analytic aspects of floor control protocols are also briefly discussed.

DTIC

Floors; Multimedia; Resources

20070008496 Carnegie-Mellon Univ., Pittsburgh, PA USA

New Streaming Algorithms for Fast Detection of Superspreaders

Venkataraman, Shobha; Song, Dawn; Gibbons, Phillip B; Blum, Avrim; May 2004; 28 pp.; In English

Contract(s)/Grant(s): DAAD19-02-1-0389; CCR-0122581

Report No.(s): AD-A461026; CMU-CS-04-142; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461026

High-speed monitoring of Internet traffic is an important and challenging problem, with applications to real-time attack detection and mitigation, traffic engineering, etc. However, packet-level monitoring requires fast streaming algorithms that use very little memory space and little communication among collaborating network monitoring points. In this paper, we consider the problem of detecting superspreaders, which are sources that connect to a large number of distinct destinations. We propose several new streaming algorithms for detecting superspreaders, and prove guarantees on their accuracy and memory

requirements. We also show experimental results on real network traces. Our algorithms are substantially more efficient (both theoretically and experimentally) than previous approaches. We also provide several extensions to our algorithms -- we show how to identify superspreaders in a distributed setting, with sliding windows, and when deletions are allowed in the stream. More generally, our algorithms are applicable to any problem that can be formulated as follows: given a stream of (x,y) pairs, find all the x's that are paired with a large number of distinct y's. We call this the heavy distinct-hitters problem. There are many network security applications of this general problem. This paper discusses these and other applications, and for concreteness, focuses on the superspreader problem.
DTIC
Algorithms; Internets; Security

20070008534 California Univ., Santa Cruz, CA USA
Group Coordination Support for Synchronous Internet Collaboration
Dommel, Hans-Peter; Garcia-Luna-Aceves, J J; Apr 1999; 8 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F19628-96-C-0038
Report No.(s): AD-A461101; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461101

Group coordination mechanisms, such as floor control, support fair access to shared resources whose semantics do not allow for concurrent usage. One new approach integrates group coordination with extended multicast services.
DTIC
Coordination; Floors; Internets

20070008542 Carnegie-Mellon Univ., Pittsburgh, PA USA
Efficient Constructions for One-way Hash Chains
Hu, Yih-Chun; Jakobsson, Markus; Perrig, Adrian; Nov 5, 2003; 27 pp.; In English
Contract(s)/Grant(s): DAAD19-02-1-0389
Report No.(s): AD-A461109; CMU-CS-03-220; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461109

In this paper we present two new constructions for one-way hash chains, which significantly improve the efficiency of one-way chains. Our first construction, the Sandwich-chain, provides a smaller bandwidth overhead for one-way chain values, and enables efficient verification of one-way chain values if the trusted one-way chain value is far away. Our second construction, Comb Skipchain, features a new lower bound for one-way chains in terms of storage and traversal overhead. In fact previously, researchers cite a lower bound of log2(n) for the product of per-value traversal overhead and memory requirements for one-dimensional chains. We show that one can achieve a lower bound by considering multi-dimensional chains. In particular, our two-dimensional construction requires O(log(n)) memory and O(1) traversal overhead, thereby improving on the one-dimensional bound. In addition, the setup cost for the one-way chain is in contrast only O(n/log(n)). Other benefits for both constructions include a faster verification step than the traditional hash chains provide; a verifier can 'catch up' efficiently, after having missed some number of previously released hash values (for the Sandwich-chain); and resistance against DoS attacks on authentication values. Moreover, we describe fractal traversal schemes for our proposed structures, bringing down the traversal costs for our structure to the same as those of the simpler 'traditional' hash chain. Our new construction is orthogonal to most previously proposed techniques, and can be used in conjunction with techniques for efficient setup or verification of one-way chains.
DTIC
Chains; Construction; Cryptography; Data Transmission; Security

20070008544 Carnegie-Mellon Univ., Pittsburgh, PA USA
IPwatch: A Tool for Monitoring Network Locality
Lorence, Mark J; Satyanarayanan, M; Feb 15, 1988; 18 pp.; In English
Contract(s)/Grant(s): F33615-84-K-1520; ARPA ORDER-4976
Report No.(s): AD-A461111; CMU-ITC-88-067; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461111

In this paper we introduce the concepts of Logical and Physical Network Locality and point out their importance to the performance of distributed systems. We then describe the design of IPwatch, a simple and inexpensive tool for monitoring logical network locality. IPwatch exploits short-term locality to enable monitoring of medium- and long-term locality of large

networks using modest computational resources. We describe experiments at Carnegie Mellon University to validate our ideas and to calibrate IPwatch. The results confirm the existence of substantial short-term locality in this environment. Less than 5 percent of the possible host pairs account for 75 percent of the traffic, and less than 15 percent of them account for 90 percent. Comparative measurements on another network in our environment show even stronger short-term locality.
DTIC
Computer Networks; Internets; Protocol (Computers); Software Development Tools

20070008560 Carnegie-Mellon Univ., Pittsburgh, PA USA
Semantic Web Technologies to Reconcile Privacy and Context Awareness
Gandon, Fabien L; Sadeh, Norman M; Dec 2003; 37 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-02-2-0035; F30602-98-2-0135
Report No.(s): AD-A461135; CMU-CS-03-211; CMU-ISRI-03-107; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461135

Increasingly, application developers are looking for ways to provide users with higher levels of personalization that capture different elements of a user's operating context, such as her location, the task that she is currently engaged in, who her colleagues are, etc. While there are many sources of contextual information, they tend to vary from one user to another and also over time. Different users may rely on different location tracking functionality provided by different cell phone operators; they may use different calendar systems, etc. In this article, we describe work on a Semantic e-Wallet aimed at supporting automated identification and access of personal resources, each represented as a Semantic Web Service. A key objective is to provide a Semantic Web environment for open access to a user's contextual resources, thereby reducing the costs associated with the development and maintenance of context-aware applications. A second objective is, through Semantic Web technologies, to empower users to selectively control who has access to their contextual information and under which conditions. This work has been carried out in the context of myCampus, a context-aware environment aimed at enhancing everyday campus life. Empirical results obtained on Carnegie Mellon's campus are discussed.
DTIC
Internets; Privacy; Semantics

20070008581 Carnegie-Mellon Univ., Pittsburgh, PA USA
Estimating Available Bandwidth Using Packet Pair Probing
Hu, Ningning; Steenkiste, Peter; Sep 9, 2002; 28 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-99-1-0518; F30602-96-1-0287
Report No.(s): AD-A461170; CMU-CS-02-166; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461170

The packet pair mechanism has been shown to be a reliable method to measure the bottle-neck link bandwidth of a network path. However, the use of packet pairs to measure available bandwidth has had more mixed results. In this paper, we study how packet pairs and packet trains can be used to estimate the available bandwidth on a network path. As a starting point for our study, we construct the gap model, a simple model that captures the relationship between the competing traffic and the input and output packet pair gap for a single hop network. We validate the model using measurements on a testbed. The gap model shows that the initial probing gap is a critical parameter when using packet pairs to estimate available bandwidth. Based on this insight, we propose a new technique to measure the available bandwidth -- the Initial Gap Increasing (IGI) algorithm, which experimentally determines the best initial gap for measuring available bandwidth. Our experiments show that measurements that take 4-6 round trip times allow us to estimate the available bandwidth to within about 10%.
DTIC
Bandwidth; Estimates; Estimating

20070008606 Carnegie-Mellon Univ., Pittsburgh, PA USA
Intrusion Detection, Diagnosis, and Recovery with Self-Securing Storage
Strunk, John D; Goodson, Garth R; Pennington, Adam G; Soules, Craig A; Ganger, Gregory R; May 2002; 31 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F49620-01-1-0433; F30602-99-2-0539
Report No.(s): AD-A461216; CMU-CS-02-140; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461216

Self-securing storage turns storage devices into active parts of an intrusion survival strategy. From behind a thin storage interface (e.g., SCSI or CIFS), a self-securing storage server can watch storage requests, keep a record of all storage activity, and prevent compromised clients from destroying stored data. This paper describes three ways self-securing storage enhances an administrator's ability to detect, diagnose, and recover from client system intrusions. First, storage-based intrusion detection offers a new observation point for noticing suspect activity. Second, post-hoc intrusion diagnosis starts with a plethora of normally-unavailable information. Finally, post-intrusion recovery is reduced to restarting the system with a pre-intrusion storage image retained by the server. Combined, these features can improve an organization's ability to survive successful digital intrusions.
DTIC
Computer Storage Devices; Data Storage; Detection; Diagnosis; Warning Systems

20070008607 Carnegie-Mellon Univ., Pittsburgh, PA USA
Resolving the Paradox of the Active User: Stable Suboptimal Performance in Interactive Tasks
Fu, Wai-Tat; Gray, Wayne D; Jan 2004; 36 pp.; In English
Contract(s)/Grant(s): F49620-97-1-0353; F49620-03-1-0143
Report No.(s): AD-A461217; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461217

This paper brings the intellectual tools of cognitive science to bear on resolving the paradox of the active user [Interfacing Thought: Cognitive Aspects of Human Computer Interaction, Cambridge, MIT Press, MA, USA] the persistent use of inefficient procedures in interactive tasks by experienced or even expert users when demonstrably more efficient procedures exist. The goal of this paper is to understand the roots of this paradox by finding regularities in these inefficient procedures. We examine three very different data sets. For each data set, we first satisfy ourselves that the preferred procedures used by some subjects are indeed less efficient than the recommended procedures. We then amass evidence, for each set, and conclude that when a preferred procedure is used instead of a more efficient, recommended procedure, the preferred procedure tends to have two major characteristics: (1) the preferred procedure is a well-practiced, generic procedure that is applicable either within the same task environment in different contexts or across different task environments, and (2) the preferred procedure is composed of interactive components that bring fast, incremental feedback on the external problem states. The support amassed for these characteristics leads to a new understanding of the paradox. In interactive tasks, people are biased towards the use of general procedures that start with interactive actions. These actions require much less cognitive effort as each action results in an immediate change to the external display that, in turn, cues the next action. Unfortunately for the users, the bias to use interactive unit tasks leads to a path that requires more effort in the long run. Our data suggest that interactive behavior is composed of a series of distributed choices; that is, people seldom make a once-and-for-all decision on procedures. This series of biased selection of interactive unit tasks often leads to a stable suboptimal level of performance.
DTIC
Paradoxes; Resolution; User Requirements

20070008609 Carnegie-Mellon Univ., Pittsburgh, PA USA
An Internet-style Approach to Managing Wireless Link Errors
Eckhardt, David A; May 2002; 154 pp.; In English
Contract(s)/Grant(s): F19628-92-C-0116
Report No.(s): AD-A461219; CMU-CS-02-141; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461219

As wired computer networks support increasingly sophisticated applications and wireless local area networks become ubiquitous and fast, it is more natural for users to seek a 'wireless Internet' experience that is qualitatively the same as that provided by the wired Internet. However, wireless LANs pose two fundamental challenges to this vision. Harsh and dynamic error environments challenge end-to-end adaptation at the transport and application layers. In addition, dynamic and location-dependent errors challenge the notion of 'fair' scheduling of flows sharing a wireless link. This dissertation advances the claim that a combination of protocol-blind link-level error control and error-sensitive link scheduling effectively addresses these two challenges. The first step is a bit-level trace-based analysis of the error environment provided by a particular wireless link technology (AT&T WaveLAN I) in the face of attenuation and interference. Based on the insights revealed by this analysis, the next step is designing an adaptive link-level error control module. Finally, we propose a new notion of fairness appropriate for error-prone wireless links. This new scheduling approach balances application sensitivity to error-induced throughput changes against the need to preserve link efficiency. The proposed mechanisms are evaluated by deploying them in an actual operating system, running on real hardware, and subjecting them to trace replay of the error environments we

observed. Particular attention is given to the interaction between link-level error control and TCP's end-to-end error and congestion control mechanisms. The result is a system that can noticeably improve application-level throughput in a wide variety of error environments and can sensibly allocate limited and dynamic network capacity among network flows.
DTIC
Errors; Internets; Wireless Communication

20070008610 Colorado Univ., Boulder, CO USA
Visual AgenTalk: Anatomy of a Low Threshold, High Ceiling End User Programming Environment
Repenning, Alexander; Ambach, James; Jan 25, 1996; 16 pp.; In English
Contract(s)/Grant(s): CDA-940860; RED925-3425
Report No.(s): AD-A461220; CU-CS-802-96; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461220

Typical approaches to end user programming involve design trade-offs between ease of use and expressiveness End user programming environments are either easy to use and not very expressive (low threshold/low ceiling) or more difficult to use but more powerful (high threshold/high ceiling). We propose the development of end user programming environments that are both low threshold and high ceiling by combining a collection of mechanisms that address the issues of program comprehensibility, language tailorability, and interactive multimodality. In this paper, we describe the layered anatomy of a low threshold/high ceiling environment that is usable by both end users and language designers. We then illustrate our theory with a description of a new low threshold/high ceiling end user programming environment called Visual AgenTalk.
DTIC
Anatomy; Computer Programming; Programming Environments; Software Engineering; User Requirements

20070008611 Carnegie-Mellon Univ., Pittsburgh, PA USA
Dynamic Function Placement in Active Storage Clusters
Amiri, Khalil; Petrou, David; Ganger, Gregory; Gibson, Garth; Jun 1999; 26 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00174-96-0002; DARPA ORDER-D306
Report No.(s): AD-A461222; CMU-CS-99-140; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461222

Optimally partitioning application and file system functionality within a cluster of clients and servers is a difficult problem due to dynamic variations in application behavior, resource availability and workload mixes. This paper presents ABACUS, a run-time system that monitors and dynamically changes function placement for applications that manipulate large data sets. Several examples of data-intensive workloads are used to show the importance of proper function placement and its dependence on dynamic runtime characteristics, with performance differences frequently reaching 2-10X. We evaluate how well the ABACUS prototype adapts to run-time system behavior, including both long-term variation (e.g., filter selectivity) and short-term variation (e.g.,multi-phase applications and inter-application resource contention). Our experiments with ABACUS indicate that it is possible to adapt in all of these situations and that the adaptation converges most quickly in those cases where the performance impact is most significant.
DTIC
Computer Storage Devices; Data Storage; Functional Analysis

20070008613 Air Force Research Lab., Rome, NY USA
Using Agents to Exploit Heterogeneous Parallelism on High Performance Computers
Linderman, Mark H; Jan 1999; 4 pp.; In English
Report No.(s): AD-A461226; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461226

While homogeneous parallelism has traditionally been exploited on scaleable high performance computers (HPCs) for applications such as signal processing, parallelism in requiring data dependent processing applications is often difficult to predict and exploit with traditional methods. This paper describes the adaptation of 'agent-based' systems that have been investigated in other domains such as the Internet. An agent is a autonomous process that adapts to its environment to accomplish a specific task. An agent first discovers the location of needed information, and then either sends the data to a central location or spawns processes to process the information in place. A process is spawned by encapsulating its executable

code and state information (including how and where to send the results) into a package sent to the host compute node. The process is then scheduled and executed according to its priority.
DTIC
Computers; Heterogeneity

20070008614 Carnegie-Mellon Univ., Pittsburgh, PA USA
Verifiable Secret Redistribution for Threshold Sharing Schemes
Wong, Theodore M; Wang, Chenxi; Wing, Jeannette M; Oct 2002; 19 pp.; In English
Contract(s)/Grant(s): F30602-00-2-0523
Report No.(s): AD-A461227; CMU-CS-02-114-R; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461227

We present a new protocol for the verifiable redistribution of secrets from (m,n) to (m',n') access structures for threshold sharing schemes. Our protocol enables the addition or removal of shareholders and also guards against mobile adversaries that cause permanent damage. We observe that existing protocols either cannot be readily extended to allow redistribution between different access structures, or have vulnerabilities that allow faulty old shareholders to corrupt the shares of new shareholders. Our primary contribution is that, in our protocol, new shareholders can verify the validity of their shares after redistribution between different access structures.
DTIC
Protocol (Computers); Security

20070008621 Carnegie-Mellon Univ., Pittsburgh, PA USA
Verifiable Secret Redistribution for Threshold Sharing Schemes
Wong, Theodore M; Wang, Chenxi; Wing, Jeannette M; Feb 2002; 17 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-00-2-0523
Report No.(s): AD-A461236; CMU-CS-02-114; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461236

We present a new protocol for verifiably redistributing secrets from an (m, n) threshold sharing scheme to an (m', n') scheme. Our protocol guards against dynamic adversaries. We observe that existing protocols either cannot be readily extended to allow redistribution between different threshold schemes, or have vulnerabilities that allow faulty old shareholders to distribute invalid shares to new shareholders. Our primary contribution is that in our protocol, new shareholders can verify the validity of their shares after redistribution between different threshold schemes.
DTIC
Algorithms; Cryptography; Protocol (Computers)

20070008650 Carnegie-Mellon Univ., Pittsburgh, PA USA
Early Experience with an Internet Broadcast System Based on Overlay Multicast
Chu, Yang-hua; Ganjam, Aditya; Ng, T S; Rao, Sanjay G; Sripanidkulchai, Kunwadee; Zhan, Jibin; Zhang, Hui; Dec 2003; 33 pp.; In English
Contract(s)/Grant(s): F30602-99-1-0518; NSF-9624979
Report No.(s): AD-A461282; CMU-CS-03-214; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461282

In this paper, we report on experience in building and deploying an operational Internet broadcast system based on Overlay Multicast. In over a year, the system has been providing a cost-effective alternative for Internet broadcast, used by over 3600 users spread across multiple continents in home, academic and commercial environments. Technical conferences and special interest groups are the early adopters. Our experience conforms that Overlay Multicast can be easily deployed and can provide reasonably good application performance. The experience has led us to identify fir-order issues that are guiding our future efforts and are of importance to any Overlay Multicast protocol or system. Our key contributions are (i) enabling a real Overlay Multicast application and strengthening the case for overlays as a viable architecture for enabling group communication applications on the Internet, (ii) the details in engineering and operating a fully functional streaming system, addressing a wide range of real-world issues that are not typically considered in protocol design studies, and (iii) the data, analysis methodology, and experience that we are able to report given our unique standpoint.
DTIC
Broadcasting; Internets

20070008676 California Univ., Santa Cruz, CA USA

An Efficient Path Selection Algorithm for On-Demand Link-State Hop-by-Hop Routing

Roy, Soumya; Garcia-Luna-Aceves, J J; Jan 2002; 5 pp.; In English

Contract(s)/Grant(s): F49620-00-1-0330; F30602-97-2-0338

Report No.(s): AD-A461324; No Copyright; Avail.: CASI: A01, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461324

Traditional routing protocols based on link-state information form a network topology through the exchange of link-state information by flooding or by reporting partial topology information, and by computing shortest routes to each reachable destination using a path-selection algorithm like Dijkstra's algorithm or the Bellman-Ford algorithm. However, in an on-demand, link-state routing protocol, no one node needs to know the paths to every other node in the network. Accordingly, when a node chooses a next hop for a given destination, it must be true that the next hop has reported a path to the same destination; otherwise, packets sent through that node would be dropped. In this paper, the authors present a new path-selection algorithm that, unlike traditional shortest path algorithms, computes shortest paths with the above on-demand routing constraint.

DTIC

Algorithms; Packet Switching; Protocol (Computers); Topology; Wireless Communication

20070008729 Naval Research Advisory Committee, Arlington, VA USA

Venture Capital

Lister, M J; Andreassen, A; Bales, Shanda; Biddle, J G; Chang, M M; McCormick, R; Packard, W J; Sun, T; Jul 2006; 42 pp.; In English; Original contains color illustrations

Report No.(s): AD-A461470; NRAC-06-3; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461470

Leveraging venture capital to the advantage of the Naval Services should be viewed as part of the larger project of reforming the acquisition system to permit rapid introduction of new technologies to the Fleet and Force. There is no need for the Department of the Navy to imitate any of the existing venture capital models found in the Defense and Intelligence Communities. These have been of limited value at best, and often simply repeat in a different key the familiar pathologies of the research and development system. Equity investment on the part of the Government is not necessary to gain access to emerging technology. Rather, the Government needs to realize that its acquisition processes are the obstacle. Fix those, and the technology will be available.

DTIC

Acquisition; Military Technology; Navy

20070008731 California Univ., Santa Cruz, CA USA

A Multipath Framework Architecture for Integrated Services

Vutukury, Srinivas; Garcia-Luna-Aceves, J J; Jan 2000; 6 pp.; In English

Contract(s)/Grant(s): F30602-97-1-0291; F19628-96-C-0038

Report No.(s): AD-A461474; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA461474

A major concern with the IETF proposed Integrated Services (Intserv) architecture for providing Quality of Service is that the amount of reservation state it stores in the routers and the RSVP protocol it uses to maintain the consistency of reservation state may not be scalable to high-speed backbone networks. Because of the large number of flows in the backbone network, the refresh messages associated with RSVP's soft-state mechanism, apart from consuming memory, bandwidth and computing power, can experience significant queuing delays and prevent correct functioning of the soft-state mechanism. For the refresh mechanism to scale, therefore, the reservation state size must be bounded so that delays of time-sensitive refresh messages can also be bounded through adequate bandwidth allocation. Earlier the authors described the Scalable Multipath Aggregated Routing architecture (SMART), in which the reservation state size is a function of number of destinations rather than number of flows in the network. In this paper, they describe a reservation protocol (AGREE) to maintain this reservation state aggregated along the multipaths. The AGREE protocol, like RSVP, uses soft-states, but also ensures that the refresh messages experience bounded queuing delays. The SMART architecture combined with the AGREE protocol is significantly more scalable compared to the Intserv/RSVP model.

DTIC

Allocations; Bandwidth; Multipath Transmission; Packet Switching; Protocol (Computers)

20070008744 California Univ., Santa Cruz, CA USA
Routing Strategies in Ad-Hoc Wireless Networks
Raju, Jyoti; Dec 2002; 172 pp.; In English
Report No.(s): AD-A461488; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461488

Ad-hoc wireless networks present a unique design problem for routing. Wireless networks suffer from low bandwidth due to high rates of interference and inherent limitations of the medium. Mobility also increases the bandwidth used for control packets. To conserve on precious bandwidth, routing protocols should generate as few updates as possible. In this dissertation, we propose distance vector solutions to ad-hoc routing because unlike existing routing solutions our solutions do not use sequence numbers and thus are not prone to inefficient or wrong behavior in the presence of node failures. First, we introduce ROAM, the first protocol to correctly tackle the 'searching to infinity' problem found in on-demand routing protocols. ROAM can be used in networks with low rates of topology changes because it required reliable updates. Next, we describe two protocols DST (on-demand) and BEST (table-driven) for networks with high rates of topology change. Simulation experiments carried out in two different simulation packages show that these protocols perform an order of magnitude better than representative on-demand and table-driven routing solutions for ad-hoc networks. Finally, we introduce MDST, an on-demand protocol that extends the source tracing algorithm used in DST to create and maintain multiple paths in an ad-hoc wireless network. Multipath routing can be used in ad hoc networks to achieve greater resilience to route failures and better end-to-end delays. Multipath routing is also essential when using QoS metrics like delay in order to avoid route oscillation. We show that multiple paths that are node disjoint and loop free can be maintained with less overhead than DST. Further, these multiple paths decrease the delay of packet delivery and increase the throughput of the network.
DTIC
Computer Networks; Local Area Networks; Wireless Communication

20070008841 Sun Microsystems Labs., Palo Alto, CA USA
A Routing Architecture for Mobile Integrated Services Networks
Murthy, Shree; Garcia-Luna-Aceves, J J; Jan 1998; 33 pp.; In English
Contract(s)/Grant(s): DAAB07-95-C-D157; F19628-96-C-0038
Report No.(s): AD-A461613; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461613

A drawback of the conventional Internet routing architecture is that its route computation and packet forwarding mechanisms are poorly integrated with congestion control mechanisms. Any datagram offered to the network is accepted; routers forward packets on a best-effort basis and react to congestion only after the network resources have already been wasted. A number of proposals improve on this to support multimedia applications; a promising example is the Integrated Services Packet Network (ISPN) architecture. However, these proposals are oriented to networks with fairly static topologies and rely on the same conventional Internet routing protocols to operate. This paper presents a routing architecture for mobile integrated services networks in which network nodes (routers) can move constantly while providing end-do-end performance guarantees. In the proposed connectionless routing architecture, packets are individually routed towards their destinations on a hop by hop basis. A packet intended for a given destination is allowed to enter the network if and only if there is at least one path of routers with enough resources to ensure its delivery within a finite time.
DTIC
Multipath Transmission; Systems Integration

20070008842 California Univ., Santa Cruz, CA USA
A Scalable and Loop-Free Multicast Internet Protocol
Parsa, M; Garcia-Luna-Aceves, J J; Jan 1997; 16 pp.; In English
Contract(s)/Grant(s): F19628-93-C-0175
Report No.(s): AD-A461614; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461614

In network multimedia applications, such as multiparty teleconferencing, users often need to send the same information to several (but not necessarily all) other users. To manage such one-to-many or many-to-many communication efficiently in wide-area internetworks, it is imperative to support and perform multicast routing. Multicast routing sends a single copy of a message from a source to multiple receivers over a communication link that is shared by the paths to the receivers. Loop-freedom is a specially important consideration in multicasting, because applications using multicasting tend to be multimedia and bandwidth intensive, and loops in multicast routing duplicates looping packets. We present a new multicast

routing protocol, called Multicast Internet Protocol (MIP), which offers a simple and flexible approach to constructing both group-shared and shortest-paths multicast trees. MIP can be sender-initiated or receiver-initiated or both; therefore, it can be tailored to the particular nature of an application's group dynamics and size. MIP is independent of the underlying unicast routing algorithms used. MIP is robust and adapts under dynamic network conditions (topology or link cost changes) to maintain loop-free multicast routing. Under stable network conditions, MIP has no maintenance or control message overhead.
DTIC
Internets; Protocol (Computers)

20070008869 California Univ., Santa Cruz, CA USA
A New Approach to On-Demand Loop-Free Routing in Ad Hoc Networks
Garcia-Luna-Aceves, J J; Mosko, Marc; Perkins, Charles E; Jan 2003; 11 pp.; In English
Contract(s)/Grant(s): F49620-00-1-0330; DAAD19-01-C-0026
Report No.(s): AD-A461647; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461647

A new protocol is presented for on-demand loop-free routing in ad hoc networks. The new protocol called labeled distance routing (LDR) protocol uses a distance invariant to establish all ordering criterion and per-destination sequence numbers to reset the invariant resulting in loop-freedom at every instant. The distance invariant allows nodes to change their next hops or distances to destinations without creating routing-table loops. The destination sequence number which only the destination may increment permits nodes to reset the values of their distance invariants. The performance of LDR is compared against the performance of three other protocols that are representative of the state-of-the-art namely AODV, DSR, and OLSR.
DTIC
Communication Networks; Protocol (Computers); Wireless Communication

20070008873 California Univ., Santa Cruz, CA USA
Scalable Multicasting: The Core-Assisted Mesh Protocol
Madruga, Ewerton L; Garcia-Luna-Aceves, J J; Jan 1999; 28 pp.; In English
Contract(s)/Grant(s): F30602-97-2-0338
Report No.(s): AD-A461653; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461653

Most of the multicast routing protocols for ad-hoc networks today are based on shared or source-based trees; however, keeping a routing tree connected for the purpose of data forwarding may lead to a substantial network overhead. A different approach to multicast routing consists of building a shared mesh for each multicast group. In multicast meshes, data packets can be accepted from any router, as opposed to trees where data packets are only accepted from routers with whom a tree branch has been established. The difference among multicast routing protocols based on meshes is in the method used to build these structures. Some mesh-based protocols require the flooding of sender or receiver announcements over the whole network. This paper presents the Core-Assisted Mesh Protocol, which uses meshes for data forwarding, and avoids flooding by generalizing the notion of core-based trees introduced for internet multicasting. Group members form the mesh of a group by sending join requests to a set of cores. Simulation experiments show that meshes can be used effectively as multicast routing structures without the need for flooding control packets.
DTIC
Computer Networks; Protocol (Computers); Telecommunication

20070008874 California Univ., Santa Cruz, CA USA
Efficient Policy-Based Routing Without Virtual Circuits
Smith, Bradley R; Garcia-Luna-Aceves, J J; Jan 2004; 11 pp.; In English
Contract(s)/Grant(s): N66001-00-8942
Report No.(s): AD-A461654; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461654

The inclusion of multiple metrics in a routing computation is called policy-based routing. Previous work on solutions to this problem have focused on virtual-circuit-based solutions, and have resulted in computationally expensive algorithms. This paper presents a number of advances in the provision of policy-based routing services in networks and internetworks. An integrated policy-based routing architecture is formulated where the general problem is decomposed into a traffic engineering problem of computing routes in the context of administrative traffic constraints, and a quality-of-service (QoS) problem of

computing routes in the context of performance-related path constraints. A family of routing algorithms are presented for computing routes in the context of these constraints which achieve new levels of computational efficiency. Lastly, a forwarding architecture is presented that efficiently supports hop-by-hop forwarding in the context of multiple paths to each destination, which is required for policy-based routing.
DTIC
Circuits; Internets; Policies

20070008880 California Univ., Santa Cruz, CA USA
A Self-Correcting Neighbor Protocol for Mobile Ad-Hoc Wireless Networks
Mosko, Marc; Garcia-Luna-Aceves, J J; Jan 2002; 6 pp.; In English
Contract(s)/Grant(s): N00014-99-1-0167
Report No.(s): AD-A461662; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461662

Mobile wireless ad-hoc networks lack some basic abilities taken for granted in wired networks, such as the ability to know adjacent nodes. We present a neighbor discovery protocol, with particular application to broadcast flooding. The Neighbor Exchange Protocol (NXP) has two main improvements over simple periodic broadcast schemes: (1) it only sends Hello packets when necessary to maintain topology and (2) uses sequence numbers in redistributed information to aid in convergence. In simulation, we compare NXP to a periodic protocol and simple flooding for all-node packet broadcasts and two dissemination techniques. We show that we maintain similar delivery rates while using fewer control packets in most configurations.
DTIC
Computer Networks; Correction; Interprocessor Communication; Protocol (Computers); Wireless Communication

20070008882 California Univ., Santa Cruz, CA USA
A New Approach to On-demand Loop-Free Multipath Routing
Raju, Jyoti; Garcia-Luna-Aceves, J J; Jan 1999; 7 pp.; In English
Contract(s)/Grant(s): F30602-97-2-0338
Report No.(s): AD-A461666; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461666

We present and verify ROAM, an on-demand routing algorithm that maintains multiple loop-free paths to destinations. Each router maintains entries only for those destinations for which data flows through the router, which reduces storage space requirements and the amount of bandwidth needed to maintain correct routing tables. In ROAM, routes are established and maintained on demand using diffusing computations. A router does not send updates for active destinations, unless its distance to them increases beyond a given threshold. ROAM maintains state that informs routers when a destination is unreachable and prevents routers from sending unnecessary search packets attempting to find paths to an unreachable destination. ROAM is shown to converge in a finite time after an arbitrary sequence of topological changes and is shown to be loop-free at every instant. The time and communication complexities of ROAM are analyzed.
DTIC
Algorithms; Internets; Multipath Transmission

20070008883 California Univ., Santa Cruz, CA USA
A New Approach to Channel Access Scheduling for Ad Hoc Networks
Bao, Lichun; Garcia-Luna-Aceves, J J; Jan 2001; 12 pp.; In English
Contract(s)/Grant(s): F30602-97-2-0338
Report No.(s): AD-A461671; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461671

Three types of collision-free channel access protocols for ad hoc networks are presented. These protocols are derived from a novel approach to contention resolution that allows each node to elect deterministically one or multiple winners for channel access in a given contention context (e.g., a time slot), given the identifiers of its neighbors one and two hops away. The new protocols are shown to be fair and capable of achieving maximum utilization of the channel bandwidth. The delay and throughput characteristics of the contention resolution algorithms are analyzed, and the performance of the three types of channel access protocols is studied by simulations.
DTIC
Computer Networks; Scheduling

20070008887 California Univ., Santa Cruz, CA USA
Enhanced Dominant Pruning Applied to the Route Discovery Process of On-Demand Routing Protocols
Spohn, Marco A; Garcia-Luna-Aceves, J J; Jan 2003; 7 pp.; In English
Contract(s)/Grant(s): F49620-00-1-0330
Report No.(s): AD-A461681; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461681

Dominant Pruning (DP) is a distributed connected dominating-set algorithm that can be used for reducing the impact of flooding in wireless ad-hoc networks. We propose an enhanced dominant pruning (EDP) approach to be used in the route discovery process of on-demand routing protocols. To show the benefits of EDP, we integrated EDP into the Ad-hoc On-demand Distance Vector (AODV) protocol. We present detailed simulation results showing that our approach improves standard AODV in most aspects, and that it is simple and easy to implement. Our approach is compared against AODV and OLSR, as good representatives of on-demand and proactive routing for ad-hoc wireless networks.
DTIC
Communication Networks; Protocol (Computers); Routes

20070008888 California Univ., Santa Cruz, CA USA
Distributed, Scalable Routing Based on Vectors of Link States
Garcia-Luna-Aceves, J J; Behrens, Jochen; Sep 1994; 14 pp.; In English
Contract(s)/Grant(s): N00014-92-J-1807
Report No.(s): AD-A461682; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461682

Link vector algorithms (LVA) are introduced for the distributed maintenance of routing information in large networks and internets. According to an LVA, each router maintains a subset of the topology that corresponds to adjacent links and those links used by its neighbor routers in their preferred paths to known destinations. Based on that subset of topology information, the router derives its own preferred paths and communicates the corresponding link-state information to its neighbors. An update message contains a vector of updates; each such update specifies a link and its parameters. LVAs can be used for different types of routing. The correctness of LVAs is verified for arbitrary types of routing when correct and deterministic algorithms are used to select preferred paths at each router and each router is able to differentiate old updates from new. LVAs are shown to have better performance than the ideal link-state algorithm based on flooding and the distributed Bellman-Ford algorithm.
DTIC
Algorithms; Communication Networks; Vector Analysis

20070008889 California Univ., Santa Cruz, CA USA
Securing the Border Gateway Routing Protocol
Smith, Bradley R; Garcia-Lunes-Aceves, J J; Jan 1996; 6 pp.; In English
Contract(s)/Grant(s): F19628-96-C-0038
Report No.(s): AD-A461684; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461684

We analyze the security of the BGP routing protocol, and identify a number of vulnerabilities in its design and the corresponding threats. We then present a set of proposed modifications to the protocol which minimize or eliminate the most significant threats. The innovation we introduce is the protection of the second-to-last information contained in the AS PATH attributes by digital signatures, and the use of techniques developed for detecting loops in path-finding protocols to verify the selected route's path information. With these techniques we are able to secure full path information in near constant space, and avoid the recursive protection mechanisms previously assumed necessary.
DTIC
Countermeasures; Data Transmission; Protocol (Computers); Security

20070008891 California Univ., Santa Cruz, CA USA
Source-Tree Routing in Wireless Networks
Garcia-Luna-Aceves, J J; Spohn, Marcello; Jan 1999; 11 pp.; In English
Contract(s)/Grant(s): F30602-97-2-0338
Report No.(s): AD-A461694; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461694

We present the source-tree adaptive routing (STAR) protocol and analyze its performance in wireless networks with broadcast radio links. Routers in STAR communicate to their neighbors their source routing trees either incrementally or in atomic updates. Source routing trees are specified by stating the link parameters of each link belonging to the paths used to reach every destination. Hence, a router disseminates link-state updates to its neighbors for only those links along paths used to reach destinations. Simulation results show that STAR is an order of magnitude more efficient than any topology-broadcast protocol, and four times more efficient than ALP, which was the most efficient table-driven routing protocol based on partial link-state information reported to date. The results also show that STAR is even more efficient than the Dynamic Source Routing (DSR) protocol, which has been shown to be one of the best performing on-demand routing protocols.
DTIC
Communication Networks; Protocol (Computers); Wireless Communication

20070008893 California Univ., Santa Cruz, CA USA
Using Minimal Source Trees for On-Demand Routing in Ad Hoc Networks
Roy, Soumya; Garcia-Luna-Aceves, J J; Jan 2001; 11 pp.; In English
Contract(s)/Grant(s): F30602-97-2-0338
Report No.(s): AD-A461698; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461698

The on-demand routing protocols that have been proposed to date use either path information (e.g., DSR) or distance information (e.g., AODV). We present SOAR, an on-demand link-state protocol based on partial link-state information in which a wireless router communicates to its neighbors the link states of only those links in its source tree that belong to the paths it chooses to advertise for reaching destinations with which it has active flows. SOAR does not require periodic link-state advertisements when there are no link connectivity changes in the network. Simulation studies for several scenarios of node mobility and traffic flows reveal that SOAR performs more efficiently than DSR, which is one of the best performing on-demand routing approaches based on path information.
DTIC
Protocol (Computers); Topology

20070008895 California Univ., Santa Cruz, CA USA
Reliable Data Delivery in Event-Driven Wireless Sensor Networks
Rangarajan, Hari; Garcia-Luna-Aceves, J J; Jan 2004; 7 pp.; In English
Contract(s)/Grant(s): F49620-00-1-0330
Report No.(s): AD-A461701; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461701

Protocols for sensor networks have traditionally been designed using the best effort delivery model. However, there are many specific applications that need a reliable data dissemination protocol. We present a protocol for efficient and reliable data delivery to all sensor nodes in an energy-constrained, event-driven sensor network in which nodes are mobile or static. The new protocol, SPROID (Scalable Protocol for RObust Information Dissemination), identifies data generated by a unique tag, uses content tables for faster dissemination of information and guarantees reliable dissemination to all nodes in the network within a finite time. SPROID can be made to work with any kind of physical layer requirements, but we focus on the case of a single-channel broadcast medium. Simulations results show that SPROID achieves complete data dissemination in shorter time and with more energy efficiency than SPIN (sensor network protocols using information negotiation).
DTIC
Information Dissemination; Protocol (Computers); Wireless Communication

20070008897 California Univ., Santa Cruz, CA USA
The Effect of Exerting Adequate Persistence in Collision Avoidance Protocols
Garcia-Luna-Aceves, J J; Tzamaloukas, Asimakis; Jan 1999; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-97-2-0338
Report No.(s): AD-A461704; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461704

Many medium-access control (MAC) protocols based on a collision-avoidance handshake between the sender and the receiver have been proposed for wireless networks. To date, however, the analysis of these protocols has assumed non-persistent strategies in sending control packets for collision avoidance. The persistent strategies discussed in the past for

CSMA and CSMA/CD provide performance improvements over non-persistent access only at small traffic loads. We present and analyze a limited persistence approach to the transmission of collision-avoidance control packets. With limited persistence, a node senses the channel before sending collision-avoidance control packets. If the channel is sensed busy, the node persists sensing for an amount of time proportional to the transmission time of a control packet. The node can transmit its control packet if the channel is idle within its persistence waiting time and the channel is known to be available for transmissions; otherwise, the node backs off for a random amount of time and tries sending its control packet at the end of that time. We analyze the effect of limited persistence in source-initiated and receiver-initiated collision avoidance protocols by comparing their throughput with and without persistence; the analysis shows that limited persistence makes collision-avoidance protocols more efficient.
DTIC
Collision Avoidance; Protocol (Computers)

20070008898 California Univ., Santa Cruz, CA USA
KHIP - A Scalable Protocol for Secure Multicast Routing
Shields, Clay; Garcia-Luna-Aceves, J J; Jan 1999; 13 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F19628-96-C-0038; F30602-97-1-0291
Report No.(s): AD-A461705; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461705

We present Keyed HIP (KHIP), a secure, hierarchical multicast routing protocol. We show that other shared-tree multicast routing protocols are subject to attacks against the multicast routing infrastructure that can isolate receivers or domains or introduce loops into the structure of the multicast routing tree. KHIP changes the multicast routing model so that only trusted members are able to join the multicast tree. This protects the multicast routing against attacks that could form branches to unauthorized receivers, prevents replay attacks and limits the effects of flooding attacks. Untrusted routers that are present on the path between trusted routers cannot change the routing and can mount no denial-of-service attack stronger than simply dropping control messages. KHIP also provides a simple mechanism for distributing data encryption keys while adding little overhead to the protocol.
DTIC
Access Control; Identities; Numerical Control; Protocol (Computers)

20070008899 California Univ., Santa Cruz, CA USA
Solutions to Hidden Terminal Problems in Wireless Networks
Fullmer, Chane L; Garcia-Luna-Aceves, J J; Jan 1997; 12 pp.; In English
Contract(s)/Grant(s): DAAB07-95-C-D157; DAAH04-96-1-0210
Report No.(s): AD-A461706; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461706

The floor acquisition multiple access (FAMA) discipline is analyzed in networks with hidden terminals. According to FAMA, control of the channel (the floor) is assigned to at most one station in the network at any given time, and this station is guaranteed to be able to transmit one or more data packets to different destinations with no collisions. The FAMA protocols described consist of nonpersistent carrier or packet sensing, plus a collision-avoidance dialogue between a source and the intended receiver of a packet. Sufficient conditions under which these protocols provide correct floor acquisition are presented and verified for networks with hidden terminals; it is shown that FAMA protocols must use carrier sensing to support correct floor acquisition. The throughput of FAMA protocols is analyzed for single-channel networks with hidden terminals; it is shown that carrier-sensing FAMA protocols perform better than ALOHA and CSMA protocols in the presence of hidden terminals.
DTIC
Detection; Floors; Multiple Access; Protocol (Computers)

20070008900 California Univ., Santa Cruz, CA USA
Performance of Floor Acquisition Multiple Access in Ad-Hoc Networks
Garcia-Luna-Aceves, J J; Fullmer, Chane L; Jan 1998; 7 pp.; In English
Contract(s)/Grant(s): DAAB07-95-C-D157; DAAH04-96-1-0210
Report No.(s): AD-A461707; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461707

The performance of the FAMA-NCS protocol in ad-hoc networks is analyzed. FAMA-NCS (for floor acquisition multiple access with non-persistent carrier sensing) guarantees that a single sender is able to send data packet free of collisions to a given receiver at any given time. FAMA-NCS is based on a three-way handshake between sender and receiver in which the sender uses non-persistent carrier sensing to transmit a request-to-send (RTS) and the receiver sends a clear-to-send (CTS) that lasts much longer than the RTS to serve as a 'busy tone' that forces all hidden nodes to back off long enough to allow a collision-free data packet to arrive at the receiver. It is shown that FAMA-NCS performs better than ALOHA, CSMA, and all prior proposals based on collision avoidance dialogues (e.g., MACA, MACAW, and IEEE 802.11 DFWMAC) in the presence of hidden terminals. Simulations experiments are used to confirm the analytical results.
DTIC
Detection; Floors; Multiple Access; Protocol (Computers); Radio Equipment; Stations

20070008901 California Univ., Santa Cruz, CA USA
Sender- and Receiver-Initiated Multiple Access Protocols for Ad-Hoc Networks
Tzamaloukas, Asimakis E; Dec 2000; 158 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-97-2-0338
Report No.(s): AD-A461708; No Copyright; Avail.: CASI: A08, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461708

This thesis focuses on the medium access control (MAC) layer. Many MAC protocols for wireless networks proposed or implemented to date are based on collision-avoidance handshakes between sender and receiver. The key objective of collision-avoidance handshakes is reducing or eliminating the collision of data packets from a source at any given receiver due to interference from packets from other sources. In the vast majority of these protocols, including the IEEE 802.11 standard, the handshake is sender-initiated, in that the sender asks the receiver for permission to transmit using a short control packet, and transmits only after the receiver sends a short clear-to-send notification. There are two main objectives in this work: analyze the effect of reversing the collision-avoidance handshake as a way to improve the performance of MAC protocols under any conditions in the network, and design MAC protocols that provide correct floor acquisition without carrier sensing or code pre-assignment. We show that receiver-initiated collision-avoidance MAC protocols not only outperform any sender-initiated ones, but also guarantee collision-free data transmission and seamless support for mobility by using simple, low-cost wireless radios. We study the effect of persistent carrier sensing in receiver- as well as sender-initiated MAC protocols. We extend our work to multi-channel radios and introduce novel collision-avoidance MAC protocols that eliminate the need for carrier sensing and code pre-assignment, and improve the utilization of the medium in the presence of unicast, multicast and broadcast traffic.
DTIC
Communication Networks; Multiple Access; Protocol (Computers); Receivers; Transmitters

20070008902 California Univ., Santa Cruz, CA USA
Secure Hierarchical Multicast Routing and Multicast Internet Anonymity
Shields, Clay; Jun 1998; 103 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F19628-96-C-0038; F30602-97-1-0291
Report No.(s): AD-A461709; No Copyright; Avail.: CASI: A06, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461709

In a computer network, multicast provides an efficient many-to-many service by constructing a delivery tree across all the members of the multicast group. There are a number of existing protocols for performing multicast routing. This work improves the field of multicast routing by presenting a new protocol that can be used to construct a hierarchical multicast tree composed of heterogeneous multicast domains. It also shows how this protocol can also be made secure, so that only authorized multicast members may use the multicast tree to send and receive data. Finally, this work presents multicast as a method of providing anonymity for participants in Internet communication.
DTIC
Computer Networks; Internets; Security

20070008903 California Univ., Santa Cruz, CA USA
Routing in the Internet Using Partial Link State Information
Spohn, Marcelo; Sep 2001; 157 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-97-2-0338
Report No.(s): AD-A461710; No Copyright; Avail.: CASI: A08, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461710

This thesis focuses on routing in wired and wireless segments of the Internet using partial link-state information. Although efficient algorithms have been proposed based on both link-state and distance-vector information, link-state routing is more efficient than distance-vector routing when constraints are placed on the paths offered to destinations, which is the case for QoS routing offering paths with required delay, bandwidth, reliability, cost, or other parameters. We present a new link-state routing protocol for wired internetworks called ALP (adaptive link-state protocol). In ALP, a router sends updates to its neighbors regarding the links in its preferred paths to destinations. Each router decides which links to report to its neighbors based on its local computation of preferred paths. A router running ALP does not ask its neighbors to delete links; instead, a router simply updates its neighbors with the most recent information about those links it decides to take out of its preferred paths. We introduce and analyze two routing algorithms for wireless networks: the source- tree adaptive routing (STAR) protocol, and the neighborhood-aware source routing (NSR) protocol. STAR is the first example of a table-driven routing protocol that is more efficient than prior table-driven and on-demand routing protocols by exploiting link-state information to allow paths taken to destinations to deviate from the optimum in order to save bandwidth without creating loops. NSR is an on-demand routing protocol based on partial topology information and source routing. STAR is shown to be more efficient than the dynamic source routing (DSR) protocol in small ad hoc networks, and NSR is shown to outperform STAR and DSR in large wireless networks with mobile nodes.
DTIC
Communication Networks; Internets; Protocol (Computers)

20070008904 California Univ., Santa Cruz, CA USA
Hop-Reservation Multiple Access (HRMA) for Ad-Hoc Networks
Tang, Zhenyu; Garcia-Luna-Aceves, J J; Jan 1999; 9 pp.; In English
Contract(s)/Grant(s): F30602-97-2-0338
Report No.(s): AD-A461711; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461711

A new multichannel MAC protocol called Hop-Reservation Multiple Access (HRMA) for wireless ad-hoc networks (multi-hop packet radio networks) is introduced, specified and analyzed. HRMA is based on simple half-duplex, very-slow frequency-hopping spread spectrum (FHSS) radios and takes advantage of the time synchronization necessary for frequency hopping. HRMA allows a pair of communicating nodes to reserve a frequency hop using a reservation and handshake mechanism that guarantee collision-free data transmission in the presence of hidden terminals. We analyze the throughput achieved in HRMA for the case of a hypercube network topology assuming variable-length packets, and compare it against the multichannel slotted ALOHA protocol, which represents the current practice of MAC protocols in commercial ad-hoc networks based on spread spectrum radios, such as Metricom's Ricochet system. The numerical results show that HRMA can achieve much higher throughput than multichannel slotted ALOHA within the traffic-load ranges of interest, especially when the average packet length is large compared to the duration of a dwell time in the frequency hopping sequence, in which case the maximum throughput of HRMA is close to the maximum possible value.
DTIC
Frequency Hopping; Multiple Access; Protocol (Computers); Spread Spectrum Transmission

20070008905 California Univ., Santa Cruz, CA USA
A Protocol for Topology-Dependent Transmission Scheduling in Wireless Networks
Tang, Zhenyu; Garcia-Luna-Aceves, J J; Jan 1999; 6 pp.; In English
Contract(s)/Grant(s): F30602-97-2-0338
Report No.(s): AD-A461712; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461712

A new channel access protocol for ad-hoc networks based on topology-dependent transmission scheduling, named collision-avoidance time allocation (CATA), is introduced. CATA allows nodes to contend for and reserve time slots by means of a distributed reservation and handshake mechanism. Contention is limited among nodes within two hops of one another, which provides a very efficient spatial reuse of the bandwidth available. CATA ensures that no collisions occur in successfully reserved time slots, even when hidden terminals exist. Reservations in CATA support unicasting, multicasting and broadcasting simultaneously, and adapt to dynamic service time. The throughput achieved by CATA is analyzed for the case of a fully-connected network topology. Numerical results show that CATA can achieve very high throughput.
DTIC
Collision Avoidance; Data Transmission; Protocol (Computers); Scheduling; Slots; Topology

20070008906 California Univ., Santa Cruz, CA USA
Design Issues for Floor Control Protocols
Dommel, Hans-Peter; Garcia-Luna-Aceves, J J; Jan 1995; 13 pp.; In English
Contract(s)/Grant(s): N00014-92-J-1807
Report No.(s): AD-A461713; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461713

Floor control allows users of networked multimedia applications to remotely share resources like cursors, data views, video and audio channels, or entire applications without access conflicts. Floors are mutually exclusive permissions, granted dynamically to collaborating users, mitigating race conditions and guaranteeing fair and deadlock-free resource access. Although floor control is an early concept within computer-supported cooperative work, no framework exists and current floor control mechanisms are often limited to simple objects. While small-scale collaboration can be facilitated by social conventions, the importance of floors becomes evident for large-scale application sharing and teleconferencing orchestration. In this paper, the concept of a scalable session protocol is enhanced with floor control. Characteristics of collaborative environments are discussed, and session and floor control are discerned. The system's and user's requirements perspectives are discussed, including distributed storage policies, packet structure and user-interface design for floor presentation, manipulation, and triggering conditions for floor migration. Interaction stages between users, and scenarios of participant withdrawal, late joins, and establishment of subgroups are elicited with respect to floor generation, bookkeeping, and passing. An API is proposed to standardize and integrate floor control among shared applications. Finally, a concise classification for existing systems with a notion of floor control is introduced.
DTIC
Floors; Protocol (Computers)

20070008907 California Univ., Santa Cruz, CA USA
FAMA-PJ: A Channel Access Protocol for Wireless LANs
Fullmer, Chane L; Garcia-Luna-Aceves, J J; Jan 1995; 11 pp.; In English
Contract(s)/Grant(s): N00014-92-J-1807; N00014-94-1-0688
Report No.(s): AD-A461714; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461714

We specify and analyze a new channel access protocol for wireless local area networks. The new protocol, FAMA-PJ, consists of both carrier sensing and a collision detection mechanism based on control packets and jamming that prevent collision of data packets with control or data packets from other stations. Control of the channel (which we call the floor) is assigned to at most one station in the network at a time, and this station is guaranteed to be able to transmit one or more data packets to different destinations with no collision with transmissions from other stations. The minimum control packet size required to enforce correct floor control is specified as a function of the channel propagation delay and transmit to receive turn around time. The throughput and delay of FAMA-PJ are analyzed and compared with the throughput and delay of non-persistent CSMA. This analysis shows that FAMA-PJ can provide similar or better throughput than non-persistent CSMA in a high-speed wireless local area network, and that is more stable and has better delay characteristics than non-persistent CSMA.
DTIC
Floors; Jamming; Local Area Networks; Multiple Access; Protocol (Computers); Wireless Communication

20070008908 California Univ., Santa Cruz, CA USA
Modeling Energy Consumption in Single-Hop IEEE 802.11 Ad Hoc Networks
Carvalho, Marcelo M; Margi, Cintia B; Obraczka, Katia; Garcia-Luna-Aceves, J J; Jan 2004; 7 pp.; In English
Contract(s)/Grant(s): F49620-00-1-0330
Report No.(s): AD-A461715; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461715

This paper presents an analytical model to predict energy consumption in saturated IEEE 802.11 single-hop ad hoc networks under ideal channel conditions. The model we introduce takes into account the different operational modes of the IEEE 802.11 DCF MAC, and is validated against packet level simulations. In contrast to previous works that attempted to characterize the energy consumption of IEEE 802.11 cards in isolated, contention-free channels (i.e., single sender/receiver pair), this paper investigates the extreme opposite case, i.e., when nodes need to contend for channel access under saturation conditions. In such scenarios, our main findings include: (1) contrary to what most previous results indicate, the radio's transmit mode has marginal impact on overall energy consumption, while other modes (receive, idle, etc.) are responsible for

most of the energy consumed; (2) the energy cost to transmit useful data increases almost linearly with the network size; and (3) transmitting large payloads is more energy efficient under saturation conditions.
DTIC
Communication Networks; Energy Consumption; Wireless Communication

20070008910 California Univ., Santa Cruz, CA USA
The Ordered Core Based Tree Protocol
Shields, Clay; Garcia-Luna-Aceves, J J; Jan 1997; 9 pp.; In English
Contract(s)/Grant(s): N00014-94-1-0688
Report No.(s): AD-A461717; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461717

This paper presents a new protocol, the Ordered Core Based Tree (OCBT) protocol, which remedies several shortcomings of the Core Based Tree (CBT) multicast protocol. We show that the CBT protocol can form loops during periods of routing instability, and that it can consistently fail to build a connected multicast tree, even when the underlying routing is stable. The OCBT protocol provably eliminates these deficiencies and reduces the latency of tree repair following a link or core failure. OCBT also improves scalability by allowing flexible placement of the cores that serve as points of connection to a multicast tree. Simulation results show that the amount of control traffic in OCBT is comparable to that in CBT.
DTIC
Computer Networks; Protocol (Computers)

20070008912 California Univ., Santa Cruz, CA USA
A Scalable Model for Channel Access Protocols in Multihop Ad Hoc Networks
Carvalho, Marcelo M; Garcia-Luna-Aceves, J J; Jan 2004; 16 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F49620-00-1-0330
Report No.(s): AD-A461721; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461721

A new modeling framework is introduced for the analytical study of medium access control (MAC) protocols operating in multihop ad hoc networks. The model takes into account the effect of physical-layer parameters on the success of transmissions, the MAC protocol on the likelihood that nodes can access the channel, and the connectivity of nodes in the network. A key feature of the model is that nodes can be modeled individually, i.e., it allows a per-node setup of many layer-specific parameters. Moreover, no spatial probability distribution or a particular arrangement of nodes is assumed; the model allows the computation of individual (per-node) performance metrics for any given network topology and radio channel model. To show the applicability of the modeling framework, we model multihop ad hoc networks using the IEEE 802.11 distributed coordination function and validate the results from the model with discrete- event simulations in Qualnet. The results show that our model predicts results that are very close to those attained by simulations, and requires seconds to complete compared to several hours of simulation time.
DTIC
Communication Networks; Models; Protocol (Computers)

20070008919 California Univ., Santa Cruz, CA USA
Delay Analysis of IEEE 802.11 in Single-Hop Networks
Carvalho, Marcelo M; Garcia-Luna-Aceves, J J; Jan 2003; 11 pp.; In English
Contract(s)/Grant(s): F49620-00-1-0330
Report No.(s): AD-A461736; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461736

This paper presents an analytical model to compute the average service time and jitter experienced by a packet when transmitted in a saturated IEEE 802.11 ad hoc network. In contrast to traditional work in the literature, in which a distribution is usually fitted or assumed, we use a bottom-up approach and build the first two moments of the service time based on the IEEE 802.11 binary exponential backoff algorithm and the events underneath its operation. Our model is general enough to be applied to any type of IEEE 802.11 wireless ad hoc network where the channel state probabilities driving a node's backoff operation are known. We apply our model to saturated single-hop ad hoc networks under ideal channel conditions. We validate our model through extensive simulations and conduct a performance evaluation of a node's average service time and jitter for

both direct sequence and frequency-hopping spread spectrum physical layers.
DTIC
Frequency Hopping; Local Area Networks; Mathematical Models; Packet Switching; Protocol (Computers); Vibration; Wireless Communication

20070008920 California Univ., Santa Cruz, CA USA
Differentiating Congestion vs. Random Loss: A Method for Improving TCP Performance Over Wireless Links
Parsa, Christina; Garcia-Luna-Aceves, J J; Jan 2000; 5 pp.; In English
Contract(s)/Grant(s): N00014-99-1-0167
Report No.(s): AD-A461737; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461737

Recent research has focused on the problems associated with TCP performance in the presence of wireless links and ways to improve its performance. We present an extension to TCP Santa Cruz which improves TCP performance over lossy wireless links. TCP has no mechanism to differentiate random losses on the wireless link from congestion, and therefore treats all losses as congestive. We present a simple method in which our protocol is able to differentiate these random losses, thereby avoiding the rate-halving approach taken by standard TCP whenever any loss is detected. We compare the performance of our protocol against TCP Reno and demonstrate higher throughput and lower end-to-end delay with our approach.
DTIC
Congestion; Networks; Protocol (Computers); Wireless Communication

20070008923 California Univ., Santa Cruz, CA USA
Distributed Dynamic Channel Access Scheduling for Ad Hoc Networks
Bao, Lichun L; Garcia-Luna-Aceves, J J; Mar 15, 2002; 35 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-97-2-0338; F49620-00-1-0330
Report No.(s): AD-A461740; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461740

Three types of collision-free channel access protocols for ad hoc networks are presented. These protocols are derived from a novel approach to contention resolution that allows contending entities to elect one or multiple winners for channel access in any given contention context (e.g., a time slot) in a distributed fashion. In multihop wireless networks, the only required information for each entity is the identifiers of its neighbors one and two hops away. The new protocols are shown to be fair and capable of achieving maximal utilization of the channel bandwidth. The delay and throughput characteristics of the contention resolution algorithms are analyzed, and the performance of the three types of channel access protocols is studied by simulations and compared with that of optimal static scheduling algorithms.
DTIC
Computer Networks; Scheduling

20070008925 California Univ., Santa Cruz, CA USA
Link-State Routing in Networks with Unidirectional Links
Bao, Lichun L; Garcia-Luna-Aceves, J J; Jan 1999; 7 pp.; In English
Contract(s)/Grant(s): F30602-97-2-0338
Report No.(s): AD-A461742; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461742

It is shown that a unidirectional link of a network can be used for routing only if it has an inclusive cycle, which is a path that can carry routing updates from the downstream node to the upstream node joined by the unidirectional link. A new routing algorithm for networks with unidirectional links is then presented, which incrementally disseminates link state information and selectively utilizes unidirectional links in networks. The new algorithm is verified to be correct and its complexity is analyzed. Simulations on a 20-node unidirectional network show that the new algorithm is more efficient than topology broadcasting.
DTIC
Computer Networks; Inks

20070008927 California Univ., Santa Cruz, CA USA
Group Allocation Multiple Access with Collision Detection
Muir, Andrew; Garcia-Luna-Aceves, J J; Jan 1997; 10 pp.; In English
Contract(s)/Grant(s): DAAB07-95-C-D157
Report No.(s): AD-A461746; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461746

The Group Allocation Multiple Access with Collision Detection (GAMA/CD) protocol for scheduling variable-length packet transmissions in a local area network is specified and analyzed. GAMA/CD provides the advantages of both TDMA and CSMA/CD by maintaining a dynamically-sized cycle that varies in length depending on the network load; each cycle is composed of a contention period and a group transmission period. During the contention period, a station with one or more packets to send competes for membership in the transmission group. Once a member of the transmission group, a station is able to send data without collision during each; as long as a station has data to send, it maintains its position in the group. This can be viewed as either allowing station to 'share the floor' in organized manner, or as establishing frames that are not synchronized on a slot-basis and vary their length dynamically based on demand. Both the throughput and the delay of GAMA/CD are presented and analyzed. To validate our analysis, the results of both models are compared to the throughput and delay produced by a simulation of GAMA/CD.
DTIC
Allocations; Collision Parameters; Collisions; Detection; Multiple Access

20070008929 California Univ., Santa Cruz, CA USA
TULIP: A Link-Level Protocol for Improving TCP over Wireless Links
Parsa, Christina; Garcia-Luna-Aceves, J J; Jan 1999; 6 pp.; In English
Contract(s)/Grant(s): DAAB07-95-D157; DAAH04-96-1-0210
Report No.(s): AD-A461750; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461750

We present the transport unaware link improvement protocol (TULIP), which dramatically improves the performance of TCP over lossy wireless links, without competing with or modifying the transport- or network-layer protocols. TULIP is tailored for the half-duplex radio links available with today's commercial radios and provides a MAC acceleration feature applicable to collision-avoidance MAC protocols (e.g., IEEE 802.11) to improve throughput. TULIP's timers rely on a maximum propagation delay over the link, rather than performing a round-trip time estimate of the channel delay. The protocol does not require a base station and keeps no TCP state. TULIP is exceptionally robust when bit error rates are high; it maintains high goodput, i.e., only those packets which are in fact dropped on the wireless link are retransmitted and then only when necessary. The performance of TULIP is compared against the performance of the Snoop protocol (a TCP-aware approach) and TCP without link-level retransmission support. The results of simulation experiments using the actual code of the Snoop protocol show that TULIP achieves higher throughput, lower packet delay, and smaller delay variance.
DTIC
Protocol (Computers); Wireless Communication

20070008933 California Univ., Santa Cruz, CA USA
Organizing Multicast Receivers Deterministically by Packet-Loss Correlation
Levine, Brian N; Pauly, Sanjoy; Garcia-Luna-Aceves, J J; Jan 1998; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F19628-96-C-0038.
Report No.(s): AD-A461757; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461757

The ability to trace multicast paths is currently available in the Internet by means of IGMP MTRACE packets. We introduce Tracer, the first protocol that organizes the receivers of a multicast group deterministically into a logical tree structure while maintaining exact packet-loss correlation for local error recovery, and without requiring any changes to existing multicast routing protocols. Tracer uses MTRACE packets in IGMP to allow a receiver host to obtain its path to the source of a multicast group. Receivers use the multicast path information to determine how to achieve local error recovery and effective congestion control. We compare the tracing approach with prior mechanisms that attempt local recovery. Results of measurements carried out over the CAIRN illustrate the fact that tracing multicast paths is an effective tool to organize receivers based on their packet-loss correlation.
DTIC
Internets; Losses; Protocol (Computers); Receivers; Traffic

20070008982 California Univ., Santa Cruz, CA USA

Hop Reservation Multiple Access (HRMA) for Multichannel Packet Radio Networks

Tang, Zhenyu; Garcia-Luna-Aceves, J J; Jan 1998; 9 pp.; In English

Contract(s)/Grant(s): F30602-97-2-0338

Report No.(s): AD-A461856; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461856

A new multichannel MAC protocol called Hop Reservation Multiple Access (HRMA) for packet-radio networks is introduced, specified and analyzed. HRMA is based on very-slow frequency hopping spread spectrum (FHSS) and takes advantage of the time slotting necessary for frequency hopping. HRMA allows a pair of communicating nodes to reserve a frequency hop (channel) using a hop reservation and handshake mechanism on every hop to guarantee collision-free data transmission in the presence of hidden terminals. HRMA provides a baseline to offer QoS in ad-hoc networks based on simple half-duplex slow FHSS radios. We analyze the throughput achieved in HRMA for the case of a fully connected network assuming variable-length packets, and compare it against an ideal multichannel access protocol and the multichannel slotted ALOHA protocol. The numerical results show that HRMA can achieve much higher throughput than multichannel slotted ALOHA in the traffic-load ranges of interest, especially when the average packet length is large compared to a slot size, in which case the maximum throughput of HRMA is close to what can be obtained with an ideal protocol.

DTIC

Communication Networks; Multichannel Communication; Multiple Access

20070009040 Mitre Corp., Bedford, MA USA

Intelligence Community Public Key Infrastructure (IC PKI)

Jan 2002; 20 pp.; In English; Original contains color illustrations

Report No.(s): AD-A460253; No Copyright; Avail.: CASI: A03, Hardcopy

OUTLINE: * The Intelligence Community * Why is PKI needed on CLASSIFIED networks? * What is in an IC PKI Certificate? * Current IC PKI Status * Notional IC PKI Topology * MITRE IC PKI/FSD Laboratory * Certificate Validation * IC PKI Requirements and Issues * Conclusion

DTIC

Access Control; Intelligence; Numerical Control

20070009057 Colorado Univ., Boulder, CO USA

The BIGMAC User's Manual

Myers, EugEugene; Nov 1978; 94 pp.; In English

Contract(s)/Grant(s): MCS77-02194; DAAG29-78-G-0046

Report No.(s): AD-A461281; CU-CS-145-78; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The BIGMAC system is a programmable utility for performing textual transformations on ANSI FORTRAN code. BIGMAC was developed for the specific purpose of replacing procedure calls with in-line code. For the purposes of modularity and hierarchical development it is frequently desirable to code simple routines for low level data abstractions such as stacks and lists. However, it is undesirable to pay the runtime costs of parameter passing and routine linkage for such frequently invoked routines. BIGMAC remedies the situation by allowing one to program and develop a prototype of the modular variety and then produce the efficient production code by transforming the prototype with BIGMAC. The degree of speed-up will depend on the machine and compiler in question. In a recent large scale application, BIGMAC speeded up the DAVE system by 47%. BIGMAC can, of course, be used for conventional macro applications. Of greater interest, is that BIGMAC is general enough to enable the programming of limited language extensions. The design of BIGMAC incorporates many of the principles found in typical macro facilities. It is rather unusual in that macros are not templates for textual substitution but are executable routines. This very dynamic approach affords a great deal of flexibility with low developmemt overhead, as an existing language can be used as the basis for the macro language. The base language provides conditional execution and local and global data management. The developer need only concern himself with the macro system interface. However, in the case of a language with weak string capabilities (e.g., FORTRAN), the designer must also bolster the base languages capabilities in this regard. BIGMAC macros are routines written in such an extension of FORTRAN.

DTIC

Computer Programming; Construction; Manuals; Programming Languages; User Manuals (Computer Programs)

20070009064 California Univ., Santa Cruz, CA USA
Improving Internet Multicast with Routing Labels
Levine, Brian N; Garcia-Luna-Aceves, J J; Jan 1997; 11 pp.; In English
Contract(s)/Grant(s): F19628-96-C-0038
Report No.(s): AD-A461758; No Copyright; Avail.: CASI: A03, Hardcopy

The IP-multicast architecture is extended with addressing information along multicast routing trees that permits more efficient and sophisticated multicast routing options and encourages communication and cooperation between IP and higher-layer protocols. The Addressable Internet Multicast (AIM) architecture is introduced that enables sources to restrict the delivery of packets to a subset of the receivers in a multicast group on a per-packet basis, permits receivers to listen to subsets of sources on a subscription basis, provides nearest-host routing, and allows higher-layer protocols to place packets into application-defined logical streams, sot that hosts may direct the multicast routing of packets based on application-defined contexts. In addition, the Reliable Multicast Architecture (RMA) is introduced to support end-to-end reliable multicasting using heterogeneous reliable multi-cast protocols and providing acknowledgment trees implicitly, thereby eliminating the ACK implosion problem and allowing NAK-avoidance algorithms to work within local groups.
DTIC
Architecture (Computers); Internets; Marking; Message Processing; Protocol (Computers)

20070009078 California Univ., Santa Cruz, CA USA
A Simple Approximation to Minimum-Delay Routing
Vutukury, Srinivas; Garcia-Luna-Aceves, J J; Jan 1999; 13 pp.; In English
Contract(s)/Grant(s): F30602097-1-0291; F19628-96-C-0038
Report No.(s): AD-A461850; No Copyright; Avail.: CASI: A03, Hardcopy

The conventional approach to routing in computer networks consists of using a heuristic to compute a single shortest path from a source to a destination. Single-path routing is very responsive to topological and link-cost changes; however, except under light traffic loads, the delays obtained with this type of routing are far from optimal. Furthermore, if link costs are associated with delays, single-path routing exhibits oscillatory behavior and becomes unstable as traffic loads increase. On the other hand, minimum-delay routing approaches can minimize delays only when traffic is stationary or very slowly changing. We present a near-optimal routing framework that offers delays comparable to those of optimal routing and that is as flexible and responsive as single-path routing protocols proposed to date. First, an approximation to the Gallager's minimum-delay routing problem is derived, and then algorithms that implement the approximation scheme are presented and verified. We introduce the first routing algorithm based on link-state information that provides multiple paths of unequal cost to each destination that are loop-free at every instant. We show through simulations that the delays obtained in our framework are comparable to those obtained using the Gallager's minimum-delay routing. Also, we show that our framework renders far smaller delays and makes better use of resources than traditional single-path routing.
DTIC
Approximation; Computer Networks

20070009093 California Univ., Santa Cruz, CA USA
Improving TCP Congestion Control Over Internets With Heterogeneous Transmission Media
Parsa, Christina; Garcia-Luna-Aceves, J J; Jan 1999; 10 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-99-1-0167
Report No.(s): AD-A461908; No Copyright; Avail.: CASI: A02, Hardcopy

We present a new implementation of TCP that is better suited to today's Internet than TCP Reno or Tahoe. Our implementation of TCP, which we call TCP Santa Cruz, is designed to work with path asymmetries, out-of-order packet delivery, and networks with lossy links, limited bandwidth and dynamic changes in delay. The new congestion-control and error-recovery mechanisms in TCP Santa Cruz are based on: using estimates of delay along the forward path, rather than the round-trip delay; reaching a target operating point for the number of packets in the bottleneck of the connection, without congesting the network; and making resilient use of any acknowledgments received over a window, rather than increasing the congestion window by counting the number of returned acknowledgments. We compare TCP Santa Cruz with the Reno and Vegas implementations using the ns2 simulator. The simulation experiments show that TCP Santa Cruz achieves significantly higher throughput, smaller delays, and smaller delay variances than Reno and Vegas. TCP Santa Cruz is also shown to prevent the swings in the size of the congestion window that typify TCP Reno and Tahoe traffic, and to determine the direction of

congestion in the network and isolate the forward throughput from events on the reverse path.
DTIC
Congestion; Heterogeneity; Internets; Protocol (Computers)

20070009094 Yale Univ., New Haven, CT USA
Design Principles of Policy Languages for Path-Vector Protocols
Griffin, Timothy G; Jaggard, Aaron D; Ramachandran, Vijay; Apr 2004; 28 pp.; In English
Contract(s)/Grant(s): N00014-01-1-0431; N00014-01-1-0795
Report No.(s): AD-A461910; YALEU/DCS/TR-1250; No Copyright; Avail.: Defense Technical Information Center (DTIC)

BGP is unique among IP-routing protocols in that routing is determined using semantically rich routing policies. However this expressiveness has come with hidden risks. The interaction of locally defined routing policies can lead to unexpected global routing anomalies, which can be very difficult to identify and correct in the decentralized and competitive Internet environment. These risks increase as the complexity of local policies increase. which is precisely the current trend. BGP policy languages have evolved in a rather organic fashion with little effort to avoid policy-interaction problems. We believe that researchers should start to consider how to design policy languages for path-vector protocols in order to avoid routing anomalies while obtaining desirable protocol properties. We take a few steps in this direction by identifying the important dimensions of this design space and characterizing some of the inherent design trade-offs. We do this in a general way that is not constrained by the details of BGP.
DTIC
Design Analysis; Languages; Networks; Policies; Protocol (Computers)

20070009107 Colorado Univ., Boulder, CO USA
Scalable Internet Resource Discovery: Research Problems and Approaches
Bowman, C M; Danzig, Peter B; Manber, Udi; Schwartz, Michael F; Oct 1993; 26 pp.; In English
Contract(s)/Grant(s): F49620-93-1-0052
Report No.(s): AD-A461948; CU-CS-679-93; No Copyright; Avail.: CASI: A03, Hardcopy

No abstract available
Internets; Problem Solving; Resources Management

20070009126 Drexel Univ., Philadelphia, PA USA
Prioritized Elastic Round Robin: An Efficient and Low-Latency Packet Scheduler with Improved Fairness
Kanhere, Salil S; Sethu, Harish; Jul 2003; 44 pp.; In English
Contract(s)/Grant(s): F30602-00-2-0501; NSF-CCR-9984161
Report No.(s): AD-A461973; TR-DU-CS-03-03; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In emerging high-speed integrated-services packet-switched networks, fair packet scheduling algorithms in switches and routers will play a critical role in providing the Quality-of- Service (QoS) guarantees required by real-time applications. Elastic Round Robin (ERR), a recently proposed scheduling discipline, is very efficient with an O(1) work complexity. In addition, it has superior fairness and delay characteristics in comparison to other algorithms of equivalent efficiency. However, since ERR is inherently a round robin scheduling algorithm, it suffers from the limitations of all round robin schedulers such as (i) bursty transmission and (ii) the inability of the flows lagging in service to receive precedence over the flows that have received excess service. Recently, Tsao and Lin have proposed a new scheme, Pre-order Deficit Round Robin, which tries to eliminate the problems associated with the round robin service order of Deficit Round Robin (DRR). In this report, we present a new scheduling discipline called Prioritized Elastic Round Robin (PERR), based on a similar principle as Pre-order DRR but in a modified and improved form, which overcomes the limitations of ERR.We derive an upper bound on the latency achieved by PERR using a novel technique based on interpreting the scheduling algorithm as an instance of a nested version of ERR. Our analytical results show that PERR has better fairness characteristics and a significantly lower latency bound in comparison to other scheduling disciplines of equivalent work complexity such as DRR, ERR and Pre-order DRR. We further present simulation results, using both synthetic and real traffic traces, which illustrate the improved performance characteristics of PERR.
DTIC
Networks; Scheduling

20070009176 ITT Industries, Inc., Rome, NY USA

Operational Information Management Security Architecture

Choo, Vic; Muehrcke, Carol; Vienneau, Rob; Dec 2006; 137 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8750-05-C-0105; Proj-JBIS

Report No.(s): AD-A462036; No Copyright; Avail.: CASI: A07, Hardcopy

This effort developed and demonstrated a basic security architecture for the Operational Information Management (OIM) project (previously known as Joint Battlespace Infosphere (JBI), with a particular focus on authentication and authorization. New security techniques, concepts of user privileges and access policies were investigated to support efficient and accreditable access control in a multi-level, secure environment implemented using a OIM-based infrastructure. Emphasis was on future compatibility with Net-Centric Enterprise Services (NCES) and Global Information Grid Enterprise Systems (GIG-ES) protocols, policies and processes for secure sharing of information between tactical assets, Command and Control (C2) platforms and intelligence, Surveillance and Reconnaissance (ISR) systems connected via an OIM infrastructure, as well as compliance with Director of Central Intelligence Directive (DCID) 6/3 guidance and requirements. The architecture specification includes a series of flow diagrams to show how information enters and propagates through the security components. The intent of the architecture design is not to prescribe how to implement each module, rather it shows what steps are necessary for the architecture to function properly. As part of the architecture development process, a methodology for assessing the risk associated with the architecture was also defined. The resulting architecture recommendations were demonstrated for a small OIM Reference Implementation instance and covered authentication and authorization, security policy management, and access control for increasing levels of security.

DTIC

Access Control; Computer Networks; Information Management; Numerical Control; Security

20070009179 Naval Postgraduate School, Monterey, CA USA

Battlefield Object Control via Internet Architecture

Luqi,; Harn, Meng-Chyi; Hsu, Shih-Ping; Berzins, V; Jan 2002; 15 pp.; In English; Original contains color illustrations

Report No.(s): AD-A462041; No Copyright; Avail.: CASI: A03, Hardcopy

The motivation of this study is to reach the goal of information and competition superiority for the future battlefield. The authors have developed an adaptive C4ISR system for military applications, called the Real-time Object Control System (ROCS), by integrating the following information transformation technologies: Global Positioning System (GPS), Geographic Information System (GIS), Battlefield Information Transmission System (BITS), and Intelligent Transportation System (ITS). The basic architecture of the ROCS consists of three parts: the front-end position system, the GPRS (General Packet Radio Server) (2.5) and 3G telecommunications system, and the rear-end control center. Users can command and control battlefield objects via this transformation architecture. They also describe an application of the ROCS to the vehicle object control system that has been designed for an Internet Protocol-based operational environment.

DTIC

Adaptation; Command and Control; Data Transmission; Global Positioning System; Internets; Real Time Operation

20070009183 Library of Congress, Washington, DC USA

Net Neutrality: Background and Issues

Gilroy, Angele A; May 16, 2006; 7 pp.; In English

Report No.(s): AD-A462049; CRS-RS22444; No Copyright; Avail.: CASI: A02, Hardcopy

As the 109th Congress continues to debate telecommunications reform, a major point of contention is the question of whether action is needed to ensure unfettered access to the Internet. The move to place restrictions on the owners of the networks that compose and provide access to the Internet, to ensure equal access and nondiscriminatory treatment, is referred to as 'net neutrality.' There is no single accepted definition of 'net neutrality.' However, most people would agree that any such definition should include the general principles that owners of the networks that compose and provide access to the Internet should not control how consumers lawfully use that network, and they should not be able to discriminate against content providers' access to that network. Concern over whether it is necessary to take steps to ensure access to the Internet for content, services, and applications providers, as well as consumers, and if so, what these should be, is a major focus in the debate over telecommunications reform. Some policymakers contend that more specific regulatory guidelines may be necessary to protect the marketplace from potential abuses that could threaten the net neutrality concept. Others contend that existing laws and FCC policies are sufficient to deal with potential anti-competitive behavior and that such regulations would have negative effects on the expansion and future development of the Internet. The issue of 'net neutrality' is expected to remain in the forefront as the 109th Congress continues its debate over telecommunications reform. For information on

legislative activity, see CRS Issue Brief IB10045, 'Broadband Internet Regulation and Access: Background and Issues,' by Angele A. Gilroy and Lennard G. Kruger. This report will be updated as events warrant.
DTIC
Broadband; Internets; Policies; Regulations

20070009214 Michigan Univ., Ann Arbor, MI USA
Energy-Aware Quality of Service Adaptation
Pillai, Padmanabhan; Huang, Hai; Shin, Kang G; Jan 2003; 33 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0120
Report No.(s): AD-A462108; No Copyright; Avail.: CASI: A03, Hardcopy

In a wide variety of embedded control applications, it is often the energy resources that form the fundamental limits on the system, not the system's computing capacity. Various techniques have been developed to improve energy efficiency in hardware, such as Dynamic Voltage Scaling (DVS), effectively extending the battery life of these systems. However, a comprehensive mechanism of task adaptation is needed in order to make the best use of the available energy resources, even in the presence of DVS or other power-reducing mechanisms. Further complicating this are the strict timeliness guarantees required by real-time applications commonly found in embedded systems. This paper develops a new framework called Energy-aware Quality of Service (EQoS) that can manage realtime tasks and adapt their execution to maximize the benefits of their computation for a limited energy budget. The concept of an adaptive real-time task and the notion of utility, a measure of the benefit or value gained from their execution, are introduced. Optimal algorithms and heuristics are developed to maximize the utility of the system for a desired system runtime and a given energy budget, and then extended to optimize utility without regard to runtime. We demonstrate the effects of DVS on this system and how EQoS in conjunction with DVS can provide significant gains in utility for fixed energy budgets. Finally, we evaluate this framework through both simulations and experimentation on a working implementation.
DTIC
Adaptation; Algorithms; Electric Potential; Energy Policy; Energy Transfer; Microprocessors

20070009222 Naval Research Lab., Washington, DC USA
Mobile Networking Technology Within INSC
Macker, Joseph P; Jan 2003; 8 pp.; In English; Original contains color illustrations
Report No.(s): AD-A462118; No Copyright; Avail.: CASI: A02, Hardcopy

We provide an overview of the INSC Mobility Task area efforts including: a brief overview of technology areas investigated, a discussion of research developments, and example results from experimentation and demonstration. The main areas investigated were Mobile Ad hoc Network (MANET) routing and mobile IP version 6 (MIPv6) protocols. Early simulation efforts were performed along with more recent network emulation and live experimentation. Network mobility experimentation and demonstration has taken place in both localized, controlled coalition environments and between participating coalition laboratory sites across the INSC WAN. The localized testing environments enabled more meaningful performance analysis while the WAN tests have demonstrated architectural and interoperable functionality. Example results are presented describing example MANET routing and MIPv6 performance analysis. Finally, some early lessons learned are discussed along with recommended areas of further work.
DTIC
Communication Networks; Mobility

20070009231 Newlink Global Engineering, Inc., Springfield, VA USA
Extended Littoral Battlespace (ELB) Secure Network Voice Gateway
Adamson, R B; Moran, Tom; Cole, Jr , Raymond; McBeth, Michael S; Jan 2007; 5 pp.; In English; Original contains color illustrations
Report No.(s): AD-A462133; No Copyright; Avail.: CASI: A01, Hardcopy

The Extended Littoral Battlespace (ELB) Advanced Concept Technology Demonstration (ACTD) uses wireless Local Area Network (LAN) technology to provide U.S. Marines in the field with multimedia connectivity to shore-based and afloat command and control centers. Computer network voice communication services are being evaluated and demonstrated as part of the ELB project. A gateway is needed for network voice users to communicate with users on other tactical voice and military telephone systems. We describe a scalable network voice gateway based on commercial off-the-shelf technology to

be demonstrated as part of the ELB ACTD. Concepts for future capabilities and design issues are also discussed.
DTIC
Computer Networks; Local Area Networks; Voice Communication; Wireless Communication

20070009233 Norwegian Defence Research Establishment, Kjeller, Norway
Valet Services: Improving Hidden Servers with a Personal Touch
Oeverlier, Lasse; Syverson, Paul; Jan 2006; 23 pp.; In English
Report No.(s): AD-A462136; XB-NRL/MR/5540; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Location hidden services have received increasing attention as a means to resist censorship and protect the identity of service operators. Research and vulnerability analysis to date has mainly focused on how to locate the hidden service. But while the hiding techniques have improved, almost no progress has been made in increasing the resistance against DoS attacks directly or indirectly on hidden services. In this paper we suggest improvements that should be easy to adopt within the existing hidden service design, improvements that will both reduce vulnerability to DoS attacks and add QoS as a service option. In addition we show how to hide not just the location but the existence of the hidden service from everyone but the users knowing its service address. Not even the public directory servers will know how a private hidden service can be contacted, or know it exists.
DTIC
Computer Information Security; Protocol (Computers); Touch

20070009236 Norwegian Defence Research Establishment, Kjeller, Norway
Locating Hidden Servers
Oeverlier, Lasse; Syverson, Paul; Jan 2006; 16 pp.; In English
Report No.(s): AD-A462140; No Copyright; Avail.: CASI: A03, Hardcopy

Hidden services were deployed on the Tor anonymous communication network in 2004. Announced properties include server resistance to distributed DoS. Both the EFF and Reporters Without Borders have issued guides that describe using hidden services via Tor to protect the safety of dissidents as well as to resist censorship. We present fast and cheap attacks that reveal the location of a hidden server. Using a single hostile Tor node we have located deployed hidden servers in a matter of minutes. Although we examine hidden services over Tor, our results apply to any client using a variety of anonymity networks. In fact, these are the first actual intersection attacks on any deployed public network: thus confirming general expectations from prior theory and simulation. We recommend changes to route selection design and implementation for Tor. These changes require no operational increase in network overhead and are simple to make; but they prevent the attacks we have demonstrated. They have been implemented.
DTIC
Communication Networks; Computer Information Security; Computer Networks; Position (Location)

20070009250 Air Force Research Lab., Rome, NY USA
Coalition Network Management System
Turnbaugh, Eugene D; Dec 2006; 15 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-4219
Report No.(s): AD-A462157; AFRL-IF-RS-TR-2006-350; No Copyright; Avail.: CASI: A03, Hardcopy

Under the auspices of The Technical Cooperation Program, a Project Arrangement (PA) entitled Coalition Command Control and Communications Demonstration Environment (CC3DE) between the US, Australia and Canada was created and realized from 2000 to 2003. Those three nations collaborated on a Coalition Network Management System (CNMS) under the CC3DE PA. A new PA, entitled Policy Enabled Coalition Communications (PECC), will incorporate the UK and will iterate the design and concept of CNMS. As of this interim report, the PA still has not been signed due to export control language differences between nations. It is expected the PA will be signed by the end of 2006. Despite the limitation of an unsigned PA, AFRL has moved forward with in-house work on policy-based solutions for the coalition environment, to include: designing a modern service oriented architecture (SOA) for the coalition enterprise; identifying requirements for secure, cross-domain exchange of SOA protocols; begin design of reasoning resource monitors using semantic technology; and creating a NM protocol generator to test NM tool scalability.
DTIC
Communication Networks; Management Systems; Policies; Resources Management

20070009268 Michigan Univ., Ann Arbor, MI USA

Towards Capturing Representative AS-Level Internet Topologies

Chang, Hyunseok; Govindan, Ramesh; Jamin, Sugih; Shenker, Scott J; Willinger, Walter; Jan 2002; 15 pp.; In English

Contract(s)/Grant(s): N00014-01-1-0617

Report No.(s): AD-A462179; No Copyright; Avail.: CASI: A03, Hardcopy

Recent studies concerning the Internet connectivity at the AS level have attracted considerable attention. These studies have exclusively relied on the BGP data from Oregon route-views [1] to derive some unexpected and intriguing results. The Oregon route-views data sets reflect AS peering relationships, as reported by BGP, seen from a handful of vantage points in the global Internet. The possibility that these data sets from Oregon route-views may provide only a very sketchy picture of the complete inter-AS connections that exist in the actual Internet has received surprisingly little scrutiny. In this paper, we will use the term AS peering relationship to mean that there is at least one direct router-level connection between two existing ASs, and that these two ASs agree to exchange traffic by enabling BGP between them. By augmenting the Oregon route-views data sets with BGP summary information from a large number of Internet Looking Glass sites and with routing policy information from Internet Routing Registry (IRR) databases, we find that (1) a significant number of existing AS connections remain hidden from most BGP routing tables, (2) the AS connections to tier-1 ASs are in general more easily observed than those to non tier-1 ASs, and (3) there are at least about 25-50% more AS connections in the Internet than commonly-used BGP-derived AS maps reveal (but only about 2% more ASs). These findings point out the need for an increased awareness of and a more critical attitude toward the applicability and completeness of given data sets at hand when establishing the generality of any particular observations about the Internet.

DTIC

Autonomy; Internets; Protocol (Computers); Topology

20070009270 Space and Naval Warfare Systems Command, Charleston, SC USA

Architecture for Secure Network Voice

McBeth, Michael S; Cole, Raymond; Adamson, R B; Jan 1999; 5 pp.; In English; Original contains color illustrations

Report No.(s): AD-A462182; No Copyright; Avail.: CASI: A01, Hardcopy

Voice over Internet Protocol (VoIP) is an emerging technology that promises economic and performance advantages by reducing hardware and enabling object oriented voice applications. Technology and products alone will not automatically bring these advantages to the military. A system architecture approach is needed. Our approach translates user driven requirements into products that are secure, interoperable, and easy to use. Using the DoD's C4ISR Architecture Framework, Version 2.0, we define operational, system, and technical views for secure Network voice. From these views, we explore some enabling technologies and applications to make Network voice an Information Appliance for Joint Vision 2010.

DTIC

Internets; Voice Communication

20070009291 Technische Univ., Twente, Netherlands

Guess what? Here is a new tool that finds some new guessing attacks

Corin, Ricardo; Malladi, Sreekanth; Alves-Foss, Jim; Etalle, Sandro; Jan 2003; 11 pp.; In English

Contract(s)/Grant(s): F30602-02-1-0178

Report No.(s): AD-A462221; No Copyright; Avail.: Defense Technical Information Center (DTIC)

If a protocol is implemented using a poor password, then the password can be guessed and verified from the messages in the protocol run. This is termed as a guessing attack. Published design and analysis efforts always lacked a general definition for guessing attacks. Further, they never considered possible type-flaws in the protocol runs or using messages from other protocols. In this paper, we provide a simple and general definition for guessing attacks. We explain how we implemented our definition in a tool based on constraint solving. Finally, we demonstrate some new guessing attacks that use type-flaws and multiple protocols which we found using our tool.

DTIC

Access Control; Computer Information Security; Intrusion; Numerical Control; Protocol (Computers); Security

20070009298 Michigan Univ., Ann Arbor, MI USA

A Microeconomic Approach to Intelligent Resource Sharing in Multiagent Systems

Lee, Jaeho; Durfee, Edmund H; Jan 1995; 14 pp.; In English

Contract(s)/Grant(s): DAAE07-92-C-R012

Report No.(s): AD-A462235; No Copyright; Avail.: CASI: A03, Hardcopy

We have analyzed characteristics of sharable resources and developed techniques for intelligently sharing resources specifically, communication channels among agents in multiagent systems. Our techniques allow agents to nearly optimize their communication behavior in a self-organizing and distributed fashion, involving the use of a microeconomic pricing system based on economic laws of supply and demand and trading among agents in real-time. Our analyses are based on three measures of performance: fairness of resource allocation, waiting time for resources, and utilization of resources. Our initial analysis indicates that fairness and utilization are conflicting, in that the best utilization with a fair allocation is equivalent to the worst utilization with an unfair resource allocation, assuming the allocation policy is statically defined. To strike a balance in performance, we have developed mechanisms that establish an artificial economy, where agents can dynamically reallocate goods (resource access) using a competitive market pricing mechanism. However, unlike more common market-oriented methods, our approach does not demand convergence to equilibrium, but permits more rapid, heuristic trading, leading to near optimal performance where both buyers and sellers of resources can benefit. Our studies show that agents employing our mechanisms can dramatically improve utilization while still providing fair access to the resources.
DTIC
Artificial Intelligence; Economics; Resource Allocation; Resources

20070009301 Naval Research Lab., Washington, DC USA
Reputation in Privacy Enhancing Technologies
Dingledine, Roger; Mathewson, Nick; Syverson, Paul; Jan 2002; 7 pp.; In English
Report No.(s): AD-A462241; No Copyright; Avail.: CASI: A02, Hardcopy

Reputation is the linchpin of a dynamic and pseudonymous future. In a networked world in which individuals interact via anonymous re-mailers, and where the online services they use are themselves provided by an ever-changing pool of semi-anonymous users, the distinction between pseudonym and identity blurs. In this world, reputation is one of the few tools that can still provide trust -- trust among the users of distributed services, and even the trust necessary to maintain reliability and accountability of these services. In its most general form, reputation is memory about past performance. This memory can be localized and idiosyncratic, as in the case of users who remember which servers have worked well in the past; centralized and shared, as in the case of an auction site that tracks customer satisfaction of various vendors; distributed and shared, as in the case of servers that vote one another into different reliability categories; or even implicit within the structure of the system itself, as in the case of systems that embody trust as microcurrency that reliable systems tend to accumulate. While reputation might superficially seem inimical to privacy concerns, systems with explicit reputation can actually enable privacy by controlling the flow of information about pseudonymous individuals, and reducing the demand for out-of-line information exposure. As with security, it is tempting but incorrect to think that reputation is a simple matter of bolting an extra service to the side of an existing system. This point is illustrated by two reputation systems that have been designed for use in re-mailer networks.
DTIC
Client Server Systems; Electronic Mail; Electronic Publishing; Privacy; Protocol (Computers); Reliability

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CYBERNETICS, ARTIFICIAL INTELLIGENCE AND ROBOTICS

Includes feedback and control theory, information theory, machine learning, and expert systems. For related information see also *54 Man/System Technology and Life Support*.

20070007349 Professional Services Group, Inc., Winter Park, FL USA
Detection of Terrorist Preparations by an Artificial Intelligence Expert System Employing Fuzzy Signal Detection Theory
Koltko-Rivera, Mark E; Oct 25, 2004; 47 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460204; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460204

No abstract available
Artificial Intelligence; Expert Systems; Signal Detection

20070007359 Research Inst. for Communication, Information Processing and Ergonomics, Wachtberg-Werthhoven, Germany

From Unstructured to Structured Information in Military Intelligence - Some Steps to Improve Information Fusion

Biermann, Joachim; Chantal, Louis de; Korsnes, Reinert; Rohmer, Jean; Uendeger, Cagatay; Oct 25, 2004; 40 pp.; In English; Original contains color illustrations

Report No.(s): AD-A460220; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460220

No abstract available

Intelligence; Multisensor Fusion

20070007370 Massachusetts Univ., Amherst, MA USA

A Framework for Learning and Control in Intelligent Humanoid Robots

Brock, Oliver; Fagg, Andrew; Grupen, Roderic; Platt, Robert; Rosenstein, Michael; Sweeney, John; Jan 2005; 37 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): CDA-9703217; DABT63-99-1-0004

Report No.(s): AD-A460241; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460241

Future application areas for humanoid robots range from the household, to agriculture, to the military, and to the exploration of space. Service applications such as these must address a changing, unstructured environment, a collaboration with human clients, and the integration of manual dexterity and mobility. Control frameworks for service-oriented humanoid robots must, therefore, accommodate many independently challenging issues including: techniques for configuring networks of sensorimotor resources; modeling tasks and constructing behavior in partially observable environments; and integrated control paradigms for mobile manipulators. Our approach advocates actively gathering salient information, modeling the environment, reasoning about solutions to new problems, and coordinating ad hoc interactions between multiple degrees of freedom to do mechanical work. Representations that encode control knowledge are a primary concern. Individual robots must exploit declarative structure for planning and must learn procedural strategies that work in recognizable contexts. We present several pieces of an overall framework in which a robot learns situated policies for control that exploit existing control knowledge and extend its scope. Several examples drawn from the research agenda at the Laboratory for Perceptual Robotics are used to illustrate the ideas.

DTIC

Hierarchies; Machine Learning; Robotics; Robots; Trajectory Control

20070007383 SRI International Corp., Menlo Park, CA USA

Planning

Georgeff, Michael P; Mar 1987; 57 pp.; In English

Contract(s)/Grant(s): N00014-85-C-0251

Report No.(s): AD-A460271; No Copyright; Avail.: CASI: A04, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460271

The ability to act appropriately in dynamic environments is critical to the survival of all living creatures. For lower life forms, it seems that sufficient capability is provided by stimulus-response and feedback mechanisms. Higher life forms, however, must be able to anticipate the future and form plans of action to achieve their goals. Reasoning about action and plans can thus be seen as fundamental to the development of intelligent machines that are capable of dealing effectively with real-world problems. Researchers in artificial intelligence (AI) have long been concerned with this area of investigation [73]. But, as with most of AI, it is often difficult to relate the different streams of research and to understand how one technique compares with others. Much of this difficulty derives from the varied (and sometimes confused) terminology and the great diversity of problems that arise in real-world planning. Indeed, there are few practical planning systems for which the class of appropriate applications can be clearly delineated. This article attempts to clarify some of the issues that are important in reasoning about actions and plans. As the field is still young, it would be premature to expect us to have a stable foundation on which to build a discipline of planning. Nevertheless, I hope that the following discussion contributes toward that objective and that it will help the reader to evaluate the pertinent literature.

DTIC

Artificial Intelligence; Feedback

20070007386 SRI International Corp., Menlo Park, CA USA

A Fuzzy Controller for Flakey, An Autonomous Mobile Robot

Saffiotti, Alessandro; Ruspini ,Sr , Enrique H; Konolige, Sr , Kurt G; Mar 1993; 36 pp.; In English

Contract(s)/Grant(s): F49620-91-C-0060; N00014-89-C-0096

Report No.(s): AD-A460275; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460275

Controlling the movement of an autonomous mobile robot In real-world unstructured environments requires the ability to pursue strategic goals under conditions of uncertainty, incompleteness, and imprecision. We describe a fuzzy controller for a mobile robot that can take multiple strategic goals into consideration. Through the use of fuzzy logic, goal-oriented behavior (e.g., trying to reach a given location) and reactive behavior (e.g., avoiding previously unknown obstacles on the way) are smoothly blended into one sequence of control actions. The fuzzy controller has been implemented on the SRI robot Flakey, and Its performance demonstrated in several different environments, including the first AAAI robotic competition, where Flakey placed second.

DTIC

Autonomy; Control; Controllers; Fuzzy Systems; Robots

20070007408 Lockheed Martin Advanced Technology Labs., Cherry Hill, NJ USA

Actionable Intelligence for the Warfighter

Morizio, Nicholas; Gigli, Sergio; Pawlowski, Angela; May 2005; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A460434; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460434

Lockheed Martin Advanced Technology Laboratories (LM ATL) has researched and developed Situation Understanding technologies to provide tailored, Actionable Intelligence to the individual warfighter. Situation Understanding (SU) is a core requirement of the Future Combat Systems and programs such as the Distributed Common Ground Station Army. LM ATL has developed an SU Engine to automatically fuse multiple intelligence reports with track data into a Common Relevant Operating Picture (CROP) of the battlespace. The SU Engine augments the CROP with hypotheses as to the relationships that may exist between entities, environment, and events within the battlespace. These relationships are then used as the basis for inferring the most likely and most dangerous courses of actions that the enemy may be pursuing. The Future Force is actively trading weight for intelligence, while at the same time supporting a broader range of missions, with fewer operators and greater volumes of information. The SU Engine maintains the context of the various warfighters that the system is supporting. A warfighter's context includes location of the warfighter, the warfighter's mission, and the state of the battlespace surrounding the warfighter. The SU Engine, based on any explicit information requests provided by the warfighter combined with needs inferred by the SU Engine, dynamically composes multi-level fusion services to convert raw sensor and report data into higher level relationships and ultimately into predictions of enemy courses of action. The SU Engine can access sensor and report data from a range of sources including service-enabled net-centric systems. Services within the SU Engine are described using industry open standards augmented with semantic definitions to support just-in-time service composition.

DTIC

Decision Support Systems; Intelligence; Situational Awareness

20070007457 Rice Univ., Houston, TX USA

The Total Variation Regularized L1 Model for Multiscale Decomposition

Yin, Wotao; Goldfarb, Donald; Osher, Stanley; Jan 2006; 24 pp.; In English

Contract(s)/Grant(s): N00014-03-1-0514

Report No.(s): AD-A460529; RU-TR-06-16; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA460529

This paper studies the total variation regularization model with an L1 fidelity term (TV-L1) for decomposing an image into features of different scales. We first show that the images produced by this model can be formed from the minimizers of a sequence of decoupled geometry sub-problems. Using this result we show that the TV-L1 model is able to separate image features according to their scales, where the scale is analytically defined by the G-value. A number of other properties including the geometric and morphological invariance of the TV-L1 model are also proved and their applications discussed.

DTIC

Decomposition; Image Processing; Pattern Recognition

20070007489 SRI International Corp., Menlo Park, CA USA
Planning Natural-Language Utterances to Satisfy Multiple Goals
Appelt, Douglas E; Mar 1982; 189 pp.; In English
Contract(s)/Grant(s): N00014-80-C-0296
Report No.(s): AD-A460595; No Copyright; Avail.: CASI: A09, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460595

This technical note presents the results of research on a planning formalism for a theory of natural-language generation that will support the generation of utterances that satisfy multiple goals. Previous research in the area of computer generation of natural-language utterances has concentrated on two aspects of language production: (1) the process of producing surface syntactic forms from an underlying representation, and (2) the planning of illocutionary acts to satisfy the speaker's goals. This work concentrates on the interaction between these two aspects of language generation and considers the overall problem to be one of refining the specification of an illocutionary act into a surface syntactic form, emphasizing the problems of achieving multiple goals in a single utterance. Planning utterances requires an ability to reason in detail about what the hearer knows and wants. A formalism, based on a possible-worlds semantics of an intensional logic of knowledge and action, was used for representing the effects of illocutionary acts and the speaker's beliefs about the hearer's knowledge of the world. Techniques are described that enable a planning system to use the representation effectively. The language-planning theory and knowledge representation are embodied in a computer system called KAMP (Knowledge And Modalities Planner), which plans both physical and linguistic actions, given a high-level description of the speaker's goals. The research has application to the design of gracefully interacting computer systems, multiple-agent planning systems, and the planning of knowledge acquisition.
DTIC
Artificial Intelligence; Linguistics; Natural Language (Computers); Natural Language Processing; Planning

20070007500 Massachusetts Inst. of Tech., Cambridge, MA USA
Interactive Problem Solving and Dialogue in the ATIS Domain
Seneff, Stephanie; Hirschman, Lynette; Zue, Victor W; Jan 1991; 7 pp.; In English
Contract(s)/Grant(s): N00014-89-J-1332
Report No.(s): AD-A460614; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460614

This paper describes the present status of the discourse and dialogue models within the MIT ATIS system, extended to support the notion of booking a flight. The discourse model includes not only the resolution of explicit anaphoric references, but also indirect and direct references to information mentioned earlier in the conversation, such as a direct reference to an entry in a previously displayed table or an indirect reference to a date, as in 'the following Thursday.' The system keeps a history table containing objects such as flights and dates, represented as semantic frames, as well as the active ticket, previously booked tickets, and previously displayed tables. During flight reservations scenarios, the system monitors the state of the ticket (which is displayed to the user), making sure that all information is complete (by querying the user) before allowing a booking. It may even initiate calls to the database to provide additional unsolicited information as appropriate. We have collected several dialogues of subjects using the system to make reservations, and from these, we are learning how to design better dialogue models.
DTIC
Artificial Intelligence; Human-Computer Interface; Information Systems; Problem Solving; Speech; Speech Recognition

20070007504 AT and T Labs Research, Florham Park, NJ USA
Natural Language Generation in Dialog Systems
Rambow, Owen; Bangalore, Srinivas; Walker, Marilyn; Jan 2001; 5 pp.; In English
Contract(s)/Grant(s): MDA972-99-3-0003
Report No.(s): AD-A460619; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA460619

Recent advances in Automatic Speech Recognition technology have put the goal of naturally sounding dialog systems within reach. However, the improved speech recognition has brought to light a new problem: as dialog systems understand more of what the user tells them, they need to be more sophisticated at responding to the user. The issue of system response to users has been extensively studied by the natural language generation community, though rarely in the context of dialog systems. We show how research in generation can be adapted to dialog systems, and how the high cost of hand-crafting

knowledge-based generation systems can be overcome by employing machine learning techniques.
DTIC
Artificial Intelligence; Natural Language (Computers); Responses; Speech Recognition

20070007538 Army Research Lab., Adelphi, MD USA
Multi-Camera Persistent Surveillance Test Bed
Baran, David; O'Brien, Barry; Fung, Nick; Kovach, Jesse; Miller, David; Jan 2007; 30 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460692; ARL-TR-4031; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460692

Recognizing the U.S. military's superiority in open battlefield environments adversaries have moved the battle into cities generating a different set of technical challenges for the modern warfighter. Combat in urban environments characterized by large civilian populations and high building densities requires a different tactical approach to ground operations. Radical new solutions are required to reduce the number of dangerous situations our Soldiers encounter by providing them with improved situational awareness. Small reconnaissance surveillance and target acquisition (RSTA) platforms have the ability to cooperate through information sharing to increase the situational awareness over a region of interest (RSTA). One RSTA task that can be performed by such platforms is persistent surveillance - the ability to monitor objects of interest without interruption over a large ROI. This paper discusses the design and implementation of a persistent surveillance test bed comprised of a homogenous group of stationary assets. Further it examines persistent surveillance algorithms that can be reduced to practice and their proposed implementation and evaluation within the test bed.
DTIC
Cameras; Image Processing; Surveillance; Target Acquisition; Test Stands

20070007542 Army Tank-Automotive Research and Development Command, Warren, MI USA
Pedestrian Detection for Anti-Tampering Vehicle Protection
Del Rose, Michael; Frederick, Philip; Reed, Jack; Mar 6, 2005; 9 pp.; In English
Report No.(s): AD-A460700; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460700

Vehicle survivability in the form of anti-tampering tools is an important part of the FCS community of vehicles. Autonomous or semi-autonomous vehicles traversing through unknown terrain require the ability to detect, predict, and avoid potential aggression from hostile forces. Expanding upon pedestrian detection techniques will provide a viable solution in the near term. With the current vision based pedestrian detection algorithms, an anti-tampering suite can be developed. First, the system must determine people in the scene. Once this is accomplished, the people can be checked for weapons and their movements can be tracked. Finally deciphering the tracked movements can help distinguish between friendly and unfriendly actions by people. This paper will discuss the need for an anti-tampering suite and how pedestrian detection techniques can be used to address this need.
DTIC
Combat; Protection; Robotics; Support Systems

20070007544 Army Tank-Automotive Command, Warren, MI USA
Operational Effectiveness Modeling of Intelligent Systems
Kerr, Michael; Jun 2006; 5 pp.; In English
Report No.(s): AD-A460704; TACOM-TR-15667; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460704

As the Army pushes ahead with the development of intelligent vehicle systems, TARDEC is working to meet these challenges by developing platforms with greater autonomy. Using TRADOC's CASTFOREM model, the Army's premier ground combat simulation model, my office provides operational effectiveness analysis to quantify the battlefield effectiveness of TARDEC concepts. This paper will first review our past efforts to provide operational effectiveness analysis to TARDEC's intelligent vehicle programs. A few years ago, our office performed a comprehensive evaluation of TARDEC's RAVE concepts, evaluating the effectiveness of semi- and fully-autonomous platforms. The paper will then discuss the many challenges associated with modeling autonomous and semi-autonomous platforms. These challenges are related to the

platform's behaviors and the unique threats faced by unmanned platforms.
DTIC
Autonomous Navigation; Combat; Models; Simulation; System Effectiveness

20070007654 SRI International Corp., Menlo Park, CA USA
Classification-Based Tracking of Objects and Materials
Laws, Kenneth I; Jul 1988; 26 pp.; In English
Contract(s)/Grant(s): MDA903-86-C-0084; DACA76-85-C-0004
Report No.(s): AD-A460907; TN-443; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460907

SRI's KNIFE image analysis system can be used for tracking objects and material classes from one image to another. Variations on this theme are the initial acquisition of target instances from database signatures and the subsequent acquisition of additional instances in an image once a few objects have been labeled. Classification-based tracking is facilitated by improved color and texture-energy transforms. KNIFE's labeling and partitioning methods can be used with complex targets, and are relatively unaffected by occlusions and changes in object appearance during tracking.
DTIC
Classifications; Image Processing; Targets

20070007664 SRI International Corp., Menlo Park, CA USA
Objective Functions for Feature Discrimination
Fua, Pascal; Hanson, Andrew J; May 1989; 9 pp.; In English
Contract(s)/Grant(s): MDA903-83-C-0027; DACA76-85-C-0004
Report No.(s): AD-A460919; TN-465; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460919

We propose and evaluate a class of objective functions that rank hypotheses for feature labels. Our approach takes into account the representation cost and quality of the shapes themselves, and balances the geometric requirements against the photometric evidence. This balance is essential for any system using Under constrained or generic feature models. We introduce examples of specific models allowing the actual computation of the terms in the objective function, and show how this framework leads naturally to control parameters that have a clear semantic meaning. We illustrate the properties of our objective functions on synthetic and real images.
DTIC
Image Processing; Pattern Recognition

20070007680 California Univ., Santa Cruz, CA USA
A General Iterative Regularization Framework for Image Denoising
Charest, Jr , Michael R; Elad, Michael; Milanfar, Peyman; Mar 2006; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F49620-03-1-038
Report No.(s): AD-A460941; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA460941

Many existing techniques for image denoising can be expressed in terms of minimizing a particular cost function. We address the problem of denoising images in a novel way by iteratively refining the cost function. This allows us some control over the trade-off between the bias and variance of the image estimate. The result is an improvement in the mean-squared error as well as the visual quality of the estimate. We consider four different methods of updating the cost function and compare and contrast them. The framework presented here is extendable to a very large class of image denoising and reconstruction methods. The framework is also easily extendable to deblurring and inversion as we briefly demonstrate. The effectiveness of the proposed methods is illustrated on a variety of examples.
DTIC
Costs; Image Reconstruction

20070007684 SRI International Corp., Menlo Park, CA USA
Recognizing Objects in a Natural Environment: A Contextual Vision System (CVS)
Fischler, Martin A; Strat, Thomas M; Mar 1989; 25 pp.; In English
Contract(s)/Grant(s): MDA903-86-C-0084; DACA76-85-C-0004
Report No.(s): AD-A460946; SRI-TN-463; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460946

Existing machine vision techniques are not competent to reliably recognize objects in unconstrained views of natural scenes. In this paper we identify a number of weaknesses in current recognition systems, including an inability to solve the partitioning problem or to effectively use context and other types of knowledge beyond that of immediate object appearance. We propose specific mechanisms for dealing with some of these problems and describe the design of a vision system that incorporates these new mechanisms. The system has been partially implemented and we include some experimental results indicative of its operation and performance.
DTIC
Computer Vision; Pattern Recognition; Robotics; Three Dimensional Bodies

20070007690 SRI International Corp., Menlo Park, CA USA
Prosody, Syntax and Parsing
Bear, John; Price, Patti; Apr 4, 1990; 10 pp.; In English
Contract(s)/Grant(s): N00014-85-C-0013; IRI-8905249
Report No.(s): AD-A460957; SRI-TN-480; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460957

We describe the modification of a grammar to take advantage of prosodic information provided by a speech recognition system. This initial study is limited to the use of relative duration of phonetic segments in the assignment of syntactic structure specifically in ruling out alternative parses in otherwise ambiguous sentences. Taking advantage of prosodic information in parsing can make a spoken language system more accurate and more efficient, if prosodic-syntactic mismatches, or unlikely matches, can be pruned. We know of no other work that has succeeded in automatically extracting speech information and using it in a parser to rule out extraneous parses.
DTIC
Parsing Algorithms; Speech Recognition; Syntax

20070007692 SRI International Corp., Menlo Park, CA USA
Parsing as Deduction
Pereira, Fernando C; Warren, David H; Jun 1983; 10 pp.; In English
Contract(s)/Grant(s): N00039-80-C-0575
Report No.(s): AD-A460960; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA460960

By exploring the relationship between parsing and deduction, a new and more general view of chart parsing is obtained that encompasses parsing for grammar formalisms based on unification, and is the basis of the Earley Deduction proof procedure for definite clauses. The efficiency of this approach for an interesting class of grammars is discussed.
DTIC
Artificial Intelligence; Charts; Context Free Languages; Grammars; Linguistics; Natural Language Processing; Parsing Algorithms; Proving

20070007694 California Univ., Santa Cruz, CA USA
Regularized Kernel Regression for Image Deblurring
Takeda, Hiroyuki; Farsiu, Sina; Milanfar, Peyman; Jan 2006; 6 pp.; In English
Contract(s)/Grant(s): F49620-03-1-0387
Report No.(s): AD-A460966; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460966

The framework of kernel regression, a nonparametric estimation method, has been widely used in different guises for solving a variety of image processing problems including denoising and interpolation. In this paper, we extend the use of kernel regression for deblurring applications. Furthermore, we show that many of the popular image reconstruction techniques are special cases of the proposed framework. Simulation results confirm the effectiveness of our proposed methods.
DTIC
Focusing; Image Processing; Kernel Functions

20070008019 International Computer Science Inst., Berkeley, CA USA
Using Prosody for Automatic Sentence Segmentation of Multi-Party Meetings
Kolar, Jachym; Shriberg, Eilzabeth; Liu, Yang; Jan 2006; 9 pp.; In English
Contract(s)/Grant(s): NBCHD-030010; HR0011-06-C-0023
Report No.(s): AD-A459015; No Copyright; Avail.: CASI: A02, Hardcopy

We explore the use of prosodic features beyond pauses, including duration, pitch, and energy features, for automatic sentence segmentation of ICSI meeting data. We examine two different approaches to boundary classification: score-level combination of independent language and prosodic models using HMMs, and feature-level combination of models using a boosting-based method (BoosTexter). We report classification results for reference word transcripts as well as for transcripts from a state-of-the-art automatic speech recognizer (ASR). We also compare results using the lexical model plus a pause-only prosody model, versus results using additional prosodic features. Results show that (1) information from pauses is important, including pause duration both at the boundary and at the previous and following word boundaries; (2) adding duration, pitch, and energy features yields significant improvement over pause alone; (3) the integrated boosting-based model performs better than the HMM for ASR conditions; (4) training the boosting-based model on recognized words yields further improvement.
DTIC
Models; Segments; Sentences; Speech Recognition

20070008020 International Computer Science Inst., Berkeley, CA USA
On Speaker-Specific Prosodic Models for Automatic Dialog Act Segmentation of Multi-Party Meetings
Kolar, Jachym; Shriberg, Elizabeth; Liu, Yang; Jan 2006; 5 pp.; In English
Contract(s)/Grant(s): NBCHD-030010; HR0011-06-C-0023
Report No.(s): AD-A459018; No Copyright; Avail.: CASI: A01, Hardcopy

We explore speaker-specific prosodic modeling for dialog act segmentation of speech from the ICSI Meeting Corpus. We ask whether features beyond pauses help individual speakers, and whether some speakers benefit from prosody models trained on only their speech. We find positive results for both questions, although the second is more complex. Feature analysis reveals that duration is the most used feature type, followed by pause and pitch features. Results also suggest a difference between native and nonnative speakers in feature usage patterns. We conclude that features beyond pauses are useful for dialog act segmentation in natural conversation, and that for some speakers, speaker-specific training yields further gains.
DTIC
Models; Segments; Speech

20070008039 SRI International Corp., Menlo Park, CA USA
A Nonclausal Connection-Graph Resolution Theorem-Proving Program
Stickel, Mark E; Oct 1982; 15 pp.; In English
Contract(s)/Grant(s): N00039-80-C-0575
Report No.(s): AD-A460606; No Copyright; Avail.: CASI: A03, Hardcopy

This paper describes the theory behind, and features of, a new theorem-proving program that combines the use of nonclausal resolution and connection graphs. The program is being developed as a reasoning component of a natural-language-understanding system. The most important characteristics of the program are as follows: (1) nonclausal resolution is used as the inference system, which eliminates some of the redundancy and unreadability of clause-based systems; (2) a connection graph is used to represent permitted resolution operations, which restricts the search space and facilitates the use of graph searching for efficient deduction; and (3) heuristic search and special logical connectives are used for program control. This paper describes these aspects of the program, citing their advantages and disadvantages, and reviews the program's implementation and future status.
DTIC
Computer Programs; Data Processing; Linguistics; Machine Learning; Natural Language (Computers); Natural Language Processing; Theorem Proving

20070008041 SRI International Corp., Menlo Park, CA USA
Sentence Disambiguation by a Shift-Reduce Parsing Technique
Shieber, Stuart M; Mar 1983; 17 pp.; In English
Contract(s)/Grant(s): N00039-80-C-0575
Report No.(s): AD-A460621; No Copyright; Avail.: CASI: A03, Hardcopy

Native speakers of English show definite and consistent preferences for certain readings of syntactically ambiguous sentences. A user of a natural-language processing system would naturally expect it to reflect the same preferences. Thus, such systems must model in some way the linguistic performance as well as the linguistic competence of the native speaker. The authors have developed a parsing algorithm -- a variant of the LALR(1) shift-reduce algorithm -- that models the preference behavior of native speakers for a range of syntactic preference phenomena reported in the psycholinguistic literature, including

the recent data on lexical preferences. The algorithm yields the preferred parse deterministically, without building multiple parse trees and choosing among them. As a side effect, it displays appropriate behavior in processing the much discussed garden-path sentences. The parsing algorithm has been implemented and has confirmed the feasibility of this approach to the modeling of these phenomena.
DTIC
Ambiguity; Linguistics; Natural Language (Computers); Natural Language Processing; Parsing Algorithms; Sentences; Syntax

20070008122 Naval Academy, Annapolis, MD USA
Robot Imitation Learning of High-Level Planning Information
Crabbe, Frderick L; Hwa, Rebecca; May 2, 2005; 10 pp.; In English
Report No.(s): AD-A460420; USNA-CS-TR-2005-03; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460420
We present a system that enables a robot to learn to plan through demonstration and imitation. An imitator acquires planning operators by observing a demonstrators, segmenting the demonstrators actions into planning steps, and learning the preconditions and effects of the operators. When the imitator tries to execute its own plans, it learns to perform the operations through reinforcement learning, and corrects errors in the previously learned operator effects.
DTIC
Learning; Machine Learning; Planning; Robots

20070008180 SRI International Corp., Menlo Park, CA USA
Scene Modeling: A Structural Basis for Image Description
Tenenbaum, Jay M; Fischler, Martin A; Barrow, Harry G; Jul 1980; 31 pp.; In English
Contract(s)/Grant(s): DAAG29-79-C-0216
Report No.(s): AD-A460264; TN-221; No Copyright; Avail.: CASI: A03, Hardcopy
Conventional statistical approaches to image modeling are fundamentally limited because they take no account of the underlying physical structure of the scene nor of the image formation process. The image features being modeled are frequently artifacts of viewpoint and illumination that have no intrinsic significance for higher-level interpretation. In this paper a structural approach to modeling is argued for that explicitly relates image appearance to the scene characteristics from which it arose. After establishing the necessity for structural modeling in image analysis, a specific representation for scene structure is proposed and then a possible computational paradigm for recovering this description from an image is described.
DTIC
Image Processing; Image Analysis

20070008463 California Univ., Santa Cruz, CA USA
Super-Drizzle: Applications of Adaptive Kernel Regression in Astronomical Imaging
Takeda, Hiroyuki; Farsiu, Sina; Christou, Julian; Milanfar, Peyman; Jan 2006; 16 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F49620-03-1-0387
Report No.(s): AD-A460967; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460967
The drizzle algorithm is a widely used tool for image enhancement in the astronomical literature. For example, a very popular implementation of this method, as studied by Frutcher and Hook, has been used to fuse, denoise, and increase the spatial resolution of the images captured by the Hubble Space Telescope (HST). However, the drizzle algorithm is an ad-hoc method, equivalent to a spatially adaptive linear filter, which limits its range of performance. To improve the performance of the drizzle algorithm, we make contact with the field of non-parametric statistics and generalize the tools and results for use in image processing and reconstruction. In contrast to the parametric methods, which rely on a specific model of the signal of interest, non-parametric methods rely on the data itself to dictate the structure of the model, in which case this implicit model is referred to as a regression function. We promote the use and improve upon a class of non-parametric methods called kernel regression.
DTIC
Astronomy; Image Processing; Imaging Techniques; Kernel Functions

20070008465 SRI International Corp., Menlo Park, CA USA
A New Characterization of Attachment Preferences
Pereira, Fernando C; Mar 1983; 18 pp.; In English
Contract(s)/Grant(s): N00039-80-C-0575
Report No.(s): AD-A460976; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460976

Several authors have tried to model attachment preferences for structurally ambiguous sentences that cannot be disambiguated from semantic information. These models lack rigor and have been widely criticized. By starting from a precise choice of parsing model, it is possible to give a simple and rigorous description of Minimal Attachment and Right Association that avoids some of the problems of other models.
DTIC
Ambiguity; Context Free Languages; Grammars; Linguistics; Natural Language (Computers); Natural Language Processing; Parsing Algorithms; Sentences

20070008468 SRI International Corp., Menlo Park, CA USA
Proving Properties of Rule-Based Systems
Waldinger, Richard J; Stickel, Mark E; Dec 1990; 30 pp.; In English
Contract(s)/Grant(s): F30602-87-D-0094; CCR-8904809
Report No.(s): AD-A460982; SRI-TN-494; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460982

Rule-based systems are being applied to tasks of increasing responsibility. Deductive methods are being applied to their validation, to detect flaws in these systems and enable us to use them with more confidence. Each system of rules is encoded as a set of axioms that define the system theory. The operation of the rule language and information about the subject domain are also described in the system theory. Validation tasks, such as establishing termination, unreachability, or consistency, or verifying properties of the system, are all phrased as conjectures. If we succeed in establishing the validity of the conjecture in the system theory, we have carried out the corresponding validation task. If the proof is restricted to be sufficiently constructive, we may extract from it information other than a simple yes/no answer. For example, we may obtain a description of a situation in which an error or anomaly may occur. A method for the gradual formulation of specifications based on the attempted proof of a series of conjectures has been found to be suitable for rule-based systems. Such a specification can serve as the basis for a reengineering of the system using conventional software technology. Validation conjectures are proved and disproved by a new theorem-proving system, SNARK, which implements (nonclausal) resolution and paramodulation, an optional constructive restriction, and some facilities for proof by induction. The system has already been applied to prove properties of a number of simple rule-based systems.
DTIC
Systems Analysis

20070008485 SRI International Corp., Menlo Park, CA USA
Image-to-Image Correspondence: Linear-Structure Matching
Smith, Grahame B; Wolf, Helen C; Jul 13, 1984; 22 pp.; In English
Contract(s)/Grant(s): MDA903-83-C-0027; NASA-9-16664
Report No.(s): AD-A461004; TN-331; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461004

We examine the task of matching images of a scene when they are taken from very different vantage points, when there is considerable scale change, and when the image orientations are unknown. We use the linear structures in the scene as the basis of our correspondence procedure. This paper considers the problem of describing the linear structures in a manner that is invariant relative to the variations that can occur among images, and discusses a method of finding the best description of the linear structures.
DTIC
Image Processing; Linearity

20070008489 SRI International Corp., Menlo Park, CA USA

Persistence, Intention, and Commitment

Cohen, Sr , Philip R; Levesque, Hector J; Feb 19, 1987; 45 pp.; In English

Contract(s)/Grant(s): N00039-84-K-0078

Report No.(s): AD-A461012; SRI-TN-415; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461012

This paper explores principles governing the rational balance among an agent's beliefs, goals, actions, and intentions. Such principles provide specifications for artificial agents, and approximate a theory of human action (as philosophers use the term). By making explicit the conditions under which an agent can drop his goals, i.e., by specifying how the agent is committed to his goals, the formalism captures a number of important properties of intention. Specifically, the formalism provides analyses for Bratman's three characteristic functional roles played by intentions, and shows how agents can avoid intending all the foreseen side effects of what they actually intend. Finally, the analysis shows how intentions can be adopted relative to a background of relevant beliefs and other intentions or goals. By relativizing one agent's intentions in terms of beliefs about another agent's intentions (or beliefs), we derive a preliminary account of interpersonal commitments.

DTIC

Artificial Intelligence; Autonomy

20070008499 SRI International Corp., Menlo Park, CA USA

Choosing a Basis for Perceptual Space

Barnard, Stephen T; Jan 3, 1984; 22 pp.; In English

Contract(s)/Grant(s): MDA903-83-C-0027

Report No.(s): AD-A461038; SRI-PROJ-5355; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461038

If it is possible to interpret an image as a projection of rectangular forms, there is a strong tendency for people to do so. In effect, a mathematical basis for a vector space appropriate to the world, rather than to the image, is selected. A computational solution to this problem is presented. It works by back projecting image features into three-dimensional space, thereby generating (potentially) all possible interpretations, and by selecting those which are maximally orthogonal. In general, two solutions that correspond to perceptual reversals are found. The problem of choosing one of these is related to the knowledge of verticality. A measure of consistency of image features with a hypothetical solution is defined. In conclusion, the model supports an information-theoretic interpretation of the Gestalt view of perception.

DTIC

Images; Space Perception

20070008512 SRI International Corp., Menlo Park, CA USA

Rational Interaction as the Basis for Communication

Cohen, Philip R; Levesque, Hector J; Apr 21, 1988; 39 pp.; In English

Contract(s)/Grant(s): N00039-84-K-0078

Report No.(s): AD-A461059; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461059

This paper derives the basis of a theory of communication from a formal theory of rational interaction. The major result is a demonstration that illocutionary acts need neither be primitive, nor explicitly recognized. As a test case, we derive Searle's conditions on requesting from principles of rationality coupled with a theory of imperatives. The theory rests on a formal account of intention and distinguishes insincere or nonserious imperatives from true requests. A theory of purposeful communication thus emerges as a consequence of principles of action and interaction.

DTIC

Information Theory; Telecommunication

20070008539 Tennessee Univ., Knoxville, TN USA

SAFER Under Vehicle Inspection Through Video Mosaic Building

Koschan, Andreas; Page, David; Ng, Fin-Choon; Abidi, Mongi; Gorsich, David; Gerhart, Grant; Jan 2004; 9 pp.; In English

Contract(s)/Grant(s): W56HC2V-04-C-0044; FG02-86NE37968

Report No.(s): AD-A461106; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461106

The current threats to US security, both military and civilian, have led to an increased interest in the development of technologies to safeguard national facilities such as military bases, federal buildings, nuclear power plants, and national laboratories. As a result, the imaging, robotics, and intelligent systems (IRIS) laboratory at the University of Tennessee has established a research consortium, known as security automation and future electromotive robotics (SAFER), to develop, test, and deploy sensing and imaging systems. In this paper, we describe efforts made to build multi-perspective mosaics of infrared and color video data for the purpose of under vehicle inspection. It is desired to create a large, high-resolution mosaic that may be used to quickly visualize the entire scene shot by a camera making a single pass underneath the vehicle. Several constraints are placed on the video data in order to facilitate the assumption that the entire scene in the sequence exists on a single plane. Therefore, a single mosaic is used to represent a single video sequence.
DTIC
Detectors; Inspection; Mosaics; Roads; Robotics; Security

20070008541 Carnegie-Mellon Univ., Pittsburgh, PA USA
Adaptive, Hands-Off Stream Mining
Papadimitriou, Spiros; Brockwell, Anthony; Faloutsos, Christos; Dec 2002; 32 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N66001-00-1-8936
Report No.(s): AD-A461108; CMU-CS-02-205; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461108

Sensor devices and embedded processors are becoming ubiquitous, especially in measurement and monitoring applications. Automatic discovery of patterns and trends in the large volumes of such data is of paramount importance. The combination of relatively limited resources (CPU, memory and/or communication bandwidth and power) poses some interesting challenges. We need both powerful and concise languages to represent the important features of the data, which can (a) adapt and handle arbitrary periodic components, including bursts, and (b) require little memory and a single pass over the data. This allows sensors to automatically (a) discover interesting patterns and trends in the data, and (b) perform outlier detection to alert users. We need a way so that a sensor can discover something like the hourly phone call volume so far follows a daily and a weekly periodicity, with bursts roughly every year, which a human might recognize as, e.g., the Mother's Day surge. When possible and if desired, the user can then issue explicit queries to further investigate the reported patterns. In this work we propose AWSOM (Arbitrary Window Stream mOdeling Method), which allows sensors operating in remote or hostile environments to discover patterns efficiently and effectively, with practically no user intervention. Our algorithms require limited resources and can thus be incorporated in individual sensors, possibly alongside a distributed query processing engine [CCC+02, BGS01, MSHR02]. Updates are performed in constant time, using sub-linear (in fact, logarithmic) space. Existing, state of the art forecasting methods (AR, SARIMA, GARCH, etc.) fall short on one or more of these requirements. To the best of our knowledge, AWSOM is the first method that has all the above characteristics.
DTIC
Data Mining; Detection; Information Retrieval; Mining; Pattern Recognition; Remote Sensing

20070008543 Carnegie-Mellon Univ., Pittsburgh, PA USA
A Description and Evaluation of PARAGON's Type Hierarchies for Data Abstraction
Sherman, Mark; Jan 1989; 30 pp.; In English
Contract(s)/Grant(s): F33615-81-K-1539; ARPA ORDER-3597
Report No.(s): AD-A461110; CMU-ITC-078; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461110

The goals of Paragon can be grouped into three broad classes: abstract data type specification goals, abstract data type representation goals and automatic-processing goals. The paper demonstrates how a type hierarchy [Technically, a directed acyclic graph of types, but type hierarchy is a more commonly used term.] can be used for writing programs using the object-manager model to specify abstractions, refine the specifications, write representations for the abstractions and combine representations as desired. These capabilities are not available in current languages, so the Paragon design shows how type hierarchies can be used in new language designs. A number of programs were written and translated with a prototype system that processes Paragon, thus the suggested language is not a mere paper design, but a complete language that can be implemented and used for programming. However, its age in a rapidly advancing field is showing, and a significant redesign would be required to be used as a production system.
DTIC
Data Processing; Hierarchies

20070008545 Carnegie-Mellon Univ., Pittsburgh, PA USA
Automatic Modeling and Localization for Object Recognition
Wheeler, Mark D; Oct 25, 1996; 143 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAH04-94-G-0006
Report No.(s): AD-A461112; CMU-CS-96-188; No Copyright; Avail.: CASI: A07, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461112

Being able to accurately estimate an object's pose (location) in an image is important for practical implementations and applications of object recognition. Recognition algorithms often trade off accuracy of the pose estimate for efficiency -- usually resulting in brittle and inaccurate recognition. One solution is object localization -- a local search for the object's true pose given a rough initial estimate of the pose. Localization is made difficult by the unfavorable characteristics (for example, noise, clutter, occlusion and missing data) of real images. In this thesis, we present novel algorithms for localizing 3D objects in 3D range-image data (3D-3D localization) and for localizing 3D objects in 2D intensity-image data (3D-2D localization). Our localization algorithms utilize robust statistical techniques to reduce the sensitivity of the algorithms to the noise, clutter, missing data, and occlusion which are common in real images. Our localization results demonstrate that our algorithms can accurately determine the pose in noisy, cluttered images despite significant errors in the initial pose estimate. Acquiring accurate object models that facilitate localization is also of great practical importance for object recognition. In the past, models for recognition and localization were typically created by hand using computer-aided design (CAD) tools. Manual modeling suffers from expense and accuracy limitations. In this thesis, we present novel algorithms to automatically construct object-localization models from many images of the object. We present a consensus-search approach to determine which parts of the image justifiably constitute inclusion in the model. Using this approach, our modeling algorithms are relatively insensitive to the imperfections and noise typical of real image data. Our results demonstrate that our modeling algorithms can construct very accurate geometric models from rather noisy input data.
DTIC
Models; Pattern Recognition; Position (Location)

20070008549 Carnegie-Mellon Univ., Pittsburgh, PA USA
Motion Estimation from Image and Inertial Measurements
Strelow, Dennis W; Nov 2004; 169 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F08630-03-0024; MDA972-01-9-0017
Report No.(s): AD-A461118; CMU-CS-04-178; No Copyright; Avail.: CASI: A08, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461118

Robust motion estimation from image measurements would be an enabling technology for Mars rover, micro air vehicle, and search and rescue robot navigation; modeling complex environments from video; and other applications. While algorithms exist for estimating six degree of freedom motion from image measurements, motion from image measurements suffers from inherent problems. These include sensitivity to incorrect or insufficient image feature tracking; sensitivity to camera modeling and calibration errors; and long-term drift in scenarios with missing observations, i.e., where image features enter and leave the field of view. The integration of image and inertial measurements is an attractive solution to some of these problems. Among other advantages, adding inertial measurements to image-based motion estimation can reduce the sensitivity to incorrect image feature tracking and camera modeling errors. On the other hand, image measurements can be exploited to reduce the drift that results from integrating noisy inertial measurements, and allows the additional unknowns needed to interpret inertial measurements, such as the gravity direction and magnitude, to be estimated. This work has developed both batch and recursive algorithms for estimating camera motion, sparse scene structure, and other unknowns from image, gyro, and accelerometer measurements. A large suite of experiments uses these algorithms to investigate the accuracy, convergence, and sensitivity of motion from image and inertial measurements. Among other results, these experiments show that the correct sensor motion can be recovered even in some cases where estimates from image or inertial estimates alone are grossly wrong, and explore the relative advantages of image and inertial measurements and of omnidirectional images for motion estimation.
DTIC
Algorithms; Cameras; Image Processing; Inertial Platforms; Measurement; Motion

20070008583 Carnegie-Mellon Univ., Pittsburgh, PA USA
Discriminative Distance Measures for Object Detection
Mahamud, Shyjan; Dec 2002; 140 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-00-1-0915
Report No.(s): AD-A461172; CMU-CS-02-161; No Copyright; Avail.: CASI: A07, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461172

The reliable detection of an object of interest in an input image with arbitrary background clutter and occlusion has to a large extent remained an elusive goal in computer vision. Traditional model-based approaches are inappropriate for a multi-class object detection task primarily due to difficulties in modeling arbitrary object classes. Instead, we develop a detection framework whose core component is a nearest neighbor search over object parts. The performance of the overall system is critically dependent on the distance measure used in the nearest neighbor search. A distance measure that minimizes the mis-classification risk for the 1-nearest neighbor search can be shown to be the probability that a pair of input measurements belong to different classes. This pair-wise probability is not in general a metric distance measure. Furthermore, it can out-perform any metric distance, approaching even the Bayes optimal performance. In practice, we seek a model for the optimal distance measure that combines the discriminative powers of more elementary distance measures associated with a collection of simple feature spaces that are easy and efficient to implement; in our work, we use histograms of various feature types like color, texture and local shape properties. For performing efficient nearest neighbor search over large training sets, the linear model was extended to discretized distance measures that combines distance measures associated with discriminators organized in a tree-like structure. Finally, the nearest neighbor search over object parts was integrated into a whole object detection system and evaluated against both an indoor detection task as well as a face recognition task yielding promising results.
DTIC
Detection; Images

20070008639 SRI International Corp., Menlo Park, CA USA
Procedural Knowledge
Georgeff, Michael P; Lansky, Amy L; Jan 1987; 34 pp.; In English
Contract(s)/Grant(s): N00014-80-C-0296; N00014-85-C-0251
Report No.(s): AD-A461266; SRI-TN-411; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461266

Much of commonsense knowledge about the real world is in the form of procedures or sequences of actions for achieving particular goals. In this paper, a formalism is presented for representing such knowledge using the notion of process. A declarative semantics for the representation is given, which allows a user to state facts about the effects of doing things in the problem domain of interest. An operational semantics is also provided, which shows how this knowledge can be used to achieve particular goals or to form intentions regarding their achievement. Given both semantics, our formalism additionally serves as an executable specification language suitable for constructing complex systems. A system based on this formalism is described, and examples involving control of an autonomous robot and fault diagnosis for NASA's space shuttle are provided.
DTIC
Artificial Intelligence; Planning; Semantics

20070008668 Indigo Systems Corp., Goleta, CA USA
TOD Versus MRT When Evaluating Thermal Imagers that Exhibit Dynamic Performance
Kostrzewa, Joseph; Long, John; Graff, John; Vincent, John D; Jan 2003; 14 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N66001-01-C-8054
Report No.(s): AD-A461310; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461310

While it is universally recognized that image quality of a thermal sensor is a strong function of spatial uniformity, the metrics commonly used to assess performance do not adequately measure the effectiveness of non-uniformity correction (NUC). Image uniformity is generally not static, particularly if correction terms are updated intermittently (with periodic shuttering) or gradually (with scene-based NUC). Minimum Resolvable Temperature (MRT), the most prevalent test for characterizing overall imaging performance, is poorly suited for characterizing dynamic performance. The Triangle Orientation Discrimination (TOD) metric proposed by Bijl and Valeton, because of its short observation window, provides better capability for evaluating sensors that exhibit non-negligible uniformity drift. This paper compares the effectiveness of MRT and TOD for measuring dynamic performance. TOD measurements of a shutter-based thermal imager are provided immediately after shutter correction and 3 minutes later. The drift in TOD performance shows excellent correlation to drift in system noise.
DTIC
Flir Detectors; Infrared Instruments

20070008681 University of Southern California, Marina del Rey, CA USA

The Effect of Affect: Modeling the Impact of Emotional State on the Behavior of Interactive Virtual Humans

Marsella, Stacy; Gratch, Jonathan; Rickel, Jeff; Jan 2001; 6 pp.; In English

Contract(s)/Grant(s): DAAD19-99-C-0046

Report No.(s): AD-A461332; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA461332

A person s behavior provides significant information about their emotional state, attitudes, and attention. Our goal is to create virtual humans that convey such information to people while interacting with them in virtual worlds. The virtual humans must respond dynamically to the events surrounding them, which are fundamentally influenced by users actions, while providing an illusion of human-like behavior. A user must be able to interpret the dynamic cognitive and emotional state of the virtual humans using the same nonverbal cues that people use to understand one another. Towards these goals, we are integrating and extending components from three prior systems: a virtual human architecture with a range of cognitive and motor capabilities, a model of emotional appraisal, and a model of the impact of emotional state on physical behavior. We describe the key research issues, our approach, and an initial implementation in an Army peacekeeping scenario.

DTIC

Computerized Simulation; Emotional Factors

20070008690 Army Tank-Automotive Research and Development Command, Warren, MI USA

Insider's View of the 2004 DARPA Grand Challenge

Kania, Robert T; Frederick, Philip A; Jaczkowski, Jeff; Jun 2, 2004; 9 pp.; In English

Report No.(s): AD-A461364; PN-14065; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461364

The DARPA Grand Challenge was a competition between autonomous ground vehicles racing between Los Angeles and Las Vegas in March of 2004. According to DARPA, 'The purpose of the challenge is to leverage American ingenuity to accelerate the development of autonomous vehicle technologies that can be applied to military requirements.' This paper focuses on some of the innovations, in mobility and perception, utilized on vehicles at the competition from the perspective of DOE volunteers involved with vehicle inspection, start line qualification, vehicle following, and finish line verification.

DTIC

Artificial Intelligence; Signal Processing

20070008799 University of Southern California, Marina del Rey, CA USA

Projector-Camera Systems for Immersive Training

Treskunov, Anton; Pair, Jarrell; Jan 2006; 6 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-99-D-0046

Report No.(s): AD-A461567; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461567

Real time computer graphics are limited in that they can only be displayed on projection screens and monitors. Monitors and projection screens cannot be used in live fire training or scenarios in which the displays could be physically damaged by trainees. To address this issue, we have developed projection systems using computer vision based color correction and image processing to project onto non-ideal surfaces such as painted walls, cinder blocks, and concrete floors. These projector-camera systems effectively paint the real world with digital light. Any surface can become an interactive projection screen allowing unprepared spaces to be transformed into an immersive environment. Virtual bullet holes, charring, and cracks can be added to real doors, walls, tables, chairs, cabinets, and windows. Distortion correction algorithms allow positioning of projection devices out of the field of view of trainees and their weapons. This paper describes our motivation and approach for implementing projector-camera systems for use within the FlatWorld wide area mixed reality system.

DTIC

Cameras; Computer Vision; Education; Projectors

20070008853 SRI International Corp., Menlo Park, CA USA

Evidential Knowledge-Based Computer Vision

Wesley, Leonard P; Jan 21, 1986; 65 pp.; In English

Contract(s)/Grant(s): N00014-81-C-0115; N00014-82-K-0464

Report No.(s): AD-A461629; SRI-TN-374; No Copyright; Avail.: CASI: A04, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461629

It has been argued that knowledge-based systems (KBS) must reason from evidential information - i.e., information that is to some degree uncertain, imprecise, and occasionally inaccurate. This is no less true of KBS that operate in the domain of computer-based image interpretation. Recent research has suggested that the work of Dempster and Shafer (DS) provides a viable alternative to Bayesian-based techniques for reasoning from evidential information. In this paper, we discuss some of the differences between the DS theory and some popular Bayesian-based approaches to effecting the reasoning task. We then discuss some work on integrating the DS theory into a knowledge-based high-level computer vision system in order to examine various aspects of this new technology that have not been explored to date. Results from a large number of image interpretation experiments will be presented. These results suggest that a KBS's performance improves substantially when it exploits various features of the DS theory that are not readily available in pure Bayesian-based approaches.
DTIC
Computer Vision; Knowledge Based Systems

20070008856 Alphatech, Inc., Burlington, MA USA
Autonomous Agents with Application to the Evaluation of Organizational Structures
Curry, Michael L; Jan 1999; 8 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-95-C-0125
Report No.(s): AD-A461632; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461632

Experimental investigation of adaptive command and control (C2) organizations is limited in scope by the availability of qualified subjects and the complexity of experimental design and analysis for large organizational structures. These limitations challenge the study of adaptive architectures for command and control (A2C2) to represent a realistic command and control environment with a small number of human participants. This paper presents a method of representing large organizations by introducing autonomous agents that simulate additional decision-makers. These agents not only interact with the human participants via message communication, but they also interact with the environment, which indirectly affects the human participants and contributes to a more realistic environment. Since the agents act as additional uncontrolled factors and increase the variability of the experiment, it is important to control their actions such that the variability is minimized (or at least controlled). In this paper, the controllability issue is addressed by scripting agents' actions. The paper also identifies some of the challenges involved in the development of truly interactive and collaborative agents for developing, assessing, and training large C2 organizations, and suggests a course of action for the development of such agents.
DTIC
Artificial Intelligence; Autonomy; Combat; Command and Control; Decision Making; Evaluation; Organizations; Simulation; System Effectiveness

20070008865 Massachusetts Univ., Lowell, MA USA
A 3D Polar Processing Algorithm for Scale Model UHF ISAR Imaging
Beaudoin, Christopher J; Gatesman, Andrew J; Giles, Robert H; Waldman, Jerry; Nixon, William E; May 2006; 12 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461643; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461643

In recent years, UHF synthetic aperture radar has become a growing area of interest among the radar community. Due to their relatively long wavelengths, UHF systems provide advantages that may not be attainable by microwave and millimeter-wave radar systems. These advantages include excellent target detection statistics in high clutter environments, wide-area surveillance, and long stand-off ranges. UHF systems also have proven synergistic properties with higher frequency radar systems in applications such as topographical mapping. However, the ability to study the characteristics of these lower frequency radar systems in a controlled and systematic environment is difficult. In this work, a physical scale modeling process is utilized to generate three-dimensional UHF imagery that may be used to study scattering phenomenology at these wavelengths. Dimensionally and dielectrically scaled targets and scenes are measured in a 6 18 GHz microwave compact range to model the backscatter of the full-size target at UHF wavelengths. The microwave compact radar range and transceiver hardware utilized to model UHF radar signature data are briefly described. A description of the image processor used to generate three-dimensional UHF imagery from wide-band/wide-angle data collections is described as well. Finally, imagery of radar signature data collected from a M1A1 Abrams main battle tank model is examined. The high resolution imagery resulting from the wide-band/wide-angle collection will show that sub-wavelength features of ground targets are resolvable at these wavelengths.
DTIC
Algorithms; Image Processing; Imaging Techniques; Scale Models; Synthetic Aperture Radar; Ultrahigh Frequencies

20070008866 Massachusetts Univ., Lowell, MA USA

A Comparison of Fully Polarimetric X-Band ISAR Imagery of Scaled Model Tactical Targets

Goyette, Thomas M; Dickinson, Jason C; Giles, Robert; Waldman, Jerry; Nixon, William E; May 2006; 11 pp.; In English; Original contains color illustrations

Report No.(s): AD-A461644; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461644

Construction of the new 350GHz compact range has been completed and it is able to collect fully polarimetric scaled X-band radar data with 6-inch full-scale range resolution. In order to investigate the reproduction of X-band data using scale models, fully polarimetric high-resolution radar signature data has been collected on several targets which include a high-fidelity in-house built 1/16th scale T72 Main Battle Tank (MBT) and a commercially available 1/35th scale model T72 modified to match its features. A correlation study of ISAR images has been performed between the X-band data sets collected on these models, a full-scale T72, a 1/35th scale model heavy equipment transporter, and several different 1/16th scaled targets of similar size. The ISAR images formed from the data were compared using several techniques which include a two-dimensional cross-correlation of the images against one another, and the comparison of the images pixel-by-pixel to measure the percentage differences. It will be shown that the T72 data sets compare well across the three different radar platforms. It has also been found that there are persistent sharp features in the two-dimensional cross-correlation maps that are located where the real target is matched even when other parameters have changed by a significant amount. These features continue to occur when the target has been imbedded in a complex two-target scene with the heavy equipment transporter. DTIC

Imagery; Polarimetry; Radar Imagery; Superhigh Frequencies; Targets

20070008867 Massachusetts Univ., Lowell, MA USA

Acquisition of UHF and X-Band ISAR Imagery Using 1/35th Scale-Models

Goyette, Thomas M; Dickinson, Jason C; Beaudoin, Christopher; Gatesman, Andrew J; Giles, Robert; Waldman, Jerry; Nixon, William E; May 2005; 11 pp.; In English; Original contains color illustrations

Report No.(s): AD-A461645; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461645

Radar detection and identification of ground targets in diverse environments is a subject of continuing interest. It has long been known that different radar bands have advantages for different environmental conditions. For example, it has been shown that detection of targets under foliage is more easily accomplished using longer wavelength radars since there is less attenuation at these frequencies. However, higher frequency radars offer greater resolution that is crucial in target identification. Because each radar band has its own unique strengths and weakness, one current approach is the use of dual-band radar platforms. With two radar bands working simultaneously, the strengths of each radar band can be used to compliment the other. ERADS has constructed two full polarimetric compact radar ranges to acquire X-Band and UHF ISAR imagery data using 1/35th scale models. The new compact ranges allow data to be taken that can simulate a multi-frequency radar platform with frequencies low enough to detect obscured targets and high enough to provide useful resolution to aid in target identification once they have been detected. Since both compact ranges use the same scale factor, this allows measurement of the same target at the two spectral regions simply by moving the target model from one compact range to the other. Data can thus be taken whose differences in scattering are due only to the difference in radar frequency, eliminating variations due to differences in target models as well as the surrounding ground clutter. Detailed descriptions of the new compact ranges will be presented along with results from sample data sets. DTIC

Imagery; Models; Radar Signatures; Scale Models; Superhigh Frequencies; Ultrahigh Frequencies

20070008872 SRI International Corp., Menlo Park, CA USA

The Stereo Challenge Data Base

Hannah, Marsha J; Oct 10, 1985; 22 pp.; In English

Contract(s)/Grant(s): MDA903-83-C-0027

Report No.(s): AD-A461652; TN-366; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461652

No abstract available

Data Bases; Image Processing

20070008876 SRI International Corp., Menlo Park, CA USA
One-Eyed Stereo: A Unified Strategy to Recover Shape From a Single Image
Strat, Thomas M; Fischler, Martin A; Nov 5, 1985; 32 pp.; In English
Contract(s)/Grant(s): MDA903-83-C-0027
Report No.(s): AD-A461657; TN-367; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461657

A single two-dimensional image is an ambiguous representation of the three- dimensional world many different scenes could have produced the same image yet the human visual system is extremely successful at recovering a qualitatively correct depth model from this type of representation. Workers in the field of computational vision have devised a number of distinct schemes that attempt to emulate this human capability; these schemes are collectively known as 'shape from ....' methods (e.g., shape from shading, shape from texture, or shape from contour). In this paper we contend that the distinct assumptions made in each of these schemes must be tantamount to providing a second (virtual) image of the original scene, and that any one of these approaches can be translated into a conventional stereo formalism. In particular, we show that it is frequently possible to structure the problem as one of recovering depth from a stereo pair consisting of the supplied perspective image (the original image) and an hypothesized orthographic image (the virtual image). We present a new algorithm of the form required to accomplish this type of stereo reconstruction task.
DTIC
Image Processing; Shapes

20070008945 SRI International Corp., Menlo Park, CA USA
Using Causal Rules in Planning
Wilkins, David E; Jul 1987; 21 pp.; In English
Contract(s)/Grant(s): F49620-85-K-0001
Report No.(s): AD-A461784; SRI-TN-410R; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461784

Reasoning about actions necessarily involves tracking the truth of assertions about the world over time. The SIPE planning system retains the efficiency of the STRIPS assumption for this while enhancing expressive power by allowing the specification of a causal theory. Separation of knowledge about causality from knowledge about actions relieves operators of much of their representational burden and allows them to be applicable in a wide range of contexts. The implementation of causal rules is described, together with examples and evaluations of the system's expressive power and efficiency.
DTIC
Artificial Intelligence; Planning

20070008946 SRI International Corp., Menlo Park, CA USA
Behavioral Specification and Planning for Multiagent Domains
Lansky, Amy L; Nov 12, 1985; 57 pp.; In English
Contract(s)/Grant(s): N00014-85-C-0251
Report No.(s): AD-A461786; SRI-TN-360; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461786

This report discusses a new approach to the specification of properties of multiagent environments and the generation of plans for such domains. The ideas presented elaborate previous work on a formal, behavioral model of concurrent action, called GEM (the Group Element Model). By combining the GEM specification formalism with artificial intelligence techniques for planning, we have devised a framework that seems promising in several respects. First, instead of ad hoc planning techniques, we are utilizing a formal concurrency model as a basis for planning. Secondly, the model encourages the description of domain properties in terms of behavioral constraints, rather than using more traditional state predicate approaches. Behavioral descriptions, which emphasize the causal, temporal, and simultaneity relationships among actions, are particularly suited to describing the complex properties of multiagent domains. Finally, we present an initial proposal for a planner based on behavioral forms of representation. Given a set of constraints describing a problem domain, the proposed planner generates plans through a process of incremental constraint satisfaction.
DTIC
Domains; Planning

20070008989 SRI International Corp., Menlo Park, CA USA
Shading Into Texture
Pentland, Alex P; Oct 2, 1986; 26 pp.; In English
Report No.(s): AD-A461875; SRI-AIC-TN-398; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461875

Current shape-from-shading and shape-from-texture methods are applicable only to smooth surfaces, while real surfaces are often rough and crumpled. To extend such methods to real surfaces, we must have a model that also applies to rough surfaces. The fractal surface model provides a formalism that is competent to describe such natural 3-D surfaces and, in addition, is able to predict human perceptual judgments of smoothness versus roughness. We have used this model of natural surface shapes to derive a technique for 3-D shape estimation that treats shaded and textured surfaces in a unified manner. DTIC

Shapes; Surface Roughness; Textures

20070008990 SRI International Corp., Menlo Park, CA USA
A Knowledge-Based Architecture for Organizing Sensory Data
Smith, Grahame B; Strat, Thomas M; Dec 16, 1986; 14 pp.; In English
Contract(s)/Grant(s): DACA76-85-C; -0004
Report No.(s): AD-A461876; SRI-AIC-TN-399; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461876

This paper describes an architecture for an information manager that is at the core of a sensor-based autonomous system. The architecture provides the means by which sensor based data can be integrated with stored knowledge to provide the information needed for autonomous behavior. The overall architecture can be viewed as a community of independent processes each of which interact with an active database whose structure mirrors that of the three-dimensional world. DTIC

Computer Vision; Knowledge Based Systems

20070009049 Carnegie-Mellon Univ., Pittsburgh, PA USA
Segway CMBalance Robot Soccer Player
Searock, Jeremy; Browning, Brett; Veloso, Manuela; May 2004; 18 pp.; In English
Contract(s)/Grant(s): DABT63-99-1-0013
Report No.(s): AD-A461062; CMU-CS-04-143; No Copyright; Avail.: CASI: A03, Hardcopy

The Segway LLC company has provided a robust mobility platform on which to research human/robot coordination in an adversarial environment. The Segway Human Transporter (HT) is a one person dynamically self-balancing transportation vehicle. The Segway Robot Mobility Platform (RMP) is a modification of the Human Transporter capable of being programmed for autonomous operation. With these platforms, human/robot coordination is being investigated through the competitive game, Segway Soccer. The game is played between robots (RMPs) and humans (riding HTs), who can be teammates or opponents. The rules of the game are a combination of soccer and ultimate Frisbee rules. This paper describes the design of the mechanical systems necessary to allow the Segway RMP to safely and effectively play a competitive game of Segway Soccer along with humans. Specifically, the challenge of designing a soccer ball manipulation/kicking system is described in depth. DTIC

Mobility; Recreation; Robots

20070009124 Soar Technology, Inc., Ann Arbor, MI USA
An Intelligent Interface-Agent Framework for Supervisory Command and Control
Wood, Scott D; Zaientz, Jack; Beard, Jonathon; Frederiksen, Richard; Lisse, Sean; Crossman, Jacob; Huber, Marcus; Jan 2004; 26 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DASW01-03-C-0019; F30602-03-C-0022
Report No.(s): AD-A461971; No Copyright; Avail.: CASI: A03, Hardcopy

The Army's vision of the future for armored and mechanized military structure includes the use of mixed teams of human and robotic forces on a dynamic and rapidly changing battlefield. Successful implementation of this vision will require autonomous and semi-autonomous robotic forces and a command and control infrastructure that will allow human, robotic, and mixed teams to be controlled quickly and easily. For maximum effectiveness this infrastructure should allow human

commanders to control the robot teams in a similar manner to how they command human teams, that is, in the language of the military, not the language of robotic control theory. Furthermore, the human interface for robotic command and control must simplify warfighter tasks and automate processes such that cognitive workload is reduced, situation awareness is enhanced, and situational control is preserved. In this paper we present initial results from ongoing efforts in developing an intelligent user interface for controlling mixed elements of manned and robotic forces. We have developed a C3 framework of cooperative interface agents that reflect roles found in military command staffs to create a virtual staff for the commander of robotic forces by embedding these military functions within the C3 interface.
DTIC
Command and Control; Robotics

20070009168 Case Western Reserve Univ., Cleveland, OH USA
Adaptive Control Responses to Behavioral Perturbation Based Upon the Insect
Ritzmann, R E; Quinn, R D; Willis, M A; Perry, Chris E; Nov 2006; 29 pp.; In English
Contract(s)/Grant(s): F08630-03-1-0003; Proj-2502
Report No.(s): AD-A462028; RES423238-ACR; No Copyright; Avail.: CASI: A03, Hardcopy

The Munitions Directorate at Eglin AFB FL supported research at Case Western Reserve University (CWRU) in Cleveland OH describing transitional behaviors in insect walking and in flight. Quantitative descriptions of the complex decisions that a cockroach makes in deciding to climb over or tunnel under a barrier allowed the examinations of discrete brain lesions in order to pin point where and how these decisions are made. Documentation of turning movements developed hypotheses regarding how descending cues might alter local reflexes to turn the animal while retaining stability. Lesions in the brain and subsequent recordings demonstrated how the descending commands might be formulated within the brain. A robotic leg was developed (hardware model of the system)and could play a critical role in testing our hypotheses at a systems level. The obtained results also positioned CWRU to move ahead with new funding initiatives. The brain recording and stimulation projects that were initiated during this research effort are now funded by an NSF grant to the Ritzmann laboratory at CWRU. In addition, the projects that were undertaken to understand the alterations that occur at the local control level in response to descending commands is being pursued as a proposal to AFOSR.
DTIC
Adaptive Control; Brain; Hypotheses; Insects; Lesions; Perturbation; Robotics

20070009285 University of Southern California, Los Angeles, CA USA
Multi-robot Dynamic Coverage of a Planar Bounded Environment
Batalin, Maxim A; Sukhatme, Gaurav S; Jan 2003; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DABT63-99-1-0015
Report No.(s): AD-A462208; CRES-03-011; No Copyright; Avail.: CASI: A02, Hardcopy

The traditional approach to measure the efficiency of a (static) coverage task is the ratio of the intersection of the areas covered by sensors, to the total free space in the environment. Here we address the dynamic coverage problem, which requires all areas of free space in the environment to be covered by sensors in as short a time as possible. We introduce a frequency coverage metric that measures the frequency of every-point coverage, and propose a decentralized algorithm that utilizes locally available information about the environment to address this problem. Our algorithm produces exploratory, patrol-like behavior. Robots deploy communication beacons into the environment to mark previously visited areas. These nodes act as local signposts for robots which subsequently return to their vicinity. By deploying such (stationary) nodes into the environment robots can make local decisions about their motion strategy. We analyze the proposed algorithm and compare it with a baseline approach - a modified version of a static coverage algorithm described in [1].
DTIC
Algorithms; Beacons; Detectors; Robots

20070009288 Michigan Univ., Ann Arbor, MI USA
Design and Analysis of a Flipping Controller for RHex
Saranli, Uluc; Koditschek, Daniel E; Jan 2003; 19 pp.; In English; Original contains color illustrations
Report No.(s): AD-A462213; No Copyright; Avail.: CASI: A03, Hardcopy

We report on the design and analysis of a controller that can achieve dynamical self-righting of our hexapedal robot, RHex. We present an empirically tuned controller that works reasonably well on indoor surfaces, using a hybrid energy pumping strategy to overcome torque limitations of its actuators. Subsequent modeling and analysis yields a new controller

with a much wider domain of success as well as a preliminary understanding of the hybrid control strategy. Simulation results demonstrate the superiority of the improved control strategy relative to the first generation empirically designed controller.
DTIC
Control; Controllers; Design Analysis; Locomotion; Robots

20070009297 Baker (Wilfred) Engineering, Inc., San Antonio, TX USA
Translation Templates to Support Strategy Development in PVS
Lim, Hongping; Archer, Myla; Aug 16, 2006; 17 pp.; In English
Report No.(s): AD-A462234; No Copyright; Avail.: CASI: A03, Hardcopy

In presenting specifications and specification properties to a theorem prover, there is tension between convenience for the user and convenience for the theorem prover. A choice of specification formulation that is most natural to a user may be the ideal formulation for reasoning about that specification in a theorem prover. However, when the theorem prover is being integrated into a system development framework, a desirable goal of the integration is to make use of the theorem prover as easy as possible for the user. In such a context, it is possible to have the best of both worlds: specifications that are natural for a system developer to write in the language of the development framework, and representations of these specifications that are well matched to the reasoning techniques provided in the prover. In a tactic-based prover, these reasoning techniques include the use of tactics (or strategies) that can rely on certain structural elements in the theorem prover's representation of specifications. This paper illustrates how translation techniques used in integrating PVS into the TIOA (Timed Input/Output Automata) system development framework produce PVS specifications structured to support development of PVS strategies that implement reasoning steps appropriate for proving TIOA specification properties.
DTIC
Automata Theory; Templates; Theorems; Translating

20070009300 California Inst. of Tech., Pasadena, CA USA
Depth from Brightness of Moving Images
Soatto, Stefano; Perona, Pietro; Mar 12, 1995; 6 pp.; In English
Contract(s)/Grant(s): N00014-93-1-0990
Report No.(s): AD-A462238; CIT-CDS-95-008; No Copyright; Avail.: CASI: A02, Hardcopy

In this report, the authors describe a method for recursively estimating the depth of a scene from a sequence of images. The input to the estimator are brightness values at a number of locations on a grid in a video image, and the output is the relative (scaled) depth corresponding to each image-point. The estimator is invariant with respect to the motion of the viewer, in the sense that the motion parameters are not part of the state of the estimator and therefore the estimates do not depend on motion as long as there is enough parallax (i.e., the translational velocity is nonzero). This scheme is a 'direct' version of another algorithm previously presented by the authors for estimating depth from point-feature correspondence independent of motion.
DTIC
Brightness; Depth; Estimates; Images; Sequencing

20070009315 University of Southern California, Marina del Rey, CA USA
A Lighting Reproduction Approach to Live-Action Compositing
Debevec, Paul; Wenger, Andreas; Tchou, Chris; Gardner, Andrew; Waese, Jamie; Hawkins, Tim; Jul 26, 2002; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-99-D-0046
Report No.(s): AD-A462262; No Copyright; Avail.: CASI: A03, Hardcopy

We describe a process for compositing a live performance of an actor into a virtual set wherein the actor is consistently illuminated by the virtual environment. The Light Stage used in this work is a two-meter sphere of inward-pointing RGB light emitting diodes focused on the actor, where each light can be set to an arbitrary color and intensity to replicate a real-world or virtual lighting environment. We implement a digital two-camera infrared matting system to composite the actor into the background plate of the environment without affecting the visible-spectrum illumination on the actor. The color response of the system is calibrated to produce correct color renditions of the actor as illuminated by the environment. We demonstrate moving-camera composites of actors into real-world environments and virtual sets such that the actor is properly illuminated by the environment into which they are composited.
DTIC
Illuminating; Image Analysis; Image Processing; Lighting Equipment; Photomapping

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NUMERICAL ANALYSIS

Includes iteration, differential and difference equations, and numerical approximation.

20070007388 Maryland Univ., College Park, MD USA
Script-Independent Text Line Segmentation in Freestyle Handwritten Documents
Li, Yi; Zheng, Yefeng; Doermann, David; Jaeger, Stefan; Dec 2006; 29 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): MDA904-02-C-0406
Report No.(s): AD-A460371; CS-TR-4836; UMIACS-TR-2006-51; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460371

Text line segmentation in freestyle handwritten documents remains an open document analysis problem. Curvilinear text lines and small gaps between neighboring text lines present a challenge to algorithms developed for machine printed or hand-printed documents. In this paper, we propose a novel approach based on density estimation and a state-of-the-art image segmentation technique, the level set method. From an input document image, we estimate a probability map, where each element represents the probability that the underlying pixel belongs to a text line. The level set method is then exploited to determine the boundary of neighboring text lines by evolving an initial estimate. Unlike most connected component based methods, the proposed algorithm does not use any script-specific knowledge. Extensive quantitative experiments on freestyle handwritten documents with diverse scripts, such as Arabic, Chinese, Korean, and Hindi, demonstrate that our algorithm consistently outperforms previous methods. Further experiments show the proposed algorithm is robust to scale change, rotation, and noise.
DTIC
Handwriting; Segments; Texts

20070007405 Carnegie-Mellon Univ., Pittsburgh, PA USA
Assume-Guarantee Reasoning for Deadlock
Chaki, Sagar; Sinha, Nishant; Sep 2006; 39 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8721-05-C-0003
Report No.(s): AD-A460424; CMU/SEI-2006-TN-028; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460424

The use of learning to automate assume-guarantee style reasoning has received a lot of attention in recent years. This paradigm has already been used successfully for checking trace containment, as well as simulation between concurrent systems and their specifications. In this report, the learning-based automated assume-guarantee paradigm is extended to perform compositional deadlock detection. Failure automata is defined as a generalization of finite automata that accept regular failure sets. A learning algorithm LF is developed that constructs the minimal deterministic failure automaton accepting any unknown regular failure set using a minimally adequate teacher. This report shows how LF can be used for compositional regular failure language containment and deadlock detection, using non-circular and circular assume-guarantee rules. Finally, an implementation of techniques and encouraging experimental results on several nontrivial benchmarks are presented.
DTIC
Algorithms; Learning

20070007525 Brown Univ., Providence, RI USA
Modeling Uncertainty in Steady State Diffusion Problems via Generalized Polynomial Chaos
Xiu, Dongbin; Karniadakis, George E; Jul 25, 2002; 28 pp.; In English
Report No.(s): AD-A460658; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA460658

We present a generalized polynomial chaos algorithms for the solution of stochastic elliptic partial differential equations subject to uncertain inputs. In particular, were focus on the solution of the Poisson equation with random diffusivity, forcing and boundary conditions. The stochastic input and solution are represented spectrally by employing the orthogonal polynomial functionals from the Askey scheme, as a generalization of the original polynomial chaos idea of Wiener (1938). A Galerkin projection in random space is applied to derive the equations in the weak form. The resulting set of deterministic equations for each random mode is solved iteratively by a block Gauss-Seidel iteration technique. Both discrete and continuous random

distributions are considered, and convergence is verified in model problems and against Monte Carlo simulations.
DTIC
Algorithms; Chaos; Differential Equations; Diffusion; Polynomials; Steady State

20070007659 California Univ., Santa Cruz, CA USA
Local Detectors for High-Resolution Spectral Analysis: Algorithms and Performance
Shahram, Morteza; Milanfar, Peyman; Jan 2005; 13 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): CCR-9984246; F49620-03-1-0387
Report No.(s): AD-A460914; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460914

This paper develops local signal detection strategies for spectral resolution of frequencies of nearby tones. The problem of interest is to decide whether a received noise-corrupted and discrete signal is a single-frequency sinusoid or a double-frequency sinusoid. This paper presents an extension to M. Shahram and P. Milanfar (On the resolvability of sinusoids with nearby frequencies in the presence of noise, IEEE Trans. Signal Process., to appear, available at http://www.soe.ucsc.edu/~milanfar) the case where the noise variance is unknown. A general signal model is considered where the frequencies, amplitudes, phases and also the level of the noise variance is unknown to the detector. We derive a fundamental trade-off between SNR and the minimum detectable difference between the frequencies of two tones, for any desired decision error rate. We also demonstrate that the algorithm, when implemented in a practical scenario, yields significantly better performance compared to the standard subspace-based methods like MUSIC. It is also observed that the performance for the case where the noise variance is unknown, is very close to that when the noise variance is known to the detector.
DTIC
Algorithms; Detection; Detectors; High Resolution; Likelihood Ratio; Signal Detection; Signal Processing; Spectra; Spectrum Analysis

20070007663 California Univ., Santa Cruz, CA USA
Statistical and Information-Theoretic Analysis of Resolution in Imaging
Shahram, Morteza; Milanfar, Peyman; Aug 2006; 28 pp.; In English
Contract(s)/Grant(s): F49620-03-1-0387; CCR-9984246
Report No.(s): AD-A460918; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460918

In this paper, some detection-theoretic, estimation- theoretic, and information-theoretic methods are investigated to analyze the problem of determining resolution limits in imaging systems. The canonical problem of interest is formulated based on a model of the blurred image of two closely spaced point sources of unknown brightness. To quantify a measure of resolution in statistical terms, the following question is addressed: 'What is the minimum detectable separation between two point sources at a given signal-to-noise ratio (SNR), and for prespecified probabilities of detection and false alarm (Pd and Pf)?'. Furthermore, asymptotic performance analysis for the estimation of the unknown parameters is carried out using the Cram r Rao bound. Although similar approaches to this problem (for one-dimensional (1-D) and oversampled signals) have been presented in the past, the analyzes presented in this paper are carried out for the general two-dimensional (2-D) model and general sampling scheme. In particular the case of under-Nyquist (aliased) images is studied. Furthermore, the Kullback Liebler distance is derived to further confirm the earlier results and to establish a link between the detection-theoretic approach and Fisher information. To study the effects of variation in point spread function (PSF) and model mismatch, a perturbation analysis of the detection problem is presented as well.
DTIC
Detection; Fisher Information; Imaging Techniques; Information Theory; Perturbation Theory; Resolution; Statistical Analysis

20070008140 Naval Academy, Annapolis, MD USA
The McCallum Projection, Lifting, and Order-Invariance
Brown, Christopher W; May 3, 2005; 16 pp.; In English
Report No.(s): AD-A460719; USNA-CS-TR-2005-02; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460719

The McCallum Projection for Cylindrical Algebraic Decomposition (CAD) produces a smaller projection factor set than previous projections, however it does not always produce a sign-invariant CAD for the set of input polynomials. Problems may

arise when a (k+1)-level projection factor vanishes identically over a k-level cell. According to McCallum's paper, when this happens (and the k+1 is not the highest level in the CAD) we do not know whether the projection is valid, i.e. whether or not a sign-invariant CAD for the set of input polynomials will be produced when lifting is performed in the usual way. When the k-level cell in question has dimension 0, McCallum suggests a modification of the lifting method that will ensure the validity of his projection, although to my knowledge this has neve been implemented. In this paper we give easily computable criteria that often allow us to conclude that McCallum's projection is valid even though a projection factor vanishes identically over a cell. WE also improve on McCallum's modified lifting method. We have incorporated the ideas contained in this paper into QEPCAD, the most complete implementation of CAD. When McCallum's projection is invalid because of a projection factor not being order-invariant over a region on which it vanishes identically, at least a warning message ought to be issued. Currently, QEPCAD may print warning messages that are not needed, and may fail to print warning messages when they are needed. Our implementation in QEPCAD ensures that warning messages are printed when needed, and reduces the number of times warning messages are printed when not needed. Neither McCallum's modified lifting method nor our improvement of it have been implemented in QEPCAD- the design of the system would make implementing such a feature quite difficult.
DTIC
Algebra; Calculus; Cylindrical Bodies; Decomposition; Inequalities; Invariance; Polynomials

20070008148 Naval Academy, Annapolis, MD USA
An Algorithm for Improving System Safety via Software Fault Trees
Jones, Sean A; Needham, Donald M; May 26, 2005; 9 pp.; In English
Report No.(s): AD-A460495; USNA-CS-TR-2005-05; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460495

Analysis of software fault trees exposes hardware and software failure events that can lead to unsafe system states, and provides insight on improving safety throughout each phase of a system's development. Although fault trees can be pruned for low severity and low probability nodes, few techniques exist for systematically improving system safety by focusing on cost analysis of a system's fault tree nodes. In this paper, we present an algorithm for system failure mitigation, supportive of continuous software evolution, based on the reduction of a fault tree into a polynomial expression of degree g, where g is the number of inputs. We combine cost functions that model the expense of improving component reliability into a vector field which provides a measurement of the degree of difficulty of system improvement. The gradient of the vector field is evaluated for vectors providing steep assent towards the area of greatest safety improvement, which in turn provides guidance on improving design time system safety. We provide an example application of our improvement algorithm, and examine improvement verification of the resulting system modifications.
DTIC
Algorithms; Computer Programs; Fault Trees; Safety Factors; Systems Engineering

20070008188 Drexel Univ., Philadelphia, PA USA
Design, Optimization, and Implementation of a Universal FFT Processor
Kumhom, Pinit; Johnson, Jeremy; Nagvajara, Prawat; Sep 2000; 7 pp.; In English
Contract(s)/Grant(s): DABT63-98-1-0004
Report No.(s): AD-A460551; DU-MCS-00-01; No Copyright; Avail.: CASI: A02, Hardcopy

There exist Fast Fourier Transform (FFT) algorithms, called dimensionless FFTs, that work independent of dimension. These algorithms can be configured to compute different dimensional Discrete Fourier Transforms (DFTs) simply by relabeling the input data and by changing the values of the twiddle factors occurring in the butterfly operations. This observation allows one to design an FFT processor, which with minor reconfiguring can compute one, two, and three dimensional DFTs. In this paper, the authors design a family of FFT processors, parameterized by the number of points, the dimension, the number of processors, and the internal data flow, and show how to map different dimensionless FFTs onto this hardware design. Different dimensionless FFTs have different data flows and consequently lead to different performance characteristics. Using a performance model, the authors search for the optimal algorithm for the family of processors they considered. The resulting algorithm and corresponding hardware design was implemented using FPGA.
DTIC
Architecture (Computers); Design Analysis; Design Optimization; Dimensionless Numbers; Fast Fourier Transformations; Fourier Transformation; Information Flow; Optimization; Parallel Processing (Computers)

20070008220 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Direct Calculation of the Scattering Amplitude Without Partial Wave Decomposition, III, Inclusion of Correlation Effects

Shertzer, Janine; Temkin, Aaron; [2007]; 2 pp.; In English; Copyright; Avail.: Other Sources; Abstract Only

In the first two papers in this series, we developed a method for studying electron-hydrogen scattering that does not use partial wave analysis. We constructed an ansatz for the wave function in both the static and static exchange approximations and calculated the full scattering amplitude. Here we go beyond the static exchange approximation, and include correlation in the wave function via a modified polarized orbital. This correlation function provides a significant improvement over the static exchange approximation: the resultant elastic scattering amplitudes are in very good agreement with fully converged partial wave calculations for electron-hydrogen scattering. A fully variational modification of this approach is discussed in the conclusion of the article Popular summary of Direct calculation of the scattering amplitude without partial wave expansion. III .....' by J. Shertzer and A. Temkin. In this paper we continue the development of In this paper we continue the development of a new approach to the way in which researchers have traditionally used to calculate the scattering cross section of (low-energy) electrons from atoms. The basic mathematical problem is to solve the Schroedinger Equation (SE) corresponding the above physical process. Traditionally it was always the case that the SE was reduced to a sequence of one-dimensional (ordinary) differential equations - called partial waves which were solved and from the solutions 'phase shifts' were extracted, from which the scattering cross section was calculated.

Derived from text

Scattering Amplitude; Correlation; Wave Functions

20070008459 Colorado State Univ., Fort Collins, CO USA

Advancing Air Force Scheduling through Modeling Problem Topologies

Howe, Adele; Whitley, L D; Aug 3, 2006; 30 pp.; In English

Contract(s)/Grant(s): F49620-03-1-0233

Report No.(s): AD-A460845; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460845

Because of the difficulties of obtaining data from real applications, researchers tend to develop their new algorithms on artificial problems and do not model what makes an algorithm successful. Developers then have little guidance on which algorithms are best for which applications. All of this makes it difficult for research results to transfer to deployment. Our project endeavored to ameliorate this situation by 1) modeling the topology of scheduling algorithms utilizing real problems of interest to the Air Force, 2) developing and evaluating new search algorithms by exploiting the modeled topology of real applications and 3) disseminating the problems, algorithms and results via a publicly available repository.

DTIC

Algorithms; Scheduling; Tasks; Topology

20070008480 New Mexico State Univ., Las Cruces, NM USA

An Interlingual-based Approach to Reference Resolution

Farwell, David; Helmreich, Stephen; Jan 2000; 12 pp.; In English

Contract(s)/Grant(s): N66001-99-1-8915

Report No.(s): AD-A460997; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460997

In this paper, we outline an interlingual-based procedure for resolving reference and suggest a practical approach to implementing it. We assume a two-stage language analysis system. First, a syntactic analysis of an input text results in a functional structure in which certain cases of pronominal reference are resolved. Second, the f-structure is mapped onto an interlingual representation. As part of this mapping, the reference of tile various f-structure elements is resolved resulting in the addition of information to certain existing IL objects (coreference) or in the creation of new IL objects which are added to the domain of discourse (initial reference).

DTIC

English Language; Linguistics; Natural Language Processing

20070008487 SRI International Corp., Menlo Park, CA USA
Evaluation of Scene-Analysis Algorithms
Laws, Kenneth I; Aug 1984; 17 pp.; In English
Contract(s)/Grant(s): MDA903-79-C-0588
Report No.(s): AD-A461007; TN-332; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461007

A software evaluation methodology has been developed at SRI International for evaluating contributions to the ARPA/DMA Image Understanding Testbed. This paper describes the criteria that have shaped the evaluation methodology. Diverse examples of evaluation results are presented for the GHOUGH object detection System from the University of Rochester, the PHOENIX segmentation system from Carnegie-Mellon University (CMU), and the RELAX relaxation package from the University of Maryland.
DTIC
Algorithms; Computer Programs; Scene Analysis

20070008525 Army Tank-Automotive and Armaments Command, Warren, MI USA
Using Support Vector Machines to Classify Whether a Car is in Front of You or Not
Del Rose, Michael S; Jul 27, 2004; 17 pp.; In English
Report No.(s): AD-A461081; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461081

Support Vector Machine (SVM) theory is a learning machine theory developed by V. Vapnik. Its most common uses are for classification problems and regression. Like other learning machines, the distribution of the population does not need to be known. It is sufficient only to know that a distribution exists. What sets SVMs apart from other learning machines is its ability to classify items correctly with a relatively small sample size. In this paper I will briefly describe learning machines and SVMs. It will not be a complete tutorial on either subject. If the reader desires to learn more about them, then please refer to the references at the end of this paper. I will also give the theory and results of using SVMs to classify whether there is a car in front of you or not, using an image from a digital camera.
DTIC
Machine Learning; Vector Analysis

20070008530 Carnegie-Mellon Univ., Pittsburgh, PA USA
Delaunay Refinement Mesh Generation
Shewchuk, Jonathan R; May 18, 1997; 214 pp.; In English
Contract(s)/Grant(s): F30602-96-1-0287; CMS-9318163
Report No.(s): AD-A461096; No Copyright; Avail.: CASI: A10, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461096

Delaunay refinement is a technique for generating unstructured meshes of triangles or tetrahedral suitable for use in the finite element method or other numerical methods for solving partial differential equations. Popularized by the engineering community in the mid-1980s, Delaunay refinement operates by maintaining a Delaunay triangulation or Delaunay tetrahedralization, which is refined by the insertion of additional vertices. The placement of these vertices is chosen to enforce boundary conformity and to improve the quality of the mesh. Pioneering papers by L. Paul Chew and Jim Ruppert have placed Delaunay refinement on firm theoretical ground. The purpose of this thesis is to further this progress by cementing the foundations of two-dimensional Delaunay refinement, and by extending the technique and its analysis to three dimensions.
DTIC
Floating Point Arithmetic; Grid Generation (Mathematics); Numerical Analysis; Partial Differential Equations; Triangles

20070008532 Carnegie-Mellon Univ., Pittsburgh, PA USA
Survey of Polygonal Surface Simplification Algorithms
Heckbert, Paul S; Garland, Michael; May 1, 1997; 32 pp.; In English
Contract(s)/Grant(s): F19628-93-C-0171; CCR-9357763
Report No.(s): AD-A461098; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461098

This paper surveys methods for simplifying and approximating polygonal surfaces. A polygonal surface is a piecewise-linear surface in 3-D defined by a set of polygons; typically a set of triangles. Methods from computer graphics,

computer vision, cartography, computational geometry, and other fields are classified, summarized, and compared both practically and theoretically. The surface types range from height fields (bivariate functions), to manifolds, to non-manifold self-intersecting surfaces. Piecewise-linear curve simplification is also briefly surveyed.
DTIC
Algorithms; Polygons; Simplification; Surveys

20070008535 Carnegie-Mellon Univ., Pittsburgh, PA USA
Scheduling Dependent Real-Time Activities
Clark, Raymond K; Aug 1990; 259 pp.; In English
Contract(s)/Grant(s): F30602-85-C-0274; F33602-88-D-0027
Report No.(s): AD-A461102; CMU-CS-90-155; No Copyright; Avail.: CASI: A12, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461102

A real-time application is typically composed of a number of cooperating activities that must execute within specific time intervals. Since there are usually more activities to be executed than there are processors on which to execute them, several activities must share a single processor. Necessarily, satisfying the activities timing constraints is a prime concern in making the scheduling decisions for that processor. Unfortunately, the activities are not independent. Rather, they share data and devices, observe concurrency constraints on code execution and send signals to one another. These interactions can be modeled as contention for shared resources that must be used by one activity at a time. An activity awaiting access to a resource currently held by another activity is said to depend on that activity, and a dependency relationship is said to exist between them. Dependency relationships may encompass both precedence constraints and resource conflicts. No algorithm solves the problem of scheduling activities with dynamic dependency relationships in a way that is suitable for all real-time systems. This thesis provides an algorithm, called DASA, that is effective for scheduling the class of real-time systems known as supervisory control systems. Simulation experiments that account for the time required to make scheduling decisions demonstrate that DASA provides equivalent or superior performance to other scheduling algorithms of interest under a wide range of conditions for parameterized. synthetic workloads. DASA performs particularly well during overloads. when it is impossible to complete all of the activities. This research makes a number of contributions to the field of computer science, including: a formal model for analyzing scheduling algorithms; the DASA scheduling algorithm, which integrates resource management with standard scheduling functions; results that demonstrate the efficacy of DASA in a variety of situations, and simulator.
DTIC
Algorithms; Command and Control; Real Time Operation; Scheduling

20070008540 Carnegie-Mellon Univ., Pittsburgh, PA USA
PASTENSE: A Fast Start-up Algorithm for Scalable Video Libraries
Harizopoulos, Stavros; Gibson, Garth A; Mar 2001; 17 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00174-96-0002; ARPA ORDER-D306
Report No.(s): AD-A461107; CMU-CS-01-105; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461107

Striping video clip data over many physical resources (typically disk drives) balances video server load with less data replication. Current striped video delivery algorithms can have high start-up latency if the load is high. We propose a new, fast start-up algorithm, PASTENSE. This algorithm minimizes start-up latency by using aggressive prefetching to exploit disk idle time, and using available RAM to dynamically optimize the newly requested video's schedule. Our proposed method (a) does not require changes in the existing striped data placement (b) it never performs worse than alternate designs and (c) it achieves significant benefits: up to 9 times faster start-up times for high loads.
DTIC
Algorithms; Libraries; Video Compression; Video Signals

20070008547 Carnegie-Mellon Univ., Pittsburgh, PA USA
Inter-Iteration Scalar Replacement in the Presence of Conditional Control-Flow
Budiu, Mihai; Goldstein, Seth C; Feb 1, 2004; 31 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): BT6396-C-0083; N00014-01-1-0659
Report No.(s): AD-A461114; CMU-CS-04-103; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461114

We revisit the classical problem of scalar replacement of array elements and pointer accesses. We generalize the state-of-the-art algorithm, by Carr and Kennedy [CK94], to handle a combination of both conditional control-flow and inter-iteration data reuse. The basis of our algorithm is to make the dataflow availability information precise using a technique we call SIDE: Statically Instantiate and Dynamically Evaluate. In SIDE the compiler inserts explicit code to evaluate the dataflow information at runtime. Our algorithm operates within the same assumptions of the classical one (perfect dependence information) and has the same limitations (increased register pressure). It is, however, optimal in the sense that within each code region where scalar promotion is applied given sufficient registers each memory location is read and written at most once.
DTIC
Algorithms; Iteration; Replacing; Scalars

20070008567 University of Southern California, Marina del Rey, CA USA
Towards a Unified Approach to Memory- and Statistical-Based Machine Translation
Marcu, Daniel; Jan 2001; 9 pp.; In English
Contract(s)/Grant(s): N66001-00-1-9814
Report No.(s): AD-A461149; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461149

We present a set of algorithms that enable us to translate natural language sentences by exploiting both a translation memory and a statistical-based translation model. Our results show that an automatically derived translation memory can be used within a statistical framework to often find translations of higher probability than those found using solely a statistical model. The translations produced using both the translation memory and the statistical model are significantly better than translations produced by two commercial systems: our hybrid system translated perfectly 58% of the 505 sentences in a test collection, while the commercial systems translated perfectly only 40-42% of them.
DTIC
Algorithms; Machine Translation; Natural Language (Computers)

20070008580 Massachusetts Univ., Amherst, MA USA
An Unsupervised Algorithm for Segmenting Categorical Timeseries into Episodes
Cohen, Paul; Heeringa, Brent; Adams, Niall; Jan 2002; 16 pp.; In English
Contract(s)/Grant(s): DASG60-99-C-0074; F30602-01-2-0580
Report No.(s): AD-A461169; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461169

This paper describes an unsupervised algorithm for segmenting categorical time series into episodes. The VOTING-EXPERTS algorithm first collects statistics about the frequency and boundary entropy of ngrams, then passes a window over the series and has two 'expert methods' decide where in the window boundaries should be drawn. The algorithm successfully segments text into words in four languages. The algorithm also segments time series of robot sensor data into subsequences that represent episodes in the life of the robot. We claim that VOTING-EXPERTS finds meaningful episodes in categorical time series because it exploits two statistical characteristics of meaningful episodes.
DTIC
Algorithms; Time Series Analysis

20070008603 Yale Univ., New Haven, CT USA
Relating Two Formal Models of Path-Vector Routing
Jaggard, Aaron D; Ramachandran, Vijay; Jul 2004; 14 pp.; In English
Contract(s)/Grant(s): N00014-01-1-0795
Report No.(s): AD-A461211; YALEU/DCS/TR/1301; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461211

This paper unifies two independently developed formalisms for path-vector routing protocols such as the Border Gateway Protocol (BGP), the standard interdomain routing protocol for the Internet. The works of Griffin, Jaggard, and Ramachandran [4] and Sobrinho [8] proved conditions for guaranteed protocol convergence, but as they operate at different levels of abstraction in modeling the protocols, the relationship between them is not obvious. Here we provide a rigorous translation between the two frameworks and use it to connect the convergence results, yielding a more complete set of analysis tools than in either paper alone. We motivate our discussion by presenting an example of applying both frameworks to analyze a set of

protocols; in doing so, we show how the models, in conjunction, give important guidelines for protocol design.
DTIC
Networks; Protocol (Computers); Semantics; Vector Analysis

20070008631 Carnegie-Mellon Univ., Pittsburgh, PA USA
A SAT-Based Algorithm for Reparameterization in Symbolic Simulation
Chauhan, Pankaj; Kroening, Daniel; Clarke, Edmund; Dec 3, 2003; 30 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-01-1-0796; CCR-9803774
Report No.(s): AD-A461257; CMU-CS-03-191; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461257

Parametric representations used for symbolic simulation of circuits usually use BDDs. After a few steps of symbolic simulation, state set representation is converted from one parametric representation to another smaller representation, in a process called reparameterization. For large circuits, the reparametrization step often results in a blowup of BDDs and is expensive due to a large number of quantifications of input variables involved. Efficient SAT solvers have been applied successfully for many verification problems. This paper presents a novel SAT-based reparameterization algorithm that is largely immune to the large number of input variables that need to be quantified. We show experimental results on large industrial circuits and compare our new algorithm to both SAT-based Bounded Model Checking and BDD-based symbolic simulation. We were able to achieve on average 3x improvement in time and space over BMC and able to complete many examples that BDD-based approach could not even finish.
DTIC
Algorithms; Aptitude; Parameterization; Psychological Tests; Simulation

20070008648 Colorado Univ., Boulder, CO USA
Efficient Algorithms for a Family of Matroid Intersection Problems
Gabow, Harold N; Tarjan, Robert E; Jan 1982; 90 pp.; In English
Contract(s)/Grant(s): MCS78-18909; MCS75-22870
Report No.(s): AD-A461278; CU-CS-214-82; No Copyright; Avail.: CASI: A05, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461278

Consider a matroid where each element has a real-valued cost and a color, red or green; a base is sought that contains q red elements and has smallest possible cost An algorithm for the problem in general matroids is presented, along with a number of variations. its efficiency is demonstrated by implementations on specific matroids. In all cases but one, the running time matches the best-known algorithm for the problem without the red element constraint. On graphic matroids, a smallest spanning tree with q red edges can be found in time O(n log n) more than what is needed to find a minimum spanning tree. A special case is finding a smallest spanning tree with a degree constraint; here the time is only O(m+n) more than that needed to find one minimum spanning tree. On transversal and matching matroids, the time is the same as the best-known algorithms for a minimum cost base. This also holds for transversal matroids for convex graphs, which model a scheduling problem on unit-length jobs with release times and deadlines. On partition matroids, a linear-time algorithm is presented. Finally an algorithm related to our general approach finds a smallest spanning tree on a directed graph, where the given root has a degree constraint. Again the time matches the best-known algorithm for the problem without the red element (i.e., degree) constraint.
DTIC
Algorithms; Mathematical Models; Problem Solving

20070008653 California Univ., Berkeley, CA USA
Detecting Errors Before Reaching Them
de Alfaro, Luca; Henzinger, Thomas A; Mang, Freddy Y; Jan 2000; 17 pp.; In English
Contract(s)/Grant(s): MDA972-99-1-0001; NAG2-1214
Report No.(s): AD-A461287; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461287

Any formal method or tool is almost certainly more often applied in situations where the outcome is failure (a counter example) rather than success (a correctness proof). We present a method for symbolic model checking that can lead to significant time and memory savings for model-checking runs that fall while occurring only a small overhead for model-checking runs that succeed. Our method discovers an error as soon as it cannot be prevented which can be long before it actually occurs; for example the violation of an invariant may become unpreventable many transitions before the invariant

is violated. The key observation is that 'unpreventability' is a local property of a single module: an error is unpreventable in a module state if no environment can prevent it. Therefore unpreventability is inexpensive to compute for each module yet can save much work in the state exploration of the global compound system. Based on different degrees of information available about the environment we define and implement several notions of 'unpreventability' including the standard notion of uncontrollability from discrete-event control. We present experimental results for two examples a distributed database protocol and a wireless communication protocol.
DTIC
Arithmetic; Binary Digits; Detection; Errors; Iteration; Mathematical Models

20070008665 SRI International Corp., Menlo Park, CA USA
Learning Control Parameters of a Vision Process Using Contextual Information
Houzellet, Stephane; Strat, Thomas M; Fua, Pascal; Fischler, Martin A; Apr 6, 1994; 49 pp.; In English
Contract(s)/Grant(s): DACA76-92-C-0034
Report No.(s): AD-A461306; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461306

Two of the problems that the user of an image understanding system must continuously face are the choice of an appropriate algorithm and the setting of its associated parameters. These requirements mean that the user must have a fairly high degree of expertise with the algorithms to accomplish a given task effectively. If, on the other hand, the system itself is able to learn how to select among its algorithms and to set their parameters through its experience with similar tasks, it should be possible to reduce the need for operator expertise while improving efficiency at the same time. This paper presents a method to accomplish this goal. Contextual information computed from the task and the input data is used to search for similar situations, and determine whether or not au algorithm is applicable, and which parameters are suitable for it. Different approaches have been investigated as the basis for finding similar situations. The first one uses a measure of similarity between context element values. The second one uses a categorization method based on conceptual clustering. The main problem is the need to deal with both numerical and categorical variables. To demonstrate the efficiency of our approach, we describe experiments involving the use of a snake algorithm to perform the task of curvilinear feature extraction. Our implementation allows the various parameters of this technique to be context-specific. We show in this setting how our system makes the use of a vision process easier by reducing the needed user expertise and improving efficiency in obtaining the desired results.
DTIC
Algorithms; Independent Variables; Learning

20070008682 California Univ., Santa Cruz, CA USA
Design and Analysis of Distributed Routing Algorithms
Murthy, Shree N; Jun 1994; 70 pp.; In English
Contract(s)/Grant(s): N00014-92-J-1807
Report No.(s): AD-A461336; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461336

Route assignment is one of the operational problems of communication network, and adaptive routing schemes are required to achieve real time performance. This thesis introduces, verifies and analyses two new distributed, shortest-path routing algorithms, which are called, Path-Finding Algorithm (PFA) and Loop-Free Path-Finding Algorithm (LPA). Both algorithms require each routing node to know only the distance and the second-to-last-hop (or predecessor) node to each destination. In addition to the above information, LPA uses an efficient inter-neighbor coordination mechanism spanning over a single hop. PFA reduces the formation of temporary loops significantly, while LPA achieves loop-freedom at every instant by eliminating temporary loops. The average performance of these two algorithms is compared with the Diffusing Update Algorithm (DUAL) and an ideal link state (ILS) using Dijkstra's shortest-path algorithm by simulation; this performance comparison is made in terms of time taken for convergence, number of packets exchanged and the total number of operations required for convergence by each of the algorithms. The simulations were performed using a C-based simulation tool called Drama, along with a network simulation library. The results indicated that the performance of PFA is comparable to that of DUAL and ILS and that a significant improvement in performance can be achieved with LPA over DUAL and ILS.
DTIC
Algorithms; Communication Networks; Design Analysis; Simulation

20070008696 Abdelmalek Essaadi Univ., Tetuan, Morocco
Advanced Interconnect and Device-Field Modeling
Essaaidi, Mohamed; Jan 15, 2007; 13 pp.; In English
Contract(s)/Grant(s): N62558-02-M-5602
Report No.(s): AD-A461387; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461387

This final report describes the progress that has been made with the different tasks of this project. The highlights are that most of the tasks planned for this project have been carried out and completed successfully with some delay owing to some technical problems that could not be avoided. Those tasks concerned the development of OOP codes using C++ based on the Method of Moments for microwave interconnections analysis considering different geometrical configurations (i.e. multiconductor and multilayer structures) and physical parameters (e.g. conductor loss) using the Method of Moments and the Method of Lines. Furthermore, a novel approach based on the FDTD method has been developed for the global modeling of RF and microwave circuits and antennas which couples the EM and the active devices equivalent circuits models. Also, a GUI has been developed using C++ for the FDTD code together with a Web based RF and Microwave Intercommunions Simulator using JavaScript Language in the framework of two MSc theses.
DTIC
Electric Connectors; Models

20070008771 Stanford Univ., Stanford, CA USA
Algorithm Design for Computational Fluid Dynamics, Scientific Visualization, and Image Processing
Fedkiw, Ron; Jan 29, 2007; 7 pp.; In English
Contract(s)/Grant(s): N00014-01-1-0620
Report No.(s): AD-A461529; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461529

We developed a novel approach to extend the particle level set method to the simulation of as many regions as desired. The various regions can be liquids or gases of any type with differing viscosities, densities, viscoelastic properties, etc. We also proposed techniques for simulating interactions between materials, whether it be simple surface tension forces or more complex chemical reactions with one material converting to another or two materials combining to form a third. When discretizing the underlying Navier-Stokes equations for multiphase flow, an additional difficulty occurs since discretization stencils cross region boundaries naively combining non-smooth or even discontinuous data. Recently, we developed a new coding paradigm that allows one to incorporate physical jump conditions in data 'on the fly,' which is significantly more efficient for multiple regions, especially at triple points or near boundaries with solids. This removes the need for any algorithm changes that might reduce the accuracy of the scheme, and moreover even removes the need for changes to the code itself. Besides this work we have also addressed scalability including methods on octree and Run Length Encoded (RLE) data structure, as well parallel implementation such as MPI. Other work includes work on fracture.
DTIC
Algorithms; Computational Fluid Dynamics; Image Processing; Scientific Visualization; Visual Perception

20070008838 California Univ., Santa Cruz, CA USA
Distributed Assignment of Codes for Multihop Packet-Radio Networks
Garcia-Luna-Aceves, J J; Raju, Jyoti; Jan 1997; 6 pp.; In English
Contract(s)/Grant(s): DAAB07-95-C-D157
Report No.(s): AD-A461610; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461610

This paper describes and analyzes a distributed algorithm for assigning codes in a dynamic, multihop wireless radio network. The algorithm does not require any form of synchronization and is completely distributed. The algorithm can be used for both the transmitter oriented and receiver oriented code assignment. The algorithm is proven to be correct and its complexity is analyzed. The implementation of the code assignment algorithm as part of the medium access control (MAC) and routing protocols of a multihop packet-radio network is discussed.
DTIC
Algorithms; Communication Networks; Telecommunication

20070008884 California Univ., Santa Cruz, CA USA
Unidirectional Link-State Routing With Propagation Control
Bao, Lichun; Garcia-Luna-Aceves, J J; Jan 2000; 7 pp.; In English
Report No.(s): AD-A461672; F30602-97-2-0338; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461672

Abstract Unidirectional links can occur in wireless networks and mixed-media networks. However, the vast majority of routing algorithms proposed to date require bidirectional links to operate. We present an efficient link-state routing algorithm, which we call ULPC, that operates with unidirectional links. ULPC is based on the concept of inclusive cycle of a link, which is the distance that link-state updates about the link must propagate to ensure correct routing within the network. ULPC incrementally disseminates and selectively utilizes unidirectional link-state information to build correct routing tables. ULPC is verified to be correct. Simulations on a 20-node network with unidirectional links show that ULPC is superior over the traditional link-state routing algorithms relying on topology broadcast.
DTIC
Algorithms; Computer Networks

20070008896 California Univ., Santa Cruz, CA USA
A Distributed Algorithm for Multipath Computation
Vutukury, Srinivas; Garcia-Luna-Aceves, J J; Jan 1999; 6 pp.; In English
Contract(s)/Grant(s): F30602-97-1-0291; F19628-96-C-0038
Report No.(s): AD-A461703; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461703

Today's Internet routing protocols either provide a single path between each source-destination pair, or multiple paths of equal length. Furthermore, the paths provided by RIP and OSPF are not free of loops during times of network transition. Single-path routing algorithms are inherently slow in responding to congestion and temporary traffic bursts; consequently, the delays experienced by packets in these networks are far from optimal. Recently, we developed a framework for designing routing algorithms that offer 'near-optimal' delays; a key component in this framework consists of using a fast responsive routing protocol that builds multipaths for each destination in the computer network, such that they are loop-free at all times. This paper studies the performance of MPATH (multipath routing algorithm) by simulation and compares it against the performance of other state-of-the-art routing algorithms.
DTIC
Algorithms; Computation; Multipath Transmission; Protocol (Computers)

20070008909 California Univ., Santa Cruz, CA USA
An Iterative Algorithm for Delay-Constrained Minimum-Cost Multicasting
Parsa, Mehrdad; Zhu, Qing; Garcia-Luna-Aceves, J J; Jan 1998; 41 pp.; In English
Contract(s)/Grant(s): F19628-93-C-0175; F19628-96-C-0038
Report No.(s): AD-A461716; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461716

The bounded shortest multicast algorithm (BSMA) is presented for constructing minimum-cost multicast trees with delay constraints. BSMA can handle asymmetric link characteristics and variable delay bounds on destinations, specified as real values and minimizes the total cost of a multicast routing tree. Instead of the single-pass tree construction approach used in most previous heuristics, the new algorithm is based on a feasible-search optimization strategy that starts with the minimum-delay multicast tree and monotonically decreases the cost by iterative improvement of the delay-bounded multicast tree. BSMA's expected time complexity is analyzed, and simulation results are provided showing that BSMA can achieve near-optimal cost reduction with fast execution.
DTIC
Algorithms; Computer Networks; Cost Effectiveness

20070008922 California Univ., Santa Cruz, CA USA
Neighbor-Aware Control in Ad Hoc Networks
Bao, Lichun L; Dec 2002; 177 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-97-2-0338; F49620-00-1-0330
Report No.(s): AD-A461739; No Copyright; Avail.: CASI: A09, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461739

Ad hoc networks have very unique features, such as dynamic topologies, relatively limited bandwidth and wireless signal propagation schemes, which present difficult challenges for wireless communication. We propose control mechanisms for channel access scheduling and topology control in ad hoc networks, respectively, which utilize the neighborhood information within two hops to cope with the difficulties of communicating in ad hoc networks. First, we present the neighbor-aware contention resolution (NCR) algorithm, and analyze its generic performance with regard to the contention delay and system throughput. The required neighbor information in NCR for ad hoc networks is acquired through the neighbor protocol, which is based on a random channel access mechanism and a reliable message propagation scheme using retransmissions. Then, four channel access protocols based on NCR are presented, namely NAMA, LAMA, PAMA and HAMA, which correspond to node-, link-, pair- wise- and hybrid-activation multiple access protocols, respectively. These protocols are aimed at ad hoc networks with omnidirectional antennas, and their performance is analyzed. Furthermore, channel access protocols, adapted from NAMA and PAMA, are considered for heterogeneous ad hoc networks that include unidirectional links, which may occur due to power and signal propagation differences between wireless stations.
DTIC
Algorithms; Computer Networks; Multiple Access; Protocol (Computers)

20070008937 SRI International Corp., Menlo Park, CA USA
On the Imaging of Fractal Surfaces
Pentland, Alex; Kube, Paul; Dec 16, 1986; 13 pp.; In English
Contract(s)/Grant(s): MDA903-83-C-0027; DCR-85-19283
Report No.(s): AD-A461768; SRI-TN-390; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461768
We examine the imaging of standard Brownian Fractal surfaces, and find that given certain assumptions, a Fractal surface with power spectrum proportional to f-Beta has an image with power spectrum proportional to f squared -Beta.
DTIC
Brownian Movements; Fractals; Image Processing; Imaging Techniques

20070008950 California Univ., Santa Cruz, CA USA
Node-Centric Hybrid Routing for Ad Hoc Networks
Roy, Soumya; Garcia-Luna-Aceves, J J; Jan 2002; 10 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F49620-00-1-0330
Report No.(s): AD-A461790; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461790
We present node-centric approaches to hybrid routing for ad hoc networks in which normal nodes are distinguished from special nodes, called netmarks, hosting popular network services or functioning as points of attachment to the Internet. With node-centric hybrid routing, netmarks force common nodes to maintain routing information for them by either sending routing updates proactively, or by requiring nodes to maintain on-demand routing entries towards them for extended periods of time. Routes between peer nodes are set up on-demand. Two node-centric routing solutions are presented based on partial link-state information. Simulation results using ns2 show that maintaining table-driven routing for netmarks and on-demand routing for common nodes performs much better than purely ondemand routing protocols based on distance vectors, path information, or link-state information.
DTIC
Algorithms; Internets; Protocol (Computers)

20070009052 University of Southern California, Marina del Rey, CA USA
Statistical Phrase-Based Translation
Koehn, Philipp; Och, Franz J; Marcu, Daniel; Jan 2003; 8 pp.; In English
Report No.(s): AD-A461156; No Copyright; Avail.: CASI: A02, Hardcopy
We propose a new phrase-based translation model and decoding algorithm that enables us to evaluate and compare several, previously proposed phrase-based translation models. Within our framework, we carry out a large number of experiments to understand better and explain why phase-based models out-performed word-based models. Our empirical results, which hold for all examined language pairs, suggest that the highest levels of performance can be obtained through relatively simple means: heuristic learning of phrase translations from word-based alignments and lexical weighting of phrase translations. Surprisingly, learning phrases longer than three words and learning phrases from high-accuracy word-level

alignment models does not have a strong impact on performance. Learning only syntactically motivated phrases degrades the performance of our systems.
DTIC
Algorithms; Decoding; Grammars; Translating

20070009063 California Univ., Santa Cruz, CA USA
Hybrid Channel Access Scheduling in Ad Hoc Networks
Bao, Lichun; Garica-Luna-Aceves, J J; Jan 2002; 13 pp.; In English
Contract(s)/Grant(s): F49620-00-1-0330
Report No.(s): AD-A461756; No Copyright; Avail.: CASI: A03, Hardcopy

We present the hybrid activation multiple access (HAMA) protocol for ad hoc networks. Unlike previous channel access scheduling protocols that activate either nodes or links only, HAMA is a node-activation channel access protocol that also maximizes the chance of link activations using time- and code-division schemes. HAMA only requires identifiers of the neighbors within two hops from each node to schedule channel access. Using this neighborhood information, each node determines whether to transmit in the current time slot on a dynamically assigned spreading code. A neighbor protocol supplements HAMA with up-to-date two-hop neighborhood information by reliably propagating the one-hop neighbor updates through a novel random access technique. The throughput and delay characteristics of HAMA in randomly-generated multihop wireless networks are studied by analyses and simulations. The results of the analyses show that HAMA achieves higher channel utilization in ad hoc networks than a distributed scheduling scheme based on node activation, similar throughout as a well-known scheduling algorithm based on complete topology information, and much higher throughout than the ideal CSMA and CSMA/CA protocols.
DTIC
Algorithms; Code Division Multiple Access; Networks; Scheduling

20070009072 Brown Univ., Providence, RI USA
Modeling Uncertainty in Flow Simulations via Generalized Polynomial Chaos
Xiu, Dong; Karniadakis, George E; Oct 10, 2002; 38 pp.; In English
Report No.(s): AD-A461813; No Copyright; Avail.: CASI: A03, Hardcopy

No abstract available
Algorithms; Chaos; Incompressible Flow; Polynomials; Simulation

20070009074 Brown Univ., Providence, RI USA
Asymptotic Properties of Proportional-Fair Sharing Algorithms: Extensions of the Algorithm
Kushner, Harold J; Whiting, Philip A; Jan 2003; 10 pp.; In English
Contract(s)/Grant(s): DAAD-19-02-1-0425; ECS-0097447
Report No.(s): AD-A461822; No Copyright; Avail.: CASI: A02, Hardcopy

We are concerned with the allocation of transmitter time and power for randomly time varying mobile data communications. Time is divided into small scheduling intervals, called slots, and information on the channel rates for the various users is available at the start of the slot, when the user selections are made. There is a conflict between selecting the user set that can get the most immediate data through and helping users with poor average rates. The Proportional Fair Sharing method (PFS) deals with such con icts. In [5, 6] the convergence and basic qualitative properties were analyzed. Stochastic approximation results were used to analyze the long term properties. The paths of the (suitably interpolated) throughputs converge to the solution of an ODE, akin to a mean flow. The ODE has a unique equilibrium point. It is asymptotically stable and optimal in that it is the maximizer of a concave utility function. There is a large family of such algorithms, each member corresponding to a concave utility function. The basic idea of PFS extends to many systems of current importance for which it was not originally intended, and a variety of such extensions are treated here to illustrate the possibilities. One might have minimal throughput constraints, nonlinear dependence of rate on allocated power, minimal SNR requirements, etc. In some recent applications, the number of slots in a scheduling intervals is random, and the length is not known when the selection is made. The form of the PFS rule is adapted to the application. Then the basic results continue to hold. The asymptotic properties of the ODE characterize the behavior of the algorithm.
DTIC
Algorithms; Asymptotic Properties; Asymptotic Series; Nonlinear Systems; Stochastic Processes

20070009076 Brown Univ., Providence, RI USA
Stochastic Modeling of Flow-Structure Interactions using Generalized Polynomial Chaos
Xiu, Dongbin; Lucor, Didier; Su, C; Karniadakis, George E; Sep 11, 2001; 21 pp.; In English
Report No.(s): AD-A461832; No Copyright; Avail.: Defense Technical Information Center (DTIC)
No abstract available
Algorithms; Chaos; Flow Characteristics; Polynomials; Stochastic Processes

20070009080 Brown Univ., Providence, RI USA
Importance Sampling, Large Deviations, and Differential Games
Dupuis, Paul; Wang, Hui; Jan 2002; 37 pp.; In English
Contract(s)/Grant(s): DAAD19-00-1-0549; DAAD19-02-1-0425
Report No.(s): AD-A461855; No Copyright; Avail.: CASI: A03, Hardcopy
A heuristic that has emerged in the area of importance sampling is that the changes of measure used to prove large deviation lower bounds give good performance when used for importance sampling. Recent work, however, has suggested that the heuristic is incorrect in many situations. The perspective put forth in the present paper is that large deviation theory suggests many changes of measure, and that not all are suitable for importance sampling. In the setting of Cramer's Theorem, the traditional interpretation of the heuristic suggests a fixed change of distribution on the underlying independent and identically distributed summands. In contrast, we consider importance sampling schemes where the exponential change of measure is adaptive, in the sense that it depends on the historical empirical mean. The existence of asymptotically optimal schemes within this class is demonstrated. The result indicates that an adaptive change of measure, rather than a static change of measure, is what the large deviations analysis truly suggests. The proofs utilize a control-theoretic approach to large deviations, which naturally leads to the construction of asymptotically optimal adaptive schemes in terms of a limit Bellman equation. Numerical examples contrasting the adaptive and standard schemes are presented, as well as an interpretation of their different performances in terms of differential games.
DTIC
Differential Games; Game Theory; Sampling

20070009082 Brown Univ., Providence, RI USA
Stability and Control of Mobile Communications Systems With Time Varying Channels
Buche, Robert; Kushner, Harold J; Aug 10, 2001; 35 pp.; In English
Contract(s)/Grant(s): DAAD19-00-1-0549; ECS-9979250
Report No.(s): AD-A461863; No Copyright; Avail.: Defense Technical Information Center (DTIC)
Consider the forward link of a mobile communications system with a single transmitter and rather arbitrary randomly time varying channels connecting the base to the mobiles. Data arrives at the base in some random way (and might have a burst character) and is queued according to the destination until transmitted. The main issues are the allocation of transmitter power and time to the various queues in a queue and channel-state dependent way to assure stability and good operation. The control decisions are made at the beginning of the (small) scheduling intervals. Stability methods are used to allocate time and power. Many schemes of current interest can be handled: For example, CDMA with control over the bit interval and power per bit, TDMA with control over the time allocated, power per bit, and bit interval, as well as arbitrary combinations. There might be random errors in transmission which require retransmission. The channel-state process might be known or only partially known. The details of the scheme are not directly involved; all essential factors are incorporated into a rate and error function. The system and channel process are scaled by speed. Under a stability assumption on a model obtained from the mean drift, and some other natural conditions, it is shown that the scaled physical system can be controlled to be stable, uniformly in the speed, for fast enough speeds. Owing to the non-Markov nature of the problem, we use the perturbed Liapunov function method, which is very useful for the analysis of non-Markovian systems. Finally, the stability method is used to actually choose the power and time allocations. The allocation will depend on the Liapunov function. But each such function corresponds loosely to an optimization problem for some performance criterion. Since there is a choice of Liapunov functions, various performance criteria can be taken into account in the allocations. The resulting controls are quite reasonable.
DTIC
Mobile Communication Systems; Stability; Time Division Multiplexing

20070009083 Brown Univ., Providence, RI USA
Under-Resolution and Diagnostics in Spectral Simulations of Complex-Geometry Flows
Kirby, Robert M; Karniadakis, George E; Jan 2001; 45 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461869; No Copyright; Avail.: CASI: A03, Hardcopy

Large-scale simulations are often under-resolved at some level, but they are still useful in extracting both qualitative and quantitative information about the flow. In order to use such results effectively we need to characterize the numerical uncertainty of under-resolved simulations. However, different numerical methods exhibit different, behavior, and spectral-based methods in particular may over-predict fluctuations both in amplitude and frequency due to their very low artificial dissipation in contrast with finite differences. In this chapter, we provide insight into under-resolved spectral simulations and document several diagnostic signs of under-resolution for spectral/hp element methods. We first review the state-of-the-art in direct numerical simulation and present a new class of spectral methods on unstructured grids for handling complex-geometry compressible and incompressible flows. We the focus on the effects of under-resolving the nonlinear contributions, and finally we present prototype cases for both transitional and turbulent flows.
DTIC
Compressible Flow; Diagnosis; Incompressible Flow; Mathematical Models; Simulation; Spectra; Spectral Methods; Turbulence; Unstructured Grids (Mathematics)

20070009085 Naval Research Lab., Monterey, CA USA
Nodal High-Order Discontinuos Galerkin Methods for the Spherical Shallow Water Equations
Giraldo, F X; Hesthaven, J S; Warburton, T; Jan 2001; 26 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F49620-1-0426
Report No.(s): AD-A461874; No Copyright; Avail.: Defense Technical Information Center (DTIC)
We develop and evaluate a high-order discontinuous Galerkin method for the solution of the shallow water equations on the sphere. To overcome well known problems with polar singularities, we consider the shallow water equations in Cartesian coordinates, augmented with a Lagrange multiplier to ensure that fluid particles are constrained to the spherical surface. The global solutions are represented by a collection of curvilinear quadrilaterals from an icosahedral grid. On each of these elements the local solutions are assumed to be well approximated by a high-order nodal Lagrange polynomial, constructed from a tensor-product of the Legendre-Gauss-Lobatto points which also supplies a high-order quadrature. The shallow water equations are satisfied in a local discontinuous element fashion with solution continuity being enforced weakly. The numerical experiments, involving a comparison of weak and strong conservation forms as well as the impact of over-integration, confirm the expected high-order accuracy and the potential for using such highly parallel formulations in numerical weather prediction.
DTIC
Flow Equations; Forecasting; Galerkin Method; Polar Regions; Prediction Analysis Techniques; Shallow Water

20070009087 Brown Univ., Providence, RI USA
Analytical Theory of Grating Couplers for Waveguide Sensing: A Perturbational Approach and Its Limitations
Horvath, R; Wilcox, L C; Pedersen, H C; Skivesen, N; Hesthaven, J S; Johansen, P M; Jan 2004; 33 pp.; In English
Contract(s)/Grant(s): DAAD19-01-1-0631
Report No.(s): AD-A461885; No Copyright; Avail.: CASI: A03, Hardcopy
The in-coupling process for grating-coupled planar optical waveguide sensors is investigated in the case of TE waves. A simple analytical model based on the Rayleigh-Fourier method is applied together with a perturbational technique to calculate analytical expressions for the guided wave amplitudes. In addition, analytical expressions are derived for the position correction and width of the in-coupling resonant peaks. Numerical computations verify the model for shallow gratings both in terms of peak shape and position and provide the limitations for the analytical formulas.
DTIC
Couplers; Mathematical Models; Numerical Analysis; Perturbation; Waveguides

20070009088 Brown Univ., Providence, RI USA
Convergence of Proportional-Fair Sharing Algorithms Under General Conditions
Kushner, Harold J; Whiting, Philip A; Feb 2003; 24 pp.; In English
Contract(s)/Grant(s): DAAD19-00-1-0549; ECS-0097447
Report No.(s): AD-A461886; No Copyright; Avail.: CASI: A03, Hardcopy
We are concerned with the allocation of the base station transmitter time in time varying mobile communications with many users who are transmitting data. Time is divided into small scheduling intervals, and the channel rates for the various users are available at the start of the intervals. Since the rates vary randomly, in selecting the current user there is a conflict between full use (by selecting the user with the highest current rate) and fairness (which entails consideration for users with poor throughput to date). The Proportional Fair Scheduler (PFS) of the Qualcomm High Data Rate (HDR) system and related

algorithms are designed to deal with such conflicts. The aim here is to put such algorithms on a sure mathematical footing and analyze their behavior. The available analysis [6], while obtaining interesting information, does not address the actual convergence for arbitrarily many users under general conditions. Such algorithms are of the stochastic approximation type and results of stochastic approximation are used to analyze the long term properties. It is shown that the limiting behavior of the sample paths of the throughputs converges to the solution of an intuitively reasonable ordinary differential equation, which is akin to a mean flow. We show that the ODE has a unique equilibrium and that it is characterized as optimizing a concave utility function, which shows that PFS is not ad-hoc, but actually corresponds to a reasonable maximization problem. These results may be used to analyze the performance of PFS. The results depend on the fact that the mean ODE has a special form that arises in problems with certain types of competitive behavior. There is a large set of such algorithms, each one corresponding to a concave utility function. This set allows a choice of tradeoffs between the current rate and throughout. Extensions to multiple antenna and frequency systems are given.
DTIC
Algorithms; Convergence; Differential Equations

20070009089 Centre National de la Recherche Scientifique, Inria Rocquencourt, France
Heavy Traffic Analysis of AIMD Models
Altman, Eitan; Kushner, Harold J; Mar 2004; 23 pp.; In English
Contract(s)/Grant(s): DAAD19-02-1-0425; ESC-0097447
Report No.(s): AD-A461890; No Copyright; Avail.: CASI: A03, Hardcopy

We study heavy traffic asymptotics of many Additive Increase Multiplicative Decrease (AIMD) connections sharing a common router in the presence of other uncontrolled traffic, called 'mice'. The system is scaled by speed and average number of sources. With appropriate scalings of the packet rate and buffer content, an approximating delayed diffusion model is derived. By heavy traffic we mean that there is relatively little spare capacity in the operating regime. In contrast to previous scaled models, the randomness due to the mice or number of connections is not averaged, and plays its natural and dominant role. The asymptotic heavy traffic model allows us to analyze buffer and loss management policies of early marking or discarding as a function of the queue size and/or the total input rate and to choose a nearly optimal function via use of an appropriate limiting optimal control problem, captures the essential features of the physical problem, and can guide us to good operating policies. After studying the asymptotics of a large number of persistent AIMD connections we also handle the asymptotic of finite AIMD connections whose number varies as connections arrive and leave. The data illustrate some of the advantages of the approach.
DTIC
Asymptotic Series; Models; Traffic

20070009102 California Univ., Santa Cruz, CA USA
A Loop-Free Path-Finding Algorithm: Specification, Verification and Complexity
Garcia-Luna-Aceves, J J; Murthy, Shree; Jan 1995; 10 pp.; In English
Contract(s)/Grant(s): N00014-92-J-1807; F19628-93-C-0175
Report No.(s): AD-A461943; No Copyright; Avail.: CASI: A02, Hardcopy

The loop-free path-finding algorithm (LPA) is presented. LPA speci es the second-to-last hop and distance to each destination to ensure termination; in addition, it uses an inter-neighbor synchronization mechanism to eliminate temporary loops. A detailed proof of LPA's correctness is presented and its complexity is evaluated. LPA's average performance is compared by simulation with the performance of algorithms representative of the state of the art in distributed routing, namely an ideal link-state (ILS) algorithm and a loop-free algorithm that is based on internodal coordination spanning multiple hops (DUAL). The simulation results show that LPA is a more scalable alternative than DUAL and ILS in terms of the average number of steps, messages, and operations needed for each algorithm to converge after a topology change. LPA is shown to achieve loop freedom at every instant without much additional overhead over that incurred by prior algorithms based on second-to-last hop and distance information.
DTIC
Algorithms; Mean Free Path

20070009104 California Univ., Berkeley, CA USA
Visual Servoing via Navigation Functions
Cowan, Noah J; Weingarten, Joel D; Koditschek, Daniel E; Feb 6, 2002; 33 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461945; No Copyright; Avail.: CASI: A03, Hardcopy

This technical report presents a framework for visual servoing that guarantees convergence to a visible goal from most initially visible configurations while maintaining full view of all the feature points along the way. The method applies to first and second order fully actuated plant models. The solution entails three components: a model for the 'occlusion-free' workspace; a change of coordinates from image to model coordinates; and a navigation function for the model space. We present three example applications of the framework, along with experimental validation of its practical efficacy.
DTIC
Algorithms; Computer Vision; Convergence; Image Processing; Navigation

20070009138 University of Southern California, Los Angeles, CA USA
A Spectral Multidomain Penalty Method Model for the Simulation of High Reynolds Number Localized Incompressible Stratified Turbulence (Preprint)
Diamessis, P J; Domaradzki, J A; Hesthaven, J S; Dec 15, 2003; 39 pp.; In English
Contract(s)/Grant(s): N00014-001-0756
Report No.(s): AD-A461987; No Copyright; Avail.: CASI: A03, Hardcopy

A spectral multidomain penalty method model has been developed for the simulation of high Reynolds number localized stratified turbulence. This is the first time that a penalty method, with a particular focus on subdomain interface treatment, has been used with a multidomain scheme to simulate incompressible flows. The temporal discretization ensures maximum temporal accuracy by combining third order stiffly stable and backward differentiation schemes with a high-order boundary condition for the pressure. In the non-periodic vertical direction, a spectral multidomain discretization is used and its stability is ensured through use of penalty techniques, spectral filtering and strong adaptive interfacial averaging. The penalty method is implemented in different formulations for both the explicit non-linear term advancement and the implicit treatment of the viscous terms. The multidomain model is validated by comparing results of simulations of the mid-to-late time momentumless stratified turbulent wake to the corresponding laboratory data for a towed sphere. The model replicates correctly the characteristic vorticity and internal wave structure of the stratified wake and exhibits robust agreement with experiments in terms of the temporal power laws in the evolution of mean profile characteristic velocity and lengthscales.
DTIC
High Reynolds Number; Reynolds Number; Simulation; Spectral Theory; Turbulence

20070009184 Howard Univ., Washington, DC USA
A Study of Inverse Methods for Processing of Radar Data
Chouikha, Mohamed F; Oct 2006; 13 pp.; In English
Contract(s)/Grant(s): FA8650-04-1-6536; Proj-7184
Report No.(s): AD-A462060; No Copyright; Avail.: CASI: A03, Hardcopy

This is a special report for the project 'A Study of Inverse Methods for Processing of Radar Data' supported by the DoD US Air Force Research Lab. This project started on July 1, 2004 and continued until August 31, 2005. The goal of this project is to investigate the possibility of new inversion algorithms for radar image processing to improve signal quality and reduce the effects of clutter based on study of known geophysical inversion algorithms. Results of processing synthetic data shows promise to future processing of actual radar data.
DTIC
Algorithms; Geophysics; Image Processing; Inversions; Radar Data; Synthetic Aperture Radar

20070009257 University of Southern California, Los Angeles, CA USA
Scheduling with Group Dynamics: a Multi-Robot Task Allocation Algorithm based on Vacancy Chains
Dahl, Torbjorn S; Mataric, Maja J; Sukhatme, Gaurav S; Jan 2002; 38 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-00-1-0638; DE-FG03-01ER45905
Report No.(s): AD-A462165; No Copyright; Avail.: CASI: A03, Hardcopy

Existing task allocation and scheduling algorithms, including task- allocation algorithms for multi-robot systems, generally assume that tasks are independent. This assumption is often violated in groups of cooperative mobile robots, where the group dynamics can have a critical impact on performance. We present a multi-robot task allocation algorithm that is sensitive to group dynamics. Our algorithm is based on vacancy chains, a resource distribution process common in human and animal societies. We study the problem of cooperative transportation in simulation. We demonstrate through experiments in simulation that if robots keep local task utility estimates, and follow a greedy task selection policy, the interactions in the group cause the collection of learned policies to converge toward an optimal allocation pattern as defined by the vacancy chain

framework. As the robots are continuously updating their individual utility estimates, the vacancy chain algorithm has the additional property of adapting automatically to changes in the environment, e.g., robot breakdowns or changes in task values. Our experiments show that in the case of such changes, the vacancy chain algorithm consistently outperforms random and static task allocation algorithms. Finally, the vacancy chain algorithm uses no communication or unique roles, and as a result it is more likely to scale to large groups and will degrade gracefully in response to individual breakdowns.
DTIC
Algorithms; Chains; Group Dynamics; Robots; Scheduling; Tasks

20070009259 Massachusetts Univ., Amherst, MA USA
Contentful Mental States for Robot Baby
Cohen, Paul R; Oates, Tim; Beal, Carole R; Adams, Niall; Jan 2002; 7 pp.; In English
Contract(s)/Grant(s): DASG60-99-C-0074
Report No.(s): AD-A462169; No Copyright; Avail.: CASI: A02, Hardcopy

In this paper we claim that meaningful representations can be learned by programs, although today they are almost always designed by skilled engineers. We discuss several kinds of meaning that representations might have, and focus on a functional notion of meaning as appropriate for programs to learn. Specifically, a representation is meaningful if it incorporates an indicator of external conditions and if the indicator relation informs action. We survey methods for inducing kinds of representations we call structural abstractions. Prototypes of sensory time series are one kind of structural abstraction, and though they are not denoting or compositional, they do support planning. Deictic representations of objects and prototype representations of words enable a program to learn the denotational meanings of words. Finally, we discuss two algorithms designed to find the macroscopic structure of episodes in a domain-independent way.
DTIC
Algorithms; Artificial Intelligence; Robots

20070009299 Risoe National Lab., Roskilde, Denmark
A Multidomain Pseudospectral Formulation for the Simulation of Elastic Wave Scattering
Nielsen, Steen A; Hesthaven, Jan S; Mar 15, 2001; 38 pp.; In English
Contract(s)/Grant(s): F49620-1-0426; DMS-0074257
Report No.(s): AD-A462237; No Copyright; Avail.: CASI: A03, Hardcopy

In many areas of acoustical imaging, such as ultrasonic non-destructive evaluation (NDE), a realistic calculation of ultrasonic field parameters and associated elastic wave scattering requires the treatment of discontinuous, layered solids in complex geometries. These facts suggest the need for an accurate and geometrically flexible numerical approach for the simulation of the ultrasonic field, rather than reliance on semi-analytic solutions. In this paper we present an approach for solving the elastic wave equation in discontinuous layered materials in general complex geometries. The approach, based on a direct pseudospectral solution of the time-domain elastodynamic equations consists of five steps. The first step decomposes the global computational domain into a number of subdomains adding the required geometrical flexibility to the method. Moreover, this decomposition allows for efficient parallel computations, hence decreasing the computational time. The second step in the method maps every subdomain onto the unit square using transfinite blending functions. With this curvilinear mapping the elastodynamic equations can be solved to spectral accuracy, and furthermore, complex interfaces can be approximated smoothly, thus avoiding staircasing. The third step of the method deals with the evaluation of spatial derivatives on Chebyshev-Gauss-Lobatto nodal points within each subdomain, by means of a pseudospectral approach, while the fourth step reconstruct a global solution from the local solutions using properties of the equations of elastodynamics. In a final step, the global solution is advanced in time using a fourth order Runge-Kutta scheme. Several examples of elastic wave scattering related to ultrasonic NDE are presented as evidence of the accuracy and flexibility of the proposed computational method.
DTIC
Elastic Waves; Elastodynamics; Mathematical Models; Scattering; Simulation; Spectral Methods; Wave Equations; Wave Propagation; Wave Scattering

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STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; time series analysis; and stochastic processes.

20070007277 Washington Univ., Seattle, WA USA
Model-based Clustering with Dissimilarities: A Bayesian Approach
Oh, Man-Suk; Raftery, Adrian; Dec 16, 2003; 31 pp.; In English
Contract(s)/Grant(s): N00014-01-1-0745
Report No.(s): AD-A459759; TR-441; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA459759
No abstract available
Bayes Theorem; Mathematical Models

20070007451 George Mason Univ., Fairfax, VA USA
On Applying Point-Interval Logic to Criminal Forensics
Ishaque, Mashood; Zaidi, Abbas K; Levis, Alexander H; Jan 2006; 16 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA9550-05-1-0106
Report No.(s): AD-A460519; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460519
Application of a temporal logic to forensic analysis, especially in answering certain investigative questions relating to time-sensitive information, is presented. A set of temporal facts is taken from the London bombing incident that took place on July 7, 2005, to illustrate the approach. The information used in the illustration is gathered through the online news sites. A hypothetical investigation on the information is carried out to identify certain time intervals of potential interest to crime investigators. A software tool called Temper that implements temporal logic is used.
DTIC
Information Retrieval; Sensitivity; Software Development Tools; Targets

20070007474 Columbia Univ., New York, NY USA
Translating Collocations for Use in Bilingual Lexicons
Smadja, Frank; McKeown, Kathleen; Jan 1994; 6 pp.; In English
Contract(s)/Grant(s): N00014-89-J-1782
Report No.(s): AD-A460571; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460571
Collocations are notoriously difficult for non-native speakers to translate, primarily because they are opaque and can not be translated on a word by word basis. We describe a program named Champollion which, given a pair of parallel corpora in two different languages, automatically produces translations of an input list of collocations. Our goal is to provide a tool to compile bilingual lexical information above the word level in multiple languages and domains. The algorithm we use is based on statistical methods and produces p word translations of n word collocations in which n and p need not be the same; the collocations can be either flexible or fixed compounds. For example, Champollion translates 'to make a decision,' 'employment equity,' and 'stock market,' respectively into: 'prendre une decision,' 'equite en matiere d'emploi,' and 'bourse.' Testing and evaluation of Champollion on one year's worth of the Hansards corpus yielded 300 collocations and their translations, evaluated at 77% accuracy. In this paper, we describe the statistical measures used, the algorithm, and the implementation of Champollion, presenting our results and evaluation.
DTIC
Collocation; Machine Translation

20070007477 Johns Hopkins Univ., Baltimore, MD USA
Minimum Bayes-Risk Decoding for Statistical Machine Translation
Kumar, Shankar; Byrne, William; Jan 2004; 9 pp.; In English
Contract(s)/Grant(s): 0121285; N00014-01-1-0685
Report No.(s): AD-A460576; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460576
We present Minimum Bayes-Risk (MBR) decoding for statistical machine translation. This statistical approach aims to

minimize expected loss of translation errors under loss functions that measure translation performance. We describe a hierarchy of loss functions that incorporate different levels of linguistic information from word strings, word-to-word alignments from an MT system, and syntactic structure from parse-trees of source and target language sentences. We report the performance of the MBR decoders on a Chinese-to-English translation task. Our results show that MBR decoding can be used to tune statistical MT performance for specific loss functions.
DTIC
Bayes Theorem; Decoding; Hierarchies; Linguistics; Machine Translation; Speech; Speech Recognition; Statistical Analysis; Translating

20070007493 Brown Univ., Providence, RI USA
The Gauss-Seidel Numerical Procedure for Markov Stochastic Games
Kushner, Harold J; Jan 2004; 7 pp.; In English
Contract(s)/Grant(s): DAAD19-02-1-0425
Report No.(s): AD-A460599; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA460599

Consider the problem of value iteration for solving Markov stochastic games. One simply iterates backwards, via a Jacobi-like procedure. The convergence of the Gauss-Seidel form of this procedure is shown for both the discounted and ergodic cost problems, under appropriate conditions, with extensions to problems where one stops when a boundary is hit or if any one of the players chooses to stop, with associated costs. Generally, the Gauss-Seidel procedure accelerates convergence.
DTIC
Game Theory; Markov Processes; Numerical Analysis; Stochastic Processes

20070007494 Brown Univ., Providence, RI USA
Spectral Polynomial Chaos Solutions of the Stochastic Advection Equation
Jardak, M; Su, C; Karniadakis, G E; Oct 29, 2001; 22 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460601; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA460601

We present a new algorithm based on Wiener-Hermite functionals combined with Fourier collocation to solve the advection equation with stochastic transport velocity. We develop different stategies of representing the stochastic input, and demonstrate that this approach is orders of magnitude more efficient than Monte Carlo simulations for comparable accuracy.
DTIC
Advection; Algorithms; Chaos; Polynomials; Spectra; Stochastic Processes

20070007501 BBN Systems and Technologies Corp., Cambridge, MA USA
Algorithms That Learn to Extract Information BBN: Description of the Sift System as Used for MUC-7
Miller, Scott; Crystal, Michael; Fox, Heidi; Ramshaw, Lance; Schwartz, Richard; Stone, Rebecca; Weischedel, Ralph; Jan 1998; 18 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DABT63- 94-C-0062; F30602-97-C-0096
Report No.(s): AD-A460615; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460615

For MUC-7, BBN has for the first time fielded a fully-trained system for NE, TE, and TR; results are all the output of statistical language models trained on annotated data, rather than programs executing handwritten rules. Such trained systems have some significant advantages: 1. They can be easily ported to new domains by simply annotating data with semantic answers. 2. The complex interactions that make rule-based systems difficult to develop and maintain can here be learned automatically from the training data. We believe that the results in this evaluation are evidence that such trained systems, even at their current level of development, can perform roughly on a par with rules hand-tailored by experts. Since MUC-3, BBN has been steadily increasing the proportion of the information extraction process that is statistically trained. Already in MET-1, our name-finding results were the output of a fully statistical, HMM-based model, and that statistical Identifinder(trademark) model was also used for the NE task in MUC-7. For the MUC-7 TE and TR tasks, BBN developed SIFT, a new model that represents a significant further step along this path, replacing PLUM, a system requiring handwritten patterns, with SIFT, a single integrated trained model.
DTIC
Algorithms; Extraction; Linguistics; Natural Language Processing

20070007512 Colorado Univ., Boulder, CO USA
Branch Prediction Using Selective Branch Inversion
Manne, Srilatha; Klauser, Artur; Grunwald, Dirk; Mar 1999; 25 pp.; In English
Contract(s)/Grant(s): CCR-9401689; MIP-9706286
Report No.(s): AD-A460642; CU-CS-882-99; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460642

In this paper, we describe a family of branch predictors that use confidence estimation to improve the performance of an underlying branch predictor. With this method, referred to as Selective Branch Inversion (SBI), a confidence estimator determines when the branch predictor is likely to be incorrect; branch decisions for these low-confidence branches are inverted. We show that SBI with an underlying Gshare branch predictor and an optimized confidence estimator outperforms other equal sized predictors such as the best Gshare predictor and Cshare with dynamic history length fitting, as well as equally complex McFarling, Bi-Mode, and Gskewed predictors. Our analysis shows that SBI achieves its performance through conflict detection and correction, rather than through conflict avoidance as some of the previously proposed predictors such as Bi-Mode and Agree. We also show that SBI can be used with other underlying branch predictors, such as McFarling, to improve their performance even further. Finally we show that Dynamic Inversion Monitoring (DIM) can be used as a safeguard to turn off SBI in cases where it degrades the overall performance when compared to the underlying predictor.
DTIC
Inversions; Statistical Analysis

20070007522 Brown Univ., Providence, RI USA
The Wiener-Askey Polynomial Chaos for Stochastic Differential Equations
Xiu, Dongbin; Karniadakis, George E; Jan 2003; 27 pp.; In English
Report No.(s): AD-A460654; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA460654

We present a new method for solving stochastic differential equations based on Galerking projections and extensions of Wiener's polynomial chaos. Specifically, we represent the stochastic processes with an optimum trial basis from the Askey family of orthogonal polynomials that reduces the dimensionality of the system and leads to exponential convergence of the error. Several continuous and discrete processes are treated, and numerical examples show substantial speed-up compared to Monte-Carlo simulations for low dimensional stochastic inputs.
DTIC
Chaos; Differential Equations; Polynomials; Stochastic Processes

20070007592 Pennsylvania State Univ., University Park, PA USA
Underwater Acoustic Signal Processing
Culver, Richard L; Sibul, Leon H; Bradley, David L; Jan 2007; 22 pp.; In English
Contract(s)/Grant(s): N00014-05-1-0157
Report No.(s): AD-A460793; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460793

The reports cover progress to develop a signal processing structure that exploits available knowledge of the environment and of signal and noise variability induced by the environment. The research is directed toward passive sonar detection and classification, continuous wave (CW) and broadband signals, shallow water operation, both platform-mounted and distributed systems, and frequencies below 1 kHz. The results of this research are expected to lead to new passive sonar detectors and classifiers that take advantage of knowledge of medium variability and uncertainty. The results are mainly applicable to passive processing. However, the active processor can be considered 'a detector matched to the estimated ocean.' These results could have significant impact on Navy sonar system applications.
DTIC
Signal Processing; Signal Transmission; Sound Waves; Underwater Acoustics

20070008022 Brown Univ., Providence, RI USA
The Gauss-Seidel Numerical Procedure for Markov Stochastic Games
Kushner, Harold J; Oct 29, 2003; 11 pp.; In English
Contract(s)/Grant(s): DAAD19-02-1-0425; ECS-0097447
Report No.(s): AD-A459436; No Copyright; Avail.: CASI: A03, Hardcopy

No abstract available
Game Theory; Markov Processes; Stochastic Processes

20070008023 Brown Univ., Providence, RI USA
Numerical Approximations for Nonlinear Stochastic Systems With Delays
Kushner, Harold J; Aug 15, 2004; 34 pp.; In English
Contract(s)/Grant(s): DAAD19-02-1-0425; ECS-0097447
Report No.(s): AD-A459437; No Copyright; Avail.: CASI: A03, Hardcopy
No abstract available
Approximation; Nonlinear Systems; Stochastic Processes

20070008027 Massachusetts Univ., Amherst, MA USA
Temporal Abstraction in Bayesian Networks
Burns, Brendan; Morrison, Clayton T; Jan 2003; 7 pp.; In English
Contract(s)/Grant(s): F30602-01-2-0580
Report No.(s): AD-A459894; No Copyright; Avail.: CASI: A02, Hardcopy
A current popular approach to representing time in Bayesian belief networks is through Dynamic Bayesian Networks (DBNs) (Dean & Kanazawa, 1989). DBNs connect sequences of entire Bayes networks, each representing a situation at a snapshot in time. The authors present an alternative method for incorporating time into Bayesian belief networks that utilizes abstractions of temporal representations. This method maintains the principled Bayesian approach to reasoning under uncertainty, providing explicit representation of sequence and potentially complex temporal relationships, while also decreasing overall network complexity compared to DBNs.
DTIC
Bayes Theorem; Belief Networks; Neural Nets; Robots

20070008145 Naval Academy, Annapolis, MD USA
Low Level Segmentation for Imitation Learning Using the Expectation Maximization Algorithm
Warner, Andrew D; May 3, 2005; 14 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460525; USNA-CS-TR-2005-04; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460525
Imagine a robot that is able to develop skills on its own, without being programmed directly. This robot would be invaluable in any business, factory, or laboratory. Unfortunately, this problem, known as inductive learning, is very difficult, and has several varieties. One such is imitation learning. The overall process of imitation learning begins with one robot observing another robot performing a task. The watcher then breaks down, or segments, the demonstrating robot's actions into basic actions called planning units. Next the observing robot uses the planning units to create a plan that accomplishes the required task. The execution of a successful plan demonstrates that the robot has correctly implemented an inductive learning process. The scope of this research does not allow the problem of imitation learning to be discussed in its entirety; however, it does investigate an important subset of the larger problem. This paper focuses on the segmentation of the data, specifically how to break it up into the steps that provide the building blocks of the robots ultimate plan.
DTIC
Algorithms; Expectation; Machine Learning; Robots; Segments

20070008171 Pennsylvania Univ., Philadelphia, PA USA
Parsing the Voyager Domain Using Pearl
Magerman, David M; Marcus, Mitchell P; Jan 1991; 7 pp.; In English
Contract(s)/Grant(s): N00014-85-K-0018; N00014-89-C-0171
Report No.(s): AD-A460709; H91-1043; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460709
This paper describes a natural language parsing algorithm for unrestricted text which uses a probability-based scoring function to select the 'best' parse of a sentence according to a given grammar. The parser, Pearl, is a time-asynchronous bottom-up chart parser with Earley-type lop-down prediction which pursues the highest-scoring theory in the chart, where the score of a theory represents the extent to which the context of the sentence predicts that interpretation. This parser differs from previous attempts at stochastic parsers in that it uses a richer form of conditional probabilities based on context to predict likelihood. Pearl also provides a framework for incorporating the results of previous work in part-of-speech assignment, unknown word models, and other probabilistic models of linguistic features in one parsing tool, interleaving these techniques instead of using the traditional pipeline architecture. In tests performed on the Voyager direction-finding domain, Pearl has

been successful at resolving part-of-speech ambiguity, determining categories for unknown words, and selecting correct parses first using a very loosely fitting covering grammar.
DTIC
Parsing Algorithms; Natural Language (Computers); Domains

20070008173 Boston Univ., Boston, MA USA
Weight Estimation for N-Best Rescoring
Kannan, Ashvin; Ostendorf, Mari; Rohlicek, J R; Jan 1992; 3 pp.; In English
Contract(s)/Grant(s): IRI-8902124
Report No.(s): AD-A460643; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460643

This paper describes recent improvements in the weight estimation technique for sentence hypothesis rescoring using the N-Best formalism. Mismatches between training and test data are also explored.
DTIC
Weighting Functions; Formalism

20070008473 California Univ., Santa Cruz, CA USA
Collision Avoidance in Multi-Hop Ad Hoc Networks
Wang, Yu; Garcia-Luna-Aceves, J J; Jan 2002; 11 pp.; In English
Contract(s)/Grant(s): F49620-00-1-0330
Report No.(s): AD-A460987; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA460987

Collision avoidance is very important in contention-based medium access control protocols for multi-hop ad hoc networks due to the adverse effects of hidden terminals. Four-way sender-initiated schemes are the most popular collision-avoidance schemes to date. Although there has been considerable work on the performance evaluation of these schemes, most analytical work is confined to single-hop ad hoc networks or networks with very few hidden terminals. In this paper, the authors use a simple analytical model to derive the saturation throughput of collision avoidance protocols in multi-hop ad hoc networks with nodes randomly placed according to a two-dimensional Poisson distribution. They show that the sender-initiated collision-avoidance scheme achieves much higher throughput than the idealized carrier sense multiple access (CSMA) scheme with an ideal separate channel for acknowledgments. More importantly, they show that the collision avoidance scheme can accommodate much fewer competing nodes within a region in a network infested with hidden terminals than in a fully-connected network, if reasonable throughput is to be maintained. This shows that the scalability problem of contention-based collision-avoidance protocols looms much earlier than people might expect. Simulation experiments of the popular IEEE 802.11 MAC protocol validate the predictions made in the analysis.
DTIC
Collision Avoidance; Computer Networks; Packet Switching; Protocol (Computers); Transmitters; Wireless Communication

20070008519 SRI International Corp., Menlo Park, CA USA
Approximate Reasoning: Past, Present, Future
Ruspini, Enrique H; Jun 27, 1990; 26 pp.; In English
Contract(s)/Grant(s): F49620-89-K-0001; DAAL03-89-K-0156
Report No.(s): AD-A461069; SRI-TN-492; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461069

This note presents a personal view of the state of the art in the representation and manipulation of imprecise and uncertain information by automated processing systems. To contrast their objectives and characteristics with the sound deductive procedures of classical logic, methodologies developed for that purpose are usually described as relying on Approximate Reasoning. Using a unified descriptive framework, we will argue that, far from being mere approximations of logically correct procedures, approximate reasoning methods are also sound techniques that describe the properties of a set of conceivable states of a real-world system. This framework, which is based on the logical notion of possible worlds, permits the description of the various approximate reasoning methods and techniques and simplifies their comparison. More importantly, our descriptive model facilitates the understanding of the fundamental conceptual characteristics of the major methodologies. We examine first the development of approximate reasoning methods from early advances to the present state of the art, commenting also on the technical motivation for the introduction of certain controversial approaches. Our unifying semantic

model is then introduced to explain the formal concepts and structures of the major approximate reasoning methodologies: classical probability calculus, the Dempster-Shafer calculus of evidence, and fuzzy (possibilistic) logic. In particular, we discuss the basic conceptual differences between probabilistic and possibilistic approaches. Finally, we take a critical look at the controversy about the need and utility for diverse methodologies, and assess requirements for future research and development.
DTIC
Computers; Logic Design; Mathematical Logic

20070008536 Carnegie-Mellon Univ., Pittsburgh, PA USA
Learning Bayesian Network Model Structure from Data
Margaritis, Dimitris; May 2003; 127 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-98-2-0137; DAAE-07-98-CL-032
Report No.(s): AD-A461103; CMU-CS-03-153; No Copyright; Avail.: CASI: A07, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461103

In this thesis I address the important problem of the determination of the structure of directed statistical models, with the widely used class of Bayesian network models as a concrete vehicle of my ideas. The structure of a Bayesian network represents a set of conditional independence relations that hold in the domain. Learning the structure of the Bayesian network model that represents a domain can reveal insights into its underlying causal structure. Moreover, it can also be used for prediction of quantities that are dif cult, expensive, or unethical to measure such as the probability of lung cancer for example based on other quantities that are easier to obtain. The contributions of this thesis include (a) an algorithm for determining the structure of a Bayesian network model from statistical independence statements; (b) a statistical independence test for continuous variables; and nally (c) a practical application of structure learning to a decision support problem, where a model learned from the database most importantly its structure is used in lieu of the database to yield fast approximate answers to count queries, surpassing in certain aspects other state-of-the-art approaches to the same problem.
DTIC
Bayes Theorem; Networks

20070008558 Carnegie-Mellon Univ., Pittsburgh, PA USA
Modeling Syntax for Parsing and Translation
Venable, Peter; Dec 15, 2003; 131 pp.; In English
Contract(s)/Grant(s): N66001-00-C-8007
Report No.(s): AD-A461133; CMU-CS-03-216; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461133

Syntactic structure is an important component of natural language utterances, for both form and content. Therefore, a variety of applications can benefit from the integration of syntax into their statistical models of language. In this thesis, two new syntax-based models are presented, along with their training algorithms: a monolingual generative model of sentence structure, and a model of the relationship between the structure of a sentence in one language and the structure of its translation into another language. After these models are trained and tested on the respective tasks of monolingual parsing and word-level bilingual corpus alignment, they are demonstrated in two additional applications. First, a new statistical parser is automatically induced for a language in which none was available, using a bilingual corpus. Second, a statistical translation system is augmented with syntax-based models. Thus the contributions of this thesis include: a statistical parsing system; a bilingual parsing system, which infers a structural relationship between two languages using a bilingual corpus; a method for automatically building a parser for a language where no parser is available; and a translation model that incorporates phrase structure.
DTIC
Models; Parsing Algorithms; Syntax; Translating

20070008600 California Univ., Santa Cruz, CA USA
Quantitative Solution of Omega-Regular Games
Alfaro, Luca de; Majumdar, Rupak; Jan 2004; 25 pp.; In English
Contract(s)/Grant(s): N00014-02-1-0671; F33616-C-98-3614
Report No.(s): AD-A461206; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461206

We consider two-player games played for an infinite number of rounds, with omega-regular winning conditions. The games may be concurrent, in that the players choose their moves simultaneously and independently, and probabilistic, in that the moves determine a probability distribution for the successor state. We introduce quantitative game mu-ca1cu1us, and we show that the maximal probability of winning such games can be expressed as the fixpoint formulas in this calculus. We develop the arguments both for deterministic and for probabilistic concurrent games; as a special case, we solve probabilistic turn-based games with omega-regular winning conditions, which was also open. We also characterize the optimality, and the memory requirements, of the winning strategies. In particular, we show that while memoryless strategies suffice for winning games with safety and reachability conditions, Buechi conditions require the use of strategies with infinite memory. The existence of optimal strategies, as opposed to xi-optimal, is only guaranteed in games with safety winning conditions.
DTIC
Algorithms; Automata Theory; Calculus; Game Theory; Games; Probability Theory; Problem Solving

20070008617 California Univ., Berkeley, CA USA
From Fairness to Chance
de Alfaro, Luca; Jan 1999; 34 pp.; In English
Contract(s)/Grant(s): DAAH-04-96-1-0341; F33615-98-C-6314
Report No.(s): AD-A461231; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461231

Fairness is a mathematical abstraction used in the modeling of a wide range of phenomena, including concurrency, scheduling, and probability In this paper, we study fairness in the context of probabilistic systems, and we introduce probabilistic fairness, a novel notion of fairness that is itself defined in terms of probability. The definition of probabilistic fairness makes it invariant with respect to synchronous composition, and facilitates the design of model-checking algorithms for quantitative properties of probabilistic systems. We compare probabilistic fairness with other notions of fairness for probabilistic systems, and we provide algorithms that solve the verification problem for various classes of probabilistic properties on finite-state systems with fairness.
DTIC
Algorithms; Mathematical Models; Probability Theory

20070008632 Brown Univ., Providence, RI USA
Explicit Solution to a Robust Queueing Control Problem
Dupuis, Paul; Jan 2001; 30 pp.; In English
Contract(s)/Grant(s): DAAD19-99-1-0223; DMS-0072004
Report No.(s): AD-A461259; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461259

We consider the robust optimal control of a law of large numbers approximation of a stochastic network. The robust control problem is formulated as a differential game, with one player choosing the policies that determine service and routing assignments, and the other choosing quantities such as the arrival and service rates, subject to constraints. The cost to be minimized by the first player and maximized by the second is the time till the origin is reached. An explicit formula is given for the value function, and some of its basic properties are studied.
DTIC
Queueing Theory; Stochastic Processes

20070008683 Yale Univ., New Haven, CT USA
Fast Algorithms for Spherical Harmonic Expansions
Rokhlin, Vladimir; Tygert, Mark; Dec 17, 2004; 31 pp.; In English
Contract(s)/Grant(s): F49620-03-C-0041
Report No.(s): AD-A461342; YALEU/DCS/RR-1309; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461342

An algorithm is introduced for the rapid evaluation at appropriately chosen nodes on the two-dimensional sphere S(exp 2) in R(exp 3) of functions specified by their spherical harmonic expansions (known as the inverse spherical harmonic transform), and for the evaluation of the coefficients in spherical harmonic expansions of functions specified by their values at appropriately chosen points on S(exp 2) (known as the forward spherical harmonic transform). The procedure is numerically stable and requires an amount of CPU time proportional to N(logN) log(1/epsilon), where N is the number of nodes in the

discretization of S(exp 2), and epsilon is the precision of computations. The performance of the algorithm is illustrated via several numerical examples.
DTIC
Algorithms; Coefficients; Spherical Harmonics

20070008684 Stanford Univ., Stanford, CA USA
Model Checking of Probabilistic and Nondeterministic Systems
Bianco, Andrea; de Alfaro, Luca; Jan 1995; 16 pp.; In English
Contract(s)/Grant(s): DAAH04-95-1-0317
Report No.(s): AD-A461346; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461346

The temporal logics pCTL and pCTL* have been proposed as tools for the formal specification and verification of probabilistic systems; as they can express quantitative bounds on the probability of system evolution, they can be used to specify system properties such as reliability and performance. In this paper, we present model-checking algorithms for extensions of pCTL and pCTL* to systems in which the probabilistic behavior coexists with nondeterminism, and show that these algorithms have polynomial-time complexity in the size of the system. this provides a practical tool for reasoning on the reliability and performance of parallel systems.
DTIC
Probability Theory; Temporal Logic

20070008746 California Univ., Berkeley, CA USA
Quantitative Solution of Omega-Regular Games
de Alfaro, Luca; Majumdar, Rupak; Jul 2001; 10 pp.; In English
Contract(s)/Grant(s): F49620-00-1-0327
Report No.(s): AD-A461490; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461490

We consider two-player games played for an infinite number of rounds with omega-regular winning conditions. The games may be concurrent in that the players choose their moves simultaneously and independently and probabilistic in that the moves determine a probability distribution for the successor state. We introduce quantitative game mu-calculus, and we show that the maximal probability of winning such games can be expressed as the fixpoint formulas in this calculus. We develop the arguments both for deterministic and for probabilistic concurrent games; as a special case we solve probabilistic turn-based games with omega-regular winning conditions which was also open. We also characterize the optimality and the memory requirements of the winning strategies. In particular we show that while memoryless strategies suffice for winning games with safety and reachability conditions Buchi conditions require the use of strategies with infinite memory. The existence of optimal strategies as opposed to epsilon-optimal, is only guaranteed in games with safety winning conditions.
DTIC
Automata Theory; Calculus; Game Theory; Games; Probability Distribution Functions; Problem Solving

20070008756 California Univ., Berkeley, CA USA
Computing Minimum and Maximum Reachability Times in Probabilistic Systems
de Alfaro, Luca; Jan 1999; 18 pp.; In English
Contract(s)/Grant(s): DAAH-04-96-1-0341; F33615-98-C-3614
Report No.(s): AD-A461508; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461508

A Markov decision process is a generalization of a Markov chain in which both probabilistic and nondeterministic choice coexist. Given a Markov decision process with costs associated with the transitions and a set of target states the stochastic shortest path problem consists in computing the minimum expected cost of a control strategy that guarantees to reach the target. In this paper, we consider the classes of stochastic shortest path problems in which the costs are all non-negative, or all non-positive. Previously, these two classes of problems could be solved only under the assumption that the policies that minimize or maximize the expected cost also lead to the target with probability 1. This assumption does riot necessarily hold for Markov decision processes that arise as model for distributed probabilistic systems. We present efficient methods for solving these two classes of problems without relying on additional assumptions. The methods are based on algorithms to transform the original problems into problems that satisfy the required assumptions. The methods lead to the efficient solution

of two basic problems in the analysis of the reliability arid performance of partially-specified systems: the computation of the minimum (or maximum) probability of reaching a target set, and the computation of the minimum (or maximum) expected time to reach the set.
DTIC
Algorithms; Automata Theory; Markov Chains; Markov Processes; Statistical Decision Theory; Stochastic Processes

20070008761 California Univ., Berkeley, CA USA
The Verification of Probabilistic Systems Under Memoryless Partial-Information Policies is Hard
de Alfaro, Luca; Jan 1999; 14 pp.; In English
Contract(s)/Grant(s): DAAH-04-96-1-0341; F33615-98-C-3614
Report No.(s): AD-A461516; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461516

Several models of probabilistic systems comprise both probabilistic and nondeterministic choice. In such models, the resolution of nondeterministic choices is mediated by the concept of policies (sometimes called adversaries). A policy is a criterion for choosing among nondeterministic alternatives on the basis of the past sequence of states of the system. By fixing the resolution of nondeterministic choice, a policy reduces the system to an ordinary stochastic system, thus making it possible to reason about the probability of events of interest. A partial information policy is a policy that can observe only a portion of the system state, and that must base its choices on finite sequences of such partial observations. We argue that in order to obtain accurate estimates of the worst-case performance of a probabilistic system, it would often be desirable to consider partial-information policies. However, we show that even when considering memoryless partial-information policies, the problem of deciding whether the system can stay forever with positive probability in a given subset of states becomes NP-complete. As a consequence, many verification problems that can be solved in polynomial time under perfect-information policies, such as the model-checking of pCTL or the computation of the worst-case long-run average outcome of tasks, become NP-hard under memoryless partial-information policies. On the positive side, we show that the worst-case long-run average outcome of tasks under memoryless partial-information policies can be computed by solving a nonlinear programming problem, opening the way to the use of numerical approximation algorithms.
DTIC
Automata Theory; Mathematical Models; Policies; Stochastic Processes

20070008779 California Univ., Berkeley, CA USA
Concurrent Reachability Games
Alfaro, Luca de; Henzinger, Thomas A; Kupferman, Orna; Jan 1998; 13 pp.; In English
Contract(s)/Grant(s): DAAH04-96-1-0341; N00014-95-1-0520
Report No.(s): AD-A461541; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461541

An open system can be modeled as a two-player game between the system and its environment. At each round of the game, player 1 (the system) and player 2 (the environment) independently and simultaneously choose moves, and the two choices determine the next state of the game. Properties of open systems can be modeled as objectives of these two-player games. For the basic objective of reachability can player 1 force the game to a given set of target states? there are three types of winning states, according to the degree of certainty with which player 1 can reach the target. From type-1 states, player 1 has a deterministic strategy to always reach the target. From type-2 states, player 1 has a randomized strategy to reach the target with probability 1. From type-3 states, player 1 has for every real epsilon \g 0 a randomized strategy to reach the target with probability greater than 1 -epsilon. We show that for finite state spaces, all three sets of winning states can be computed in polynomial time: type- 1 states in linear time, and type-2 and type-3 states in quadratic time. The algorithms to compute the three sets of winning states also enable the construction of the winning and spoiling strategies. Finally, we apply our results by introducing a temporal logic in which all three kinds of winning conditions can be specified, and which can be model checked in polynomial time. This logic, called Randomized ATL, is suitable for reasoning about randomized behavior in open (two-agent) as well as multi-agent systems.
DTIC
Algorithms; Architecture (Computers); Game Theory; Games; Mathematical Models

20070008813 Chirp Corp., La Jolla, CA USA
Multiecho Processing by an Echolocating Dolphin
Altes, Richard A; Dankiewicz, Lois A; Moore, Patrick W; Helweg, David A; Aug 2003; 13 pp.; In English
Report No.(s): AD-A461581; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461581

Bottlenose dolphins (Tursiops truncatus) use short, wideband pulses for echolocation. Individual waveforms have high-range resolution capability but are relatively insensitive to range rate. Signal-to-noise ratio (SNR) is not greatly improved by pulse compression because each waveform has small time-bandwidth product. The dolphin, however, often uses many pulses to interrogate a target, and could use multipulse processing to combine the resulting echoes. Multipulse processing could mitigate the small SNR improvement from pulse compression, and could greatly improve range-rate estimation, moving target indication, range tracking, and acoustic imaging. All these hypothetical capabilities depend upon the animal's ability to combine multiple echoes for detection and/or estimation. An experiment to test multiecho processing in a dolphin measured detection of a stationary target when the number N of available target echoes was increased, using synthetic echoes. The SNR required for detection decreased as the number of available echoes increased, as expected for multiecho processing. A receiver that sums binary-quantized data samples from multiple echoes closely models the N dependence of the SNR required by the dolphin. Such a receiver has distribution-tolerant (nonparametric) properties that make it robust in environments with nonstationary and/or non-Gaussian noise, such as the pulses created by snapping shrimp.
DTIC
Acoustics; Detection; Dolphins; Echoes; Pulse Compression; Random Noise; Signal to Noise Ratios

20070008839 California Univ., Berkeley, CA USA
Stochastic Transition Systems
de Alfaro, Luca; Jan 1998; 17 pp.; In English
Contract(s)/Grant(s): DAAH04-95-1-0317; DAAH04-96-1-0341
Report No.(s): AD-A461611; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461611

Traditional methods for the analysis of system performance and reliability generally assume a precise knowledge of the system and its workload. Here, we present methods that are suited for the analysis of systems that contain partly unknown or unspecified components such as systems in their early design stages. We introduce stochastic transition systems, a high-level formalism for the modeling of timed probabilistic systems. Stochastic transition systems extend current modeling capabilities by enabling the representation of transitions having unknown delay distributions alongside transitions with zero or exponentially-distributed delay. We show how these various types of transitions can be uniformly represented in terms of nondeterminism, probability, fairness and time, yielding efficient algorithms for system analysis. Finally, we present methods for the specification and verification of long-run average properties of STSs. These properties include many relevant performance and reliability indices, such as system throughput, average response time, and mean time between failures.
DTIC
Probability Theory; Space Transportation System; Stochastic Processes

20070008868 California Univ., Berkeley, CA USA
How to Specify and Verify the Long-Run Average Behavior of Probabilistic Systems
de Alfaro, Luca; Jan 1998; 13 pp.; In English
Contract(s)/Grant(s): DAAH04-95-1-0317; DAAH04-96-1-0341
Report No.(s): AD-A461646; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461646

Long-run average properties of probabilistic systems refer to average behavior of the system, measured over a period of time whose length diverges to infinity. These properties include many relevant performance and reliability indices, such as system throughput, average response time, and mean time between failures. In this paper, we argue that current formal specification methods cannot be used to specify long-run average properties of probabilistic systems. To enable the specification of these properties, we propose an approach based on the concept of experiments. Experiments are labeled graphs that can be used to describe behavior patterns of interest, such as the request for a resource followed by either a grant or a rejection. Experiments are meant to be performed infinitely often, and it is possible to specify their long-run average outcome or duration. We propose simple extensions of temporal logics based on experiments, and we present model-checking algorithms for the verification of properties of finite-state timed probabilistic systems in which both probabilistic and nondeterministic choice are present. The consideration of system models that include nondeterminism enables the

performance and reliability analysis of partially specified systems, such as systems in their early design stages.
DTIC
Computers; Probability Theory; Reliability

20070008878 SRI International Corp., Menlo Park, CA USA
A Stochastic Approach to Stereo Vision
Barnard, Stephen T; Apr 4, 1986; 12 pp.; In English
Contract(s)/Grant(s): DACA76-85-C-0004; MDA903-83-C-0027
Report No.(s): AD-A461659; TN-373; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461659

A stochastic optimization approach to stereo matching is presented. Unlike conventional correlation matching and feature matching, the approach provides a dense array of disparities, eliminating the need for interpolation. First, the stereo matching problem is defined in terms of finding a disparity map that satisfies two competing constraints: (1) matched points should have similar image intensity, and (2) the disparity map should be smooth. These constraints are expressed in an 'energy' function that can be evaluated locally. A simulated annealing algorithm is used to find a disparity map that has very low energy (i.e., in which both constraints have simultaneously been approximately satisfied). Annealing allows the large-scale structure of the disparity map to emerge at higher temperatures, and avoids the problem of converging too quickly on a local minimum. Results are shown for a sparse random-dot stereogram, a vertical aerial stereogram (shown in comparison to ground truth), and an oblique ground-level scene with occlusion boundaries.
DTIC
Image Processing; Stereoscopic Vision; Stochastic Processes

20070008944 SRI International Corp., Menlo Park, CA USA
Recognition by Parts
Pentland, Alex P; Aug 25, 1987; 34 pp.; In English
Contract(s)/Grant(s): MDA903-86-C-0084; DCR-83-12766
Report No.(s): AD-A461783; SRI-TR- 406; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461783

We argue that most natural objects have a part structure that we can recover from image data and thus use as the basis for 'general-purpose' recognition. We describe a 'parts' representation that is fairly general purpose, despite having only a small number of parameters. Having this expressive power captured by a small number of parameters allows us to approach the problem of recovering an object's part structure by use of minimal length encoding. We present several examples of recovering part structure using various types of range imagery to show that the recovery procedure is robust.
DTIC
Goodness of Fit; Object-Oriented Programming; Pattern Recognition; Statistical Tests

20070009066 Brown Univ., Providence, RI USA
Numerical Approximations for Stochastic Differential Games: The Ergodic Case
Kushner, Harold J; Dec 2001; 27 pp.; In English
Contract(s)/Grant(s): DAAD19-99-1-0223; ECS-0097447
Report No.(s): AD-A461762; No Copyright; Avail.: CASI: A03, Hardcopy

The Markov chain approximation method is a widely used, relatively easy to use, and efficient family of methods for the bulk of stochastic control problems in continuous time, for reflected-jump-diffusion type models. It has been shown to converge under broad conditions, and there are good algorithms for solving the numerical problems, it the dimension is not too high. We consider a class of stochastic differential games with a reflected diffusion system model and ergodic cost criterion and where the controls for the two players are separated in the dynamics and cost function. It is shown that the value of the game exists and that the numerical method converges to this value as the discretization parameter goes to zero. The actual numerical method solves a stochastic game for a finite state Markov chain and ergodic cost criterion. The essential conditions are nondegeneracy and that a weak local consistency condition hold 'almost everywhere' for the numerical approximations, just as for the control problem.
DTIC
Approximation; Ergodic Process; Probability Theory; Stochastic Processes

20070009067 Boston Univ., Boston, MA USA

The Specialized Mappings Architecture

Rosales, Romer; Sclaroff, Stan; Apr 10, 2003; 36 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-03-1-0108; N00014-01-1-0444

Report No.(s): AD-A461765; No Copyright; Avail.: CASI: A03, Hardcopy

A probabilistic, nonlinear supervised learning model is proposed: the Specialized Mappings Architecture (SMA). The SMA employs a set of several forward mapping functions that are estimated automatically from training data. Each specialized function maps certain domains of the input space (e.g., image features) onto the output space (e.g., articulated body parameters). The SMA can model ambiguous, one-to-many mappings that may yield multiple valid output hypotheses. Once learned, the mapping functions generate a set of output hypotheses for a given input via a statistical inference procedure. The SMA inference procedure incorporates an inverse mapping or feedback function in evaluating the likelihood of each of the hypothesis. Possible feedback functions include computer graphics rendering routines that can generate images for given hypotheses. The SMA employs a variant of the Expectation-Maximization algorithm for simultaneous learning of the specialized domains along with the mapping functions, and approximate strategies for inference. The framework is demonstrated in a computer vision system that can estimate the articulated pose parameters of a human's body or hands, given silhouettes from a single image. The accuracy and stability of the SMA are also tested using synthetic images of human bodies and hands, where ground truth is known.

DTIC

Maximum Likelihood Estimates; Models

20070009070 North Carolina State Univ., Raleigh, NC USA

Adaptive Optimization of Least Squares Tracking Algorithms: With Applications to Adaptive Antenna Arrays for Randomly Time-Varying Mobile Communications Systems

Buche, Robert; Kushner, Harold J; Feb 9, 2003; 24 pp.; In English

Contract(s)/Grant(s): DAAD19-02-1-0425; ECS-9979250

Report No.(s): AD-A461785; No Copyright; Avail.: CASI: A03, Hardcopy

Adaptive antenna arrays are widely used for reducing the effects of interference and increasing capacity in mobile communications systems. The adaptation typically consists of updating the antenna weights by a recursive least-squares-type algorithm. We will add another adaptive loop that greatly improves the operation when the environment for the various links is randomly time-varying. The analysis is via stochastic approximation type arguments. Consider a single cell system with an (receiving) antenna array at the base station. Algorithms for tracking time varying parameters require a balance between the need to follow changes (implying a short memory) and the need to average the effects of disturbance (implying a long memory).

DTIC

Adaptation; Algorithms; Antenna Arrays; Least Squares Method; Mobile Communication Systems; Time; Variations

20070009086 Brown Univ., Providence, RI USA

Fast and Accurate Boundary Variation Method for Multi-Layered Diffraction Optics

Wilcox, L C; Dinesen, P G; Hesthaven, J S; Jan 2003; 40 pp.; In English

Contract(s)/Grant(s): DAAD19-01-1-0631

Report No.(s): AD-A461881; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A boundary variation method for the forward modeling of multi-layered diffraction optics is presented. The approach enables for fast and high-order accurate modeling of infinite periodic and finite aperiodic transmission optics, consisting of an arbitrary number of materials and interfaces of general shape, subject to plane wave illumination or, by solving a sequence of problems, illumination by beams The key elements of the algorithm are discussed as are details of an efficient implementation. Numerous comparisons with exact solutions and highly accurate direct solutions con firms the accuracy, versatility, and efficiency of the proposed method.

DTIC

Algorithms; Boundaries; Diffraction; Diffractive Optics; Optical Materials; Variational Principles

20070009092 Brown Univ., Providence, RI USA

Large Deviation Principle for Occupancy Problems With Colored Balls

Dupuis, Paul; Nuzman, Carl; Whiting, Phil; Jun 6, 2003; 33 pp.; In English

Contract(s)/Grant(s): DAAD19-02-1-0425; DMS-0072004

Report No.(s): AD-A461905; No Copyright; Avail.: CASI: A03, Hardcopy

A Large Deviations Principle (LDP), demonstrated for occupancy problems with indistinguishable balls, is generalized to the case in which balls may be distinguished by a finite number of colors. The colors of the balls are chosen independently from the occupancy process itself. There are r balls thrown into n urns with the probability of a ball entering a given urn being 1/n (Maxwell-Boltzman statistics). The LDP applies with the scale parameter n going to infinity and the number of balls increasing proportionally. It holds under mild restrictions, the key one being that the coloring process by itself satisfies a LDP. Hence the results include the important special cases of deterministic coloring patterns and of colors chosen with fixed probabilities independently for each ball.
DTIC
Color; Stochastic Processes

20070009095 Brown Univ., Providence, RI USA
Adaptive Importance Sampling for Uniformly Recurrent Markov Chains
Dupuis, Paul; Wang, Hui; Jan 2003; 39 pp.; In English
Contract(s)/Grant(s): DAAD19-00-1-0549; DAAD19-02-1-0425
Report No.(s): AD-A461913; No Copyright; Avail.: CASI: A03, Hardcopy

Importance sampling is a variance reduction technique for efficient estimation of rare-event probabilities by Monte Carlo. In standard importance sampling schemes, the system is simulated using an a priori fixed change of measure suggested by a large deviation lower bound analysis. Recent work, however, has suggested that such schemes do not work well in many situations. In this paper, we consider adaptive importance sampling in the setting of uniformly recurrent Markov chains. By adaptive, we mean that the change of measure depends on the history of the samples. Based on a control-theoretic approach to large deviations, the existence of asymptotically optimal adaptive schemes is demonstrated in great generality. In this framework, the difference between a static change of measure and an adaptive change and a feed-back control. The implementation of the adaptive schemes is carried out with the help of a limiting Bellman equation. Also presented are numerical examples contrasting the adaptive and standard schemes.
DTIC
Adaptation; Markov Chains; Markov Processes; Sampling

20070009128 George Mason Univ., Fairfax, VA USA
Combat Identification with Bayesian Networks
Laskey, George; Laskey, Kathryn; Jan 2002; 14 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461975; No Copyright; Avail.: CASI: A03, Hardcopy

Correctly identifying tracks is a difficult but important capability for U.S. Navy ships and aircraft. It is difficult because of the inherent uncertainty, complexity, and short timelines involved. It is important because the price of failure is missed or civilian engagements and fratricide. Today, Navy ships and aircraft primarily use an If-Then rule-based system in evaluating radar and IFF information to perform Combat Identification (CID). To cope with the uncertainty and complexity of CID, Bayesian Networks have been suggested to integrate radar, IFF, and other lower quality sources to perform the identification determination. The goal of this project is to show that Bayesian Networks can be used to support CID investment decisions. Two investments, a new sensor and good maintenance, were compared in a difficult CID scenario in four different environments. The paper applies techniques from decision analysis and Bayesian networks to address the challenges of CID. The CID network was developed using good knowledge engineering practices.
DTIC
Bayes Theorem; Charge Injection Devices; Classifications; Combat; Decision Support Systems; Military Operations; Systems Integration; Targets; Warfare

20070009139 North Carolina State Univ., Raleigh, NC USA
Control of Mobile Communication Systems with Time-Varying Channels via Stability Methods (Preprint)
Buche, Robert; Kushner, Harold J; Mar 2004; 20 pp.; In English
Contract(s)/Grant(s): DAAD-19-02-1-0425
Report No.(s): AD-A461988; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Consider the forward link of a mobile communications system with a single transmitter and connecting to K destinations via randomly varying channels. Data arrives in some random way and is queued according to the K destinations until transmitted. Time is divided into small scheduling intervals. Current systems can estimate the channel (e.g., via pilot signals) and use this information for scheduling. The issues are the allocation of transmitter power and/or time and bandwidth to the

various queues in a queue and channel-state dependent way to assure stability and good operation. The decisions are made at the beginning of the scheduling intervals. Stochastic stability methods are used both to assure that the system is stable and to get appropriate allocations, under very weak conditions. The choice of Liapunov function allows a choice of the effective performance criteria. The resulting controls are readily implementable and allow a range of tradeoffs between current rates and queue lengths. The various extensions allow a large variety of schemes of current interest to be covered. All essential factors are incorporated into a mean rate function, so that the results cover many different systems. Because of the non-Markovian nature of the problem, we use the perturbed Stochastic Liapunov function method, which is well adapted to such problems. The method is simple and effective.
DTIC
Mobile Communication Systems; Queueing Theory; Stability; Telecommunication; Time; Variations

20070009140 Yale Univ., New Haven, CT USA
Computing Diameter in the Streaming and Sliding-Window Models (Preprint)
Feigenbaum, Joan; Kannan, Sampath; Zhang, Jian; Dec 23, 2002; 15 pp.; In English
Contract(s)/Grant(s): N00014-01-1-0795
Report No.(s): AD-A461989; No Copyright; Avail.: CASI: A03, Hardcopy

We investigate the diameter problem in the streaming and sliding-window models. We show that, for a stream of n points or a sliding window of size n, any exact algorithm for diameter requires Omega(n) bits of space. We present a simple epsilon-approximation algorithm for computing the diameter in the streaming model. Our main result is an epsilon-approximation algorithm that maintains the diameter in two dimensions in the sliding windows model using Omicron [(1/epsilon (exp 3/2) log3 n(log R + log log n + log 1/epsilon))] bits of space, where R is the maximum, over all windows, of the ratio of the diameter to the minimum non-zero distance between any two points in the window.
DTIC
Geometry; Sliding

20070009142 Colorado Univ., Boulder, CO USA
Modeling Parallel, Distributed Computations using ParaDiGM - A Case Study: the Adaptive Global Optimization Algorithm
Demeure, Isabelle M; Smith, Sharon L; Nutt, Gary J; Dec 1988; 42 pp.; In English
Contract(s)/Grant(s): AFOSR-85-0251
Report No.(s): AD-A461991; CU-CS-419-88; No Copyright; Avail.: CASI: A03, Hardcopy

ParaDiGM the Parallel Distributed computation Graph Model, was designed to model implementations of parallel computations to be run on distributed message-based computer systems. We have used it to model two implementations of a complex adaptive parallel global optimization algorithm. In this paper, we introduce the ParaDiGM constructs, describe the algorithm, and then present the models of the implementations. These examples illustrate ParaDiGM's utility as a modeling formalism for representing and studying implementations of parallel, distributed algorithms.
DTIC
Algorithms; Optimization; Stochastic Processes

20070009317 Space and Naval Warfare Systems Command, San Diego, CA USA
New Uses of Second Order Probability Techniques in Estimating Critical Probabilities in Command & Control
Bamber, D; Goodman, I R; Jan 2000; 54 pp.; In English
Report No.(s): AD-A462271; No Copyright; Avail.: CASI: A04, Hardcopy

It is an understatement that both the theory and applications of probability conditional or unconditional play an essential role in the processing and use of disparate information in decision-making in C4I systems. Apropos to the theme of this symposium, 'Making Information Superiority Happen', the paper outlined here describes new applications, insights, and theoretical aspects of ongoing work by the authors toward improving the rationale for use of probability theory, keeping in mind issues of scalability and computational complexity. This paper extends the ideas first presented in last year's CCRTS at Newport, RI. In short, the mathematical theme of this paper is both a summary of past research efforts together with new results on the problem of best estimating partially specified conditional and unconditional probabilities of interest via a second order bayesian probability approach. Among the new derivations provided in this paper is a significant reduction in computational effort in obtaining (again, in the second order probability sense) optimal or near-optimal probability estimates,

all within the setting of a boolean conditional event algebra which allows full compatibility with conditional probability evaluations.
DTIC
Command and Control; Estimating; Probability Theory

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SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

Includes mathematical modeling of systems; network analysis; mathematical programming; decision theory; and game theory.

20070007346 North Carolina State Univ., Raleigh, NC USA
Detection of Denial of QoS Attacks on Diffserv Networks
Mahadik, Vinay A; Jan 2002; 95 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-99-1-0540
Report No.(s): AD-A460201; No Copyright; Avail.: CASI: A05, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460201

In this work, we describe a method of detecting denial of Quality of Service (QoS) attacks on Differentiated Services (DiffServ) networks. Our approach focuses on real time and quick detection, scalability to large networks, and a negligible false alarm generation rate. This is the first comprehensive study on DiffServ monitoring. Our contributions to this research area are 1. We identify several potential attacks, develop/use research implementations of each on our testbed and investigate their effects on the QoS sensitive network flows. 2. We study the effectiveness of several anomaly detection approaches; select and adapt SRI's NIDES statistical inference algorithm and EWMA Statistical Process Control technique for use in our anomaly detection engine. 3. We then emulate a Wide Area Network on our testbed. We measure the effectiveness of our anomaly detection system in detecting the attacks and present the results obtained as a justification of our work. 4. We verify our findings through simulation of the network and the attacks on NS2 (the Network Simulator, version 2). We believe that given the results of the tests with our implementation of the attacks and the detection system, further validated by the simulations, the method is a strong candidate for QoS-intrusion detection for a low-cost commercial deployment.
DTIC
Internets; Security

20070007356 Mitre Corp., Bedford, MA USA
Asymmetric Wargaming: Toward a Game Theoretic Perspective
Whittaker, G M; Sep 2000; 20 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460215; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460215

As we enter the 21st century the art and practice of warfare is radically changing. The US has emerged as the dominant conventional military power only to find its adversaries working their way out of the box. The Defense Advanced Research Projects Agency Information Systems Office (DARPA/ISO) which is seeking new approaches to asymmetric threat modeling, analysis and prediction sponsored this work as well as several related research efforts during FY 2000. This paper enumerates some of the main features of the asymmetric environment and summarizes shortfalls in our current wargame technology. It is argued that contemporary developments in game theory provide a flexible and promising framework in which to efficiently model adversarial motivation and to generate representative asymmetric strategies for improved automation of behaviors in simulations and to support Information Operations analysis and planning. Genetic programming and reinforcement learning are suggested approaches for extraction and refinement of multi-player models from historical data.
DTIC
Asymmetry; War Games

20070007385 SRI International Corp., Menlo Park, CA USA
High-Accuracy Large-Vocabulary Speech Recognition Using Mixture Tying and Consistency Modeling
Digalakis, Vassilios; Murveit, Hy; Jan 1994; 7 pp.; In English
Contract(s)/Grant(s): N00014-92-C-0154
Report No.(s): AD-A460273; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460273

Improved acoustic modeling can significantly decrease the error rate in large-vocabulary speech recognition. Our

approach to the problem is twofold. We first propose a scheme that optimizes the degree of mixture tying for a given amount of training data and computational resources. Experimental results on the Wall Street Journal (WSJ) Corpus show that this new form of output distribution achieves a 25% reduction in error rate over typical tied- mixture systems. We then show that an additional improvement can be achieved by modeling local time correlation with linear discriminant features.
DTIC
Consistency; Markov Processes; Mathematical Models; Speech Recognition

20070007497 SRI International Corp., Menlo Park, CA USA
The Use of Prosody in Syntactic Disambiguation
Price, Patti; Ostendorf, Mari; Shattuck-Hufnagel, Stefanie; Fong, Cynthia; Jan 1991; 7 pp.; In English
Contract(s)/Grant(s): NSF-IRI-8805680; NSF-IRI-8905249
Report No.(s): AD-A460611; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460611

Prosodic structure and syntactic structure are not identical; neither are they unrelated. Knowing when and how the two correspond could yield better quality speech synthesis, could aid in the disambiguation of competing syntactic hypotheses in speech understanding, and could lead to a more comprehensive view of human speech processing. In a set of experiments involving 35 pairs of phonetically similar sentences representing seven types of structural contrasts, the perceptual evidence shows that some, but not all, of the pairs can be disambiguated on the basis of prosodic differences. The phonological evidence relates the disambiguation primarily to boundary phenomena, although prominences sometimes play a role. Finally, phonetic analyses describing the attributes of these phonological markers indicate the importance of both absolute and relative measures.
DTIC
Natural Language Processing

20070007499 BBN Systems and Technologies Corp., Cambridge, MA USA
On Deftly Introducing Procedural Elements into Unification Parsing
Bobrow, R; Ramshaw, Lance; Jan 1990; 5 pp.; In English
Contract(s)/Grant(s): N00014-89-C-0008
Report No.(s): AD-A460613; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460613

Unification grammars based on complex feature structures are theoretically well-founded, and their declarative nature facilitates exploration of various parsing strategies. However, a straightforward implementation of such parsers can be painfully inefficient, exploding lists of possibilities and failing to take advantage of search control methods long utilized in more procedurally-oriented parsers. In the context of BBN's Delphi NL system, we have explored modifications that gain procedural efficiency without sacrificing the theoretical advantages of unification-based CFG's.
DTIC
Context Free Languages; Grammars; Parsing Algorithms

20070007697 Oregon State Univ., Corvallis, OR USA
Predictability and Dynamics of Geophysical Fluids Flows - GRA Extension
Samelson, Roger M; Jan 2007; 2 pp.; In English
Contract(s)/Grant(s): N00014-06-1-1369
Report No.(s): AD-A461005; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461005

Research under this grant, an extension of Grant number N00014-98-1-08l3 that supported the completion of the Ph.D. thesis of Christopher L. Wolfe, focused primarily on computations of unstable nonlinear periodic solutions, time-dependent normal modes (Floquet vectors) and singular vectors in a two-layer quasi-geostrophic channel model. The model was studied in a strongly nonlinear regime, in which small disturbances to an unstable, steady, zonal, baroclinic shear flow grow to finite amplitude and continue to vacillate irregularly for arbitrarily long times. The computation of time-dependent, normal-mode disturbances to unstable, nonlinear, time-periodic basic flows in a high-dimensional geophysical fluid model opens a new perspective on the analysis of disturbance growth in time-dependent flows, and on the closely related problem of error growth in predictive models of time-dependent flows.
DTIC
Geophysical Fluids; Predictions; Time Dependence

20070007698 George Mason Univ., Fairfax, VA USA
HSI and Cognitive Modeling
Boehm-Davis, Deborah A; Jan 2007; 7 pp.; In English
Contract(s)/Grant(s): N00014-05-1-0438
Report No.(s): AD-A461008; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461008

This project involved two components: (a) data collection to understand the performance outcomes resulting from interruptions and (b) knowledge/skill enhancement for an ONR project officer. The data collection efforts included both naturalistic and laboratory observations of performance as a function of interruptions. The naturalistic study demonstrated the difficulties inherent in this type of research and provided the foundation for the development of a laboratory task on which data were collected, analyzed, and reported.
DTIC
Cognition; Data Acquisition; Interruption; Systems Integration

20070008028 Commonwealth Scientific and Industrial Research Organization, Melbourne, Victoria, Australia
Final Report on the Experimental Assessment of Porous Screens for Protection Against Shock Effects
Snyman, I M; Sep 2005; 23 pp.; In English
Contract(s)/Grant(s): N62558-05-P-0155
Report No.(s): AD-A460233; DPSS-2005/158; No Copyright; Avail.: CASI: A03, Hardcopy

Use the theoretical knowledge of shock attenuation and advance with experimental evidence to the point where the results can be used in practical scenario. Our first objective is to characterize the material with respect to shock attenuation from a blast load. This achieved by the design and development of a test rig that can be used to evaluate analyze and eventually understand the parameters in a material that influence shock attenuation with verification of the existing theory.
DTIC
Blast Loads; Porosity; Protection

20070008037 National Defense Univ., Washington, DC USA
Complexity, Global Politics, and National Security
Alberts, David S; Czerwinski, Thomas J; Jan 1997; 188 pp.; In English
Report No.(s): AD-A460550; No Copyright; Avail.: CASI: A09, Hardcopy

Complexity theory can be viewed as the native form for investigating the properties and behavior of the dynamics of nonlinear systems. By nonlinear systems, one means the arrangement of nature -- life and its complications, such as warfare -- in which inputs and outputs are not proportional; where the whole is not quantitatively equal to its parts, or even, qualitatively, recognizable in its constituent components; and where cause and effect are not evident. It is an environment where phenomena are unpredictable, but within bounds, self-organizing; where unpredictability frustrates conventional planning, where solution as self-organization defeats control; and where the 'bounds' are the actionable variable, requiring new ways of thinking and acting. The inquiry into the nature of nonlinearity, and the rise of Complexity theory has of necessity paralleled the development of the computer. Nonlinearity is extremely difficult to work with unless aided by the computer. The 11 contributions to this symposium were as follows: The Simple and the Complex, by Murray Gell-Mann; America in the World Today, by Zbigniew Brzezinski; Complex Systems: The Role of Interactions, by Robert Jervis; Many Damn Things Simultaneously: Complexity Theory and World Affairs, by James N. Rosenau; Complexity, Chaos, and National Security Policy: Metaphors or Tools?, by Alvin M. Saperstein; The Reaction to Chaos, by Steven R. Mann; Clausewitz, Nonlinearity, and the Importance of Imagery, by Alan D. Beyerchen ;Complexity and Organization Management, by Robert R. Maxfield; Command and (Out of) Control: The Military Implications of Complexity Theory, by John F. Schmitt; Complexity Theory and Airpower: A New Paradigm for Airpower in the 21st Century, by Steven M. Rinaldi; and Chaos Theory and U.S. Military Strategy: A 'Leapfrog' Strategy for U.S. Defense Policy, by Michael J. Mazarr. A 28-page bibliography on Chaos and Complexity is included.
DTIC
Chaos; International Relations; Nonlinear Systems; Politics; Security; Warfare

20070008479 SRI International Corp., Menlo Park, CA USA
Introducing the Tileworld: Experimentally Evaluating Agent Architectures
Pollack, Martha E; Ringuette, Marc; May 1990; 9 pp.; In English
Contract(s)/Grant(s): N00014-89-C-0095
Report No.(s): AD-A460996; SRI-TR-489; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460996

We describe a system called Tileworld, which consists of a simulated robot agent and a simulated environment which is both dynamic and unpredictable. Both the agent and the environment are highly parameterized, enabling one to control certain characteristics of each. We can thus experimentally investigate the behavior of various meta-level reasoning strategies by tuning the parameters of the agent, and can assess the success of alternative strategies in different environments by tuning the environmental parameters. Our hypothesis is that the appropriateness of a particular meta-level reasoning strategy will depend in large part upon the characteristics of the environment in which the agent incorporating that strategy is situated. We describe our initial experiments using Tileworld, in which we have been evaluating a version of the meta-level reasoning strategy proposed in earlier work by one of the authors [Bratman et al., 1988].

DTIC

Metadata; Robots; Simulation

20070008520 SRI International Corp., Menlo Park, CA USA
A System for Labeling Self-Repairs in Speech
Bear, John; Dowding, John; Shriberg, Elizabeth; Price, Patti; Feb 22, 1993; 10 pp.; In English
Contract(s)/Grant(s): N00014-90-C-0085
Report No.(s): AD-A461074; SRI-TN-522; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461074

This document outlines a system for labeling self-repairs in spontaneous speech. The system marks the location and extent of a repair, as well as relevant words in the region of the repair. Together these labels determine the relationship between the 'error' and the hypothesized 'correction.' The system is designed to be able to capture distinctions among different repair patterns while remaining easy to learn, apply, and integrate into existing transcription formats. Although the system was originally developed to aid our research on automatic detection and correction of repairs, we hope that it may also prove useful for annotation of spontaneous speech data in related fields. By 'self-repairs' we refer to cases in which one or more words (or word fragments) must be disregarded in determining a speaker's 'intended' utterance. Although one can never be sure exactly what a speaker intends, listeners can often reliably make such judgments.

DTIC

Linguistics; Natural Language Processing

20070008521 SRI International Corp., Menlo Park, CA USA
From Image Irradiance to Surface Orientation
Smith, Grahame B; Dec 1982; 22 pp.; In English
Contract(s)/Grant(s): MDA903-79-C-0588; DAAG29-79-C-0216
Report No.(s): AD-A461075; SRI-TN-273; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461075

The image irradiance equation constrains the relationship between surface orientation in a scene and the irradiance of its image. This equation requires detailed knowledge of both the scene illumination and the reflectance of the surface material. For this equation to be used to recover surface orientation from image irradiance, additional constraints are necessary. The constraints usually employed require that the recovered surface be smooth. We demonstrate that smoothness is not sufficient for this task. A new formulation of shape from shading is presented in which surface orientation is related to image irradiance without requiring detailed knowledge of the scene illumination, or of the albedo of the surface material. This formulation, which assumes isotropic scattering, provides some interesting performance parallels to those exhibited by the human visual system.

DTIC

Irradiance; Shapes

20070008522 Naval Air Warfare Center, Orlando, FL USA

Complementary Methods of Modeling Team Performance

Freeman, Jared T; Pharmer, James A; Lorenzen, Christy; Santoro, Thomas P; Kieras, David; Jan 2002; 14 pp.; In English; Original contains color illustrations

Report No.(s): AD-A461076; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461076

Computational tools and techniques for modeling team performance have advanced significantly in recent years. However, there have been few efforts to combine complementary modeling approaches. In the Manning Affordability Initiative, we have applied three modeling technologies to experimental data from a single domain (air defense warfare), a single scenario, and common watchstation technologies (current AEGIS technology and an advanced prototype). The conclusion of this multi-year project in early 2002 offers an opportunity to review the findings. The proposed panelists will summarize a human-in-the-loop experiment conducted to provide modeling data and present findings from efforts to integrate three modeling approaches for design and design validation. Team Optimal Design (TOD) focuses on team modeling. The Integrated Performance Modeling Environment (IPME) uses a general task modeling technique that applies well to individuals or teams. The GOMS Language Evaluation and Analysis Tool (GLEAN) combines individual models of users interacting as a team.

DTIC

Human Performance; Models; Performance Prediction; Teams

20070008576 Carnegie-Mellon Univ., Pittsburgh, PA USA

A Practical Approach to Replication of Abstract Data Objects

Bloch, Joshua J; May 1990; 178 pp.; In English

Contract(s)/Grant(s): F33615-87-C-1499; ARPA ORDER-4976

Report No.(s): AD-A461165; CMU-CS-90-133; No Copyright; Avail.: CASI: A09, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461165

There is a great need for computer systems that remain available with high probability at all times. Highly available systems can be implemented on networks of general purpose computers by replicating data: storing the data redundantly at two or more of the nodes comprising the system. Some replication protocol is necessary to control access to the replicas. In essence, the replication protocol orchestrates the replicas to form a single distributed data object. If a replicated data object is to be used in an application where data consistency is required, the replicated object must display the same semantics as its serially accessed, single-site counterpart. It is difficult to design replication protocols that combine one-copy serializability with high performance. This dissertation describes an architecture that provides efficient, easy-to-use replicated implementations for a wide variety of useful data types, including directories, record files with secondary indices on selected fields, and priority queues. The data objects display single-copy serial semantics and provide high availability and concurrency. The architecture is relatively easy to implement as it derives its recovery and concurrency control properties from the support of an underlying distributed transaction system. A fairly complete prototype implementation of the architecture was built on top of the Camelot system. Experiments were performed to evaluate its performance. The heart of the architecture is a family of efficient replication protocols that implement a class of table-like data objects called replicated sparse memories or RSMs. The replication protocols are based on Gifford's weighted voting technique. An underlying structural property of the RSM that allows efficient implementation of all its operations is proven. Simulation results are presented that suggest RSMs are time and space efficient in a wide variety of configurations. A Markov model of the RSM is constructed and analyzed.

DTIC

Consistency; Distributed Processing; Networks; Synchronous Meteorological Satellite

20070008582 Carnegie-Mellon Univ., Pittsburgh, PA USA

Mechanisms for Internet Routing: A Study

Akella, Aditya; Chawla, Shuchi; Seshan, Srini; Jul 2002; 13 pp.; In English

Contract(s)/Grant(s): F30602-99-1-0518

Report No.(s): AD-A461171; CMU-CS-02-163; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461171

In this paper, we address the issue of Routing in the Internet from a Game Theoretic perspective. We adopt a two-pronged strategy: firstly, we revisit two 'classic' models of the Nash equilibria of a network of selfish flows in the Internet and extend their results for Nash equilibria to what we believe are more realistic settings (for example, we present results for non-linear

latency functions). Secondly, we apply our results, as well as the ′classic' results, for Nash equilibria to designing Routing schemes for networks. The goal of such schemes is not to price network usage but rather to ensure sound overall network performance in the presence of greedy behavior of the participating flows. Finally, we show how our results can be employed to build a Wide-Area routing scheme.
DTIC
Computer Networks; Internets

20070008590 Carnegie-Mellon Univ., Pittsburgh, PA USA
Efficient BDD-Based Planning for Non-Deterministic, Fault-Tolerant, and Adversarial Domains
Jensen, Rune M; Jun 2003; 222 pp.; In English
Contract(s)/Grant(s): F30602-00-2-0549; F30602-98-2-0135
Report No.(s): AD-A461185; CMU-CS-03-139; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461185

Automated planning considers selecting and sequencing actions in order to change the state of a discrete system from some initial state to some goal state. This problem is fundamental in a wide range of industrial and academic fields. Planning with non-deterministic actions can be used to model dynamic environments and alternative action behavior. One of the currently best known approaches is to employ reduced ordered Binary Decision Diagrams (BDDs). However, the approach is challenged by a frequent blow-up of the BDDs representing the search frontier and a limited number of solution classes. This thesis addresses both of these problems. With respect to the first, it contributes a general framework called state-set branching that seamlessly combines classical heuristic search and BDD-based search. We show that state-set branching naturally generalizes to non-deterministic planning and introduce heuristically guided versions of the current BDD-based non-deterministic planning algorithms. With respect to the second problem, the thesis introduces two frameworks called fault tolerant planning and adversarial planning. Fault tolerant planning addresses domains where non-determinism is caused by rare errors. The thesis contributes a new class of solutions called fault tolerant plans that are robust to a limited number of faults. In addition, it introduces specialized BDD-based algorithms for synthesizing fault tolerant plans. Adversarial planning considers situations where non-determinism is caused by uncontrollable, but known, environment actions. The current solution classes of BDD-based non-deterministic planning assume a 'friendly' environment and may never reach a goal state if the environment is hostile and informed. The thesis contributes efficient BDD-based algorithms for synthesizing winning strategies for such problems.
DTIC
Domains; Fault Tolerance; Planning

20070008593 Carnegie-Mellon Univ., Pittsburgh, PA USA
Abstraction and Counterexample-Guided Refinement in Model Checking of Hybrid Systems
Clarke, Edmund; Fehnker, Ansgar; Han, Zhi; Krogh, Bruce; Ouaknine, Joel; Stursberg, Olaf; Theobald, Michael; Jan 2003; 28 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F3361500C1701; F33615-02-C-0429
Report No.(s): AD-A461189; CMU-CS-03-104; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461189

Hybrid dynamic systems include both continuous and discrete state variables. Properties of hybrid systems, which have an infinite state space, can often be verified using ordinary model checking together with a finite-state abstraction. Model checking can be inconclusive, however, in which case the abstraction must be refined. This paper presents a new procedure to perform this refinement operation for abstractions of hybrid systems. Following an approach originally developed for finite-state systems, the refinement procedure constructs a new abstraction that eliminates a counterexample generated by the model checker. For hybrid systems, analysis of the counterexample requires the computation of sets of reachable states in the continuous state space. We show how such reachability computations with varying degrees of complexity can be used to refine hybrid system abstractions efficiently. Examples illustrate our counterexample-guided refinement procedure and experimental results for a prototype implementation of the procedure indicate significant advantages over existing methods.
DTIC
Adaptation; Decision Theory

20070008663 Carnegie-Mellon Univ., Pittsburgh, PA USA
On Correlated Failures in Survivable Storage Systems
Bakkaloglu, Mehmet; Wylie, Jay J; Wang, Chenxi; Ganger, Gregory R; May 2002; 38 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-99-2-0539
Report No.(s): AD-A461303; CMU-CS-02-129; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461303

The design of survivable storage systems involves inherent trade-offs among properties such as performance, security, and availability. A toolbox of simple and accurate models of these properties allows a designer to make informed decisions. This report focuses on availability modeling. We describe two ways of extending the classic model of availability with a single 'correlation parameter ' to accommodate correlated failures. We evaluate the efficacy of the models by comparing their results with real measurements. We also show the use of the models as design decision tools: we analyze the effects of availability and correlation on the ordering of data distribution schemes and we investigate the placement of related files.
DTIC
Computer Storage Devices; Data Storage; Failure

20070008680 California Univ., Santa Cruz, CA USA
Collision Avoidance Techniques for Packet-Radio Networks
Fullmer, Chane L; Jun 1998; 173 pp.; In English
Contract(s)/Grant(s): N00014-92-J-1807; N00014-94-1-0688
Report No.(s): AD-A461331; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461331

Medium access control for devices that share a particular medium is a fundamental problem in communications networks. We present a new protocol for medium access control called floor acquisition multiple access (FAMA). Floor acquisition protocols guarantee data packets are received without collisions from other packets. We present FAMA protocols for both single and multiple channel devices operating in ad-hoc packet radio networks. We present analytical and simulation results for FAMA protocols.
DTIC
Collision Avoidance; Communication Networks; Floors; Multiple Access

20070008724 California State Univ., Long Beach, CA USA
Strategic Mobility 21 Collaborative Toolkit System Documentation & User Manual: The TRANSWAY Toolset for Adaptive Planning
Mallon, Lawrence G; Pohl, Jens; Nov 30, 2006; 35 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-06-C-0060
Report No.(s): AD-A461459; CSU-0015; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461459

This report describes the capabilities of the TRANSWAY suite of tools in the logistical domain. It addresses in particular their suitability for supporting an end-to-end military deployment exercise that is scheduled to occur within the Southern California public transportation corridor sometime in the first half of 2007. In support of this planned exercise the ontology-based intelligent agents of the TRANSWAY adaptive toolset will be able to assist operators in the planning and re-planning of delivery plans along alternative surface routes and air channels within a geo-spatial reference frame.
DTIC
Decision Support Systems; Logistics Management; Mobility

20070008734 Commit Enterprises, Inc., Fairfax Station, VA USA
Implementing Network-Centric Command and Control
Curtis, Raymond J; Frizzell, Joseph P; Mar 17, 2005; 57 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461477; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461477

This paper examines implementation issues associated with integrated, network centric Command and Control concepts, and highlights significant challenges inherent in such a transformation from the current C2 environment within the U.S. Department of Defense (DoD). The authors argue that it will be some time before military forces can achieve a truly integrated

command and control capability because significant impediments relating to the culture, structures, processes, and products remain to be addressed. We begin by examining current developments in net-centric, service oriented and effects based operations as part of the changing nature of the U.S. military operational environment. Recent developments in command and control policy, processes and governance are highlighted, and the inherent social challenges related to achieving interoperability are briefly discussed. We examine the framework of Integrated Command & Control (IC2) and argue that development of such a capability must be based upon a shared purpose realizing that it will require a significant amount of time and patience. We then propose the way ahead by addressing the ingredients needed to achieve an IC2 capability within the U.S. Department of Defense. These include: working on the cultural and human engineering aspects of C2; creating a different, more diverse learning climate; tackling the issues of jointness, demonstrations and experimentation; and addressing the need to have an immediate, constant flow of visible deliverables to sustain the transformation journey.
DTIC
Command and Control; Military Operations; Network Control; System Effectiveness; Warfare

20070008740 Missouri Univ., Rolla, MO USA
Maxwell Garnett Model for Dielectric Mixtures Containing Conducting Particles at Optical Frequencies
Koledintseva, M Y; DuBroff, R E; Schwartz, R W; Jun 2006; 28 pp.; In English
Contract(s)/Grant(s): FA8650-04-C-5704; Proj-2865
Report No.(s): AD-A461484; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461484

Mathematical modeling of composites made of a dielectric base and randomly oriented metal inclusions is considered. Different sources of frequency dependency of metal conductivity at optical frequencies are taken into account. These include the skin-effect, dimensional (length-size) resonance of metal particles, and the Drude model. Also, mean free path of electrons in metals can be smaller than the characteristic sizes of nanoparticles, and this leads to the decrease in conductivity of metal inclusions. These effects are incorporated in the Maxwell Garnett mixing formulation, and give degrees of freedom for forming desirable optical frequency characteristics of composite media containing conducting particles.
DTIC
Dielectrics; Light (Visible Radiation); Mathematical Models

20070008795 Colorado Univ., Boulder, CO USA
A Method for Dynamic Reconfiguration of a Cognitive Radio System
Weingart, Troy; Jan 2006; 158 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461562; UCO-ECOT-831; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461562

Advances in process technology has made it possible to migrate applications that were traditionally implemented in custom silicon to general purpose processors. This transition has given birth to the field of cognitive and software-defined radio (C/SDR). These C/SDRs offer a broad range of opportunities for improving the use and utilization of radio frequency spectrum. This includes the creation of radio networks that can reconfigure their operation based on application requirements, policy updates, environmental conditions, and the ability to adapt to a wide range of protocols. One of the key benefits of having a C/SDR is its ability to change communication parameters in response to changes in application needs and/or changes in the radio frequency landscape. Such reconfiguration requires an understanding of how these communication parameters interact within the network protocol stack. Analysis of these parametric cross-layer interactions is a critical precursor in the development of a predictive model and algorithm for dynamic reconfiguration of a C/SDR. This work investigates how parameters at the physical, data link, network, and application layers interact, how desirable configurations of these parameters can be determined, and how these parameters affect the performance of file transfer and Voice over IP applications. An analysis of varying communication parameters across networking layers is used to inform the design, implementation, and evaluation of a predictive model and algorithm for dynamic reconfiguration of a cognitive radio. This model and algorithm allow a C/SDR to dynamically modify its configuration in order to improve system performance. A systematic method for development of a cognitive platform is presented. This method uses statistical analysis of variance and design of experiments techniques to inform the design and implementation of a dynamic reconfiguration algorithm.
DTIC
Adaptive Control; Telecommunication

20070008847 Raytheon Systems Co., Marlborough, MA USA
Science and Technology to Support FORCEnet (Briefing Charts)
Franklin, Jude E; Jun 2006; 37 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461619; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461619

This briefing reports on the findings and recommendations of FORCEnet Science and Technology Study Panel. The panel concluded there were eight critical FORCEnet Information Infrastructure Functional Capabilities: 1) Reliable wideband mobile communications, 2) Information management, 3) Situation awareness and understanding, 4) Information assurance 5) Modeling and simulation, 6) Dynamic composability and collaboration, 7) Support of disadvantaged user-personnel, platform or sensor, and 8) Persistent intelligence, surveillance, and reconnaissance. For each an overview, discussion of technical challenges, panel findings and recommendations is given.
DTIC
Charts; Command and Control; Research and Development; Technologies

20070008870 Alion Science and Technology, El Cajon, CA USA
Exercise Control Objects (ECOs), C2 for the Control Team
Anhalt, Michael; Dunleavy, Laura; Jun 2006; 36 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461649; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461649

The U. S. Joint Forces Command (USJFCOM), J9 Modeling and Simulation (M&S) Support Team advanced the capability of distributed simulation in support of Urban Resolve 05 (UR05), a collaborative effort conducted by USJFCOM and the Institute for Defense Analyses (IDA). Using real-world data, the scenarios in UR05 realistically replicated current operations and situations faced by warfighters in Baghdad. The team designed and employed Exercise Control Object (ECO) processes and tools for use in this distributed simulation environment. The Simulation Control Team share their intentions and actions regarding activities of the adversaries, blue forces and civilian population using ECOs. The ECOs were shared instantly among controllers and were displayed on the terrain map as symbolic objects. ECOs contain the author's identification, location coordinates, time created/modified, ECO category, free-text comments, information to be disclosed to the players. The ECO editor let controllers attach graphics and text files to the object. These ECOs were logged to support real-time and post-experiment assessment. USJFCOM's success in using ECOs to enable the JUO series of experiments and the enthusiasm and innovation that controllers showed in using them, indicates this simple tool would be useful if implemented in other simulation systems and operational C2 systems.
DTIC
Combat; Command and Control; Human-Computer Interface; Physical Exercise; Simulation

20070008871 Alion Science and Technology, El Cajon, CA USA
Situational Awareness Object (SAO), A Simple, Yet Powerful Tool for Operational C2 Systems
Anhalt, Michael; Jun 2006; 36 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461650; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461650

The U. S. Joint Forces Command (USJFCOM), J9 Modeling and Simulation (M&S) Support Team advanced the capability of distributed simulation in support of Urban Resolve 05 (UR05), a collaborative effort conducted by USJFCOM and the Institute for Defense Analyses (IDA). Using real-world data, the scenarios in UR05 realistically replicated current operations and situations faced by warfighters in Baghdad. Experiment subjects use Situational Awareness Objects (SAOs) to share their awareness of the battlespace regarding activities of the adversaries, blue forces and civilian population. SAOs are logged and support real-time, post-experiment evaluation and comprehensive after-action reviews. Throughout each JUO experiment, the SAOs structure evolved to include new options that were based on the operator's needs. The benefit of SAOs is that they are easy to create and modify to fit varied operational missions. They are shared instantly among operators with access to the database and they are displayed on the terrain map as symbolic objects. SAOs contain the author's identification, location coordinates, and time created or modified, SAO category, player's confidence level, free-text comments, associated tracks and the ability to attach graphics and text files to the object. USJFCOM's success in using SAOs to enable the JUO series of experiments and the enthusiasm and innovation that operators show in using them, indicates this simple, yet powerful tool would be useful if implemented in various operational C2 systems.
DTIC
Combat; Command and Control; Human-Computer Interface; Simulation; Situational Awareness

20070008877 Massachusetts Univ., Amherst, MA USA

Consideration of Receiver Interest for IP Multicast Delivery

Levine, Brian N; Crowcroft, Jon; Diot, Christophe; Garcia-Luna-Aceves, J J; Kurose, James F; Jan 2000; 11 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F19628-96-C-0038; F30602-97-1-0291

Report No.(s): AD-A461658; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461658

Large-scale applications are characterized by a large number of dynamic and often interactive group members. The nature of these applications is such that participants are not interested in all the content transmitted. We examine three currently available techniques to scope delivery of content to interested receivers in IP multicast: filtering, where data is filtered by middleware before passed to the application; addressing, where data is routed only to those receivers that express their interest; and hybrid approaches. We propose a framework that models large-scale application behavior. We use this framework to evaluate the performance of these applications and related protocols when the network is capable of filtering or addressing. Our results show that the current Internet architecture does not efficiently support large-scale applications because it can not efficiently manage multiple multicast groups. We show that network-level addressing is preferred to filtering and hybrid approaches given that groups are easy to create and manage. We highlight areas of research in the multicast architecture to bring about this change.

DTIC

Internets; Protocol (Computers); Receivers

20070008924 California Univ., Santa Cruz, CA USA

An Algorithm for Multipath Computation Using Distance-Vectors With Predecessor Information

Vutukury, Srinivas; Garcia-Luna-Aceves, J J; Jan 1999; 7 pp.; In English

Contract(s)/Grant(s): F30602-97-1-0291; F19628-96-C-0038

Report No.(s): AD-A461741; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461741

Routing algorithms in the IP Internet provide a single path between each source-destination pair and where more than one path is provided, they are paths of equal length. Single-path routing is inherently slow in responding to congestion and temporary traffic bursts; multiple paths are better suited to handle congestion. Also the paths provided in RIP and OSPF are not free of loops during times of network transition, which can be debilitating to network performance. We present a distributed routing algorithm for computing multiple paths that need not have equal length between each source-destination pair in a computer network such that they are loop-free at every instant in steady state as well as during network transitions. The algorithm is scalable to large networks as it uses only one-hop synchronization which is unlike diffusing computations that require internodal synchronization spanning multiple hops. The safety and liveness properties of the algorithm are proven and its complexity is analyzed.

DTIC

Algorithms; Computation; Internets; Multipath Transmission

20070008928 California Univ., Santa Cruz, CA USA

Scenario-Based Comparison of Source-Tracing and Dynamic Source Routing Protocols for Ad-Hoc Networks

Raju, Jyoti; Garcia-Luna-Aceves, J J; Oct 2001; 7 pp.; In English

Contract(s)/Grant(s): F30602-97-2-0338

Report No.(s): AD-A461747; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461747

We present source tracing as a new viable approach to routing in ad hoc networks where routers communicate the second-to-last hop and distance in preferred paths to destinations. We use two source tracing algorithms, a table-driven protocol (BEST) in which routers maintain routing information for all destinations, and an on-demand routing protocol (DST) in which routers maintain routing information for only those destinations to whom they need to forward data. Simulation experiments are used to compare these protocols with DSR, which has been shown to incur less control overhead than other on-demand routing protocols. The simulations show that DST requires far less control packets to achieve comparable or better average delays and percentage of packet delivered than DSR, and that BEST achieves comparable results to DSR while maintaining routing information for all destinations.

DTIC

Protocol (Computers)

20070008951 SRI International Corp., Menlo Park, CA USA
Perceptual Organization and the Representation of Natural Form
Pentland, Alex P; Jul 29, 1986; 41 pp.; In English
Contract(s)/Grant(s): DCR-83-12766; MDA-903-83-C-0027
Report No.(s): AD-A461792; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461792

To support our reasoning abilities perception must recover environmental regularities-e.g., rigidity, 'objectness,' axes of symmetry-for later use by cognition. To create a theory of how our perceptual apparatus can produce meaningful cognitive primitives from an array of image intensities we require a representation whose elements may be lawfully related to important physical regularities, and that correctly describes the perceptual organization people impose on the stimulus. Unfortunately, the representations that are currently available were originally developed for other purposes (e.g., physics, engineering) and have so far proven unsuitable for the problems of perception or common sense reasoning. In answer to this problem we present a representation that has proven competent to accurately describe an extensive variety of natural forms (e.g., people. mountains, clouds, trees), as well as man-made forms, in a succinct and natural manner. The approach taken in this representational system is to describe scene structure at a scale that is similar to our naive perceptual notion of 'a part,' by use of descriptions that reflect a possible formative history of the object, e.g., how the object might have been constructed from lumps of clay. For this representation to be useful it must be possible to recover such descriptions from image data; we show that the primitive elements of such descriptions may be recovered in an over constrained and therefore reliable manner. We believe that this descriptive system makes an important contribution towards solving current problems in perceiving and reasoning about natural forms by allowing us to construct accurate descriptions that are extremely compact and that capture people's intuitive notions about the part structure of three-dimensional forms.
DTIC
Image Intensifiers; Problem Solving; Trees (Plants)

20070008962 Naval Postgraduate School, Monterey, CA USA
Towards a Theory of Measures of Effectiveness
Green, John M; Johnson, Bonnie W; Jan 2002; 15 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461809; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461809

An explicit theory for 'measures of effectiveness' (MOEs as they are commonly referred to) does not exist. As a result several definitions for MOEs have been advanced, that while similar, do not provide the needed insight in to system performance evaluation. Original studies performed by the Military Operations Research Society's (MORS) Command and Control workshop in the mid-1980s laid a foundation for a more theoretical approach that was well received within the MORS community. However, little has been done in the last decade to further this work. Most papers in the latter part of the 1 990s make no reference to the workshop reports and other published papers that resulted from the workshop. This paper will present a review of the original work performed by MORS as well as relevant material that has been published in the intervening years. It will extend the original body of work using the systems-of-systems perspective originally developed by Russell Ackoff. A concise systems based definition of MOEs will be derived using this framework. The paper will also present the framework for a consistent mathematical theory for MOEs.
DTIC
Military Operations; Systems Analysis

20070008987 Boston Univ., Boston, MA USA
Discovering Clusters in Motion Time-Series Data (Preprint)
Alon, Jonathan; Sclaroff, Stan; Kollios, George; Pavlovic, Vladimir; Mar 26, 2003; 8 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-03-1-0108; N00014-01-1-C0444
Report No.(s): AD-A461872; BU-CS-TR-2003-008; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461872

A new approach is proposed for clustering time-series data. The approach can be used to discover groupings of similar object motions that were observed in a video collection. A finite mixture of hidden Markov models (HMMs) is fitted to the motion data using the expectation-maximization (EM) framework. Previous approaches for HMM-based clustering employ a k-means formulation, where each sequence is assigned to only a single HMM. In contrast, the formulation presented in this paper allows each sequence to belong to more than a single HMM with some probability, and the hard decision about the

sequence class membership can be deferred until a later time when such a decision is required. Experiments with simulated data demonstrate the benefit of using this EM-based approach when there is more overlap in the processes generating the data. Experiments with real data show the promising potential of HMM-based motion clustering in a number of applications.
DTIC
Exploration; Motion; Time Series Analysis

20070008988 SRI International Corp., Menlo Park, CA USA
High-Level Planning in a Mobile Robot Domain (Preprint)
Wilkins, David E; Jul 15, 1986; 42 pp.; In English
Contract(s)/Grant(s): F49620-79-0188
Report No.(s): AD-A461873; SRI-AIC-TN-388; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461873

An application of the SIPE planning system to high-level task planning for an autonomous indoor mobile robot is presented. The primary purpose was to evaluate the adequacy of SIPE for this domain, extending and improving the system in the process. The mobile robot domain as encoded in SIPE and the approach to interfacing the planner and the lower-level routines are described. The bulk of the paper presents both problems encountered during the process of encoding this domain, and extensions of the planning system that were made to solve them. The most significant addition was a redesign of the deductive capability of the planner, which is described in some detail. Efficiency considerations and the ability to intermingle planning and execution are discussed. The most important problem encountered involved hierarchical planning, an ambiguous term. We present a definition of it, and examine several of the reasons for this ambiguity. An explication of hierarchical-planning implementations entails two distinct notions: abstraction level and planning level A problem in currently implemented planners that is caused by mixing these two levels is presented and various remedies suggested. Three solutions that have been implemented in the current SIPE planning system are described.
DTIC
Autonomous Navigation; Robots

20070009006 Colorado Univ., Boulder, CO USA
Parallel Nonlinear Optimization: Limitations, Opportunities, and Challenges
Schnabel, Robert B; Mar 1994; 33 pp.; In English
Contract(s)/Grant(s): AFOSR-90-0109; DAAL03-91-G-0151
Report No.(s): AD-A461917; CU-CS-715-94; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461917

The availability and power of parallel computers is having a significant impact on how large-scale problems are solved in all areas of numerical computation, and is likely to have an even larger impact in the future. This paper attempts to give some indication of how the consideration of parallel computation is affecting, and is likely to affect, the field of nonlinear optimization. It does not attempt to survey the research that has been done in parallel nonlinear optimization. Rather it presents a set of examples, mainly from our own research, that is intended to illustrate many of the limitations, opportunities, and challenges inherent in incorporating parallelism into the field of nonlinear optimization. These examples include parallel methods for small to medium size unconstrained optimization problems, parallel methods for large block bordered systems of nonlinear equations, and parallel methods for both small and large-scale global optimization problems. Our overall conclusions are mixed. For generic, small to medium size problems, the consideration of parallelism does not appear to be leading to major algorithmic innovations. For many classes of large-scale problems, however, the consideration of parallelism appears to be creating opportunities for the development of interesting new methods that may be advantageous for parallel and possibly even sequential computation. In addition, a number of large-scale parallel optimization algorithms exhibit irregular coarse-grain structure, which leads to interesting computer science challenges in their implementation.
DTIC
Nonlinearity; Optimization; Parallel Computers; Parallel Processing (Computers)

20070009053 Carnegie-Mellon Univ., Pittsburgh, PA USA
Multi-Modal Network Protocols: Adapting to Highly Variable Operating Conditions
Akella, Aditya; Bharambe, Ashwin; Nath, Suman; Seshan, Srinivasan; Aug 2002; 19 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-99-1-0518
Report No.(s): AD-A461192; CMU-CS-02-170; No Copyright; Avail.: CASI: A03, Hardcopy

Most network protocols are uni-modal: they employ a single set of algorithms that allows them to cope well only within a narrow range of operating conditions. This rigid design renders these protocols inefficient in the face of widely varying operating environments or in conditions different from the ones for which they are optimized. Such uni-modal protocols have great dificulty in the mobile computing world where the operating conditions, including number of nodes, computational capabilities and rate of mobility, are not fixed. Consider, for example, routing in a network of ad-hoc nodes. Solutions like DSDV work well when the number of nodes is small. Unfortunately, such schemes scale poorly to larger population sizes. In such situations, more scalable algorithms that impose a structure on the network of ad-hoc nodes, in a manner similar to routing protocols in the Internet, provides better results. However, these scalable algorithms tend to incur high overheads in situations that DSDV handles well. Clearly, no single routing solution handles all situations that a node may encounter. Motivated by such examples, this paper attempts to answer the following question: Is it possible to redesign the traditional protocols to take on very different operating modes when faced with different environments? We present a case for such multi-modal protocols in our paper. Specifically, we discuss multi-modal reliability and routing. We show the feasibility of designing multi-modal protocols by describing how these protocols can make operating mode decisions and switch modes without additional overhead.
DTIC
Protocol (Computers); Wireless Communication

20070009054 Carnegie-Mellon Univ., Pittsburgh, PA USA
Operating System Support for Mobile Interactive Applications
Narayanan, Dushyanth; Aug 2002; 210 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F19628-93-C-0193; F19628-96-C-0061
Report No.(s): AD-A461193; CMU-CS-02-168; No Copyright; Avail.: CASI: A10, Hardcopy

Mobile interactive applications are becoming increasingly important. However, their environments are resource-poor and turbulent, with frequent and dramatic changes in resource availability. To keep response times bounded, the application and system together must adapt to changing resource conditions. In this dissertation, I present a new abstraction -- multi-fidelity computation -- and claim that it is the right abstraction for adaptation in mobile, interactive applications. I also present an API that allows a mobile interactive application to recast its core functionality as a multi-fidelity computation. I identify one of the key problems in application adaptation: predicting application performance at any given fidelity. I solve this problem in two steps. History-based prediction predicts application resource demand as a function of fidelity. A resource model then maps application resource demand and system resource supply to performance. I also describe the design and implementation of runtime support for multi-fidelity computations: the overall system architecture as well as each key component. I show how the application uses the multi- fidelity API; that the programming cost of using the API is small; and that the history-based prediction method accurately predicts application resource demand. In evaluating the system prototype, I ask three questions. First, is adaptation agile in the face of changing load conditions? Second, is the system accurate in choosing the fidelity that best matches the applications needs? Third, does the system provide substantial benefit compared to the non-adaptive case? I answer these questions through a series of experiments both with synthetic and real workloads. I show that adaptation is agile, accurate, and beneficial in bounding response time despite varying CPU and memory load. I also show that adaptation reduces the variability in response time, providing a more predictable and stable user experience.
DTIC
Adaptation; Human-Computer Interface

20070009062 California Univ., Santa Cruz, CA USA
Modeling of Collision Avoidance Protocols in Single-Channel Multihop Wireless Networks
Wang, Yu; Garcia-Luna-Aceves, J J; Jan 2003; 31 pp.; In English
Contract(s)/Grant(s): F49620-00-1-0330; DAAD19-01-C-0026
Report No.(s): AD-A461651; No Copyright; Avail.: CASI: A03, Hardcopy

Although there has been considerable work on the performance evaluation of collision avoidance schemes, most analytical work is confined to single-hop ad hoc networks or networks with very few hidden terminals. We present the first analytical model to derive the saturation throughput of collision avoidance protocols in multi-hop ad hoc networks with nodes randomly placed according to a two-dimensional Poisson distribution. We show that the sender-initiated collision-avoidance scheme achieves much higher throughput than the ideal carrier sense multiple access scheme with a separate channel for acknowledgments. More importantly, we show that the collision-avoidance scheme can accommodate much fewer competing nodes within a region in a network infested with hidden terminals than in a fully-connected network, if reasonable throughput is to be maintained. Simulations of the IEEE 802.11 MAC protocol and one of its variants validate the predictions made in

the analysis. It is also shown that the IEEE 802.11 MAC protocol cannot ensure collision-free transmission of data packets and thus throughput can degrade well below what is predicted by the analysis of a correct collision avoidance protocol. Based on these results, a number of improvements are proposed for the IEEE 802.11 MAC protocol.,
DTIC
Collision Avoidance; Communication Networks; Protocol (Computers); Wireless Communication

20070009084 Brown Univ., Providence, RI USA
Asymptotic Properties of Proportional-Fair Sharing Algorithms
Kushner, Harold J; Whiting, Philip A; May 30, 2002; 10 pp.; In English
Contract(s)/Grant(s): DAAD19-00-1-0549; ESC-9978259
Report No.(s): AD-A461871; No Copyright; Avail.: CASI: A02, Hardcopy

We are concerned with the allocation of channel or transmitter resources for time varying mobile communications. There are many users who are competing to transmit data over the resource. Time is divided into small scheduling intervals, and information on the channel rates for the various users is available at the start of the intervals. Since the rates vary randomly, there is a conflict at any time between fully exploiting the channel (by selecting the user with the highest current rate) and being fair (giving attention to users with poor rates, to assure a fair throughput for them). The Proportional Fair Scheduler (PFS) of the Qualcomm High Data Rate (HDR) system and related algorithms are designed to deal with such conflicts. There is little analysis available for such systems and our aim is to put them on a sure mathematical footing and analyze their behavior. Such algorithms are of the stochastic approximation type and results of stochastic approximation are used to analyze the long term properties of this class. The limiting behavior of the throughputs converges to the solution of an ordinary differential equation (a mean ODE), which is akin to a mean flow. The ODE has a unique equilibrium and it is optimal in the sense that it optimizes a concave utility function. The results depend on the fact that the mean ODE has a special form that arises in problems with certain types of repeated stochastic games with competitive behavior. There are a large family of such algorithms, each member corresponding to a concave utility function. Thus, is not simply ad-hoc, but actually corresponds to a reasonable maximization problem. There are extensions to multiple antenna and frequency systems. Also, the infinite backlog assumption can be dropped and the data is allowed to arrive at random.
DTIC
Algorithms; Asymptotic Properties; Differential Equations; Stochastic Processes; Telecommunication

20070009098 New Jersey Inst. of Tech., Newark, NJ USA
Three-Dimensional Metallo-Dielectric Photonic Crystals With Cubic Symmetry as Stacks of Two-Dimensional Screens
Shah, J; Moeller, K D; Grebel, H; Sternberg, O; Tobias, J M; Feb 2005; 8 pp.; In English
Contract(s)/Grant(s): DAAD19-01-1-0009; ECE-9820200
Report No.(s): AD-A461934; No Copyright; Avail.: CASI: A02, Hardcopy

Metallo-dielectric photonic crystals with cubic symmetries have been studied here both experimentally and theoretically in the millimeter wavelength region (15-60 mm). In a direct analogy to linear systems, we considered the three-dimensional lattices as a stack of two-dimensional resonating screens. The overall three-dimensional structure was introduced in the calculation through a structural phase. Such an approach proved useful in understanding the related mode propagation and guided us in a study of the transition between cubic and centered body cubic symmetries.
DTIC
Crystals; Dielectrics; Linear Systems; Millimeter Waves; Stacks; Symmetry

20070009146 Nebraska Univ., Lincoln, NE USA
A Negotiation-Based Coalition Formation Model for Agents with Incomplete Information and Time Constraints
Soh, Leen-Kiat; Jan 2002; 38 pp.; In English
Contract(s)/Grant(s): F30602-99-2-0502
Report No.(s): AD-A461997; TR-UNCSE-2002-2; No Copyright; Avail.: CASI: A03, Hardcopy

In this paper we describe a coalition formation model for a cooperative multiagent system in which each agent has incomplete information about its dynamic and uncertain world and must respond to sensed events within time constraints. With incomplete information and uncertain world parameters while lacking time, an agent cannot afford organizing a rationally optimal coalition formation. Instead, our agents use a two-stage methodology. When an agent detects an event in the world, it first compiles a list of coalition candidates that it thinks would be useful, and then negotiates with the candidates. A negotiation is an exchange of information and knowledge for constraint satisfaction until both parties agree on a deal or one

opts out. Each successful negotiation adds a new member to the agent's final coalition. The agent that initiates the coalition needs to determine the task distribution among the members of the coalition and designs its coalition strategy to increase the chance of successfully forming a working coalition. Since the environment is dynamic, noisy, and the agents are resource-constrained, agents must form the working coalition to react to events as soon as possible and with whatever partial information they currently hold.
DTIC
Dynamic Response; Information Theory; Robotics

20070009147 Michigan Univ., Ann Arbor, MI USA
What Causal Forces Shape Internet Connectivity at the AS-level?
Chang, Hyunseok; Jamin, Sugih; Willinger, Walter; Jan 2003; 24 pp.; In English
Contract(s)/Grant(s): N00014-01-1-0617
Report No.(s): AD-A462002; UM-CSE-475-03; No Copyright; Avail.: CASI: A03, Hardcopy

Two ASs are connected in the Internet AS graph only if they have a business 'peering relationship.' By focusing on the AS subgraph ASpc whose links represent provider-customer relationships, we present an empirical study that identifies three crucial causal forces at work in the design of AS connectivity: (i) AS-geography, i.e., locality and number of PoPs (Points-of-Presence) within individual ASs; (ii) AS-specific business models, abstract toy models that describe how individual ASs choose their best provider; and (iii) AS evolution, a historic account of the lives of individual ASs in a dynamic ISP market. Based on these findings that directly relate to how provider-customer relationships may be determined in the actual Internet, we develop a new optimization-driven model for Internet growth at the ASpc level. Its defining feature is an explicit construction of a novel class of intuitive, multi-objective, local optimizations by which the different ASs determine in a fully distributed and decentralized fashion their 'best' upstream provider. We show that our model is broadly robust, perforce yields graphs that match inferred AS connectivity with respect to many different metrics, and is ideal for exploring the impact of new peering incentives or policies on AS-level connectivity.
DTIC
Internets; Shapes

20070009229 Rochester Inst. of Tech., NY USA
Defense Systems Modernization and Sustainment Initiative
Nasr, Nabil; McCarthy, Edward; Haselkorn, Michael; Thurston, Michael; Dec 20, 2006; 76 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-03-1-0860
Report No.(s): AD-A462131; No Copyright; Avail.: CASI: A05, Hardcopy

The National Center for Remanufacturing and Resource Recovery (NC3R) at RIT has successfully researched and demonstrated technologies that are able to enhance the performance of defense weapons and support systems, while managing total life-cycle costs. The program areas supported by this ONR grant were Asset Health Management, Life-cycle Engineering and Economic Decision Systems, Material Aging, and Modernization through Remanufacturing and Conversion. NC3R efforts included the development of remanufacturing processes for critical aircraft and ground vehicle components, reverse engineering and upgrade for obsolete fire control system components, development of military specification diagnostic and prognostic systems, design data and configuration management for Navy ships, and platform reliability availability and maintainability assessment.
DTIC
Life Cycle Costs; Reverse Engineering

20070009261 University of Southern California, Marina del Rey, CA USA
Representing Capabilities of Problem Solving Methods
Swartout, Bill; Gil, Yolanda; Valente, Andre; Jan 1999; 9 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DABT63-95-C-0059; F30602-97-1-0195
Report No.(s): AD-A462171; No Copyright; Avail.: CASI: A02, Hardcopy

In order to develop and use shared libraries of problem-solving methods, it is of paramount importance to provide adequate descriptions of their capabilities and competence. Methods must be indexed and organized based on their capabilities so that they can be retrieved when their capability is adequate for the task at hand. This paper describes the approach taken in EXPECT for representing method capabilities and argues that it has important features that should be used for describing

methods in shared libraries. EXPECT's capability representation is tightly coupled with the domain ontologies in the knowledge base, can express task-related parameters explicitly, and is based on case grammars. This representation allows the system to reason about the capability descriptions through class subsumption and reformulation. The benefits of this approach include self-organizing method libraries, reuse, and support for explanation. The representation has already been used extensively within EXPECT to express a wide range of method capabilities, ranging from abstract to specific, small to large, and domain-dependent to general-purpose methods. The paper also discusses some of the additional features that we anticipate will be useful to structure shared method libraries.
DTIC
Knowledge Based Systems; Problem Solving

20070009262 National Defence Coll., Stockholm, Sweden
Network-Based Effectiveness
Friman, Henrik; Jun 2006; 27 pp.; In English; Original contains color illustrations
Report No.(s): AD-A462172; No Copyright; Avail.: CASI: A03, Hardcopy

Western military organizations are increasingly paying attention to the concepts of Network Centric Warfare (NCW), Network Centric Operations (NCO), Network Enabler Capabilities (NEC), and Network-Based Defense (NBD) to increase competitive advantage, innovation, and mission effectiveness. Network-based effectiveness occurs due to the influence of various factors such as people, procedures, technology, and organizations (extended from Leavitt, 1965). This text identifies aspects of network-based effectiveness that can benefit from a better understanding of leadership and management development of people, procedures, technology, and organizations. A brief discussion is presented on how leadership and management development can support network-based effectiveness. Aspects of network-based effectiveness that involve further research by scientists are identified. Thirteen briefing charts summarize the presentation.
DTIC
Leadership; Networks; Organizations; Situational Awareness; System Effectiveness

20070009302 Naval Research Lab., Washington, DC USA
A Benchmark for Comparing Different Approaches for Specifying and Verifying Real-Time Systems
Heitmeyer, C L; Labaw, B G; Jeffords, R D; Jan 1993; 5 pp.; In English
Report No.(s): AD-A462244; No Copyright; Avail.: CASI: A01, Hardcopy

To be considered correct or useful, real-time systems must deliver results within specified time intervals, either without exception or with high probability. Recently, a large number of formal methods have been invented for specifying and verifying real-time systems. It has been suggested that these formal methods need to be tested out on actual real-time systems. Such testing will allow the scalability of the methods to be assessed and also will uncover new problems requiring a formal solution. However, before these methods can be productively applied to industrial systems, greater understanding is needed about how they compare (e.g., what classes of problems they are designed to solve, the availability of mechanical support, etc.). To provide insight into the utility of different methods for solving real-time problems, the authors have developed a generic version of a real-time railroad crossing system. Their plan is to use this example as a benchmark for comparing different formalisms. In this paper, the authors define the problem, describe three classes of formalisms that can be applied, and summarize efforts currently in progress to specify the system of interest and prove properties about its behavior.
DTIC
Computer Programming; Formalism; Program Verification (Computers); Real Time Operation; Software Engineering; Systems Analysis

20070009308 California Inst. of Tech., Pasadena, CA USA
A Set-Based Methodology for White Noise Modeling
Paganini, Fernando; Sep 1995; 35 pp.; In English
Report No.(s): AD-A462253; CIT-CDS-95-023; No Copyright; Avail.: CASI: A03, Hardcopy

This paper provides a new framework for analyzing white noise disturbances in linear systems: rather than the usual stochastic approach, noise signals are described as elements in sets and their effect is analyzed from a worst-case perspective. The paper studies how these sets must be chosen in order to have adequate properties for system response in the worst-case, statistics consistent with the stochastic point of view, and simple descriptions that allow for tractable worst-case analysis. The

methodology is demonstrated by considering its implications in two problems: rejection of white noise signals in the presence of system uncertainty, and worst-case system identification.
DTIC
Linear Systems; White Noise

20070009314 Naval Postgraduate School, Monterey, CA USA
Assessments of Simulated Performance of Alternative Architectures for Command and Control: The Role of Coordination
Hocevar, Susan P; Kemple, William G; Kleinman, David; Porter, Gary; Jan 1999; 22 pp.; In English
Report No.(s): AD-A462261; No Copyright; Avail.: CASI: A03, Hardcopy

This paper presents the results of the fourth in a sequence of experiments conducted by the Adaptive Architectures for Command and Control research team. The focus of this study is on the relative effectiveness of three organizational structures in the conduct of a simulated Joint Task Force mission. Two of the three organizational architectures were optimized, using pre experimental modeling, to limit the amount of inter-nodal coordination. These two structures varied in level of workload (4-node vs. 6-node). The third structure was based on a more traditional, functional design that required more inter-nodal coordination than them model-based structures. Effectiveness was evaluated in terms of performance on the more predictable primary mission tasks as well as some less predictable tasks and a measure of general protection of the force. Overall, there is limited evidence that the 6-node structure designed to reduce inter-nodal coordination performed more effectively than the other two on the primary mission tasks. There is also limited evidence that the traditional structure that required more coordination in accomplishing primary tasks, was more effective than the model-based structures in responding to the less predictable tasks. This evidence supports the value of coordination capabilities in responding to situations of uncertainty.
DTIC
Adaptation; Architecture (Computers); Command and Control; Coordination; Simulation

20070009316 Massachusetts Univ., Amherst, MA USA
Grounding the Unobservable in the Observable: The Role and Representation of Hidden State in Concept Formation and Refinement
Morrison, Clayton T; Oates, Tim; King, Gary; Jan 2001; 6 pp.; In English
Contract(s)/Grant(s): DASG60-99-C-0074
Report No.(s): AD-A462269; No Copyright; Avail.: CASI: A02, Hardcopy

One of the great mysteries of human cognition is how we learn to discover meaningful and useful categories and concepts about the world. Why do very young children acquire concepts like ‘animate’ rather than ‘blue with red and green dots"? One answer to this question is that categories are created, refined and maintained to support accurate prediction. Knowing that an entity is animate is generally more useful for the purpose of predicting how it will behave than knowing that it is blue with red and green dots. The idea of using predictability, or a lack thereof, as the driving force behind the creation and refinement of knowledge structures has been applied in a variety of context. Virtually all of the work in this vein is based on two key assumptions. First, an assumption is made that the world is in principle deterministic; that given enough knowledge, outcomes can be predicted. Given this, an agent’s failure to predict implies that it is either missing information or incorrectly representing information. Second, it is assumed that knowledge structures sufficient for the task can be created by combining raw perceptual information in various ways. That is, everything the agent needs to make accurate predictions is available in its percepts, and the problem facing the agent is to find the right combination of elements. Our position is that the first of these assumptions represents a useful mechanism for driving unsupervised concept acquisition, whereas blind adherence to the second makes it difficult or impossible to discover some of the most fundamental concepts. To explain observed phenomena, scientists often posit the existence of unobservable entities. No one has ever seen gravity or black holes, but they explain a wide range of observable phenomena. Scientific progress would come to a standstill if not for the ability to posit and collect evidence for the existence of causally efficacious entities that do not manifest themselves directly in our percepts.
DTIC
Electrical Grounding

67
THEORETICAL MATHEMATICS

Includes algebra, functional analysis, geometry, topology, set theory, group theory and number theory.

20070007344 North Carolina State Univ., Raleigh, NC USA
Nonlinear Image Denoising Methodologies
Yufang, Bao; May 2002; 131 pp.; In English
Report No.(s): AD-A460128; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA460128

In this thesis, we propose a theoretical as well as practical framework to combine geometric prior information to a statistical/probabilistic methodology in the investigation of a denoising problem in its generic form together with its various applications in signal/image analysis. We are able in the process, to investigate, understand and mitigate existing limitations of so-called nonlinear diffusion techniques (such as the Perona-Malik equation) from a probabilistic view point, and propose a new nonlinear denoising method that is based on a random walk whose transition probabilities are selected by the information of a two-sided gradient. This results in a piecewise constant filtered image and lifts the long-standing problem of an unknown evolution stopping time.
DTIC
Diffusion; Nonlinear Systems; Nonlinearity

20070007345 Advanced Research Projects Agency, Arlington, VA USA
Toward a Practical Type Theory for Recursive Modules
Dreyer, Derek R; Harper, Robert; Crary, Karl; Mar 2001; 47 pp.; In English
Contract(s)/Grant(s): F19628-95-C-0050; ARPA ORDER-C533
Report No.(s): AD-A460172; CMU-CS-01-112; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA460172

Module systems for languages with complex type systems, such as Standard ML, often lack the ability to express mutually recursive type and function dependencies across module boundaries. Previous work by Crary, Harper and Puri set out a type-theoretic foundation for recursive modules in the context of a phase-distinction calculus for higher-order modules. Two constructs were introduced for encoding recursive modules: a xed-point module and a recursively dependent signature. Unfortunately, the implementations of both constructs involve the use of equi-recursive type constructors at higher-order kinds, the equivalence of which is not known to be decidable. In this paper, we show that the practicality of recursive modules is not contingent upon that of equi-recursive constructors. We begin with the theoretical infrastructure described above and study precisely how equi-recursiveness is used in the recursive module constructs, resulting in a clarification and generalization of the underlying ideas. We then examine in depth how the recursive module constructs in the revised type system can serve as the target of elaboration for a recursive module extension to Standard ML.
DTIC
Calculus of Variations; Modules; Programming Languages; Recursive Functions

20070007472 Naval Research Lab., Washington, DC USA
Fluctuation Induced Almost Invariant Sets
Schwartz, Ira B; Billings, Lora; Dec 28, 2006; 13 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-67-8222-07
Report No.(s): AD-A460565; NRL/MR/6790-06-9012; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA460565

We consider the approximation of fluctuation induced almost invariant sets arising from stochastic dynamical systems. We describe the dynamical evolution of densities via the SFP operator. Given a stochastic kernel with a known distribution, approximate almost invariant sets are found by translating the problem into an eigenvalue problem derived from reversible Markov processes. Two examples of the methods are used to illustrate the technique.
DTIC
Invariance; Stochastic Processes

20070007503 SRI International Corp., Menlo Park, CA USA
Local Shading Analysis
Pentland, Alex P; Nov 1982; 41 pp.; In English
Contract(s)/Grant(s): DAAG29-79-C-0216; N00014-80-C-0505
Report No.(s): AD-A460618; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460618

Local analysis of image shading, in the absence of prior knowledge about the viewed scene, may be used to provide information about the scene. It is understood that every image point has the same image intensity and first and second derivatives as the image of an umbilical point (a point with equal principal curvatures) on a Lambertian surface. Also, there is exactly one combination of surface orientation, curvature, (overhead) illumination direction, and albedo times illumination intensity that will produce a particular set of image intensity and first and second derivatives. A solution for the unique combination of surface orientation, etc., at umbilical points is presented in this paper. This solution has been extended by using general position and regional constraints to obtain estimates of the following: surface orientation at each image point; whether the surface is planar, singly curved, or doubly curved at each point; the mean illuminant direction within a region; and whether a region is convex, concave, or a saddle surface. Algorithms to recover illuminant direction, identify discontinuities, and estimate surface orientation were evaluated on both natural and synthesized images, and were found to produce useful information about the scene.
DTIC
Computer Vision; Curvature; Image Analysis; Image Processing; Images; Shadows

20070007505 SRI International Corp., Menlo Park, CA USA
A General Approach to Machine Perception of Linear Structure in Imaged Data
Fischler, Martin A; Wolf, Helen C; Feb 1983; 30 pp.; In English
Report No.(s): AD-A460620; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460620

In this paper, the authors address a basic problem in machine perception: the tracing of 'line-like' structures appearing in an image. It is shown that this problem can be viewed as the process of finding skeletons in a gray-scale image after observing the following: (1) that line detection does not necessarily depend on gradient information, but rather is approachable from the standpoint of measuring total intensity variation; and (2) that smoothing the original image produces an approximate distance transform. An effective technique for extracting the delineating skeletons from an image is presented, and examples of this approach using aerial, industrial, and radiographic imagery are shown.
DTIC
Computer Vision; Delineation; Gray Scale; Images; Pattern Recognition; Scene Analysis

20070008144 Naval Academy, Annapolis, MD USA
On Quantifer Elimination by Virtual Term Substitution
Brown, Christopher W; Aug 24, 2005; 20 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460669; USNA-CS-TR-2005-07; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460669

This paper presents a new look at Weispfenning's method of quantifier elimination by virtual term substitution and provides two important improvements. Virtual term substitution eliminates a quantified variable by substituting formulas in the remaining variables for each atomic formula in which the quantified variable appears. This paper investigates the polynomials that arise in substitution formulas Weispfenning proposed and, based on this examination, provides a simpler substitution for the general case, and alternate substitutions for several commonly occurring situations. Providing alternate substitutions allows virtual term substitution to make choices that produce simpler output.
DTIC
Substitutes; Symbolic Programming

20070008495 SRI International Corp., Menlo Park, CA USA
Quantification in Autoepistemic Logic
Konolige, Kurt; Sep 6, 1991; 48 pp.; In English
Contract(s)/Grant(s): N00014-89-C-0095
Report No.(s): AD-A461025; SRI-TR-510; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461025

Quantification in modal logic is interesting from a technical and philosophical standpoint. Here we look at quantification in autoepistemic logic, which is a modal logic of self-knowledge. We propose several different semantics, all based on the idea that having beliefs about an individual amounts to having a belief using a certain type of name for the individual.
DTIC
Predicate Calculus; Semantics

20070008615 SRI International Corp., Menlo Park, CA USA
A Multivalued Logic Approach to Integrating Planning and Control
Saffiotti, Alessandro; Konoliage, Sr, Kurt G; Ruspini, Enrique H; Jun 1993; 97 pp.; In English
Contract(s)/Grant(s): N00014-89-C-0095; F49620-91-C-0060
Report No.(s): AD-A461229; SRI-TN-533; No Copyright; Avail.: CASI: A05, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461229

Intelligent agents embedded in a dynamic, uncertain environment should incorporate capabilities for both planned and reactive behavior. Many current solutions to this dual need focus on one aspect, and treat the other one as secondary. We propose an approach for integrating planning and control based on control structures, which link physical movements to abstract action descriptions. Control structures induce behaviors of an agent, expressed as trajectories of control actions in an environment, and goals can be defined as predicates on these trajectories. By using the operations of multivalued logic, goals and behaviors can be combined to produce conjoint goals and complex controls. The ability of multi-valued logic to represent intermediate degrees of goal satisfaction allows us to formulate trade-offs between competing goals. A composition theorem relates complex controls to conjoint goals, and provides the key to using standard deliberation procedures to generate complex controllers. We describe experiments ill both planning and run-time deliberation on a mobile robot platform, Flakey.
DTIC
Approach Control

20070008850 SRI International Corp., Menlo Park, CA USA
Using Generic Geometric Knowledge to Delineate Cultural Objects in Aerial Imagery
Fua, Pascal; Hanson, Andrew J; Mar 31, 1986; 29 pp.; In English
Contract(s)/Grant(s): MDA903-83-C-0027; DACA72-85-C-0008
Report No.(s): AD-A461624; SRI-TN-378; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461624

We present a paradigm for discovering the outlines of arbitrarily complex cultural objects in aerial imagery. The approach starts with a low-level image partition and generic (as opposed to specific or template-like) object descriptions. We then use geometric reasoning and context knowledge to suggest corrections to the discrepancies between the segmentation boundaries and the object models. Finally, when the corrections appear consistent with the generic cultural object model, we resegment the partition to produce new labeled regions with clear semantic interpretations. The general features of our approach appear to be applicable to a number of other domains.
DTIC
Aerial Photography; Buildings; Edges; Knowledge Based Systems; Pattern Recognition; Segments

20070008886 SRI International Corp., Menlo Park, CA USA
Automated Deduction by Theory Resolution
Stickel, Mark E; Oct 1984; 36 pp.; In English
Contract(s)/Grant(s): N00039-84-K-0078
Report No.(s): AD-A461675; SRI-TN-340; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461675

Theory resolution constitutes a set of complete procedures for incorporating theories into a resolution theorem-proving program, thereby making it unnecessary to resolve directly upon axioms of the theory. This can greatly reduce the length of proofs and the size of the search space. Theory resolution effects a beneficial division of labor, improving the performance of the theorem prover and increasing the applicability of the specialized reasoning procedures. Total theory resolution utilizes a decision procedure that is capable of determining unsatisfiability of any set of clauses using predicates in the theory. Partial theory resolution employs a weaker decision procedure that can determine potential unsatisfiability of sets of literals. Applications include the building in of both mathematical and special decision procedures, e.g., for the taxonomic information furnished by a knowledge representation system. Theory resolution is a generalization of numerous previously known

resolution refinements. Its power is demonstrated by comparing solutions of 'Schubert's Steamroller' challenge problem with and without building in axioms through theory resolution.
DTIC
Decision Theory; Resolution

20070008916 Carnegie-Mellon Univ., Pittsburgh, PA USA
Tabled Higher-Order Logic Programming
Pientka, Brigitte; Dec 2003; 236 pp.; In English
Contract(s)/Grant(s): F19628-95-C-0050; CCR-9619584
Report No.(s): AD-A461733; CMU-CS-03-185; No Copyright; Avail.: CASI: A11, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461733

A logical framework is a general meta-language for specifying and implementing deductive systems, given by axioms and inference rules. Based on a higher-order logic programming interpretation, it supports executing logical systems and reasoning with and about them, thereby reducing the effort required for each particular logical system. In this thesis, we describe different techniques to improve the overall performance and the expressive power of higher-order logic programming. First, we introduce tabled higher-order logic programming, a novel execution model where some redundant information is eliminated using selective memoization. This extends tabled computation to the higher-order setting and forms the basis of the tabled higher-order logic programming interpreter. Second, we present efficient data-structures and algorithms for higher-order proof search. In particular, we describe a higher-order assignment algorithm which eliminates many unnecessary occurs checks and develop higher-order term indexing. These optimizations are crucial to make tabled higher-order logic programming successful in practice. Finally, we use tabled proof search in the meta-theorem prover to reason efficiently with and about deductive systems. It takes full advantage of higher-order assignment and higher-order term indexing. As experimental results demonstrate, these optimizations taken together constitute a significant step toward exploring the full potential of logical frameworks in practice.
DTIC
Algorithms; Logic Programming; Optimization; Theorems

20070008938 SRI International Corp., Menlo Park, CA USA
A Representation of Parallel Activity Based on Events, Structure, and Causality
Lansky, Amy L; Dec 8, 1986; 51 pp.; In English
Contract(s)/Grant(s): N00014-85-C-0251; IST-8511167
Report No.(s): AD-A461769; SRI-TR-401; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461769

Most AI domain representations have been based on state-oriented world models. In this paper we present an event-based model that focuses on domain events (both atomic and nonatomic) and on the causal and temporal relationships among them. Emphasis is also placed on representing locations of activity and using them to structure the domain representation. Our model is based on first-order temporal logic, which has a well-understood semantics and has been employed extensively in concurrency theory. We show how temporal-logic constraints on event histories (records of past activity) can facilitate the description of many of the complex synchronization properties of parallel, multiagent domains.
DTIC
Models; Vents

20070008939 SRI International Corp., Menlo Park, CA USA
More Notes from the Unification Underground: A Second Compilation of Papers on Unification-Based Formalisms
Shieber, Stuart M; Karttunen, Lauri; Pereira, Fernando C; Kay, Martin; Aug 1985; 61 pp.; In English
Contract(s)/Grant(s): N00039-84-K-0078
Report No.(s): AD-A461772; SRI-TN-361; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461772

This report is the second compilation of papers by members of the PATR group at SRI International and collaborators reporting on ongoing research on both practical and theoretical issues concerning grammar formalisms. The current formalism being simultaneously designed, implemented, and used by the group, PATR-II, is based on unification of directed-graph structures. The papers presented in this compilation describe techniques for efficiently implementing formalisms that make use of such a concept of unification. The first two chapters are devoted to the problem of representing directed graphs as data

structures such that unification is efficiently implementable. The final chapter describes a general technique for extending context-free parsing methods to unification-based formalisms. The techniques described in these papers have all been implemented and tested. All three chapters are versions of papers presented at the Twenty-Third Annual Meeting of the Association for Computational Linguistics, held at the University of Chicago, Chicago, Illinois, during July 8 through 12, 1985, and appear in the proceedings of that conference. Research on PATR-II was begun as part of the KLAUS (Knowledge Learning And Using System) project at SRI, and was set up with the intention of experimenting with mathematically well-defined alternatives to the DIALOGIC natural-language processing system. The more theoretical research was made possible in part by a gift from the System Development Foundation and was conducted as part of a coordinated research effort with the Situated Language program at the Center for the Study of Language and Information, Stanford University.
DTIC
Formalism; Grammars; Linguistics; Natural Language Processing

20070008940 SRI International Corp., Menlo Park, CA USA
A Prolog Technology Theorem Prover: Implementation by an Extended Prolog Compiler
Stickel, Mark E; Nov 1987; 39 pp.; In English
Contract(s)/Grant(s): N00039-84-K-0078
Report No.(s): AD-A461775; SRI-TN-382R; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461775

A Prolog technology theorem prover (PTTP) is an extension of Prolog that is complete for the full first-order predicate calculus. It differs from Prolog in its use of unification with the occurs check for soundness, the model-elimination reduction rule that is added to Prolog inferences to make the inference system complete, and depth-first iterative-deepening search instead of unbounded depth-first search to make the search strategy complete. A Prolog technology theorem prover has been implemented by an extended Prolog-to-LISP compiler that supports these additional features. It is capable of proving theorems in the full first-order predicate calculus at a rate of thousands of inferences per second.
DTIC
Compilers; Inference; Programming Languages; Prolog (Programming Language); Theorems

20070008941 SRI International Corp., Menlo Park, CA USA
A Model of Plan Inference That Distinguishes Between the Beliefs of Actors and Observers
Pollack, Martha E; Aug 20, 1986; 19 pp.; In English
Contract(s)/Grant(s): N00039-84-K-0078
Report No.(s): AD-A461776; SRI-TN-387; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461776

Existing models of plan inference (PI) in conversation have assumed that the agent whose plan is being inferred (the actor) and the agent drawing the inference (the observer) have identical beliefs about actions in the domain. I argue that this assumption often results in failure of both the PI process and the communicative process that PI is meant to support. In particular, it precludes the principled generation of appropriate responses to queries that arise from invalid plans. I describe a model of PI that abandons this assumption. It rests on an analysis of plans as mental phenomena. Judgements that a plan is invalid are associated with particular discrepancies between the belief that the observer ascribes to the actor when the former believes that the latter has some plan, and the beliefs that the observer herself holds. I show that the content of an appropriate response to a query is affected by the types of any such discrepancies of belief judged to be present in the plan inferred to underlie that query. The PI model described here has been implemented in SPIRIT, a small demonstration system that answers questions about the domain of computer mail.
DTIC
Computers; Inference; Planning

20070008947 SRI International Corp., Menlo Park, CA USA
A PROLOG Technology Theorem Prover
Stickel, Mark E; Jan 1984; 10 pp.; In English
Contract(s)/Grant(s): N00039-80-C-0575
Report No.(s): AD-A461787; SRI-TN-336; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461787

An extension of Prolog, based on the model elimination theorem-proving procedure, would permit production of a

logically complete Prolog technology theorem prover capable of performing inference operations at a rate approaching that of Prolog itself.
DTIC
Programming Languages; Prolog (Programming Language); Theorems

20070009004 Naval Research Lab., Washington, DC USA
Progress in Development of Multiple Quantum Well Retromodulators for Free-Space Data Links
Gilbreath, G C; Rabinovich, W S; Meehan, Timothy J; Vilcheck, Michael J; Stell, Mena; Mahon, Rita; Goetz, Peter G; Oh, Eun; Vasquez, John; Cochrell, Kerry; Locke, Robert; Mozersky, Sharon; Jun 2003; 29 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461914; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461914

This paper is an update in the progress of the development of NRL's Multiple Quantum Well retromodulators for compact, low power communications. We report results for data-in-flight on a small, unmanned aerial vehicle at up to 5 Mbps, in preparation for real-time video transfer using an array of devices. This data was taken at Chesapeake Bay Detachment. We also report transference of color video using wavelet compression at 15 and 30 frames per second, at 4 to 6 Mbps in lab, at eye safe intensity levels. The unit is a cornercube modulator using a 980 nm shutter. A five-element array was used for the data-in-flight. First results of our 1550 nm devices are also presented as is progress in a 'Cats Eye Retromodulator'
DTIC
Data Links; Optical Communication; Progress; Quantum Wells; Retroreflectors

20070009055 Carnegie-Mellon Univ., Pittsburgh, PA USA
Optimizations in Decision Procedures for Propositional Linear Inequalities
Strichman, Ofer; May 23, 2002; 11 pp.; In English
Contract(s)/Grant(s): N00014-01-1-0796
Report No.(s): AD-A461194; CMU-CS-02-133; No Copyright; Avail.: CASI: A03, Hardcopy

Several decision procedures that were published in the last few years for sub-theories of propositional linear inequalities, i.e. a Boolean combination of predicates that belong to the theory, are based on a graph-based analysis of the formula's predicates. The analysis is always based on the predicates while ignoring the Boolean connectives between them. In this note we show how taking this information into account can significantly reduce the (practical) complexity of the decision procedure.
DTIC
Decision Theory; Inequalities; Optimization

20070009056 Carnegie-Mellon Univ., Pittsburgh, PA USA
Reducing Separation Formulas to Propositional Logic
Strichman, Ofer; Seshia, Sanjit A; Bryant, Randal E; Apr 16, 2003; 22 pp.; In English
Contract(s)/Grant(s): N00014-01-1-0796
Report No.(s): AD-A461197; CMU-CS-02-132; No Copyright; Avail.: CASI: A03, Hardcopy

We show a reduction to propositional logic from a Boolean combination of inequalities of the form Vi is greater or equal Vj + C and Vi is less than Vj + C where C is a constant, and Vi, Vj are variables of type real or integer. Equalities and uninterpreted functions can be expressed in this logic as well. We discuss the advantages of using this reduction as compared to competing methods, and present experimental results that support our claims.
DTIC
Decision Theory; Mathematical Logic

20070009120 Air Force Research Lab., Kirkland AFB, NM USA
Cost Cumulant-Based Control for a Class of Linear Quadratic Tracking Problems
Pham, Khanh D; Aug 4, 2006; 10 pp.; In English
Report No.(s): AD-A461965; AFRL-VS-PS-TP-2006-1048; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The topic of cost cumulant control is currently receiving substantial research from the theoretical community oriented toward stochastic control theory. For instance, the present paper extends the application of cost cumulant controller design to

control of a wide class of linear quadratic tracking systems. It is shown that the tracking problem can be solved in two parts: a feedback k-cost-cumulant (kCC) control whose optimization criterion representing a linear combination of finite k cumulant indices of a finite horizon integral quadratic cost associated to a linear tracking stochastic system is determined by a set of Riccati-type differential equations and a set of time-dependent tracking variables is found by solving an auxiliary set of differential equations (incorporating the desired trajectory) backward from a stable final time.
DTIC
Cost Analysis; Costs; Differential Equations; Financial Management; Linear Equations; Quadratic Equations; Tracking Problem

20070009137 Brown Univ., Providence, RI USA
P-Refinement and P-Threads (Preprint)
Dong, Steven; Karniadakis, George E; Aug 15, 2002; 22 pp.; In English
Report No.(s): AD-A461985; No Copyright; Avail.: CASI: A03, Hardcopy

P-type refinement leads to exponential decay of numerical errors for sufficiently smooth solutions and has been used effectively in turbulence and structural mechanics simulations in the context of spectral and hp finite element discretizations. However, it induces a computational cost of O(P[d+1]) in d dimensions, which is higher than lower-order methods. In this paper, we demonstrate that by employing multi-threading within MPI processes we manage to counter- balance the cost increase associated with P-refinement. This approach reduces effectively the wall clock time, and keeps it essentially constant as the polynomial order is increased while achieving exponential convergence rate. Since the number of threads within MPI processes can be dynamically adjusted through thread library functions, the algorithm can be readily adapted for dynamic P-refinement. The resulting hybrid MPI/threads dual-level parallelism is particularly suitable for modern supercomputers consisting of 'SMP' nodes. We demonstrate this approach in simulations of two three-dimensional fluid dynamics problems.
DTIC
Threads; Three Dimensional Flow

20070009171 Michigan Univ., Ann Arbor, MI USA
Solving Difficult Instances of Boolean Satisfiability in the Presence of Symmetry
Aloul, Fadi A; Ramani, Arathi; Markov, Igor L; Sakallah, Karem A; Sep 6, 2002; 43 pp.; In English
Report No.(s): AD-A462031; CSE-TR-463-02; No Copyright; Avail.: CASI: A03, Hardcopy

Research in algorithms for Boolean satisfiability (SAT) and their implementations [45, 41, 10] has recently outpaced benchmarking efforts. Most of the classic DIMACS benchmarks [21] can now be solved in seconds on commodity PCs. More recent benchmarks [54] take longer to solve due of their large size, but are still solved in minutes. Yet, small and difficult SAT instances must exist if P not equal NP. To this end, our work articulates SAT instances that are unusually difficult for their size, including satisfiable instances derived from Very Large Scale Integration (VLSI) routing problems. With an efficient implementation to solve the graph automorphism problem [39, 50, 51], we show that in structured SAT instances difficulty may be associated with large numbers of symmetries. We point out that a previously published symmetry-detection mechanism [18] based on a reduction to the graph automorphism problem often produces many spurious symmetries. Our work contributes two new reductions to graph automorphism, which detect all correct symmetries detected previously [18] as well as phase-shift symmetries not detected earlier. The correctness of our reductions is rigorously proven, and they are evaluated empirically. We also formulate an improved construction of symmetry-breaking clauses in terms of permutation cycles and propose to use only generators of symmetries in this process. These ideas are implemented in a fully automated flow that first detects symmetries in a given SAT instance, pre-processes it by adding symmetry-breaking clauses and then calls a state-of-the-art backtrack SAT solver. Significant speed-ups are shown on many benchmarks versus direct application of the solver. In an attempt to further improve the practicality of our approach, we propose a scheme for fast opportunistic symmetry detection and also show that considerations of symmetry may lead to more efficient reductions to SAT in the VLSI routing domain.
DTIC
Algorithms; Boolean Algebra; Problem Solving; Symmetry

20070009178 Michigan Univ., Ann Arbor, MI USA
Stability Analysis of Legged Locomotion Models by Symmetry-Factored Return Maps
Altendorfer, Richard; Koditschek, Daniel E; Holmes, Philip; Jan 2003; 29 pp.; In English; Original contains color illustrations
Report No.(s): AD-A462040; No Copyright; Avail.: CASI: A03, Hardcopy

We present a new stability analysis for hybrid legged locomotion systems based on the 'symmetric' factorization of return maps. We apply this analysis to 2 and 3 degree of freedom (DOF) models of the Spring Loaded Inverted Pendulum (SLIP) with different leg recirculation strategies. Despite the non-integrability of the SLIP dynamics, we obtain a necessary condition for asymptotic stability (and a sufficient condition for instability) at a fixed point, formulated as an exact algebraic expression in the physical parameters. We use this expression to study a variety of 2 DOF SLIP models that have previously been posited as low dimensional representations of running, focusing on the sensory 'cost' required to achieve 'fast' transients as measured by the degree of singularity of the linearized dynamics. We introduce a new 3 DOF SLIP model with pitching dynamics whose stability properties, revealed by this analysis, provide for the first time the beginnings of a formal explanation for the surprisingly stable gaits of the open loop controlled robot, RHex.
DTIC
Locomotion; Stability Tests; Symmetry

20070009196 Naval Research Lab., Washington, DC USA
Establishing High Confidence in Code Implementations of Algorithms using Formal Verification of Pseudocode
Archer, Myla; Leonard, Elizabeth I; Aug 16, 2006; 17 pp.; In English
Report No.(s): AD-A462080; No Copyright; Avail.: CASI: A03, Hardcopy

Using a theorem prover to establish that a body of code correctly implements an algorithm is a task seldom undertaken because the effort required tends to be prohibitive. Direct reasoning about code in a particular programming language requires that some version of the language's semantics-e.g., axiomatic, operational, denotational-be used to determine the program correctness assertions to establish with the theorem prover. Any scheme for generating correctness assertions will be language-specific, and for languages with complex constructs, can be complex to implement and use. Direct reasoning about algorithms using a theorem prover can be not just difficult, but impossible, if the algorithms are (as is typical) specified using informal pseudocode. This paper provides high confidence in the correctness of an algorithm's implementation. The scheme uses formal pseudocode specifications, in a restricted language of while programs with (probably recursive) procedure calls, to bridge from algorithm specifications to implementations in code. Each block of formal pseudocode is verified in the theorem prover PVS by translating it into a state machine model and proving a set of state invariants. High confidence in implementation correctness is achieved by combining verification of the pseudocode with traceability arguments relating the algorithm specification to the pseudocode representation and the pseudocode representation to the actual code.
DTIC
Algorithms; Coding; Program Verification (Computers); Programming Languages; Theorems

20070009223 Colorado Univ., Boulder, CO USA
A Powerdomain Primer: A Tutorial for The Bulletin of the EATCS
Main, Michael G; Sep 1987; 39 pp.; In English
Contract(s)/Grant(s): N00014-96-1-0720
Report No.(s): AD-A462121; CU-CS-375-87; No Copyright; Avail.: CASI: A03, Hardcopy

The order-theoretic approach to programming semantics uses certain partially-ordered sets, called domains. Typically, the elements of a domain D are the 'machine states' in which a computation may proceed, and a program is represented by a state-transformation function f : D --\g D. The meaning of such a function is this: when the program is started in a state x epsilon D, then it will end in the state f (x). This 'end-state' might be a special element of D which indicates that the program never terminated. This special element is usually considered to be just another 'state' -- one that we frequently want to avoid. Of course, this is not the entire story of order-theoretic semantics: for example, I have not even mentioned what kind of partial-order a domain possesses, or the reason for the order. But this is enough of the story to motivate powerdomains. The motivation comes from a problem with the 'typical' situation described above. We assumed that the state-transition relationship was a function, so that given a start-state x epsilon D, there is a single end-state f (x) epsilon D which will be reached by the program. But, some programs are nondeterministic -- meaning that a given start-state does not uniquely determine an end-state. We may also be uncertain about precisely which state a nondeterministic program starts in. Powerdomains are the solution to this problem. Intuitively, a powerdomain P is a special kind of domain whose elements are various 'nondeterministic combinations of elements' from another domain. In this setting, a nondetermimstic program represents a function f : P --\g P. The meaning of such a function is this: when the program is started in one of the states indicated by the nondeterministic combination X epsilon P, then it will end in one of the states of f (x). In general, different notions of powerdomains are based on different intuitions about what constitutes a 'nondeterministic combination of elements'
DTIC
Computer Programming; Mathematical Logic; Semantics

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PHYSICS (GENERAL)

Includes general research topics related to mechanics, kinetics, magnetism, and electrodynamics. For specific areas of physics see *categories 71 through 77*. For related instrumentation see *35 Instrumentation and Photography*; for geophysics, astrophysics, or solar physics see *46 Geophysics, 90 Astrophysics*, or *92 Solar Physics*.

20070006582 Istituto Nazionale di Fisica Nucleare, Pisa, Italy, Stanford Linear Accelerator Center, CA, USA
Measurements of Gamma in BaBar
Marchiori, G.; Aug. 2006; 5 pp.; In English
Report No.(s): DE2006-891249; SLAC-PUB-12084; No Copyright; Avail.: Department of Energy Information Bridge

We report on the first measurements to the angle (gamma) of the Unitarity Triangle in B meson decays collected by the BABAR detector at the SLAC PEP-II asymmetric-energy B factory in the years 1999-2004.
NTIS
Linear Accelerators; Mesons

20070006583 Brookhaven National Lab., Upton, NY USA
Weak Mixing Angle and 'New Physics' (A Tale of Two Numbers)
Marciano, W.; Aug. 2006; 6 pp.; In English
Report No.(s): DE2006-891296; BNL-77015-2006-CP; No Copyright; Avail.: Department of Energy Information Bridge

The two best Z pole determinations of sin(sup 2) (theta)(sub W) (m(sub z))(sub (ovr MS)) differ by 3 sigma, a feature lost in global fits and averaging. Individually, sin(sup 2) (theta)(sub W)(m(sub Z))(sub (ovr MS)) = 0.2307(3) obtained from A(sub LR), taken together with m(sub W) = 80.410(32) GeV, points to a very light Higgs boson, m(sub H) (approx-equal) 12-63 GeV, already ruled out experimentally. it is, however, easily redeemed by low mass scale supersymmetry or models with (effectively) S (approx-equal) -0.12 and T (approx-equal) +0.06. Alternatively, sin(sup 2) (theta)(sub W) (m(sub Z))(sub (ovr MS)) (approx-equal) 0.2320(3) obtained from A(sub FB)(Z (yields) (ovr bb)), suggests a very heavy Higgs, m(sub H) (approx) 500 GeV, along with S (approx-equal) +0.45 which is suggestive of Technicolor models. Future ways to resolve this discrepancy are briefly discussed.
NTIS
Higgs Bosons; Supersymmetry

20070006584 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA
Longitudinal Phase Space Characterization of Electron Bunches at the JLAB FEL Facility
Zhang, S.; Benson, S.; Douglas, D.; Hardy, D.; Neil, G.; January 2006; 4 pp.; In English
Report No.(s): DE2006-891261; No Copyright; Avail.: Department of Energy Information Bridge

We report longitudinal phase space measurements of short electron bunches at the 10kW Free-Electron Laser Facility at Jefferson Lab using broadband synchrotron radiation and a remotely controlled fast streak camera. Accurate measurements are possible because the optical transport system uses only reflective components that do not introduce dispersion. The evolution of longitudinal phase space of the electron beam can be observed in real time while phases of accelerator RF components are being adjusted. This fast and efficient diagnostic enhances the suite of machine setup tools available to JLab FEL operators and applies to other accelerators. The results for certain beam setups will be presented.
NTIS
Electron Beams; Electron Bunching; Free Electron Lasers

20070006585 Brookhaven National Lab., Upton, NY, USA
Electroweak Physics and Precision Studies
Marciano, W.; Aug. 2006; 11 pp.; In English
Report No.(s): DE2006-891297; BNL-77016-2006-CP; No Copyright; Avail.: Department of Energy Information Bridge

The utility of precision electroweak measurements for predicting the Standard Model Higgs mass via quantum loop effects is discussed. Current values of m(sub W), sin(sup 2) (theta)(sub W)(m(sub Z))(sub (ovr MS)) and m(sub t) imply a relatively light Higgs which is below the direct experimental bound but possibly consistent with Supersymmetry expectations. The existence of Supersymmetry is further suggested by a 2(sigma) discrepancy between experiment and theory for the muon anomalous magnetic moment. Constraints from precision studies on other types of ''New Physics'' are also briefly described.
NTIS
Electroweak Interactions (Field Theory); Accuracy; Precision

20070006587 Gordon Research Conferences, Inc., Kingston, RI, USA

Quantum Control of Light and Matter (2005) Conference Held in Waterville, ME on July 31, 2005-August 5, 2005

Corkum, P. B.; Sep. 2006; 8 pp.; In English; Quantum Control of Light and Matter (2005) Conference, July 31, 2005 - August 5, 2005, Waterville, ME

Report No.(s): DE2006-891264; No Copyright; Avail.: Department of Energy Information Bridge

Quantum control arises through the interference of multiple quantum paths to the same final state. Quantum (or coherent) control uses the technology of nonlinear optics. It focuses on the end result as well as the process. The conference title Quantum Control of Light and Matter emphasizes the importance of the end result. The idea of quantum control had independent origins in nonlinear optics and in chemical dynamics but its initial impact was most strongly felt in AMO science. Now quantum control uses perturbative (relatively low intensity laser beams) and nonperturbative (intense laser beams) techniques for control.

NTIS

Atoms; Conferences; Quantum Theory

20070006589 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA

Strangeness Contribution to Nucleon Form Factors

Young, R. D.; January 2005; 5 pp.; In English

Report No.(s): DE2006-891269; No Copyright; Avail.: Department of Energy Information Bridge

We review a recent theoretical determination of the strange quark content of the electromagnetic form factors of the nucleon. These are compared with a global analysis of current experimental measurements in parity-violating electron scattering.

NTIS

Form Factors; Nucleons; Strangeness

20070006593 Brookhaven National Lab., Upton, NY USA

Analogies between Neutron and Gamma-Ray Imaging

Vanier, P. E.; January 2005; 10 pp.; In English

Report No.(s): DE2006-891294; BNL-076974-2006-CP; No Copyright; Avail.: Department of Energy Information Bridge

Although the physics describing the interactions of neutrons with matter is quite different from that appropriate for hard x-rays and gamma rays, there are a number of similarities that allow analogous instruments to be developed for both types of ionizing radiation. A pinhole camera, for example, requires that the radiation obeys some form of geometrical optics, that a material can be found to absorb some of the radiation, and that a suitable position-sensitive detector can be built to record the spatial distribution of the incident radiation. Such conditions are met for photons and neutrons, even though the materials used are quite different. Neutron analogues of the coded-aperture gamma camera and the Compton camera have been demonstrated. Even though the Compton effect applies only to photons, neutrons undergo proton-recoil scattering that can provide similar directional information. There is also an analogy in the existence of an energy spectrum for the radiation used to produce the images, and which may allow different types of sources to be distinguished from each other and from background.

NTIS

Analogies; Cameras; Compton Effect; Gamma Rays; Imaging Techniques; Neutrons

20070006595 Brookhaven National Lab., Upton, NY, USA

Simulation of a Wide-Band Low-Energy Neutrino Beam for Very Long Baseline Neutrino Oscillation Experiments

Bishai, M.; Aug. 2006; 48 pp.; In English

Report No.(s): DE2006-891295; BNL-76997-2006-IR; No Copyright; Avail.: Department of Energy Information Bridge

We present simulations of a wide-band low-energy neutrino beam for a future very long baseline neutrino oscillation (VLBNO) program using the proton beam from the Main Injector (MI) proton accelerator at Fermi National Accelerator Laboratory (Fermilab). The target and horn designs previously developed for Brookhaven Laboratory's Alternating Gradient Synchrotron (AGS) VLBNO program are used without modifications. The neutrino flux distributions for various MI proton beam energies and new high-intensity neutrino beam-line designs possible at Fermilab are presented. The beam-line siting and design parameters are chosen to match the requirements of an on-axis beam from Fermilab to one of the two possible sites for the future Deep Underground Science and Engineering Laboratory (DUSEL). A preliminary estimate of the observable event rates and spectra at a detector located in DUSEL for different beam configurations has been performed. Our preliminary

conclusions are that a 40-60 GeV 0.5 to 1 MW beam from the Fermilab Main Injector to a DUSEL site has the potential to reach the desired intensity for the next generation of neutrino oscillation experiments. Recent studies indicate that the Fermilab MI can reach a beam power of 0.5 MW at 60 GeV with incremental upgrades to the existing accelerator complex.
NTIS
Broadband; Neutrino Beams; Neutrinos; Oscillations; Simulation

20070006596 Lawrence Livermore National Lab., Livermore, CA USA
Direct-Semidirect Thermal Neutron Capture Calculations
Arbanas, G.; Dietrich, F. S.; Kerman, A. K.; Dec. 21, 2005; 10 pp.; In English
Report No.(s): DE2006-891381; UCRL-PROC-217859; No Copyright; Avail.: Department of Energy Information Bridge

A method for computing direct-semidirect (DSD) neutron radiative capture is presented and applied to thermal neutron capture on (sup 19)F, (sup 27)Al, (sup 28,29.30)Si, (sup 35,37)Cl, (sup 39,41)K, (sup 56)Fe, and (sup 238)U, in support of data evaluation effort at the O.R.N.L. The DSD method includes both direct and semidirect capture; the latter is a core-polarization term in which the giant dipole resonance is formed. We study the effects of a commonly used 'density' approximation to the EM operator and find it to be unsatisfactory for the nuclei considered here. We also study the magnitude of semidirect capture relative to the pure direct capture. Furthermore, we compare our results with those obtained from another direct capture code (Tedca (17)). We also compare our results with those obtained from analytical expression for external capture derived by Lane and Lynn (3), and its extension to include internal capture (7). To estimate the effect of nuclear deformation on direct capture, we computed direct thermal capture on (sup 238)U with and without imposition of spherical symmetry. Direct capture for a spherically symmetric (sup 238)U was approximately 6 mb, while a quadrupole deformation of 0.215 on the shape of (sup 238)U lowers this cross section down to approximately 2 mb. This result suggests that effects of nuclear deformation on direct capture warrant a further study. We also find out that contribution to the direct capture on (sup 238)U from the nuclear interior significantly cancels that coming from the exterior region, and hence both contributions must be taken into account. We reproduced a well known discrepancy between the computed and observed branching ratios in (sup 56)Fe(n,(gamma)). This will lead us to revisit the concept of doorway states in the particle-hole model.
NTIS
Capture Effect; Neutrons; Symmetry; Thermal Neutrons

20070006642 Dorsey and Whitney, LLP, New York, NY, USA
Methods and Compositions for Inhibiting Stat Signaling Pathways
Horvath, C.; Rodriguez, J.; Ulane, C. M.; Parisien, J. P.; 14 Apr 04; 57 pp.; In English
Contract(s)/Grant(s): NO-R101A1507707-01A1
Patent Info.: Filed Filed 14 Apr 04; US-Patent-Appl-SN-10-553-160
Report No.(s): PB2007-101352; No Copyright; Avail.: CASI: A04, Hardcopy

The invention relates to compositions and methods for modulating cell signaling mediated by signal transducers and activators of transcription (STAT). The compositions target cellular STAT3 and STAT1 protein, particularly STAT3, for degradation via the ubiquitination pathway. Thus, the STAT inhibiting agents are useful for inhibiting STAT mediated signal transduction events, such as responses to IL6 and v-Src, any may be applied to treating diseases associated with activated STAT proteins, particularly STAT3 activity, such as cell proliferative disorders, inflammatory reactions, and autoimmune conditions.
NTIS
Activation; Transducers

20070006652 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA
Twenty Years of Physics at MAMI--What Did it Mean
Mecking, B. A.; Jun. 2006; 11 pp.; In English
Report No.(s): DE2006-891445; No Copyright; Avail.: Department of Energy Information Bridge

The development over the last twenty years of the physics program and the experimental facilities at the Mainz Microtron MAMI will be reviewed. Ground-breaking contributions have been made to the development of experimental techniques and to our understanding of the structure of nucleons and nuclei.
NTIS
Microtrons; Active Galactic Nuclei

20070006672 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA, Lawrence Livermore National Lab., Livermore, CA USA, Princeton Univ., NJ USA, Voss Scientific, Albuquerque, NM, USA

Neutralized Drift Compression Experiments (NDCX) with a High Intensity Ion Beam

Roy, P. K.; Yu, S. S.; Waldron, W. L.; Anders, A.; Baca, D.; January 2006; 8 pp.; In English

Report No.(s): DE2006-888774; No Copyright; Avail.: National Technical Information Service (NTIS)

To create high energy density matter and fusion conditions, high-power drivers, such as lasers, ion beams, and x-ray drivers, are employed to heat targets with pulses short compared to hydro-motion. Both high energy density physics and ion-driven inertial fusion require the simultaneous transverse and longitudinal compression of an ion beam to achieve high intensities. We have previously studied the effects of plasma neutralization for transverse beam compression. The scaled experiment, the Neutralized Transport Experiment (NTX), demonstrated that an initially un-neutralized beam can be compressed transversely to (approx)1 mm radius when charge neutralization by background plasma electrons is provided. Here we report longitudinal compression of a velocity-tailored, intense, neutralized 25 mA K+ beam at 300 keV. The compression takes place in a 1-2 m drift section filled with plasma to provide space-charge neutralization. An induction cell produces a head-to-tail velocity tilt that longitudinally compresses the neutralized beam, enhances the beam peak current by a factor of 50 and produces a pulse duration of about 3 ns. The Physics of longitudinal compression, experimental procedure, and the results of the compression experiments are presented.

NTIS

Ion Beams; Beam Currents; Heavy Ions

20070006683 Toronto Univ., Ontario, Canada

First Measurement of the W Boson Mass with CDF in Run 2

Stelzer-Chilton, O.; January 2006; 116 pp.; In English

Report No.(s): DE2006-892288; No Copyright; Avail.: National Technical Information Service (NTIS)

The thesis describes a first measurement of the W Boson mass through thedecay into a muon and neutrino in Run 2 of the Tevatron. The W Bosons are produced in proton-antiproton collisions at a center of mass energy of 1.96 TeV. The data sample used for this analysis corresponds to 200 pb-1 recorded by the upgraded Collider Detector at Fermilab. The most important quantity in this measurement is the momentum of the muon measured in a magnetic spectrometer which is calibrated using the two quarkonium resonances J/Psi and Gamma(1S). Systematic uncertainties arise from the modeling of the recoil when the W Boson is produced, the momentum calibration, the modeling of W Boson production and decay dynamics and backgrounds. The result is: M(w)=80408=-50(stat.) =-57(syst.)MeV/c(2).

NTIS

Bosons; Elementary Particles

20070006686 Pennsylvania Univ., Philadelphia, PA, USA, Fermi National Accelerator Lab., Batavia, IL, USA

Progress in Top Quark Physics

Thomson, E. J.; January 2006; 11 pp.; In English

Report No.(s): DE2006-892291; FERMILAB-CONF-05-613-E; No Copyright; Avail.: National Technical Information Service (NTIS)

Experimental measurements of the properties of the top quark have improved and will continue to improve significantly, with the excellent operation of the CDF and D0 experiments and the Tevatron pp(bar) collider at the Fermi National Accelerator Laboratory. All of the final state experimental signatures from top quark production and decay are being analysed to test if this most massive quark is sensitive to new physics beyond the standard model. So far, observations are consistent with the standard model. New techniques have dramatically improved the precision of the top quark mass measurement to 1.7% and set the stage for a sub-1% measurement by 2008. This improved knowledge of the top quark mass sharpens the standard model prediction for the mass of the undiscovered Higgs boson, with implications for Higgs studies at the future LHC and ILC.

NTIS

Elementary Particles; Progress; Quarks

20070006688 Victoria Univ. of Manchester, UK, Fermi National Accelerator Lab., Batavia, IL, USA

Hard Diffractive Results and Prospects at the Tevatron

Peters, K.; Jan. 17, 2006; 6 pp.; In English

Report No.(s): DE2006-892292; FERMILAB-CONF-06-011-E; No Copyright; Avail.: National Technical Information Service (NTIS)

We review hard diffractive results and prospects at the Tevatron with an empasis on factorization breaking in diffractive processes. Uppper limits on the exclusive di-jet and X(c)(0) production cross sections at CDF and the status of the D0 Forward Proton Detectors are discussed.
NTIS
Factorization; Particle Accelerators

20070006691 Wisconsin Univ., Madison, WI, USA, Fermi National Accelerator Lab., Batavia, IL, USA
Search for RPV Scalar Leptons at Tevatron
Chuang, S.; January 2006; 4 pp.; In English
Report No.(s): DE2006-892293; FERMILAB-CONF-05-548-E; No Copyright; Avail.: National Technical Information Service (NTIS)

The authors reviewd CDF and D0 searches for R-parity violation sypersymmetry in leptons involved final states using up to 344 +-21 pb-1 Tevatron Run II data of pp(bar) collisions at sqrt(s)=1.96 TeV. All the results were in good agreement with the Standard Model expectiations. No evidence of new physics was observed. However, owing to the improvement on detectors, energy and luminosity from Run I to Run II, the limits for the existence of R-parity violation sypersymmetry have been greatly advanced.
NTIS
Elementary Particles; Leptons; Parity; Particle Accelerators; Remotely Piloted Vehicles; Scalars

20070006695 Alberta Univ., Edmonton, Alberta, Canada
Exclusive Interactions in pp(bar) Collisions at sqrt(s)=1.96 TeV
Hamilton, A.; January 2006; 97 pp.; In English
Report No.(s): DE2006-892299; No Copyright; Avail.: National Technical Information Service (NTIS)

The thesis presents two exclusive production processes in pp(bar) collisions at sqrt(s)=1.96 TeV, using the Collider Detector Facility at Fermi National Accelerator Laboratory. An observation of exclusive e+e- production through gamma gamma -\g e+e- is presented, as well as evidence for exclusive production of gamma gamma through gg -\g gamma gamma (via a quark loop). The exclusive e+e- production observation is based on 16 candidate events, with a background estimate of 2.1 +0.7 -0.3. Each event has an e+e- pair (E(T) \g 5 GeV, (n(e)) \h 2) and nothing else observable in the CDF detector. The measured cross section is 1.6 +0.5 -0.3(stat)+-0.3(sys) pb, while the predicted cross section is 1.711+-.008pb. The kinematic properties of the events are consistent with the predictions of the LPAIR Monte Carlo. The eveidence for exclusive gamma gamma production consists of 3 candidate events, with a background estimate of 0.0 +0.2 -0.0 events. Each event has two photons (E(T)(gamma) \g 5 GeV, (n(gamma)) \h 1) and nothing else observable in the CDF detector. The measured cross section for these events is 0.14 +0.14 -0.04(stat) +-0.03(sys)pb. It agrees with the theoretical prediction of 0.04 pb with a factor 3 to 5 theoretical uncertainty.
NTIS
Collisions; Elementary Particles

20070006696 Pennsylvania Univ., Philadelphia, PA, USA, Fermi National Accelerator Lab., Batavia, IL, USA
CDF b-tagging: Measuring Efficiency and False Positive Rate
Neu, C.; January 2006; 10 pp.; In English
Report No.(s): DE2006-892301; FERMILAB-CONF-06-162-E; No Copyright; Avail.: National Technical Information Service (NTIS)

The CDF experiment has developed several high pT b-jet identification tools for the Run II physics program at the Tevatron. Herein we describe in detail one such b-tagging tool that exploits the long- lifetime of the b quark by identifying decay vertices significantly displaced from the primary interaction point. The b-tag efficiency is extracted from a b enriched data sample; the method is described, including a discussion of the important systematic effects. The data-driven measurement of the false positive tag rate is also described, as well as an explanation of how the per-jet false positive rate is used to predict the background contribution to the selected sample. Finally we conclude with a discussion of issues that have proven critical for b-tagging at CDF and should be given attention as we prepare b-tagging tools for LHC experiments.
NTIS
Marking; Particle Accelerators

20070006697 California Univ., Davis, CA, USA, Fermi National Accelerator Lab., Batavia, IL, USA
New Phenomena Searches at CDF
Soha, A.; Apr. 14, 2006; 5 pp.; In English
Report No.(s): DE2006-892303; FERMILAB-CONF-06-157-E; No Copyright; Avail.: National Technical Information Service (NTIS)

We report on recent results from the Collider Detector at Fermilab (CDF) experiment, which is accumulating data from proton-antiproton collisions with sqrt(s) =1.96 TeV at Run II of the Fermilab Tevatron. The new phenomena being explored include Higgs, Supersymmetry, and large extra dimensions. We also present the latest results of searches for heavy objects, which would indicate physics beyond the Standard Model.
NTIS
Elementary Particles; Particle Accelerators

20070006699 Athens Univ., Greece, Istituto Nazionale di Fisica Nucleare, Pisa, Italy, Fermi National Accelerator Lab., Batavia, IL, USA
W and Z Cross Section Measurement at CDF
Fedorko, I.; Apr. 10, 2006; 5 pp.; In English
Report No.(s): DE2006-892304; FERMILAB-CONF-06-153-E; No Copyright; Avail.: National Technical Information Service (NTIS)

We report on the new measurement of W and Z cross section times letonic branching ratios in pp(bar) collisions at the Tevatron at sqrt(s)=1.96 TeV. The measurements are based on the decays W-\g ev, Z -\gmicro+micro- and Z -\gpi pi.
NTIS
Elementary Particles; Cross Sections

20070006701 State Univ. of New York, Buffalo, NY, USA, Fermi National Accelerator Lab., Batavia, IL, USA
Isolated Photon Cross Section Measurement at D0
Kumar, A.; January 2006; 4 pp.; In English
Report No.(s): DE2006-892305; FERMILAB-CONF-06-135-E; No Copyright; Avail.: National Technical Information Service (NTIS)

We report a new measurement of the isolated photon cross section by the D experiment at Fermilab using 326 pb..1 of data from Run II of the Tevatron. The measured cross section agrees with the theoretical predictions within uncertainties.
NTIS
Elementary Particles; Photons

20070006704 Madrid Univ., Spain, California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA, Katholieke Univ. te Leuven, Belgium, California Univ., Davis, CA, USA
First Principles Calculations of the Double Photoinization of Atoms and Molecules Using B-Splines and Exterior Complex Scaling
Martin, F.; Horner, D. A.; Vanroos, W.; Rescigno, T. N.; McCurdy, C. W.; January 2006; 6 pp.; In English
Report No.(s): DE2006-891626; No Copyright; Avail.: National Technical Information Service (NTIS)

We report a fully ab initio implementation of exterior complex scaling in B-splines to evaluate total, singly and triply differential cross sections in double photoionization problems. Results for He and H(sub 2) double photoionization are presented and compared with experiment.
NTIS
Molecules; Splines

20070006707 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA, Daresbury Nuclear Physics Lab., UK
Phase Space Tomography Diagonstic for Pitz
Holder, D. J.; Muratori, D. B.; Khodyachykh, S.; Oppelt, A.; Hannon, F. E.; January 2005; 3 pp.; In English
Report No.(s): DE2006-891646; No Copyright; Avail.: Department of Energy Information Bridge

The Photo Injector Test Facility at DESY in Zeuthen (PITZ) is a European collaboration developing RF photocathode electron guns for light source and linear collider projects. As part of the collaborative work being partially funded by the EU's FP6 programme, CCLRC Daresbury Laboratory and DESY are designing and building a phase space tomography diagnostic

based on a set of multiple quadrupoles and view screens. In order to measure the beam emittance, four screens with intermediate quadrupole doublets will be used. The equipment will be installed and tested at PITZ as part of the facility upgrade presently ongoing. Following simulations of the gun using the ASTRA code at a range of energies, simulations of the electron beam parameters through the matching and tomography sections must be undertaken in order to specify the optimum arrangement of magnets and screens.
NTIS
Electron Guns; Emittance; Light Sources; Tomography

20070006724 Manchester Univ., UK
Diffractively Produced Z Bosons in the Muon Decay Channel in pp(bar) Collisions at sqrt(s)=1.96 TeV, and the Measurement of the Efficiency of the D) Run II Luminosity Monitor
Edwards, T.; January 2006; 156 pp.; In English
Report No.(s): DE2006-892267; No Copyright; Avail.: National Technical Information Service (NTIS)
The frist analysis of diffractively produced Z bosons in the muon decay channel is presented, using data taken by the D0 detector at the Tevatron at sqrt(s)=1.96 TeV. The data sample corresponds to an integrated luminosity of 109 pb-1.
NTIS
Bosons; Collisions; Elementary Particles; Luminosity; Monitors; Muons; Particle Decay

20070006738 Stanford Linear Accelerator Center, CA, USA
Measurements of Rates, Asymmetries, and Angular Distributions in B-\g K 1+1- and B-\gK(star) 1+1- Decays
Hollar, J.; January 2006; 124 pp.; In English
Report No.(s): DE2006-891838; SLAC-R-840; No Copyright; Avail.: National Technical Information Service (NTIS)
This dissertation describes studies of the rare decays B(sub d) (yields) K(ell)(sup +)(ell)(sup -) and B(sub d) (yields) K*(ell)(sup +)(ell)(sup -), where (ell)(sup +)(ell)(sup -) is either an e(sup +)e(sup -) or a (mu)(sup +)(mu)(sup -) pair. These decays are highly suppressed in the Standard Model, and could be strongly affected by physics beyond the Standard Model. The authors measure the total branching fractions (Beta)(B(sub d) (yields) K(ell)(sup +)(ell)(sup -)) = (0.34 (+-) 0.07 (+-) 0.03) x 10(sup -6), (Beta)(B(sub d) (yields) K*(ell)(sup +)(ell)(sup -)) = (0.78(sub -0.17)(sup +0.19) (+-) 0.12) x 10(sup -6). In addition, they measure the partial branching fractions, relative abundance of muons to electrons, direct CP asymmetry, dilepton forward-backward asymmetry, and longitudinal polarization of the K* in these modes. They also search for the lepton flavor-violating decays B(sub d) (yields) Ke(sup (+-))(mu)(sup (-+)) and B(sub d) (yields) K*e(sup (+-))(mu)(sup (-+)). The measurements were performed at the SLAC PEP II storage ring running at the (Upsilon)(4S) resonance.
NTIS
Angular Distribution; Asymmetry; Particle Accelerators

20070006741 Lawrence Livermore National Lab., Livermore, CA USA
Time-Resolved Temperature Measurements in SSPX
Ludington, A. R.; Hill, D. N.; McLean, H. S.; Moller, J.; Wood, R. D.; Aug. 18, 2006; 12 pp.; In English
Report No.(s): DE2006-892077; UCRL-TR-223809; No Copyright; Avail.: National Technical Information Service (NTIS)
We seek to measure time-resolved electron temperatures in the SSPX plasma using soft X-rays from free-free Bremsstrahlung radiation. To increase sensitivity to changes in temperature over the range 100-300 eV, we use two photodiode detectors sensitive to different soft X-ray energies. The detectors, one with a Zr/C coating and the other with a Ti/Pd coating, view the plasma along a common line of sight tangential to the magnetic axis of the spheromak, where the electron temperature is a maximum. The comparison of the signals, over a similar volume of plasma, should be a stronger function of temperature than a single detector in the range of Te\h 300 eV. The success of using photodiodes to detect changing temperatures along a chord will make the case for designing an array of the detectors, which could provide a time changing temperature profile over a larger portion of the plasma.
NTIS
Bremsstrahlung; Plasmas (Physics); Temperature Measurement; Time Temperature Parameter

20070006752 Rockefeller Univ., New York, NY, USA
Diffractive and Exclusive Measurements at CDF
Gallinaro, M.; January 2006; 6 pp.; In English
Report No.(s): DE2006-892382; FERMILAB-CONF-06-173-E; No Copyright; Avail.: National Technical Information Service (NTIS)

Experimental results from the CDF experiment at the Tevatron in pp(bar) collisions at sqrt(s)=1.96 TeV are presented on the diffractive structure function at different values of the exchanged momentum transfer squared in the range 0 \h Q(2) \h 10, 000 GeV(2), on the four-momentum transfer (t) distribution in the region 0 \h (t) \h 1 GeV(2) for both soft and hard diffractive events up to Q(2) approximately 4,500 GeV(2), and on the first experimental evidence of exclusive production in both dijet and diphoton events. A novel technique to align the Roman Pot detectors is also presented.
NTIS
Elementary Particles; Particle Accelerators

20070006753 Northeastern Univ., Boston, MA, USA, Fermi National Accelerator Lab., Batavia, IL, USA
Top Quark Mass and Kinematics
Barberis, E.; January 2006; 11 pp.; In English
Report No.(s): DE2006-892313; FERMILAB-CONF-06-146; No Copyright; Avail.: National Technical Information Service (NTIS)

A summary of the results on the measurement of the Top Quark mass and the study of the kinematics of the tt(bar) system at the Tevatron collider is presented here. Results from both the CDF and D0 collaborations are reported.
NTIS
Elementary Particles; Kinematics; Quarks

20070006761 Florida Univ., Gainesville, FL, USA, Fermi National Accelerator Lab., Batavia, IL, USA
Measurements of Top Quark Pair Production Cross Section and Search for Resonances at Tevatron
Rossin, R.; January 2006; 10 pp.; In English
Report No.(s): DE2006-892322; FERMILAB-CONF-06-123-E; No Copyright; Avail.: National Technical Information Service (NTIS)

We present the measurement of the top pair production cross-section at Tevatron in p-pbar collisions at 1.96 TeV. We also compare selected kinematical distributions with the predictions of the Standard Model. In the dilepton mode, we select events with two charged leptons, high missing transverse energy and at least 2 jets. In the lepton+jets mode, we select events with one charged lepton, high missing transverse energy and at least 3 jets. We present several complementary measurements using kinematic discrimination and/or b-tagging. In the all-hadronic channel, we select events 6 jets and 8 jets. We present a measurement using an optimized kinematic selection and events with one or more displaced secondary vertices. We also report on the search for non-standard model resonance states in the invariant mass spectrum of top pairs in lepton+jets events. We present two complementary measurements, one adopts an event reconstruction technique that uses matrix element informations to increase the sensitivity for discovery, the other performs a constrained kinematic fit and requires b-tagging.
NTIS
Elementary Particles; Pair Production; Particle Accelerators; Quarks

20070006762 Lancaster Univ., UK, Fermi National Accelerator Lab., Batavia, IL, USA
New Physics Searches at the Tevatron and the LHC
Sopczak, A.; January 2006; 32 pp.; In English
Report No.(s): DE2006-892325; FERMILAB-CONF-06-134-E-T; No Copyright; Avail.: National Technical Information Service (NTIS)

The Tevatron Run-II started data-taking in spring 2001 and several searches for new particles have been performed. The preliminary 2005 results are concisely reviewed for the experiments CDF and DO. Model-independent and model- dependent limits on Higgs boson and Supersymmetric particle production are set and interpretations are given. Several limits from the LEP era have been extended. The outlook for the Tevatron and the prospects for the ATLAS and CMS experiments at the LHC for selected searches are briefly addressed.
NTIS
Elementary Particles; Particle Accelerators; Particle Production

20070006763 Texas A&M Univ., College Station, TX USA, Fermi National Accelerator Lab., Batavia, IL, USA
Searches for Beyond SM Higgs Boson at the Tevatron
Safonov, A.; January 2006; 4 pp.; In English
Report No.(s): DE2006-892323; FERMILAB-CONF-06-142; No Copyright; Avail.: National Technical Information Service (NTIS)

In the following, we describe preliminary results of searches for non-SM higgs bosons at the CDF and D0 Experiments. Both experiments use data obtained in pp(bar) collisions at the Tevatron at sqrt(s)=1.96 TeV.
NTIS
Elementary Particles; Higgs Bosons; Particle Accelerators

20070006764 Chicago Univ., Chicago, IL, USA
Top Quark Mass Measurements at CDF
Brubaker, E.; January 2006; 8 pp.; In English
Report No.(s): DE2006-892326; FERMILAB-CONF-06-124-E; No Copyright; Avail.: National Technical Information Service (NTIS)

The mass of the top quarkMtop is interesting both as a fundamental parameter of the standard model and as an important input to precision electroweak tests. The Collider Detector at Fermilab (CDF) has a robust program of top quark mass analyses, including the most precise single measurement, Mtop = 173.4 - 2.8 GeV/c2, using 680 pb-1 of pp collision data. A combination of current results from CDF gives Mtop = 172.0 - 2.7 GeV/c2, surpassing the stated goal of 3 GeV/c2 precision using 2 fb-1 of data. Finally, a combination with current D0 results gives a world average top quark mass of 172.5 - 2.3 GeV/c2.
NTIS
Elementary Particles; Quarks

20070006765 Pennsylvania Univ., Philadelphia, PA, USA
Precision Measurements of the Top QUark Mass at the Tevatron
Whiteson, D.; January 2006; 4 pp.; In English
Report No.(s): DE2006-892324; FERMILAB-CONF-06-179-E; No Copyright; Avail.: National Technical Information Service (NTIS)

We report precision measurements of the top quark mass using events collected by the DO and CDF II detectors from pp collisions at sqrt(s) = 1.96 TeV at the Fermilab Tevatron. Measurements are presented in multiple decay channels.
NTIS
Elementary Particles; Particle Accelerators; Precision; Quarks

20070006766 Brookhaven National Lab., Upton, NY USA
Single Spin Asymmetries in the BRAHMS Experiment
Videbaek, F.; Oct. 2005; 5 pp.; In English
Report No.(s): DE2006-890943; BNL-76958-2006-CP; No Copyright; Avail.: Department of Energy Information Bridge

The BRAHMS experiment at RHIC has measured the transverse single spin asymmetries in polarized pp induced pion production at RHIC. The results from the IZHIC run-5 shows a significant asymmetry for pi(+) and pi(-) at moderate x(sub f). The trend of the data is in agreement with lower energy results while the absolute values are surprisingly large. The pi (sub T) dependence is approximately inversely proportional to pi(sub T) in agreement with the pQCD expectations.
NTIS
Pions; Spin; Research

20070006769 Illinois Univ., Urbana-Champaign, IL, USA, Fermi National Accelerator Lab., Batavia, IL, USA
CDF's Higgs Sensitivity Status
Junk, T.; January 2006; 22 pp.; In English
Report No.(s): DE2006-892317; FERMILAB-CONF-05-615-E; No Copyright; Avail.: National Technical Information Service (NTIS)

The combined sensitivity of CDFs current Standard Model Higgs boson searches is presented. The expected 95% CL limits on the production cross section times the relevant Higgs boson branching ratios are computed for the W-H - bb, ZH bb, gg H W+W- W-H W-W+W- channels as they stand as of the October 2005, using results which were prepared for Summer 2005 conferences and a newer result form the gg H W+W- channel. Correlated and uncorrelated systematic uncertainties are taken into account, and the luminosity requirements for 95% CL exclusion, 3 discovery are computed for median experimental

outcomes. A list of improvements required to achieve the sensitivity to a SM Higgs boson as quantified in the Higgs Sensitivity Working Groups report is provided.
NTIS
Elementary Particles; Higgs Bosons; Sensitivity

20070006771 Rutgers - The State Univ., New Brunswick, NJ, USA
Search for MSSM Higgs Decaying to Tau Pairs in pp(bar) Collision at sqrt(s)=1.96 TeV at CDF
Jang, D.; May 2006; 120 pp.; In English
Report No.(s): DE2006-892378; No Copyright; Avail.: National Technical Information Service (NTIS)
This thesis presents the search for neutral Minimal Supersymmetric extension of Standard Model(MSSM) Higgs bosons decaying to tau pairs where one of the taus decays leptonically, and the other one hadronically. CDF Run II data with Lint = 310 pb-1 are used. There is no evidence of MSSM Higgs existance, which results in the upper limits on s(pp . f) OE BR(f . t t) in mA range between 115 and 250 GeV. These limits exclude some area in tan - vs. mA parameter space.
NTIS
Collisions; Elementary Particles; Supersymmetry; Higgs Bosons

20070006775 Rockefeller Univ., New York, NY, USA, Fermi National Accelerator Lab., Batavia, IL, USA
How to Calibrate the Jet Energy Scale
Hatakeyama, K.; Jan. 2006; 10 pp.; In English
Report No.(s): DE2006-892320; No Copyright; Avail.: National Technical Information Service (NTIS)
Top quarks dominantly decay into b-quark jets and W bosons, and the W bosons often decay into jets, thus the precise determination of the jet energy scale is crucial in measurements of many top quark properties. I present the strategies used by the CDF and DO collaborations to determine the jet energy scale. The various cross checks performed to verify the determined jet energy scale and evaluate its systematic uncertainty are also discussed.
NTIS
Bosons; Calibrating; Elementary Particles

20070006781 Okayama Univ., Japan
Measurement of J/psi meson and b-hadron production cross section at sqrt(s) = 1.96 TeV
Yamashita, T.; Jan. 2006; 142 pp.; In English
Report No.(s): DE2006-892327; No Copyright; Avail.: National Technical Information Service (NTIS)
A new measurement of the inclusive and differential production cross sections of J/psi mesons and b-hadrons in proton-antiproton collisions at sqrt(s)-1960 GeV is presented.
NTIS
Elementary Particles; Hadrons; Mesons

20070006783 Rockefeller Univ., New York, NY, USA
New Diffraction Results from the Tevatron
Terashi, K.; May 17, 2006; 4 pp.; In English
Report No.(s): DE2006-892328; FERMILAB-CONF-06-121-E; No Copyright; Avail.: National Technical Information Service (NTIS)
We present new results from studies on diffractive dijet production and exclusive production of dijet and diphoton obtained by the CDF Collaboration in proton-antiproton collisions at the Fermilab Tevatron.
NTIS
Diffraction; Elementary Particles; Particle Accelerators

20070006806 Florida Univ., Gainesville, FL, USA, Fermi National Accelerator Lab., Batavia, IL, USA
Two-particle Momentum Correlation in Jets at the Tevatron
Jindariani, S.; January 2006; 3 pp.; In English
Report No.(s): DE2006-892308; FERMILAB-CONF-05-612-E; No Copyright; Avail.: National Technical Information Service (NTIS)
Presented are the measurements of two-particle momentum correlations in jets produced in p-pbar collisions at center of mass frame energy 1.96 TeV. Studies were performed for charged particles within a restricted opening angle of 0.5 rad around

the jet axis and for dijet events with various dijet masses. Comparison of the experimental results to the theoretical predictions obtained for partons within the framework of the resummed perturbative QCD (Next-to-Leading Log Approximation) shows that the parton momentum correlations do survive the hadronization stage of jet fragmentation, thus, giving further support to the hypothesis of Local Parton-Hadron Duality.
NTIS
Correlation; Elementary Particles; Momentum; Particle Accelerators; Particle Production

20070006807 Brookhaven National Lab., Upton, NY USA
Optimizing the Dynamic Aperture for Triple Bend Achromatic Lattices
January 2006; 6 pp.; In English
Report No.(s): DE2006-891553; BNL-76924-2006; No Copyright; Avail.: Department of Energy Information Bridge

The Triple Bend Achromatic (TBA) lattice has the potential for lower natural emittance per period than the Double Bend Achromatic (DBA) lattice for high brightness light sources. However, the DBA has been chosen for 3rd generation light sources more often due to the higher number of undulator straight section available for a comparable emittance. The TBA has considerable flexibility in linear optics tuning while maintaining this emittance advantage. We have used the tune and chromaticity flexibility of a TBA lattice to minimize the lowest order nonlinearities to implement a 3rd order achromatic tune, while maintaining a constant emittance. This frees the geometric sextupoles to counter the higher order nonlinearities. This procedure is being used to improve the nonlinear dynamics of the TBA as a proposed lattice for NSLS-II facility. The flexibility of the TBA lattice will also provide for future upgrade capabilities of the beam parameters.
NTIS
Apertures; Lattice Energy

20070006808 Brookhaven National Lab., Upton, NY USA
Comparison of Double Bend and Triple Bend Achromatic Lattice Structures for NSKS-H
Kramer, S. L.; Skrinsky, S.; Bengtsson, J.; January 2006; 6 pp.; In English
Report No.(s): DE2006-891552; BNL-76923-2006; No Copyright; Avail.: National Technical Information Service (NTIS)

The Double Bend Achromatic (DBA) and the Triple Bend Achromatic (TBA) lattice have been studied rather extensively for use for the NSLS-II storage ring. The advantage of the TBA compared to the DBA in terms of emittance per period is well known. However, the DBA has the advantage of greater number of ID straight sections for the users and maybe easier to tune the dispersive section for reduced chromatic sextupole strength. We present a comparison of these lattices based on optimization of the non-linear driving terms using high order achromatic cancellation of driving terms of the nonlinear lattice.
NTIS
Optimization; Storage Rings (Particle Accelerators); Crystal Lattices

20070006810 Arizona Univ., Tucson, AZ, USA, Fermi National Accelerator Lab., Batavia, IL, USA
Measurement of Top Quark Properties at the Tevatron
Leveque, J.; January 2006; 4 pp.; In English
Report No.(s): DE2006-892366; FERMILAB-CONF-06-220-E; No Copyright; Avail.: National Technical Information Service (NTIS)

We highlight the most recent top quark properties measurements performed at the Tevatron collider by the CDF and DO experiments. The data samples used for the analyses discussed correspond to an integrated luminosity varying from 360 pb-1 to 760 pb-1.
NTIS
Elementary Particles; Particle Accelerators; Quarks

20070006811 Sussex Univ., Brighton, UK
Preliminary Measurement of Neutrino Oscillation Parameters by NuMI/MINOS and Calibration Studies for Improving this Measurement
Symes, P. A.; Nov. 2005; 243 pp.; In English
Report No.(s): DE2006-892377; No Copyright; Avail.: National Technical Information Service (NTIS)

This thesis explains the origins of neutrinos and their interactions, and the phenomenon of neutrino oscillations. Experiments for measuring neutrino oscillations are mentioned and the experiment investigated in this thesis, the Main Injector Neutrino Oscillation Search, and its neutrino beam, the Fermi National Accelerator Laboratorys Neutrinos At The

Main Injector, are described. MINOS is a long baseline (735 km) neutrino oscillation experiment with a near and a far detector, intended to make precision measurements of the atmospheric sector neutrino oscillation parameters.
NTIS
Calibrating; Meteorological Parameters; Neutrinos; Oscillations

20070007273 Fermi National Accelerator Lab., Batavia, IL, USA, European Organization for Nuclear Research, Geneva, Switzerland
Extremely High Energy Cosmic Neutrinos and Relic Neutrinos
Quigg, C.; Mar. 14, 2006; 19 pp.; In English
Report No.(s): DE2006-879073; FERMILAB-CONF-06/029-T; No Copyright; Avail.: National Technical Information Service (NTIS)

I review the essentials of ultrahigh-energy neutrino interactions, show how neutral-current detection and flavor tagging can enhance the scientific potential of neutrino telescopes, and sketch new studies on neutrino encounters with dark matter relics and on gravitational lensing of neutrinos.
NTIS
High Energy Interactions; Neutrinos

20070007274 Fermi National Accelerator Lab., Batavia, IL, USA, Pontificia Univ. Catolica, Sao Paulo, Brazil, Sao Paulo Univ., Brazil
Mass EIgenstate Purity of Boron Solar Neutrinos
Parke, S.; Nunokawa, H.; Funchal, R. Z.; Jan. 25, 2006; 3 pp.; In English
Report No.(s): DE2006-879105; No Copyright; Avail.: National Technical Information Service (NTIS)

We give a brief report on our recent paper, in which we calculate the n2 mass eigenstate purity of 8B solar neutrinos as 91-2%.
NTIS
Boron; Eigenvectors; Elementary Particles; Purity; Solar Neutrinos

20070007278 Massachusetts Inst. of Tech., Cambridge, MA, USA, SRI International Corp., Menlo Park, CA, USA
Study of the Electron Beam Dynamics in the FERMI at Elettra Linac
Cornacchia, M.; Craievich, P.; Di Mitri, S.; Pogorelov, I.; Qiang, J.; Jul. 2006; 3 pp.; In English
Report No.(s): DE2006-887067; SLAC-PUB-11963; No Copyright; Avail.: National Technical Information Service (NTIS)

A study of the electron beam dynamics in the linac is conducted for the FERMI free electron laser (FEL) founded for construction at the Sincrotrone Trieste.
NTIS
Electron Beams; Linear Accelerators

20070007410 Naval Postgraduate School, Monterey, CA USA
Evaluation of ADCP Wave Measurements
Boyd, Jeremy D; Dec 2006; 71 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460437; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460437

Nearshore wave information is important to a variety of USA Navy operations in the littorals, including mine warfare, amphibious operations, small boat operations and special forces insertions. The objective of this thesis is to evaluate the accuracy of Teledyne RDI Acoustic Doppler Current Profilers (ADCP), in measuring wave height and direction spectra, so that the military can use these for routine wave measurements nearshore. This study uses ADCP data collected in 25 and 45 m depths during the fall 2003 Nearshore Canyon Experiment (NCEX) off La Jolla, California. Data were first corrected for dropouts. Next the data quality was verified through a consistency check on the redundant velocity measurements of opposing beams, an evaluation of high frequency spectral noise levels, and a comparison of velocity and pressure measurements using linear wave theory. Finally wave height and direction spectra estimated from the ADCP data were compared to data from a directional wave buoy. The analysis revealed that the ADCP data can suffer from low signal to noise ratios in benign conditions

and deeper water. Whereas the wave height estimates are sensitive to these errors, the wave direction estimates are surprisingly robust.
DTIC
Ocean Surface; Regions; Signal to Noise Ratios; Warfare; Water Waves

20070007617 Composite Technology Development, Inc., Lafayette, CO USA
Prediction of Pressure Cycle Induced Microcrack Damage in Linerless Composite Tanks
Ryan, Kevin; Cronin, John; Arzberger, Steven; Mallick, Kaushik; Munshi, Naseem; Yazdani, Frank; Kallmeyer, Alan; Arritt, Brandon; Welsh, Jeffry S; Mar 2006; 13 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F29601-03-M-0302
Report No.(s): AD-A460828; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460828

Linerless composite tanks made from continuous carbon fiber reinforced polymers will enable significant mass and cost savings over lined, composite overwrapped tanks. The key technical challenge in developing these linerless tanks will be to choose and/or design the material to resist microcracks that may lead to leakage. Microcracks are known to form in the matrix of a composite due to mechanical stresses transverse to the reinforcing fiber direction. This paper presents an approach for characterizing the accumulation of microcracks in linerless composite tank materials under cyclic mechanical loading associated with multiple fill-and-drain pressure cycles. The model assumes that the rate of microcrack-damage accumulation is related to the microcracking fracture toughness of the material through a modified Paris-law formulation. A key artifact of this model is that microcrack-damage accumulation under cyclic load can be predicted from only two material constants. This damage accumulation model is validated through a series of coupon tests, and an illustrative example is presented to demonstrate how the model can be used to predict the microcracking performance of a linerless composite tank subjected to fatigue cycles.
DTIC
Composite Structures; Damage; Microcracks

20070007656 Science Applications International Corp., Albuquerque, NM USA
Directed Energy HPM, PP, & PPS Efforts: Magnetized Target Fusion - Field Reversed Configuration
Grabowski, Theodore C; Aug 4, 2006; 124 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F29601-00-D-0055-0036; Proj-D0E4
Report No.(s): AD-A460910; No Copyright; Avail.: CASI: A06, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460910

This effort continued MTF-FRC experimental work at Los Alamos National Laboratory's (LANL's) FRX-L (Field Reversed eXperiment -- Liner) facility and the start-up of a parallel experimental effort for forming and translation Field Reversed Configurations (FRCs) at AFRL's Building 322 on Kirtland Air Force Base. This effort also included developing an improved Crowbar switch to reduce modulation of the main discharge used to form the FRCs, as well as considerable design and construction of other FRC formation hardware. In addition, two liner-on-vacuum implosion experiments were also performed on the Shiva Star High Energy Capacitor Bank to verify the scheme that has been proposed to adiabatically compress and heat the FRCs to fusion-relevant densities and temperatures. This scheme used a deformable liner-electrode contact instead of the standard sliding contact in order to allow the placement of an aperture in the electrode that is sufficiently large (8 cm diameter) to enable FRC injection into the liner interior.
DTIC
Magnetization; Targets; Weapon Systems

20070008172 Defence Science and Technology Organisation, Edinburgh, Australia
Electromagnetic Susceptibility of the Area Denial Weapon System (ADWS)
Kuznetsov, Valerian A; Puri, Vinod P; Aug 2006; 28 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460737; DSTO-TR-1912; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460737

A practical realisation of Electromagnetic Immunity/Compatibility (EMI/EMC) testing of ordnance weapons with electrical initiation according to compliance standards is described. The Area Denial Weapon System (ADWS), which is electrically initiated and electronically controlled, was exposed to electromagnetic interference of a known intensity in an anechioic chamber by injection of induced current, in accordance with the requirements of the USA MIL-STD-461E standard

[1] and of the UK's Ordnance Board Pillar Proceeding P101 (Issue 2) [2]. Compliance of ADWS was confirmed. This report describes the test plan, procedures and results.
DTIC
Weapon Systems; Magnetic Permeability; Ordnance

20070008246 Temple Univ., Philadelphia, PA, USA
Measurement of the 3He Spin Structure Functions in the Resonance Region: A Test of Quark-Hadron Duality on the Neutron
Solvignon, P. H.; Aug. 01, 2006; 214 pp.; In English
Report No.(s): DE2006-892743; No Copyright; Avail.: National Technical Information Service (NTIS)

One of the biggest challenges in the study of the nucleon structure is the understanding of the transition from partonic degrees of freedom to hadronic degrees of freedom. In 1970, Bloom and Gilman noticed that structure function data taken at SLAC in the resonance region average to the scaling curve of deep inelastic scattering (DIS). Early theoretical interpretations suggested that these two very different regimes can be linked under the condition that the quark-gluon and quark-quark interactions are suppressed. Substantial efforts are ongoing to investigate this phenomenon both experimentally and theoretically. Quark-hadron duality has been confirmed for the unpolarized structure function F(sub 2) of the proton and the deuteron using data from the experimental Hall C at Jefferson Lab (JLab). Indications of duality have been seen for the proton polarized structure function g(sub 1) and the virtual photon asymmetry A(sub 1) at JLab Hall B and HERMES. Because of the different resonance behavior, it is expected that the onset of duality for the neutron will happen at lower momentum transfer than for the proton. Now that precise spin structure data in the DIS region are available at large x, data in the resonance region are greatly needed in order to test duality in spin-dependent structure functions. The goal of experiment E01-012 was to provide such data on the neutron ((sup 3)He) in the moderate momentum transfer (Q(sup 2)) region, 1.0 \h Q(sup 2) \h 4.0 (GeV/c(sup 2)), where duality is expected to hold. The experiment ran successfully in early 2003 at Jefferson Lab in Hall B. It was an inclusive measurement of longitudinally polarized electrons scattering from a longitudinally or transversely polarized (sup 3)He target. Asymmetries and cross section differences were measured in order to extract the (sup 3)He spin structure function g(sub 1) and virtual photon asymmetry A(sub 1) in the resonance region. A test of quark-hadron duality has then been performed for the (sup 3)He and neutron structure functions. The study of spin duality for the neutron will provide a better understanding of the mechanism of the strong interaction. Moreover, if duality is well understood, our resonance data will bring information on the high x region where theoretical predictions for A(sub 1) are drastically different.
NTIS
Neutrons; Resonance Testing

20070008248 Wisconsin Univ., Madison, WI, USA, Istituto Nazionale di Fisica Nucleare, Frascati, Italy, Lawrence Livermore National Lab., Livermore, CA USA, Stanford Linear Accelerator Center, CA, USA
Performance and Aging Studies of BaBar Resistive Plate Chambers
Band, H. R.; Anulli, F.; Cheng, C. H.; Messner, R.; Oct. 2006; 4 pp.; In English
Report No.(s): DE2006-893298; SLAC-PUB-12157; No Copyright; Avail.: National Technical Information Service (NTIS)

The BaBar detector is currently operating nearly 200 Resistive Plate Chambers (RPCs), constructed as part of an upgrade of the forward endcap muon detector in 2002. Although the average RPC efficiency remains high, numerous changes in the RPC performance (increased currents and rates) have been observed. A few of the highest rate RPCs have suffered efficiency losses of more than 15%. Several types of efficiency loss have been observed. Tests with humidified gas have shown that some of the lost efficiency is recoverable. However, efficiency losses in the highest rate regions have not yet improved with humid gases.
NTIS
Detectors; Plates (Structural Members)

20070008261 Lawrence Livermore National Lab., Livermore, CA USA
Laser Driven Quasi-Isentropic Compression Experiments (ICE) for Dynamically Loading Materials at High Strain Rates
Smith, R.; Eggert, J.; Celliers, P.; Unites, W.; Jankowski, A.; Apr. 01, 2006; 8 pp.; In English
Report No.(s): DE2006-893571; UCRL-CONF-220335; No Copyright; Avail.: National Technical Information Service (NTIS)

We demonstrate the recently developed technique of laser driven isentropic compression (ICE) for dynamically

compressing Al samples at high loading rates close to the room temperature isentrope and up to peak stresses above 100GPa. Upon analysis of the unloading profiles from a multi-stepped Al/LiF target a continuous path through Stress-Density space may be calculated. For materials with phase transformations ramp compression techniques reveals the location of equilibrium phase boundaries and provide information on the kinetics of the lattice re-ordering.
NTIS
Ice; Lasers; Strain Rate; Dynamic Loads

20070008264 Fermi National Accelerator Lab., Batavia, IL, USA, Massachusetts Inst. of Tech., Cambridge, MA, USA
B Spectroscopy at Tevatron
Kravchenko, I.; May 01, 2006; 8 pp.; In English
Report No.(s): DE2006-892426; FERMILAB-CONF-06-125-E; No Copyright; Avail.: National Technical Information Service (NTIS)

In this paper the authors report the most recent results form the CDF and D0 experiments on heavy flavor spectroscopy. The authors start with the measurements of production fractions of ground state b hadrons in pp(bar) collisions in Sec. 2. Properties of the X(3872) are discussed in Sec. 3. Results on the B(c) mesons are presented in Sec. 4. Finally, in the last two chapters the observation and measurement of masses and the widths of B** mesons is presented.
NTIS
Particle Accelerators; Spectroscopy; Flavor (Particle Physics)

20070008287 Stanford Linear Accelerator Center, CA, USA
X-Ray Pulse Length Characterization Using the Surface Magneto Optic Kerr Effect
Krejcik, P.; Sep. 2006; 3 pp.; In English
Report No.(s): DE2006-892971; SLAC-PUB-11946; No Copyright; Avail.: National Technical Information Service (NTIS)

It will be challenging to measure the temporal profile of the hard X-ray SASE beam independently from the electron beam in the LCLS and other 4th generation light sources. A fast interaction mechanism is needed that can be probed by an ultrafast laser pulse in a pump-probe experiment. It is proposed to exploit the rotation in polarization of light reflected from a thin magnetized film, known as the surface magneto optic Kerr effect (SMOKE), to witness the absorption of the x-ray pulse in the thin film. The change in spin orbit coupling induced by the x-ray pulse occurs on the subfemtosecond time scale and changes the polarization of the probe beam. The limitation to the technique lies with the bandwidth of the probe laser pulse and how short the optical pulse can be made. The SMOKE mechanism will be described and the choices of materials for use with 1.5 (angstrom) x-rays. A schematic description of the pump-probe geometry for x-ray diagnosis is also described.
NTIS
Characterization; Electron Beams; X Rays

20070008288 Lawrence Livermore National Lab., Livermore, CA USA
Two-axis Beam Steering Mirror Control System for Precision Pointing and Tracking Applications
Ulander, K.; Feb. 16, 2006; 59 pp.; In English
Report No.(s): DE2006-893570; UCRL-TH-219069; No Copyright; Avail.: National Technical Information Service (NTIS)

Precision pointing and tracking of laser beams is critical in numerous military and industrial applications. This is particularly true for systems requiring atmospheric beam propagation. Such systems are plagued by environmental influences which cause the optical signal to break up and wander. Example applications include laser communications, precision targeting, active imaging, chemical remote sensing, and laser vibrometry. The goal of this project is to build a beam steering system using a two-axis mirror to maintain precise pointing control. Ultimately, position control to 0.08% accuracy (40 irad) with a bandwidth of 200 Hz is desired. The work described encompasses evaluation of the instrumentation system and the subsequent design and implementation of an analog electronic controller for a two-axis mirror used to steer the beam. The controller operates over a wide temperature range, through multiple mirror resonances, and is independent of specific mirrors. The design was built and successfully fielded in a Lawrence Livermore National Laboratory free-space optics experiment. All measurements and performance parameters are derived from measurements made on actual hardware that was built and field tested. In some cases, specific design details have been omitted that involve proprietary information pertaining to Lawrence Livermore National Laboratory patent positions and claims. These omissions in no way impact the general validity of the work or concepts presented in this thesis.
NTIS
Beam Steering; Mirrors; Pointing Control Systems; Tracking (Position); Remote Sensing

20070008298 Harter, Secrest and Emery, LLP, Rochester, NY, USA
Self-Similar Laser Oscillator
Ilday, F. O.; Wise, F.; Clark, W. G.; 30 Jan 04; 19 pp.; In English
Patent Info.: Filed Filed 30 Jan 04; US-Patent-Appl-SN-10-769 523
Report No.(s): PB2007-102956; No Copyright; Avail.: CASI: A03, Hardcopy

A laser producing high energy ultrashort laser pulses comprises a normal dispersion segment, a gain segment, an anomalous dispersion segment with negligible nonlinearity and an effective saturable absorber arranged to form a laser cavity. Each segment is optically interconnected so that a laser pulse will propagate self-similarly therein. (A pulse that propagates in a self-similar manner is sometimes referred to as a 'similariton.') With this laser the limitations of prior art laser oscillators are avoided. Also provided are means for pumping the gain medium in the laser cavity, and means for extracting laser pulses from the laser cavity. The laser cavity is preferably a ring cavity. Preferably the laser is configured to achieve unidirectional circulation of laser pulses therein. This configuration is scalable to much higher pulse energy than lasers based on soliton-like pulse shaping.
NTIS
Fiber Lasers; Lasers; Oscillators; Patent Applications

20070008314 Lawrence Livermore National Lab., Livermore, CA USA
Combined Measurements with Three-Dimensional Design Information Verification System and Gamma Ray Imaging - A Collaborative Effort Between Oak Ridge National Laboratory, Lawrence Livermore National Laboratory, and the Joint Research Center at ISPRA
Mihailescu, L.; Vetter, K.; Ruhter, W.; Chivers, D.; Dreicer, M.; Jun. 19, 2006; 9 pp.; In English
Report No.(s): DE2006-893171; UCRL-CONF-222217; No Copyright; Avail.: National Technical Information Service (NTIS)

Oak Ridge National Laboratory (ORNL) and Lawrence Livermore National Laboratory (LLNL) have jointly performed tests to demonstrate combined measurements with a three-dimensional (3D) design information verification (DIV) system and a gamma-ray imager for potential safeguard applications. The 3D DIV system was made available by the European Commission's Joint Research Center to ORNL under a collaborative project between the U.S. Department of Energy and the European Atomic Energy Community (EURATOM). The system is able to create 3D maps of rooms and objects and of identifying changes in positions and modifications with a precision on the order of millimeters. The gamma ray imaging system consists of a 4(pi) field-of-view Compton imaging system which has two fully operational DSSD (Double-Sided Segment Detector) High-Purity Germanium (HPGe) detectors developed at LLNL. The Compton imaging instrument not only provides imaging capabilities, but provides excellent energy resolution which enables the identification of radioisotopes and nuclear materials. Joint Research Center was responsible to merge gamma-ray images with the 3D range maps. The results of preliminary first measurements performed at LLNL demonstrate, for the first time, mapping of panoramic gamma-ray images into 3D range data.
NTIS
Gamma Rays; Imaging Techniques; Information Systems; Proving

20070008318 Fermi National Accelerator Lab., Batavia, IL, USA, Tufts Univ., Boston, MA, USA
First MINOS Results from the NuMI Beam
Tagg, N.; May 01, 2006; 5 pp.; In English
Report No.(s): DE2006-892428; FERMILAB-CONF-06-130-E; No Copyright; Avail.: National Technical Information Service (NTIS)

As of December 2005, the MINOS long-baseline neutrino oscillation experiment collected data with an exposure of 0.93 OE 1020 protons on target. Preliminary analysis of these data reveals a result inconsistent with a no-oscillation hypothesis at level of 5.8 sigma. The data are consistent with neutrino oscillations reported by Super-Kamiokande and K2K, with best fit parameters of (Delta)m2/23=3.05+ -0.60/0.55x10(-3) and sin(2)2(Omega) 23=0.88+-0.12/0.15.
NTIS
Elementary Particles; Neutrinos; Oscillations

20070008319 Fermi National Accelerator Lab., Batavia, IL, USA
CDF Hot Topics
Tonelli, D.; May 01, 2006; 9 pp.; In English
Report No.(s): DE2006-892429; FERMILAB-CONF-06-116-E; No Copyright; Avail.: National Technical Information Service (NTIS)

After an introduction on the peculiarities of flavor-physics measurements at a hadron collider, and on the upgraded Collider Detector at Fermilab (CDF II), I show recent results on two-body B0 and B0 s decays into charged, pseudo-scalar, charmless mesons or into muons, to illustrate how the flavor physics program at CDF is competitive with (in B0 decays) and complementary (in B0 s decays) to B-factories. Results shown include the new measurement of the CP-violating asymmetry in B(0) -\g K+pi- decays, the first measurement of the time-evolution of B(0)(s) -\g K+K- decays, and the world best limits on the decay rates of rare B(0)(s)-\gmu+mu- modes.
NTIS
Hadrons; Detectors; Decay Rates

20070008320 Fermi National Accelerator Lab., Batavia, IL, USA
Systematic Errors in Long Baseline Oscillation Experiments
Harris, D. A.; January 2006; 6 pp.; In English
Report No.(s): DE2006-892430; FERMILAB-CONF-06-025-E; No Copyright; Avail.: Department of Energy Information Bridge

This article gives a brief overview of long baseline neutrino experiments and their goals, and then describes the different kinds of systematic errors that are encountered in these experiments. Particular attention is paid to the uncertainties that come about because of imperfect knowledge of neutrino cross sections and more generally how neutrinos interact in nuclei. Near detectors are planned for most of these experiments, and the extent to which certain uncertainties can be reduced by the presence of near detectors is also discussed.
NTIS
Neutrinos; Oscillations; Systematic Errors

20070008321 Fermi National Accelerator Lab., Batavia, IL, USA
New Measurements of Sextupole Field Decay and Snapback Effect on Tevatron Dipole Magnets
Velev, G. V.; Bauer, P.; Carcagno, R.; DiMarco, J.; Lamm, M.; January 2006; 3 pp.; In English
Report No.(s): DE2006-892481; FERMILAB-CONF-06-236-TD; No Copyright; Avail.: National Technical Information Service (NTIS)

To perform detailed studies of the dynamic effects in superconducting accelerator magnets, a fast continuous harmonics measurement system based on the application of a digital signal processor (DSP) has been built at Fermilab. Using this new system, the dynamic effects in the sextupole field, such as the field decay during the dwell at injection and the rapid subsequent 'snapback' during the first few seconds of the energy ramp, are evaluated for more than ten Tevatron dipoles from the spare pool. The results confirm the previously observed fast drift in the first several seconds of the sextupole decay and provide additional information on a scaling law for predicting snapback duration. The information presented here can be used for an optimization of the Tevatron and for future LHC operations.
NTIS
Magnetic Dipoles; Magnets; Particle Accelerators; Superconducting Magnets

20070008322 Fermi National Accelerator Lab., Batavia, IL, USA
Optics of a 1.5 TeV Injector for the LHC
Johnstone, J. A.; January 2006; 3 pp.; In English
Report No.(s): DE2006-892494; FERMILAB-CONF-06-223-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

A concept is being developed to install a second, low energy ring (LER) above the LHC to accelerate protons from 450 GeV to 1.5 TeV prior to injection into the LHC. The arc and dispersion suppresser optics of the LHC would be replicated in the LER using combined function 'transmission line' magnets originally proposed for the VLHC. To avoid costly civil construction, in the straight sections housing detectors at least, the LER and LHC must share beampipes and some magnets through the detector portion of the straights.
NTIS
Injectors; Optics

20070008323 Fermi National Accelerator Lab., Batavia, IL, USA
Determining the Neutrino Mass Hierarchy
Parke, S.; Jul. 01, 2006; 11 pp.; In English
Report No.(s): DE2006-892499; FERMILAB-CONF-06-248-T; No Copyright; Avail.: National Technical Information Service (NTIS)

In this proceedings the author reviews the physics that future experiments will use to determine the neutrino mass hierarchy.
NTIS
Hierarchies; Neutrinos

20070008324 Fermi National Accelerator Lab., Batavia, IL, USA
Status of Minos After One Year of Running
Plunkett, R.; January 2006; 9 pp.; In English
Report No.(s): DE2006-892500; FERMILAB-CONF-06-062-E; No Copyright; Avail.: National Technical Information Service (NTIS)

The MINOS experiment has recorded data from approximately 1 x 1020 protons in the NuMI beam. This experiment has a baseline of 735 km, the longest yet constructed. We report here on the status of the experimental program at MINOS.
NTIS
Injectors; Neutrinos; Oscillations

20070008325 Fermi National Accelerator Lab., Batavia, IL, USA
Searches for Squarks and Gluinos at CDF and D0 Detectors
May 01, 2006; 3 pp.; In English
Report No.(s): DE2006-892502; FERMILAB-CONF-05-610-E; No Copyright; Avail.: National Technical Information Service (NTIS)

The contribution reports on preliminary measurements on searches for squarks and gluinos at CDF and D0 detectors in pp(bar) collisions at (sq rt)s-1.96 TeV. The analyses are performed using event topoliges with multiple jets and large missing energy in the final state. The mSUGRA scenario and R-parity conservation is assumed. No excess with respect to the Standard Model predictions is observed and new limits on the gluino and squark masses are extracted.
NTIS
Elementary Particles; Parity; Standard Model (Particle Physics)

20070008326 Fermi National Accelerator Lab., Batavia, IL, USA
Physics at a New Fermilab Proton Driver
Geer, S.; Apr. 01, 2006; 12 pp.; In English
Report No.(s): DE2006-892512; FERMILAB-CONF-06-072-E; No Copyright; Avail.: National Technical Information Service (NTIS)

In 2004, motivated by the recent exciting developments in neutrino physics, the Fermilab Long Range Planning Committee identified a new high intensity Proton Driver as an attractive option for the future. At the end of 2004 the APS 'Study on the Physics of Newtrinos' concluded that the future U.S. neutrino program should have, as one of its components, 'A proton driver in the megawatt class of aboce and neutrino superbeam with an appropriate very large detector capable of observing CP violation and measuring the neutrino mass-squared differences and mixing parameters with high precision'. The presently proposed Fermilab Proton Driver is designed to accomplish these goals, and is based on, and would help develop, Linear Collider technology. In this paper the Proton Driver parameters are summarized, and the potential physics program is described.
NTIS
Proton Beams; Protons

20070008327 Stanford Linear Accelerator Center, Stanford, CA, USA
RF Distribution System for a Set of Standing-Wave Accelerator Structures
Tantawi, S. G.; Sep. 13, 2006; 12 pp.; In English
Report No.(s): DE2006-892596; SLAC-PUB-12104; No Copyright; Avail.: National Technical Information Service (NTIS)

In this paper, we study the RF feeding system for a set of standing-wave accelerator structures. To avoid the initial reflections produced by the structures, sometimes these structures are fed in pairs through a four-port 3-dB Hybrid. We present an extension to this system for an arbitrary number of accelerator structures and show it is always possible to cancel the reflection back to the source. The necessary and sufficient condition for this to happen depends only on the spacing between accelerator structures. In this system, the structures are not fed in a binary hierarchal system, rather in series with a set of directional couplers designed to bleed off an equal amount of power to each accelerator structure in the set. We study the

sensitivity of such a system to errors resulting from the differences in accelerator structures spacing. We also study the sensitivity of the system to component imperfections, such as the finite directivity of the directional couplers, and the residual reflections from the loads that are attached to these couplers. We also study the system under fault conditions, such as a breakdown in an accelerator structure or a feed waveguide.
NTIS
Radio Frequencies; Standing Waves

20070008328 Stanford Linear Accelerator Center, CA, USA
Vibration Stabilization of a Mechanical Model of a X-Band Linear Collider Final Focus Magnet
Frisch, J.; Chang, A.; Decker, V.; Doyle, E.; Eriksson, L.; Aug. 2006; 3 pp.; In English
Report No.(s): DE2006-892598; SLAC-PUB-12091; No Copyright; Avail.: National Technical Information Service (NTIS)
The small beam sizes at the interaction point of a X-band linear collider require mechanical stabilization of the final focus magnets at the nanometer level. While passive systems provide adequate performance at many potential sites, active mechanical stabilization is useful if the natural or cultural ground vibration is higher than expected. A mechanical model of a room temperature linear collider final focus magnet has been constructed and actively stabilized with an accelerometer based system.
NTIS
Accelerometers; Magnets; Superhigh Frequencies; Vibration; Models

20070008329 Stanford Linear Accelerator Center, CA, USA
Coherent Instabilities of ILC Damping Rings
Heifets, S.; Stupakov, G.; Bane, K.; Sep. 2006; 12 pp.; In English
Report No.(s): DE2006-892601; SLAC-PUB-12128; No Copyright; Avail.: Department of Energy Information Bridge
The paper presents the first attempt to estimates the ILC damping ring impedance and compare thresholds of the classical instabilities for several designs initially proposed for the DR. The work was carried out in the spring of 2006. Since then the choice of the DR is narrowed. Nevertheless, the analysis described may be useful for the next iterations of the beam stability. Overall, the conventional instabilities will have little impact on the ring performance provided the careful design of the ring minimizes the impedance below acceptable level indicated above. The only exception is the transverse CB instability. The longitudinal CB is less demanding. However, even the transverse CB instability would have threshold current above nominal provided the aperture in the wigglers is increased from 8 mm to 16 mm. The microwave instability needs more studies. Nevertheless, we should remember that the ILC DR is different from existing high-current machines at least in two respects: absence of the beam-beam tune spread stabilizing beams in colliders, and unusual strict requirements for low emittance. That may cause new problems such as bunch emittance dilution due to high-frequency wakes (BPMs, grooves), etc. Even if such a possibility exists, it probably universal for all machines and ought be addressed in the design of vacuum components rather than have effect on the choice of the machine design.
NTIS
Damping; Stability

20070008347 Brookhaven National Lab., Upton, NY USA, Fisk Univ., Nashville, TN, USA, Kansas State Univ., Manhattan, KS, USA, Yinnel Tech, Inc., South Bend, IN, USA
Te Inclusions and their Relationship to the Performance fo CdZnTe Detectors
Carini, G. A.; Bolotnikov, A. E.; Camarda, G. S.; Cui, Y.; Jackson, H.; Aug. 14, 2006; 12 pp.; In English
Report No.(s): DE2006-893015; BNL-77034-2006-CP; No Copyright; Avail.: Department of Energy Information Bridge
Te-rich secondary phases existing in CdZnTe (CZT) single crystals degrade the spectroscopic performance of these detectors. An unpredictable number of charges are trapped, corresponding to the abundance of these microscopic defects, thereby leading to fluctuations in the total collected charge and strongly affecting the uniformity of charge-collection efficiency. These effects, observed in thin planar detectors, also were found to be the dominant cause of the low performance of thick detectors, wherein the fluctuations accumulate along the charge's drift path. Reducing the size of Te inclusions from a virtual diameter of 10-20 (micro)m down to less than 5 (micro)m already allowed us to produce Frisch-ring detectors with a resolution as good as (approx)0.8% FWHM at 662 keV: Understanding and modeling the mechanisms involving Te-rich secondary phases and charge loss requires systematic studies on a spatial scale never before realized. Here, we describe a dedicated beam-line recently established at BNL's National Synchrotron Light Source for characterizing semiconductor

detectors along with a IR system with counting capability that permits us to correlate the concentration of defects with the devices' performances.
NTIS
Cadmium Tellurides; Inclusions; Semiconductors (Materials)

20070008351 Iowa State Univ. of Science and Technology, Ames, IA USA
Quantum Monte Carlo Calculations Applied to Magnetic Molecules
Engelhardt, L. P.; January 2006; 204 pp.; In English
Report No.(s): DE2006-892729; No Copyright; Avail.: Department of Energy Information Bridge

We have calculated the equilibrium thermodynamic properties of Heisenberg spin systems using a quantum Monte Carlo (QMC) method. We have used some of these systems as models to describe recently synthesized magnetic molecules, and-upon comparing the results of these calculations with experimental data-have obtained accurate estimates for the basic parameters of these models. We have also performed calculations for other systems that are of more general interest, being relevant both for existing experimental data and for future experiments. Utilizing the concept of importance sampling, these calculations can be carried out in an arbitrarily large quantum Hilbert space, while still avoiding any approximations that would introduce systematic errors. The only errors are statistical in nature, and as such, their magnitudes are accurately estimated during the course of a simulation. Frustrated spin systems present a major challenge to the QMC method, nevertheless, in many instances progress can be made. In this chapter, the field of magnetic molecules is introduced, paying particular attention to the characteristics that distinguish magnetic molecules from other systems that are studied in condensed matter physics. We briefly outline the typical path by which we learn about magnetic molecules, which requires a close relationship between experiments and theoretical calculations. The typical experiments are introduced here, while the theoretical methods are discussed in the next chapter. Each of these theoretical methods has a considerable limitation, also described in Chapter 2, which together serve to motivate the present work. As is shown throughout the later chapters, the present QMC method is often able to provide useful information where other methods fail. In Chapter 3, the use of Monte Carlo methods in statistical physics is reviewed, building up the fundamental ideas that are necessary in order to understand the method that has been used in this work. With these ideas in hand, we then provide a detailed explanation of the current QMC method in Chapter 4. The remainder of the thesis is devoted to presenting specific results: Chapters 5 and 6 contain articles in which this method has been used to answer general questions that are relevant to broad classes of systems. Then, in Chapter 7, we provide an analysis of four different species of magnetic molecules that have recently been synthesized and studied. In all cases, comparisons between QMC calculations and experimental data allow us to distinguish a viable microscopic model and make predictions for future experiments. In Chapter 8, the infamous 'negative sign problem' is described in detail, and we clearly indicate the limitations on QMC that are imposed by this obstacle. Finally, Chapter 9 contains a summary of the present work and the expected directions for future research.
NTIS
Molecules; Monte Carlo Method; Thermodynamic Properties; Magnetic Properties; Quantum Mechanics

20070008352 Fermi National Accelerator Lab., Batavia, IL, USA
Performance of the Fermilab's 4.3 MeV Electron Cooler
Shemyakin, A.; Burov, A.; Carlson, K.; Hu, M.; Kroc, T.; January 2006; 3 pp.; In English
Report No.(s): DE2006-892376; FERMILAB-CONF-06-194-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

A 4.3 MeV DC electron beam is used to cool longitudinally an antiproton beam in the Fermilabs Recycler ring. Cooling capabilities of the electron beam are characterized by the drag rate that was measured at various conditions. Fitting the results with a formula for non-magnetized cooling gives electron parameters that agree within a factor of 2 with independently measured electron beam properties.
NTIS
Antiprotons; Coolers; Cooling

20070008353 Fermi National Accelerator Lab., Batavia, IL, USA
Radiation Shielding Study for Superconducting RF Cavity Test Facility at Fermilab
Rakhno, I.; Apr. 10, 2006; 8 pp.; In English
Report No.(s): DE2006-892380; FERMILAB-TM-2350-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

The results of Monte Carlo radiation shielding study performed with the MARS15 code for the vertical test cryostat facility to be installed in the Industrial Building 1 at Fermilab are presented and discussed.
NTIS
Cavities; Radiation Shielding; Radio Frequencies; Superconducting Cavity Resonators; Superconductivity; Test Facilities

20070008354 Fermi National Accelerator Lab., Batavia, IL, USA, Swiss Federal Inst. of Technology, Zurich, Switzerland
Measurement of b-quark Jet Shapes as CDF
Lister, A.; Mar. 01, 2006; 168 pp.; In English
Report No.(s): DE2006-892383; No Copyright; Avail.: National Technical Information Service (NTIS)

The main topic of this thesis is the measurement of b-quark jet shapes at CDF. CDF is an experiment located at Fermilab, in the USA, which studies proton-antiproton collisions at a centre of mass energy of 1.96TeV. To reach this energy, the particles are accelerated using the Tevatron accelerator which is currently the highest energy collider in operation. The data used for this analysis were taken between February 2002 and September 2004 and represent an integrated luminosity of about 300 pb-1. This is the first time that b-quark jet shapes have been measured at hadron colliders.
NTIS
Elementary Particles; Quarks; Shapes

20070008356 Fermi National Accelerator Lab., Batavia, IL, USA
Electron Cooling of 8 GeV Antiprotons at Fermilabs Recycler. Results and Operational Implications
Prost, L. R.; Broemmelsiek, D.; Burov, A.; Carlson, K.; Gattuso, C.; May 01, 2006; 5 pp.; In English
Report No.(s): DE2006-892385; FERMILAB-CONF-06-098-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

Electron cooling of 8 GeV antiprotons at Fermilabs Recycler storage ring is now routinely used in the collider operation. It requires a 0.1-0.5 A, 4.3 MeV dc electron beam and is designed to increase the longitudinal phase-space density of the circulating antiproton beam. This paper briefly describes the characteristics of the electron beam that were achieved to successfully cool antiprotons. Then, results from various cooling force measurements along with comparison to a non-magnetized model are presented. Finally, operational aspects of the implementation of electron cooling at the Recycler are discussed, such as adjustments to the cooling rate and the influence of the electron beam on the antiproton beam lifetime.
NTIS
Antiprotons; Circulation; Cooling; Cooling Systems; Storage Rings (Particle Accelerators)

20070008357 Fermi National Accelerator Lab., Batavia, IL, USA
Search for Single Top Production at the Tevatron
Gresele, A.; May 01, 2006; 4 pp.; In English
Report No.(s): DE2006-892386; FERMILAB-CONF-006-229-E; No Copyright; Avail.: National Technical Information Service (NTIS)

The authors report on a search for Standard Model t-channel and s-channel single top quark production in pp(bar) collisions at a center of mass energy of 1.96 TeV. We use a data sample corresponding to 0.7 fb-1 recorded by the upgraded Collider Detector at Fermilab (CDFII) and a data sample corresponding to 370 pb-1 recorded by D0. Both CDF and D0 find no significant evidence for electroweak top quark production and set upper limits at the 95% confidence level on the production cross section.
NTIS
Elementary Particles; Particle Accelerators; Particle Collisions; Quarks

20070008359 Stanford Linear Accelerator Center, CA, USA
Determination of the Form Factors for the Decay B0 -\g D*-l+nu(underscore)l and of the CKM Matrix Element (bar)Vcb(bar)
Jul. 27, 2006; 27 pp.; In English
Report No.(s): DE2006-892621; SLAC-PUB-12014; No Copyright; Avail.: National Technical Information Service (NTIS)

The authors present a combined measurement of the Cabibbo-Kobayashi-Maskawa matrix element (V(sub cb)) and of the parameters (rho)(sup 2), R(sub 1), and R(sub 2), which fully characterize the form factors of the B(sup 0) (yields) D*(sup -)(ell)(sup +)(nu)(sub (ell)) decay in the framework of HQET, based on a sample of about 52,800 B(sup 0) (yields) D*(sup -)(ell)(sup +)(nu)(sub (ell)) decays recorded by the BABAR detector. The kinematical information of the fully reconstructed

decay is used to extract the following values for the parameters (where the first errors are statistical and the second systematic): (rho)(sup 2) = 1.156 (+-) 0.094 (+-) 0.028, R(sub 1) = 1.329 (+-) 0.131 (+-) 0.044, R(sub 2) = 0.859 (+-) 0.077 (+-) 0.022, F(1)(V(sub cb)) = (35.03 (+-) 0.39 (+-) 1.15) x 10(sup -3). By combining these measurements with the previous BABAR measurements of the form factors which employs a different technique on a partial sample of the data, they improve the statistical accuracy of the measurement, obtaining: (rho)(sup 2) = 1.179 (+-) 0.048 (+-) 0.028, R(sub 1) = 1.417 (+-) 0.061 (+-) 0.044, R(sub 2), = 0.836 (+-) 0.037 (+-) 0.022, and F(1)(V(sub cb)) = (34.68 (+-) 0.32 (+-) 1.15) x 10(sup -3). Using the lattice calculations for the axial form factor F(1), they extract (V(sub cb)) = (37.74 (+-) 0.35 (+-) 1.25 (+-) (sub 1.44)(sup 1.23)) x 10(sup -3), where the third error is due to the uncertainty in F(1).
NTIS
Form Factors; Accuracy; Errors

20070008360 Carnegie-Mellon Univ., Pittsburgh, PA, USA
Measurement of the Relative Fragmentation Fractions of B-bar Hadrons
Gibson, K. R.; Jun. 09, 2006; 169 pp.; In English
Report No.(s): DE2006-892422; No Copyright; Avail.: National Technical Information Service (NTIS)
No abstract available
Elementary Particles; Fragmentation; Hadrons

20070008361 Fermi National Accelerator Lab., Batavia, IL, USA
Photon Cross Sections at ECM = 2 TeV
Wobisch, M.; Jun. 01, 2006; 4 pp.; In English
Report No.(s): DE2006-892419; FERMILAB-CONF-06-214-E; No Copyright; Avail.: National Technical Information Service (NTIS)
Photon production rates have been studied by the D and CDF experiments in Run II of the Fermilab Tevatron Collider. Measurements of the inclusive isolated photon cross section and the di-photon cross section are presented, based on integrated luminosities of 0.3 fb..1 and 0.2 fb..1, respectively. The results are compared to perturbative QCD calculations in various approximations.
NTIS
Elementary Particles; Photons; Particle Production; Cross Sections

20070008363 Fermi National Accelerator Lab., Batavia, IL, USA
Predictions with Lattice QCD
Kronfeld, A. S.; Jul. 07, 2006; 5 pp.; In English
Report No.(s): DE2006-892418; FERMILAB-CONF-06-239-T; No Copyright; Avail.: National Technical Information Service (NTIS)
In recent years, we used lattice QCD to calculate some quantities that were unknown or poorly known. They are the q(sup 2) dependence of the form factor in semileptonic D --\g Klv decay, the leptonic decay constants of the D(sup +) and D(sub s) mesons, and the mass of the B(sub c) meson. In this paper, we summarize these calculations, with emphasis on their (subsequent) confirmation by measurements in e+e-, gamma p and pp collisions.
NTIS
Quantum Chromodynamics; Form Factors

20070008365 Fermi National Accelerator Lab., Batavia, IL, USA
Moriond Electroweak 2006. Theory Summary
Lykken, J. D.; Jul. 01, 2006; 12 pp.; In English
Report No.(s): DE2006-892416; FERMILAB-CONF-06-239-T; No Copyright; Avail.: National Technical Information Service (NTIS)
A concise look at the big picture of particle physics, including the status of the Standard Model, neutrinos, supersymmetry, extra dimensions and cosmology. Based upon the theoretical summary presented at the XLIst Rencontres de Moriond on Electroweak Interactions and Unified Theories, La Thuile, 11-18 March 2006.
NTIS
Cosmology; Electroweak Interactions (Field Theory); Elementary Particles; Neutrinos; Supersymmetry

20070008366 Pittsburgh Univ., PA, USA
Search for High-Mass Resonances Decaying to e-mu in ppbar Collisions at s(1/2) = 1.96 TeV**
Hahn, K. A.; Aug. 01, 2006; 126 pp.; In English
Report No.(s): DE2006-892417; No Copyright; Avail.: National Technical Information Service (NTIS)

We describe a general search for resonances decaying to a neutral em final state in pp(bar) collisions at a center-of-mass energy of 1.96 TeV. Using a data sample representing 344 pb-1 of integrated luminosity recorded by the CDF II experiment, we compare Standard Model predictions with the number of observed events for invariant masses between 50 and 800 GeV/c2. Finding no significant excess (5 events observed vs. 7.7 - 0.8 expected for Mem \g 100 GeV/c2), we set limits on sneutrino and Z0 masses as functions of lepton family number violating couplings.
NTIS
Collisions; Elementary Particle Interactions; Elementary Particles; Photons

20070008367 Stanford Linear Accelerator Center, CA, USA
Averages of B-Hadron Properties at the End of 2005
Battaliga, M.; Melbourne, U.; Sep. 27, 2006; 132 pp.; In English
Report No.(s): DE2006-892612; SLAC-R-846; No Copyright; Avail.: National Technical Information Service (NTIS)

This article reports world averages for measurements on b-hadron properties obtained by the Heavy Flavor Averaging Group (HFAG) using the available results as of at the end of 2005. In the averaging, the input parameters used in the various analyses are adjusted (rescaled) to common values, and all known correlations are taken into account. The averages include lifetimes, neutral meson mixing parameters, parameters of semileptonic decays, branching fractions of B decays to final states with open charm, charmonium and no charm, and measurements related to CP asymmetries.
NTIS
Hadrons; Mesons; Particle Decay

20070008369 Fermi National Accelerator Lab., Batavia, IL, USA
Application of the Lie-Transform Perturbation Theory for the Turn-by-Turn Data Analysis
Alexahin, Y.; January 2006; 3 pp.; In English
Report No.(s): DE2006-892409; FERMILAB-CONF-06-201-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

Harmonic analysis of turn-by-turn BPM data is a rich source of information on linear and nonlinear optics in circular machines. In the present report the normal form approach first introduced by R. Bartolini and F. Schmidt is extended on the basis of the Lie-transform perturbation theory to provide direct relation between the sources of perturbation and observable spectra of betatron oscillations. The goal is to localize strong perturbing elements, find the resonance driving terms - both absolute value and phase - that are necessary for calculation of the required adjustments in correction magnet circuits: e.g. skew-quadrupoles for linear coupling correction. The theory is nonlinear and permits to analyze higher order effects, such as coupling contribution to beta-beating and nonlinear sum resonances.
NTIS
Betatrons; Oscillations; Perturbation Theory; Lie Groups; Transformations (Mathematics)

20070008394 Fermi National Accelerator Lab., Batavia, IL, USA, Massachusetts Inst. of Tech., Cambridge, MA, USA
Search for B(sub S) Oscillations at CDF II
Menzemer, S.; Oct. 01, 2005; 3 pp.; In English
Report No.(s): DE2006-892407; FERMILAB-CONF-05-625-E; No Copyright; Avail.: National Technical Information Service (NTIS)

The authors report updated results in the search for B(s) flavor oscillations performed at CDF II. The authors analyze a dataset of approximately 355 pb-1 from proton-antiproton collisions at a center-of-mass energy of 1.96 TeV collected in 2002-2004 with the CDF II detector at the Tevatron Collider. Samples of both fully reconstructed B(s) -\g D(s)(3)pi, and partially reconstructed, B(s)-\gD(s)lX, decays have been studied. A combination of opposite side tagging algorithms has been used to determine the flavor of the B(s) mesons at production time.
NTIS
Elementary Particles; Mesons; Oscillations; Particle Accelerators

20070008395 Fermi National Accelerator Lab., Batavia, IL, USA
B-jets and z + b-jets at CDF
Jeans, D.; Jun. 01, 2006; 4 pp.; In English
Report No.(s): DE2006-892408; FERMILAB-CONF-06-226-E; No Copyright; Avail.: National Technical Information Service (NTIS)

The authors present CDF cross-section measurements for the inclusive production of b jets and the production b jets in association with a Z(0) boson. Both measurements are in reasonable agreement with NLO QCD predictions.
NTIS
Elementary Particles; Proton-Antiproton Interactions

20070008396 Fermi National Accelerator Lab., Batavia, IL, USA, Michigan State Univ., East Lansing, MI, USA, Tomsk State Univ., Tomsk, Russian Federation
Machine Related Backgrounds in the SiD Detector at ILC
Denisov, D. S.; Mokhov, N. V.; Striganov, S. I.; Kostin, M. A.; Tropin, I. S.; Jul. 21, 2006; 29 pp.; In English
Report No.(s): DE2006-892406; FERMILAB-FN-0790-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

With a multi-stage collimation system and magnetic iron spoilers in the tunnel, the background particle fluxes on the ILC detector can be substantially reduced. At the same time, beam-halo interactions with collimators and protective masks in the beam delivery system create fluxes of muons and other secondary particles which can still exceed the tolerable levels for some of the ILC sub-detectors. Results of modeling of such backgrounds in comparison to those from the e(sup +)e(sup -) interactions are presented in this paper for the SiD detector.
NTIS
Detectors; Collimation; Elementary Particles; Models

20070008398 State Univ. of New York, Stony Brook, NY, USA
Search for the Production of Technicolor Particles at the D-Zero Detector
Desai, S. V.; Aug. 01, 2006; 227 pp.; In English
Report No.(s): DE2006-892405; No Copyright; Avail.: National Technical Information Service (NTIS)

No abstract available
Elementary Particles; Detectors; Particle Production

20070008399 Georgia School of Technology, Atlanta, GA, USA
Design of a Boron Neutron Capture Enhanced Fast Neutron Therapy Assembly
Wang, Z.; January 2005; 188 pp.; In English
Report No.(s): DE2006-892403; No Copyright; Avail.: National Technical Information Service (NTIS)

The objective of this work was to design a reflected BNCEFNT assembly around the patients head with the goal of providing a greater than 15% dose enhancement for a 100-ppm 10B concentration. As a constraint on the BNCEFNT assembly, the total dose rate delivered to the patient should not decrease substantially. The design should not require any change in the structure of the standard treatment beam assembly. The absorbed dose to other organs of the patient using the BNCEFNT assembly should be evaluated.
NTIS
Augmentation; Boron; Capture Effect; Dosage; Fast Neutrons; Neutrons; Radiation Therapy; Research and Development; Technologies; Therapy

20070008400 Fermi National Accelerator Lab., Batavia, IL, USA, Rochester Univ., NY USA
D0 Top Physics
Pleier, M. A.; Nov. 01, 2005; 5 pp.; In English
Report No.(s): DE2006-892402; FERMILAB-CONF-05-513-E; No Copyright; Avail.: National Technical Information Service (NTIS)

The Tevatron proton-anitproton collider at Fermilab operates at a centre of mass energy of 1.96 TeV and is currently the only source for the production of top quarks. Recent D0 results on the top quark's production cross section and its properties

such as mass, helicity of the W in its decay and branching fraction B(t-\gWb) are presented, and probe the validity of the Standard Model (SM).
NTIS
Elementary Particles; Quarks; Particle Production

20070008401 Stanford Linear Accelerator Center, CA, USA, Massachusetts Univ., Amherst, MA, USA
Using Boosted Decision Trees to Separate Signal and Background in B to XsGamma Decays
Barber, J.; Sep. 27, 2006; 26 pp.; In English
Report No.(s): DE2006-892609; SLAC-TN-06-015; No Copyright; Avail.: National Technical Information Service (NTIS)

The measurement of the branching fraction of the flavor changing neutral current B (yields) X(sub s)(gamma) transition can be used to expose physics outside the Standard Model. In order to make a precise measurement of this inclusive branching fraction, it is necessary to be able to effectively separate signal and background in the data. In order to achieve better separation, an algorithm based on Boosted Decision Trees (BDTs) is implemented. Using Monte Carlo simulated events, 'forests' of trees were trained and tested with different sets of parameters. This parameter space was studied with the goal of maximizing the figure of merit, Q, the measure of separation quality used in this analysis. It is found that the use of 1000 trees, with 100 values tested for each variable at each node, and 50 events required for a node to continue separating give the highest figure of merit, Q = 18.37.
NTIS
Algorithms; Decision Theory; Neutral Currents

20070008402 Universidad Autonoma de Barcelona, Bellaterra, Spain, Fermi National Accelerator Lab., Batavia, IL, USA
Jet Properties at the Tevatron
Onofrio, M. D.; Jul. 01, 2006; 12 pp.; In English
Report No.(s): DE2006-892358; No Copyright; Avail.: National Technical Information Service (NTIS)

The RunII physics program at the Tevatron started in spring 2001 with protons and antiprotons colliding at an energy of (sq rt)s=1.96 TeV. More than 1 fb-1 of data have been collected by both the CDF and D0 experiments. In this contribution, some of the new QCD results are presented.
NTIS
Elementary Particles; Particle Accelerators; Quantum Chromodynamics

20070008407 Stanford Linear Accelerator Center, CA, USA, Wisconsin Univ., Eau Claire, WI, USA
Simulation of the BaBar Drift Chamber
Anderson, R.; Aug. 24, 2006; 17 pp.; In English
Report No.(s): DE2006-892608; SLAC-TN-06-017; No Copyright; Avail.: National Technical Information Service (NTIS)

The BaBar drift chamber (DCH) is used to measure the properties of charged particles created from e(sup +)e(sup -) collisions in the PEP-II asymmetric-energy storage rings by making precise measurements of position, momentum and ionization energy loss (dE/dx). In October of 2005, the PEP-II storage rings operated with a luminosity of 10 x 10(sup 33) cm(sup -2)s(sup -1); the goal for 2007 is a luminosity of 20 x 10(sup 33) cm(sup -2)s(sup -1), which will increase the readout dead time, causing uncertainty in drift chamber measurements to become more significant in physics results. The research described in this paper aims to reduce position and dE/dx uncertainties by improving our understanding of the BaBar drift chamber performance. A simulation program--called GARFIELD--is used to model the behavior of the drift chamber with adjustable parameters such as gas mixture, wire diameter, voltage, and magnetic field. By exploring the simulation options offered in GARFIELD, we successfully produced a simulation model of the BaBar drift chamber. We compared the time-to-distance calibration from BaBar to that calculated by GARFIELD to validate our model as well as check for discrepancies between the simulated and calibrated time-to-distance functions, and found that for a 0(sup o) entrance angle there is a very good match between calibrations, but at an entrance angle of 90(sup o) the calibration breaks down. Using this model, we also systematically varied the gas mixture to find one that would optimize chamber operation, which showed that the gas mixture of 80:20 Helium:isobutane is a good operating point, though more calculations need to be done to confirm that it is the optimal mixture.
NTIS
Charged Particles; Particle Accelerators; Simulation

20070008408 Fermi National Accelerator Lab., Batavia, IL, USA
Search for Higgs and New Phenomena at Colliders
Lammel, S.; January 2006; 11 pp.; In English
Report No.(s): DE2006-879026; No Copyright; Avail.: National Technical Information Service (NTIS)

The present status of searches fo the Higgs boson(s) and new phenomena is reviewed. The focus is on the analysis and results from the current runs of the HERA and Tevatron experiments. The LEP experiments have released their final combined MSSM Higgs results for this conference. Also included are results from sensitivty studies of the LHC experiments and lepton flavour violating searches from the B factories, KEKB and PEP-II.
NTIS
Higgs Bosons; Flavor (Particle Physics)

20070008412 Fermi National Accelerator Lab., Batavia, IL, USA
Summary of MC4BSM Discussions
Hubisz, J.; Skands, P.; January 2006; 4 pp.; In English
Report No.(s): DE2006-892264; FERMILAB-CONF-05-082-T; No Copyright; Avail.: Department of Energy Information Bridge

The general problem of obtaining fully exclusive descriptions of collider final states for an arbitrary Beyond-the-Standard-Model (BSM) physics scenario can in principle be addressed using presently existing tools. However, the necessary steps are not always transparent to non-experts, and similar physics implementations often involve duplication of effort. The workshop on Monte Carlo Tools for Beyond-the-Standard-Model Physics (MC4BSM, Fermilab, March 20-21, 2006) featured two sessions devoted to discussion of these issues; one centered on fixed-order Matrix Element Generators (MEGs) and the other on Parton Shower and Hadronisation Monte Carlos (PSMCs). We here summarize those two discussions.
NTIS
Standard Model (Particle Physics); Monte Carlo Method

20070008413 Stanford Linear Accelerator Center, CA, USA
Tracking Code for Microwave Instability
Heifets, S.; Sep. 2006; 9 pp.; In English
Report No.(s): DE2006-891832; SLAC-PUB-12122; No Copyright; Avail.: National Technical Information Service (NTIS)

To study microwave instability the tracking code is developed. For bench marking, results are compared with Oide-Yokoya results (1) for broad-band Q = 1 impedance. Results hint to two possible mechanisms determining the threshold of instability.
NTIS
Microwaves; Stability; Computer Programs

20070008414 Fermi National Accelerator Lab., Batavia, IL, USA
Applications of Barrier Bucket RF Systems at Fermilab
Bhat, C. M.; January 2006; 15 pp.; In English
Report No.(s): DE2006-892265; FERMILAB-CONF-06-102-AD; No Copyright; Avail.: Department of Energy Information Bridge

In recent years, the barrier rf systems have become important tools in a variety of beam manipulation applications at synchrotrons. Four out of six proton synchrotrons at Fermilab are equipped with broad-band barrier rf systems. All of the beam manipulations pertaining to the longitudinal phase space in the Fermilab Recycler (synchrotron used for antiproton storage) are carried out using a barrier system. Recently, a number of new applications of barrier rf systems have been developed- the longitudinal momentum mining, longitudinal phase-space coating, antiproton stacking, fast bunch compression and more. Some of these techniques have been critical for the recent spectacular success of the collider performance at the Fermilab Tevatron. Barrier bunch coalescing to produce bright proton bunches has a high potential to increase proton antiproton luminosity significantly. In this paper, I will describe some of these techniques in detail. Finally, I make a few general remarks on issues related to barrier systems.
NTIS
Radio Frequencies; Synchrotrons

20070008417 Fermi National Accelerator Lab., Batavia, IL, USA
Correction of Unevenness in Recycler Beam Profile
Crisp, J.; Hu, M.; Ng, K. Y.; January 2006; 4 pp.; In English
Report No.(s): DE2006-892298; No Copyright; Avail.: National Technical Information Service (NTIS)

A beam confined between two rf barriers in the Fermilab Recycler Ring exhibits very uneven longitudinal profile. This leads to the consequence that the momentummined antiproton bunches will have an intolerable variation in bunch intensity. The observed profile unevenness is the result of a tiny amount of rf imperfection and rf beamloading. The profile unevenness can be flattened by feeding back the uneven rf fan-back gap voltage to the low-level rf.
NTIS
Radio Frequencies; Storage Rings (Particle Accelerators); Particle Beams

20070008418 Fermi National Accelerator Lab., Batavia, IL, USA
Transverse Instability of a Rectangular Bunch
Balbekov, V.; January 2006; 3 pp.; In English
Report No.(s): DE2006-892295; No Copyright; Avail.: Department of Energy Information Bridge

Transverse instability of a rectangular bunch is investigated. Known theory of bunched beam instability is modified to take into account 100% spread of synchrotron frequency. Series of equations adequately describing the instability is derived and solved analytically and numerically. The theory is applied to the Fermilab Recycler Ring.
NTIS
Bunching; Stability; Numerical Analysis

20070008419 Fermi National Accelerator Lab., Batavia, IL, USA
Main Injector Beam Position Monitor Front-End Software
Piccoli, L.; Foulkes, S.; Votava, M.; Briegel, C.; January 2006; 9 pp.; In English
Report No.(s): DE2006-892278; FERMILAB-CONF-06-088-AD-CD; No Copyright; Avail.: National Technical Information Service (NTIS)

The front-end software developed for the Main Injector (MI) BPM upgrade is described. The software is responsible for controlling a VME crate, equipped with a Motorola PowerPC board running the VxWorks operating system, a custom made timing board and up to 10 commercial digitizer boards. The complete MI BPM system is composed of 7 independent units, each collecting data from 19 to 38 BPM pickups. The MI BPM system uses several components already employed on the successful upgrade of another Fermilab machine, the Tevatron. The front-end software framework developed for the Tevatron BPM upgrade is the base for building the MI front-end software. The framework is implemented in C++ as a generic component library (GBPM) that provides an event-driven data acquisition environment. Functionality of GBPM is extended to meet MI BPM requirements, such as the ability to handle and manage data from multiple cycles; perform readout of the digitizer boards without disrupting or missing subsequent cycles; transition between closed orbit and turn-by-turn modes within a cycle, using different filter and timing configurations; and allow the definition of new cycles during normal operation.
NTIS
Beam Injection; Beams (Radiation); Injectors; Monitors

20070008420 Fermi National Accelerator Lab., Batavia, IL, USA
Fermilab Main Injector Beam Position Monitor Upgrade
Banerjee, B.; Barker, W.; Bledsoe, S.; Boes, T.; Briegel, C.; January 2006; 9 pp.; In English
Report No.(s): DE2006-892277; FERMILAB-CONF-06-086-AD-CD; No Copyright; Avail.: Department of Energy Information Bridge

An upgrade of the Beam Position Monitor (BPM) signal processing and data acquisition system for the Fermilab Main Injector is described. The Main Injector is a fast cycling synchrotron that accelerates protons or antiprotons from 8 to 150 GeV. Each Main Injector cycle can have a totally different magnet ramp, RF frequency configuration, beam bunch structure, and injection/extraction pattern from the previous cycle. The new BPM system provides the capabilities and flexibility required by the dynamic and complex machine operations. The system offers measurement capability in the 2.5 MHz and 53 MHz channels to detect the range of bunch structures for protons and antiprotons in both wideband (turn-by-turn) and narrowband (closed-orbit) modes. The new BPM read-out system is based on the digital receiver concept and is highly configurable, allowing the signal processing of nearly all Main Injector beam conditions, including the detection of individual batches. An

overview of the BPM system in the Main Injector operating environment, some technology details and first beam measurements are presented.
NTIS
Beam Injection; Beams (Radiation); Injectors; Monitors

20070008421 Fermi National Accelerator Lab., Batavia, IL, USA
Tevatron Ionization Profile Monitors
Jansson, A.; Fitzpatrick, T.; Bowie, K.; Kwarciany, R.; Lundberg, C.; January 2006; 9 pp.; In English
Report No.(s): DE2006-892272; FERMILAB-CONF-06-105-AD-CD-E; No Copyright; Avail.: National Technical Information Service (NTIS)

In designing an ionization profile monitor system for the Tevatron some novel approaches were taken, in particular for the readout electronics. This was motivated by the desire to resolve the individual bunches in both beams simultaneously. For this purpose, custom made electronics originally developed for Particle Physics experiments was used to provide a fast charge integration with very low noise. The various parts of the read-out electronics have been borrowed or adapted from the KTev, CMS, MINOS and BTev experiments. The detector itself also had to be modified to provide clean signals with sufficient bandwidth. The system design will be described along with the initial results.
NTIS
Ionization; Monitors; Particle Accelerators

20070008422 Fermi National Accelerator Lab., Batavia, IL, USA, Stockholm Univ., Sweden
Measurement of the t anti-t Production Cross-Cection at s(1/2) = 1.96-TeV in the Combined Lepton+track and e mu Channel using 370 pb**-1 of D0 Data**
Lager, S.; May 01, 2006; 4 pp.; In English
Report No.(s): DE2006-892337; FERMILAB-CONF-06-117-E; No Copyright; Avail.: National Technical Information Service (NTIS)

A measurement of the tt(bar) production cross section at (sq rt)s = 1.96 TeV in the dilepton final states using a lepton+track selection and secondary vertex b-tagging is presented. One of the two leptons from the decay of the tt(bar) pair is allowed to be identified only as an isolated track to improve the selection efficiency. The result is combined with a measurement in the tt(bar) -\ge(mu) final state. The measurements are based on 370 pb-1 of data collected with the D0 experiment at the Tevatron collider.
NTIS
Antiprotons; Elementary Particles; Cross Sections; Particle Production

20070008423 Fermi National Accelerator Lab., Batavia, IL, USA
Latest Jet Results from Tevatron
Messina, A.; May 01, 2006; 4 pp.; In English
Report No.(s): DE2006-892336; FERMILAB-CONF-06-177-E; No Copyright; Avail.: National Technical Information Service (NTIS)

This contribution reports preliminary jet results in pp collisions at (sq rt) s = 1.96 TeV from the CDF and DO experiments. The jet inclusive cross section, measured using both the Midpoint and the KT jet clustering algorithm, is compared to next-to-leading order QCD prediction in different rapidity regions. The b-jet inclusive cross section measured exploiting the long lifetime and large mass of B hadrons is presented and compared to QCD prediction. A complementary measurement, using the large branching fraction of B hadrons into muons, is also described. The measurement of two-particle momentum correlation in jets is presented and compared to predictions.
NTIS
Elementary Particles; Particle Accelerators; Particle Collisions; Quantum Chromodynamics

20070008424 Fermi National Accelerator Lab., Batavia, IL, USA, California Univ., San Diego, La Jolla, CA, USA
Diboson Physics at the Tevatron
Neubauer, M. S.; May 01, 2006; 4 pp.; In English
Report No.(s): DE2006-892332; FERMILAB-CONF-06-115-E; No Copyright; Avail.: National Technical Information Service (NTIS)

At the Fermilab Tevatron, the CDF and D0 detectors are being used to study diboson production in pp(bar) collisions at

(sq rt)s = 1.96 TeV. We summarize recent measurements of the W(gamma), Z(gamma) and WW cross-sections and limits on WZ and ZZ production. Limits on anomalous trilinear gauge couplings are also presented.
NTIS
Elementary Particles; Particle Accelerators; Particle Production

20070008451 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA, Sao Paulo Univ., Brazil
Two-pion Exchange NN Potential from Lorentz-invariant xEFT
Higa, R.; Robilotta, M. R.; da Rocha, C. A.; January 2006; 5 pp.; In English
Report No.(s): DE2006-893175; No Copyright; Avail.: National Technical Information Service (NTIS)

We outline the progress made in the past five years by the Sao Paulo group in the development of a two-pion exchange nucleon-nucleon potential within a Lorentz-invariant framework of (baryon) chiral perturbation theory.
NTIS
Nucleon-Nucleon Interactions; Pions; Lorentz Transformations

20070008488 California Univ., San Diego, La Jolla, CA USA
High Density Planar High Temperature Superconducting Josephson Junctions Arrays
Dynes, Robert C; Cybart, Shane; Sep 2006; 96 pp.; In English
Contract(s)/Grant(s): FA9550-04-1-0228C
Report No.(s): AD-A461011; No Copyright; Avail.: CASI: A05, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461011

This report summarizes research performed on Josephson junctions fabricated from high temperature superconducting material. We have found that a circuit fabrication technique pioneered in our lab during previous AFOSR funding periods can be used to fabricate arrays of junctions as well as superconducting interference devices. The uniformity and close spacing of our devices is unsurpassed by any other junction technology. We have demonstrated tens of junctions operating coherently. If this can be scaled up to hundreds of junctions it will enable the generation of RADAR waveforms with the highest attainable accuracy allowed by quantum physics. Furthermore, we have shown that this technology can be used to fabricate superconducting quantum interference devices which may enable the fabrication of highly sensitive ultra-wideband microwave receive antenna. We also have shown that our technique is not limited to high temperature superconductors by demonstrating the first multi-junction magnesium diboride array circuit. During this period our work has resulted in 5 publications in referred journals, a PhD thesis and a patent.
DTIC
High Temperature; High Temperature Superconductors; Josephson Junctions

20070008503 Air Force Research Lab., Wright-Patterson AFB, OH USA
Low AC Loss Structures in YBCO Coated Conductors With Filamentary Current Sharing (POSTPRINT)
Barnes, Paul N; Levin, George A; Varanasi, Chakrapani; Sumption, Michael D; May 2004; 6 pp.; In English
Contract(s)/Grant(s): Proj-3145
Report No.(s): AD-A461047; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461047

Architectural design improvements, such as filamentation, to YBa(sub 2)Cu(sub 3)O(sub 7-x) (YBCO) coated conductors can result in a more ac-tolerant version of the conductor. However, finely made striations in the conductor make filament breakage more probable. In this case, weakly linking the filaments can enable current sharing among the filaments of striated coated conductors while maintaining reduced hysteretic losses. Data is presented for a YBCO sample divided into superconducting filaments separated such that the transverse critical current density of the striation is significantly less than the longitudinal critical current density along the filaments. A LAO substrate was physically scribed with parallel incisions to adversely affect the subsequent epitaxial growth of the YBCO layer between the striations. Vibrating sample magnetometry measurements verified a reduction in hysteretic loss compared to a control sample of epitaxially grown YBCO on an unscribed LAO substrate. Since filamentation requires a twist in the conductor for practical applications, a discussion is also given outlining an alternate means of accomplishing this by placing a twist in the coated conductor architecture itself.
DTIC
Alternating Current; Coatings; Conductors; Electric Conductors; YBCO Superconductors

20070008622 California Univ., Santa Barbara, CA USA

Enhanced Thermionic Emission Cooling in High Barrier Superlattice Heterostructures

Shakouri, Ali; LaBounty, Chris; Abraham, Patrick; Piprek, Joachim; Bowers, John E; Jan 1998; 11 pp.; In English

Report No.(s): AD-A461240; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461240

Thermionic emission current in heterostructures can be used to enhance thermoelectric properties beyond what can be achieved with conventional bulk materials. The Bandgap discontinuity at the junction between two materials is used to selectively emit hot electrons over a barrier layer from cathode to anode. This evaporative cooling can be optimized at various temperatures by adjusting the barrier height and thickness.

DTIC

Cooling; Superlattices; Thermionic Emission

20070008698 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Vacuum Chamber Construction and Contamination Study of A Micro Pulsed Plasma Thruster

Debevec, Jacob H; Dec 2006; 127 pp.; In English; Original contains color illustrations

Report No.(s): AD-A461390; AFIT/GAE/ENY/07-D01; No Copyright; Avail.: CASI: A07, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461390

The micro pulsed plasma thruster (micro-PPT) is a simple and versatile electric thruster capable of performing multiple missions, from precise attitude control on standard satellites to primary propulsion for nanosatellites. In order to fill this role as both industry and government move toward utilizing smaller satellites, micro-PPTs first need to be thoroughly tested on the ground. This study examines the deposition profile and rate of particle emission from the thruster so that satellite designers understand any potential contamination issues with sensitive instruments and solar panels. Employing a newly assembled vacuum chamber system, four tests were completed with the micro-PPTs, and the results showed that particles discharge in all directions, with the surfaces directly facing the propellant tube collecting exponentially more particle deposition than surfaces at wider angles.

DTIC

Construction; Contamination; Plasma Engines; Propulsion System Configurations; Propulsion System Performance; Pulsed Plasma Thrusters; Vacuum Chambers

20070008735 Air Force Research Lab., Wright-Patterson AFB, OH USA

Evaluation of Crack and Corrosion Detection Sensitivity Using Piezoelectric Sensor Arrays (Preprint)

Blackshire, James L; Martin, Steve; Cooney, Adam; Apr 2006; 10 pp.; In English

Report No.(s): AD-A461478; AFRL-ML-WP-TP-2006-431; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461478

The use of guided-wave ultrasound has significant potential for structural health monitoring in a number of critical aerospace applications. A key question which needs to be addressed with regard to damage sensing in realistic aircraft structures involves detection sensitivity levels for cracks and corrosion. In this research effort, a systematic evaluation of the detection sensitivity levels of surface-bonded piezoelectric sensor arrays has been undertaken using experimental studies and analytic modeling. A series of reference standards have been developed for variations in crack/corrosion sizes and types from micron to millimeter scales. Both engineered and realistic crack/corrosion conditions have been studied using distributed sensing approaches. In-situ damage initiation and growth studies are also being conducted using dynamic fatigue crack and electrochemical corrosion attack damage mechanisms. Preliminary results are presented for evaluating typical damage detection levels, where opportunities for improving measurement fidelity, quantification, and sensitivity in realistic aircraft structures are considered.

DTIC

Corrosion; Cracks; Damage Assessment; Detection; Piezoelectricity; Sensitivity

20070008758 Dayton Univ. Research Inst., OH USA

Corner Crack Propagation in the Presence of Residual Stresses (Preprint)

Hutson, A L; Huelsman, M; Buchanan, D; John, R; Haering, S; May 2006; 12 pp.; In English

Contract(s)/Grant(s): FA8650-04-C-5200; Proj-M02R

Report No.(s): AD-A461511; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461511

BA technology development program known as Engine Rotor Life Extension (ERLE) has been initiated by the USA Air Force. One of the key technologies being assessed under the ERLE program is the analysis of 3D crack propagation at critical locations in turbine engine components. These critical locations are typically shot peened requiring the ability to predict 3D crack propagation at stress concentration sites in the presence of residual stresses. Hence, a study was conducted to characterize and analyze a corner crack emanating from a notch in a Ni-base superalloy in the presence of shot-peen induced residual stresses. Finite element analysis of the corner crack propagation was performed using 3D codes, ZENCRACK' and FRANC3D'. Initial elastic-plastic analyses were conducted to account for plasticity-induced residual stresses at the notch. Prediction of 3D crack propagation was conducted with and without shot peening induced residual stresses for comparison with experimental results. The corner crack growth predictions correlated well with the experimental results for baseline and shot-peened specimens. Significant increase in crack growth life due to shot-peening was successfully predicted using the 3D fracture mechanics codes. The modeling of the relaxation of residual stresses due to thermal exposure and the non-linear mechanical loading was essential for accurate prediction.
DTIC
Corners; Crack Propagation; Residual Stress; Stress Concentration

20070008767 Anteon Corp., Dayton, OH USA
Analysis and Support Initiative for Structural Technology (ASIST). Delivery Order 0045: Adaptive Structures - Based on Energy Design (ASBED)
Grandhi, Ramana; Aug 2005; 23 pp.; In English
Contract(s)/Grant(s): F33615-98-D-3210-0045; Proj-A04Z
Report No.(s): AD-A461523; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461523
The research in this study develops an analysis technique for mechanized solid-state actuators. The methodology's strength stems from the fact that it can be applied to a single solid-state actuator or an actuator that is coupled to a compliant mechanism (mechanized). The technique couples the actuator to any compliant mechanism and it takes into account interactions between the mechanized actuator and its load. Thus the methodology can be applied to a myriad of loaded systems. The analysis technique is rooted in thermodynamics and thus can be expanded to a wide range of systems (piezoelectric, electrohydraulic, electrostrictive, magnetostrictive, etc.). The methodology uses energy transfer as a medium to develop analytical relationships between input parameters and output parameters. Results of the technique are consistent with existing energy-based techniques and experimental data.
DTIC
Actuators; Energy Conservation; Energy Transfer; Solid State; Support Systems; Thermodynamics

20070008802 Austrian Research Center, Seibersdorf, Austria
Possible Gravitational Anomalies in Quantum Materials. Phase 2: Experiment Assembly, Qualification and Test Results
Tajmar, M; Feb 2007; 56 pp.; In English
Contract(s)/Grant(s): FA8655-03-1-3075; Proj-2502
Report No.(s): AD-A461570; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461570
The author recently published a paper, suggesting for the first time that a reported disagreement between experimental measurements and theoretical predictions for the magnetic field in rotating superconductors might arise from an anomalous high-order gravitomagnetic contribution (also known as frame dragging or Lense-Thirring effect). In normal matter, the ratio between electromagnetic and gravitational fields is given by the difference in the respective permeabilities. However, magnetic fields generated as a consequence of the quantization of the canonical momentum in a superconductor do not depend on the permeability. Hence, there is the possibility that the ratio between those two fields might be different in a quantum material. Latest theoretical work links the generation of those non-classical gravitomagnetic fields to the ratio between the Cooper-pair mass and the bulk density of the superconductor. This report summarizes the work carried out in Phase II ? the assembly of the experiment, qualification to make sure that the required sensitivity can be met, and finally the report on the test results using BSCCO and YBCO superconductors as well as Niobium as a dummy at liquid nitrogen temperatures. The measurements show that the resolution level is low enough to test the original conditions defined in Phase I (derived from Tate?s Cooper-pair measurements), however, the resolution is about one order of magnitude above the theoretical predictions for high-temperature superconductors. No gravitational anomalies were found for BSCCO and YBCO down to the facility resolution level. Hence, gravitational fields based on Tate?s measurement have not been found with high-temperature superconductors. However, the

results do not rule out such gravitational anomalies at their theoretically predicted lower values or anomalies using Tate?s original setup (Niobium sup
DTIC
Anomalies; Gravitational Fields; Gravity Anomalies; Performance Tests; Quantum Theory; Superconductors (Materials)

20070008803 Austrian Research Center, Seibersdorf, Austria
Possible Gravitational Anomalies in Quantum Materials. Phase 1: Experiment Definition and Design
Tajmar, M; Hense, K; Feb 2007; 57 pp.; In English
Contract(s)/Grant(s): FA8655-03-1-3075
Report No.(s): AD-A461571; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461571

One of the authors (MT) recently published a paper, suggesting for the first time that a reported disagreement between experimental measurements and theoretical predictions for the magnetic field in rotating superconductors might arise from an anomalous high-order gravitomagnetic contribution (also known as frame dragging or Lense-Thirring effect). In normal matter, the ratio between electromagnetic and gravitational fields is given by the difference in the respective permeabilities. However, magnetic fields generated as a consequence of the quantization of the canonical momentum in a superconductor do not depend on the permeability. Hence, there is the possibility that the ratio between those two fields might be different in a quantum material. This report summarizes the work carried out in Phase I ? the experiment definition, detailed analysis and design. According to the performed analysis, the experimental apparatus described in this report is be able to resolve the gravitational anomaly having an ultimate resolution of 0.3 μg and exceeding the required rotational speeds and angular accelerations.
DTIC
Anomalies; Experiment Design; Gravitational Fields; Gravity Anomalies; Quantum Theory; Superconductors (Materials)

20070008805 Naval Research Lab., Washington, DC USA
International Workshop on Methane Hydrate Research and Development (4th) Held in Victoria, British Columbia, Canada on May 9-11, 2005
Coffin, Richard B; Chapman, Ross; Dec 27, 2006; 147 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461573; NRL/MR/6110--06-9007; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461573

The Fourth Workshop of the International Committee on Gas Hydrates Research and Development was held during 9-11 May 2005 in Victoria, British Columbia, Canada. Invited national agency representatives and international researchers from university, government, and industry convened to assess research priorities and to promote international collaboration on methane hydrate research. The 2.5-day workshop included plenary lectures and panel discussions, conducted as a working event where all participants engaged in open discussions to develop collaborative methane hydrate studies. The workshop was organized by the Centre for Earth and Ocean Research at the University of Victoria, Victoria, British Columbia, Canada; the Marine Biogeochemistry Section at the Naval Research Laboratory, Washington, DC, USA, the Hawaii Natural Energy Institute of the University of Hawaii, Honolulu, Hawaii, USA, and in cooperation with the Institute for Energy Utilization, AIST, Hokkaido, Japan; the Department of Physics and Technology at the University of Bergen, Bergen, Norway; the Office of Naval Research - Global; the Geological Survey of Canada, and the USA Department of Energy. This series of annual international methane hydrate research and development workshops was initiated during March 2001 at the University of Hawaii. Subsequent workshops have been held in Washington, DC, USA and Vina Del Mar, Chile. At the previous three meetings, the focus was on presentaiton of research results on selected hydrate themes and description of national hydrate research programs. The workshops have resulted in international field and laboratory collaborations between U.S., Candadian, Japanese, Chilean, and German scientists working on methane hydrate exploration off the coasts of U.S., Canada, Chile, and Japan. At the Victoria workshop, the objective was more ambitious. A primary goal was to begin discussions
DTIC
British Columbia; Canada; Hydrates; Methane

20070008823 California Univ., Santa Cruz, CA USA
Receiver-Initiated Channel-Hopping for Ad-Hoc Networks
Tzamaloukas, Asimakis; Garcia-Luna-Aceves, J J; Jan 2000; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-97-2-0338
Report No.(s): AD-A461592; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461592
No abstract available
Collision Avoidance; Frequency Hopping; Receivers; Wireless Communication

20070008825 California Univ., Santa Cruz, CA USA
Reversing the Collision-Avoidance Handshake in Wireless Networks
Garcia-Luna-Aceves, J J; Tzamaloukas, Asimakis; Jan 1999; 13 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-97-2-0338
Report No.(s): AD-A461595; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461595
No abstract available
Collision Avoidance; Reversing; Wireless Communication

20070008832 California Univ., Santa Cruz, CA USA
Channel Hopping Multiple Access with Packet Trains for Ad Hoc Networks
Tzamaloukas, Asimakis; Garcia-Luna-Aceves, J J; Jan 2000; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-97-2-0338
Report No.(s): AD-A461602; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461602
No abstract available
Collision Avoidance; Frequency Hopping; Local Area Networks; Multiple Access; Wireless Communication

20070008835 California Univ., Santa Cruz, CA USA
Channel-Hopping Multiple Access
Tzamaloukas, Asimakis; Garcia-Luna-Aceves, J J; Jan 2000; 6 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-97-2-0338
Report No.(s): AD-A461607; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461607
No abstract available
Collision Avoidance; Frequency Hopping; Local Area Networks; Multiple Access; Wireless Communication

20070008963 California Univ., Santa Cruz, CA USA
InP-Based Thermionic Coolers
Shakouri, Ali; LaBounty, Chris; Abraham, Patrick; Piprek, Joachim; Bowers, John E; May 20, 1999; 4 pp.; In English
Contract(s)/Grant(s): 442530-25845
Report No.(s): AD-A461814; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461814
Thermoelectric coolers are important elements of many optoelectronic systems. Current commercial coolers are based on non-conventional semiconductors such as BiTe. In this paper we analyze the prospect of InP based material to fabricate coolers that can be integrated with optoelectronic components. Experimental results are shown where thermionic emission current in InGaAs/InGaAsP heterostructures is used to enhance the cooling power of conventional bulk material. About one degree cooling over 1 micrometer thick barrier is observed (i.e. a cooling power of 200-300W/sq cm). Calculations for InGaAs/InAlAs superlattices show that single stage cooling by as much as 20-30 degrees should be possible.
DTIC
Coolers; Cooling; Indium Gallium Arsenides; Thermionic Emission; Thermoelectric Cooling

20070008970 California Univ., Santa Cruz, CA USA
Thermionic Emission Cooling in Single Barrier Heterostructures
Shakouri, Ali; LaBounty, Chris; Piprek, Joachim; Abraham, Patrick; Bowers, John E; Jan 4, 1999; 3 pp.; In English
Contract(s)/Grant(s): 442530-25845
Report No.(s): AD-A461836; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461836

Nonisothermal transport in InGaAsP-based heterostructure integrated thermionic coolers is investigated experimentally. Cooling on the order of a degree over 1 mm thick barriers has been observed. This method can be used to enhance thermoelectric properties of semiconductors beyond what can be achieved with the conventional Peltier effect.
DTIC
Cooling; Thermionic Emission; Thermoelectric Cooling

20070009189 Materials Systems, Inc., Littleton, MA USA
Underwater Evaluation of Piezocomposite Panels as Active Surfaces
Ting, Robert Y; Howarth, Thomas R; Gentilman, Richard L; Jan 1996; 9 pp.; In English
Report No.(s): AD-A462067; No Copyright; Avail.: CASI: A02, Hardcopy

A new class of composite materials designated as the 1-3 piezocomposite is being investigated for potential use in underwater smart material structures. In-water acoustical properties of new 1-3 composite panels were examined experimentally as a function of temperature, pressure and frequency. The measured transmitting voltage response (TVR) showed the existence of parasitic modes in the composite panel in addition to the expected thickness mode. The effect of underwater explosive shock on the TVR showed no detrimental effects in mechanical structure or acoustical performance of the piezocomposite panel. The free-field voltage sensitivity (FFVS) was constant at -185 dB referenced to 1 volt per micropascal over the testing frequency range. Linearity with electrical drive level and pressure stability of the 1-3 piezocomposites have also been established with the present choice of ceramic-polymer components. These results demonstrated that this new material is potentially useful for applications of both large-area actuators and sensors in forming active surfaces of new Smart structures.
DTIC
Panels; Piezoelectricity

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ACOUSTICS

Includes sound generation, transmission, and attenuation. For noise pollution see *45 Environment Pollution*. For aircraft noise see also *02 Aerodynamics* and *07 Aircraft Propulsion and Power*.

20070006744 Mintz, Levin, Cohn, Ferris, Glovsky and Popeo, P.C., Boston, MA, USA
Superresolution Ultrasound
Clement, G. T.; Hynynen, K. H.; 4 Aug 04; 21 pp.; In English
Contract(s)/Grant(s): NIH-CA46627
Patent Info.: Filed Filed 4 Aug 04; US-Patent-Appl-SN-10-910 841
Report No.(s): PB2007-102832; No Copyright; Avail.: CASI: A03, Hardcopy

A computer program product resides on a computer-readable medium and comprises computer-readable, computer-executable instructions for causing a computer to transmit first indicia for an ultrasound propagation arrangement to propagate ultrasound energy toward a focal region containing an object, receive second indicia from a receiver positioned to receive the propagated ultrasound energy after passing at least one of by and through the object and configured to transduce the received ultrasound energy into the second indicia, analyze the second indicia to determine magnitude and phase of the received ultrasound energy, and use the determined magnitude and phase of the received ultrasound energy and knowledge of the ultrasound energy propagated from the propagation arrangement to mathematically propagate indicia of at least one of the received ultrasound energy and the transmitted ultrasound energy to a common location.
NTIS
Patent Applications; Ultrasonics

20070007329 NASA Glenn Research Center, Cleveland, OH, USA
Source Noise Modeling Efforts for Fan Noise in NASA Research Programs
Huff, Dennis L.; October 18, 2006; 43 pp.; In English; 2006 Honeywell Acoustics Symposium, 18 Oct. 2006, Phoenix, AZ, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 561581.02.08.03.11.01; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070007329

There has been considerable progress made in fan noise prediction over the past 15 years. NASA has conducted and sponsored research that has improved both tone and broadband fan noise prediction methods. This presentation highlights progress in these areas with emphasis on rotor/stator interaction noise sources. Tone noise predictions are presented for an advanced prediction code called 'LINFLUX'. Comparisons with data are' included for individual fan duct modes. There has also been considerable work developing new fan broadband noise prediction codes and validation data from wind tunnel model tests. Results from several code validation exercises are presented that show improvement of predicted sound power levels. A summary is included with recommendations for future work.
Author
NASA Programs; Research; Aerodynamic Noise; Fan Blades; Rotor Aerodynamics; Prediction Analysis Techniques; Interactional Aerodynamics

20070007466 Catholic Univ. of America, Washington, DC USA
Ambient Noise in the Sea
Urick, R J; Jan 1984; 194 pp.; In English
Report No.(s): AD-A460546; No Copyright; Avail.: CASI: A09, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460546

By ambient noise we mean the prevailing, sustained unwanted background of sound at some spot in the ocean. It excludes momentary, occasional sounds, such as the noise of a close-by passage of a ship or of an occasional rain squall. It is the background of noise, typical of the location and depth where a measuring hydrophone is located, against which a signal,' such as the sound of a submarine or the echo from a target, must be detected. Ambient noise also excludes all forms of self-noise, such as the noise of current flow around the measurement hydrophone and its supporting structure, and obviously must exclude all forms of electrical noise. Thus, ambient noise is what is left over, so to speak, after identifiable, occasional noise sources are accounted for.
DTIC
Ambience; Background Noise; Noise (Sound); Seas

20070007506 Naval Research Lab., Washington, DC USA
Wide Area Detection and Identification of Underwater UXO Using Structural Acoustic Sensors
Bucaro, J A; Houston, B H; Saniga, M; Nelson, H; Yoder, T; Kraus, L; Carin, L; Jan 12, 2007; 16 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-MM-1513
Report No.(s): AD-A460624; NRL/MR/7130--07-9014; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460624

This new project is exploring the potential for developing a structural acoustics (SA) based sonar methodology for wide area search and identification of underwater unexploded ordnance (UXO). This new approach may have significant advantages over more conventional acoustic approaches, which rely on the formation of high resolution images. These advantages include: diverse set of 'fingerprints' leading to low false alarm rates; longer range operation leading to wide area coverage; and low frequency sediment penetration leading to buried target prosecution. A core element of the current project is a comprehensive examination of the scattering levels and features exhibited by typical UXO targets in the SA regime using NRL's state-of-the-art underwater scattering facilities, both laboratory-based and at-sea. We have recently completed the first phase of this data collection using the laboratory-based facility, and these results are reported here.
DTIC
Acoustics; Ammunition; Detection; Ordnance; Signal Detectors; Sound Detecting and Ranging

20070007518 Naval Oceanography Command, NSTL Station, MS USA
The U.S. Naval Oceanographic Office's Deep Ocean Survey Project
Cline, C H; Jul 1969; 27 pp.; In English
Report No.(s): AD-A460649; NOO-IR-69-53; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460649

The Deep Ocean Survey Project of the U. S. Naval Oceanographic Office is a multipurpose survey whose purpose is to obtain information in all strategic areas to support Navy requirements, and additionally, to contribute information beneficial to the scientific and economic community. Oceanographic, geophysical, and acoustic data are collected from ships operating in both the North Pacific and the North Atlantic Oceans. Major portions of the North Atlantic and the Western North Pacific have been surveyed under the two tasks within the Project, the Marine Geophysical Survey (MGS) performed by contractors, and the Anti Submarine Warfare/Undersea Warfare (ASW/USW Surveys) performed by Oceanographic Office personnel aboard Military Sea Transportation Service (MSTS) and charter vessels. Reports of the data are published within a year after completion of the surveys and the original data are forwarded to established data repositories after analyses are completed. The Deep Ocean Survey Project of the U. S. Naval Oceanographic Office is a multipurpose survey whose purpose is to obtain information in all strategic areas to support Navy requirements, and additionally, to contribute information beneficial to the scientific and economic community. Oceanographic, geophysical, and acoustic data are collected from ships operating in both the North Pacific and the North Atlantic Oceans. Major portions of the North Atlantic and the Western North Pacific have been surveyed under the two tasks within the Project, the Marine Geophysical Survey (MGS) performed by contractors, and the Anti Submarine Warfare/Undersea Warfare (ASW/USW Surveys) performed by Oceanographic Office personnel aboard Military Sea Transportation Service (MSTS) and charter vessels. Reports of the data are published within a year after completion of the surveys and the original data are forwarded to established data repositories after analyses are completed. DTIC

Acoustic Properties; Oceanography; Oceans; Surveys; Water Depth

20070007623 Civil Aeromedical Inst., Oklahoma City, OK USA

A Comparison of Baseline Hearing Thresholds Between Pilots and Non-Pilots and the Effects of Engine Noise

Beringer, Dennis B; Harris, Jr , Howard C; Jun 2005; 14 pp.; In English

Report No.(s): AD-A460838; DOT/FAA/AM-05/12; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460838

Observations in simulator studies suggested that the older segments of the general aviation pilot population were having difficulty hearing specific auditory warnings in the cockpit. These observations, in combination with data from Tobias (1968a; 1968b; 1972), prompted a reexamination of the hearing capabilities of pilots and non-pilots. In Phase 1, threshold data were collected for 150 non-pilots and 150 pilots using stratified age sampling. The usual higher-frequency decrements attributable to aging and general environmental exposure were found in both samples. Significant differences were found between the non-pilot and pilot samples, with greater threshold shifts between 2 and 6 kHz in evidence among the pilots. In Phase 2, participants' thresholds were measured during both a quiet condition and during exposure to simulated aircraft engine noise. Results of both phases are discussed in terms of implications for the design of auditory warnings for general aviation aircraft. DTIC

Aircraft Noise; Engine Noise; Hearing; Pilots

20070007645 Army Aeromedical Research Lab., Fort Rucker, AL USA

Insertion Loss of the HGU-56/P Aircrew Integrated Helmet System with Oregon Aero Earcup Replacement Products

Ahroon, William; LaPrath, Alisa; Gordon, Elmaree; Robinette, Martin; Hill, Melinda; Oct 2006; 143 pp.; In English

Contract(s)/Grant(s): Proj-878

Report No.(s): AD-A460887; USAARL-2007-01; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA460887

The insertion loss of the HGU-56/P Aircrew Integrated Helmet System (AIHS) configured with Oregon Aero replacement earcup products was evaluated in accordance with the American National Standard Microphone-in-Real-Ear and Acoustic Test Fixture Methods for the Measurement of Insertion Loss of Circumaural Hearing Protection Devices [ANSI S12.42-1995 (R1999)], microphone-in-real-ear method. Insertion loss of the HGU-56/P AIHS configured with the Oregon Aero HushKit replacement earcup foam was essentially equivalent to the helmet's standard configuration. Employing the Oregon Aero SoftSeal replacement earcup seal with the HushKit foam yielded a small improvement in insertion loss over the standard helmet configuration. However, the Oregon Aero SoftSeal/HushKit Combo soft replacement earcups provided significantly poorer insertion loss than the standard earcup configuration. As with the Army's current flight helmet/earcup combination, double protection (i.e., earplugs in addition to the sound-protective flight helmet) is required in certain high-noise environments.
DTIC

Ear Protectors; Flight Clothing; Flight Crews; Helmets; Insertion Loss; Replacing; Systems Integration

20070007696 Boston Univ., Boston, MA USA
Auditory and Cross-Modal Spatial Attention
Shinn-Cunningham, Barbara; Best, Virginia; Jan 2007; 10 pp.; In English
Contract(s)/Grant(s): N00014-04-1-0131
Report No.(s): AD-A461002; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461002

This final report summarizes results of experiments and theoretical analysis exploring the role of attention, to spatial location or other object attributes, in understanding auditory and auditory-visual objects in complex settings. Work examined how attention affected the ability to understand one (selective attention) or two (divided attention) spoken messages, as well as to identify complex spectro-temporal patterns. Other experiments explored how ambiguous sound mixtures are interpreted and how perceptual objects are formed in complex settings. Theoretical analysis explored the degree to which different acoustic features may help explain the abilities of listeners in complex settings with multiple, competing sources. We find that spatially and non-spatially directed attention, including attention cued through visual signals, enables listeners to better process and understand sound in a complex setting.
DTIC
Acoustics; Hearing; Visual Signals

20070008635 Missouri Univ., Columbia, MO USA
Spatial Correlation Coefficient Images for Ultrasonic Detection (Preprint)
Cepel, Raina; Ho, K C; Rinker, Brett A; Palmer, Jr ,, Donald D; Lerch, Terrence P; Neal, Steven P; Jul 2006; 24 pp.; In English
Contract(s)/Grant(s): FA8650-04-C-5704; Proj-2510
Report No.(s): AD-A461262; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461262

In ultrasonics, image formation and detection are generally based on signal amplitude. In this paper, we describe an amplitude independent approach for image formation and detection based on the similarity of adjacent signals. Signal similarity is quantified in terms of the correlation coefficient calculated between A-scans digitized at adjacent measurement positions. Correlation coefficient images are introduced for visualizing the similarity in measured A-scans. In backscatter, the approach reveals defect signals buried in noise by showing regions of increased correlation. In pitch-catch or thru-transmission, the approach reveals defects by showing regions of decreased correlation due to signal distortion caused by interaction of the beam field with the defect. Correlation coefficient and C-scan images are shown to demonstrate flat-bottom-hole detection in a stainless steel annular ring and crack detection in an aluminum aircraft structure. Simulated data are used to show the detection of planar defects at very low signal-to-noise ratio.
DTIC
Correlation Coefficients; Sound Detecting and Ranging; Ultrasonics

20070008661 Naval Research Lab., Stennis Space Center, MS USA
Acoustic-Elastic Scattering Predictions and Experimental Verifications via Water Tank Experiments
Lindwall, Dennis; Keiffer, Richard; Wood, Warren; Zingarelli, Robert; Jul 2004; 7 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461298; NRL/PP/7430-04-11; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461298

We are beginning a new series of laboratory acoustic experiments that will examine the detailed physics of acoustic-elastic scattering. These experiments will measure up-scattered acoustic waves, down-scattered elastic waves, and scattered interface waves from edges and embedded objects using a variety of is sensors. One of our goals is to verify a density-contrast hypothesis upon which the Wedge Assemblage numerical rough-interface scattering model is based and which is applicable to many sector acoustic environments. We are predicting some of these experimental results with calculations using fin finite difference (FD) codes that are designed for 2 and 3-D acoustic and 2-D elastic environments.
DTIC
Acoustic Scattering; Acoustics; Elastic Scattering; Scattering; Water

20070008712 Army War Coll., Carlisle Barracks, PA USA

Advancing Noise Robust Automatic Speech Recognition for Command and Control Applications

Bass, James D; Mar 31, 2006; 29 pp.; In English

Report No.(s): AD-A461436; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461436

This is a technical assessment paper intended for use by engineers and research scientist working on the development and integration of Automatic Speech Recognition (ASR), it will cover the state of speech and recognition technologies with emphasis on noise robust command and control (C2) application. The reliable elimination of the keyboard and mouse in mounted and un-mounted C2 systems has been a desire of systems developers and requirements writers since the development of PC-based ASR systems in the early 1990's. However, current research and commercial quality ASR applications never had the noise robustness to support a truly tactical C2 application. As ASR achieved limited operational success in noisy environments around the 2002 timeframe, the C2 requirements evolved to include the emerging system of systems approach and multilingual operational environments in support of the Global War On Terrorism (GWOT) in such environment's, the system must understand not just words as commands (ASR), but to understand phrases and sentences (semantic and syntactic) and reply in a conversational manner (speech and natural language generation). If the keyboard and mouse are to be truly eliminated, a system now needs to conduct a natural conversation with an operator and possibly others in the operational environment. This paper will cover the advances, limitations, and reasonable expectations from several levels: Research Scientist and Engineers, Program Executive Office (PEO), Program Manager (PM), and requirements office. I will also discuss the major technical challenges that remain as well as some risk assessment to help decision makers align expectations with reasonable availability dates based on current and future research efforts.

DTIC

Ambience; Command and Control; Noise (Sound); Robustness (Mathematics); Speech Recognition

20070008971 California Univ., Berkeley, CA USA

The Effect of Defects and Acoustic Impedance Mismatch on Heat Conduction SiGe Based Superlattices

Huxtable, Scott T; Abramson, Alexis R; Majumdar, Arun; Shakouri, Ali; Croke, Edward T; Nov 22, 2002; 6 pp.; In English; Original contains color illustrations

Report No.(s): AD-A461837; IMECE2002-34239; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461837

The cross-plane thermal conductivity of four Si/Ge, Si/Si0.4Ge0.6, and Si0.9Ge0.1/Si0.1Ge0.9 superlattices was measured using the 3omega technique. All four superlattices were found to have thermal conductivity values between 1.8 and 3.5 W/m-K, which are below the values of typical SixGe1-x alloys. The growth quality of these superlattices was evaluated qualitatively through the use of x-ray diffraction and transmission electron microscopy. These studies indicated that the superlattices contained a relatively high density of defects. The low thermal conductivity values are presumed to be due in large part to these defects.

DTIC

Acoustic Impedance; Conductive Heat Transfer; Defects; Superlattices; Thermal Conductivity

20070009090 Naval Research Lab., Washington, DC USA

Electroacoustic Evaluations of 1-3 Piezocomposite SonoPanel(trademark) Materials

Howarth, Thomas R; Ting, Robert Y; Jul 2000; 10 pp.; In English

Report No.(s): AD-A461901; No Copyright; Avail.: CASI: A02, Hardcopy

An advanced configuration 1-3 piezocomposite, designated by its manufacturer as SonoPanel, has been investigated for potential underwater acoustical applications. In-air electromechanical characteristics and in-water acoustical properties of the SonoPanel were experimentally examined. The in-air impedance measurement results showed the existence of parasitic modes in the composite panel in addition to the expected thickness mode. This modal behavior is identified to be related to the piezo-composite structure. In-water acoustical properties of the new 1-3 piezocomposite panels were investigated as a function of temperature, hydrostatic pressure, and frequency. The effect of underwater explosive shock on the acoustic responses showed no detrimental effects in mechanical structure or acoustical performance of the piezocomposite panel. Linearity with electrical drive level and hydrostatic pressure stability of the 1-3 piezocomposites also were established. These results suggest that the SonoPanel piezocomposite material is potentially useful for underwater acoustical applications, particularly in applications in which large area coverage is desired.

DTIC

Composite Materials; Electroacoustic Transducers; Electroacoustics

72
ATOMIC AND MOLECULAR PHYSICS

Includes atomic and molecular structure, electron properties, and atomic and molecular spectra. For elementary particle physics see *73 Nuclear Physics*.

20070009151 Bari Univ., Italy

Assessing the Effects of Soil Humic and Fulvic Acids on Germination and Early Growth of Native and Introduced Grass Varieties

Senesi, Nicola; Dec 6, 2005; 25 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N62558-05-P-0179

Report No.(s): AD-A462006; No Copyright; Avail.: CASI: A03, Hardcopy

The six humic acids (HAs) isolated by the USDA St. Paul group in duplicate from the two Wyoming soils, Guernsey North (GN1 and GN2) and Guernsey South (GS1 and GS2), and one Utah soil, Dugway (D1 and D2), object of this research, were characterized for their moisture and ash contents, elemental (C, H, N, S, O) and acidic functional group composition, and by Fourier transform infrared (FTIR) spectroscopy and fluorescence spectroscopy in the emission, excitation and synchronous scan modes. For the remainder of the contract period (20 months) research plans are the following: (a) Experiments on the germination and early growth of the two introduced varieties Vavilov and SERP-select Siberian wheatgrass as affected by the three HAs, D-HA, GS-HA, and GN-HA. (b) Chemical and spectroscopic characterization of HAs isolated from greenhouse soils. (c) Experiments on the germination and early growth of the four grass varieties, alone or in combination (based on the growth differences found in the initial studies conducted at CRREL), as affected by the greenhouse soil HAs. (d) Follow-up experiments with HA concentrations optimal to promote the growth of the four grass varieties. (e) Correlation of the germination and seedling growth data with chemical and physico-chemical parameters of the HAs examined, in order to find out the HA parameters influencing germination and growth of the plant varieties examined.

DTIC

Acids; Germination; Grasses; Soils

20070009152 Bari Univ., Italy

Assessing the Effects of Soil Humic and Fulvic Acids on Germination and Early Growth of Native and Introduced Grass Varieties

Senesi, Nicola; Jan 15, 2007; 55 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N62558-05-P-0179

Report No.(s): AD-A462007; No Copyright; Avail.: CASI: A04, Hardcopy

A total of n. 28 humic acids (HAs) were extracted by the USDA-St. Paul group using a 0.5 M NaOH solution from duplicate (A, B) or triplicate (A, B, C) samples of the two Wyoming soils, Guernsey North (GN) and Guernsey South (GS), and the one Utah soil, Dugway (D), object of this research, which were collected from greenhouse pots where the four wheatgrass varieties of interest, the cv. Pryor of the native species Slender (3) and its germplasm line SERDP-select (4) and the cv. Vavilov of the introduced species Siberian (2) and its germplasm line SERDP-select (5), were separately grown. All HA samples were characterized by the Bari (this) group for moisture and ash contents, elemental (C, H, N, S, O) and acidic functional group (total acidity, COOH, phenolic OH) composition, and by Fourier transform infrared (FT IR) spectroscopy and fluorescence spectroscopy in the emission, excitation and synchronous scan modes. For the remainder of the contract period (8 months) research plans are the following: (a) Germination and early growth experiments of the three remaining combinations by two of the grass varieties in the presence of the three soil HAs at two concentrations. (b) Comparison of the germination and seedling growth data with the chemical and spectroscopic parameters of the HAs examined, in order to possibly find out which HA parameters may influence germination and growth of the four grass varieties examined, either singularly or in combination by two. (c) Possible follow-up experiments with HA concentrations optimal to promote the growth of the grass varieties of interest.

DTIC

Acids; Germination; Grasses; Soils

73
NUCLEAR PHYSICS

Includes nuclear particles; and reactor theory. For space radiation see *93 Space Radiation*. For atomic and molecular physics see *72 Atomic and Molecular Physics*. For elementary particle physics see *77 Physics of Elementary Particles and Fields*. For nuclear astrophysics see *90 Astrophysics*.

20070007534 Library of Congress, Washington, DC USA
Iranian Nuclear Sites
Hassan, Hussein D; Nov 13, 2006; 5 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460680; CRS-RS22531; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460680

This report describes Iran's known nuclear sites listed in official International Atomic Energy Agency (IAEA) reports and includes a map with the location of the nuclear facilities. For further information and analysis of Iran's nuclear programs, see CRS Report RS21592, Iran's Nuclear Program: Recent Developments, by Sharon Squassoni; and CRS Report RL32048 Iran: U.S. Concerns and Policy Responses, by Kenneth Katzman. This report will be updated as warranted.
DTIC
Iran; Nuclear Physics; Nuclear Reactors

20070007702 Harvard Univ., Cambridge, MA USA
The Production and Study of Antiprotons and Cold Antihydrogen
Gabrielse, Gerald; Dec 2006; 8 pp.; In English
Contract(s)/Grant(s): FA9550-04-1-0149; Proj-2301
Report No.(s): AD-A461017; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461017

In 2006, we continued to report substantial progress on 'The Production and Study of Antiprotons and Cold Antihydrogen' project funded by AFOSR. Listed below are the publications funded by AFOSR support since March 1, 2004. The topics identify the new discoveries and progress: 'Strongly Magnetized Antihydrogen and Its Field Ionization,' D. Vrineeanu, B.E. Granger, R. Parrott, H. R. Sadeghpour, L. Cederbaum, A. Mody, J. N. Tan, and G. Gabrielse, Phys. Rev. Lett. 92, 133402 (2004).
DTIC
Antiprotons; Hydrogen

74
OPTICS

Includes light phenomena and the theory of optical devices; for specific optical devices see also *35 Instrumentation and Photography*. For lasers see *36 Lasers and Masers*.

20070006614 Foley and Lardner, LLP, Washington, DC, USA, Pittsburgh Univ., PA, USA
Chip-Scale Optical Spectrum Analyzers with Enhanced Resolution
Kim, H. K.; Sun, Z.; Jung, S.; 19 Aug 05; 74 pp.; In English
Contract(s)/Grant(s): 00014-99-0663; ECS-040-3865
Patent Info.: Filed Filed 19 Aug 05; US-Patent-Appl-SN-11-206-900
Report No.(s): PB2007-101341; No Copyright; Avail.: CASI: A04, Hardcopy

A Fabry-Perot cavity filter includes a first mirror and a second mirror. A gap between the first and the second mirror monotonically varies as a function of width of the filter. This filter may be used with photodetector and a channel selection filter in an optical device, such as a spectrum analyzer. The channel selection filter may be a metal nanooptic filter array which includes plurality of subwavelength apertures in a metal film or between metal islands.
NTIS
Cavities; Chips; Light (Visible Radiation); Mirrors; Spectra; Spectrum Analysis

20070006632 National Inst. of Standards and Technology, Gaithersburg, MD USA
Free Space Optics Communication System Testing in Smoke and Fire Environments
Maranghides, A.; Mell, W.; Walton, W. D.; Johnsson, E. L.; Bryner, N. P.; Apr. 2006; 1133 pp.; In English
Report No.(s): PB2007-105050; NISTIR-7317; No Copyright; Avail.: CASI: A99, Hardcopy

Free-Space Optics, also known as FSO or Optical Wireless, use laser light to transmit a digital signal, data, voice, or video information, between two transceivers. These laser-based systems require unobstructed line of sight to properly operate. FSO system performance, signal intensity and integrity, is related to beam obscuration from environmental conditions including the presence of smoke and flames. The National Communications System (NCS), the telecommunications sector specific agency under the Department of Homeland Security is interested in quantifying the performance of FSO units. In order to assess whether smoke and flames affect FSO performance, a preliminary evaluation was conducted by NCS and the National Institute of Standards and Technology (NIST). The evaluation used both computer modeling and a limited set of indoor experiments. Several obscuration scenarios based on the smoke from realistic diesel fuel fires of varying sizes were jointly developed. The NIST Fire Dynamics Simulator (FDS), a computational fluid dynamics computer fire model, was used to predict the levels of smoke obscuration for the different realistic fire scenarios at a specified distance above the fire. The FDS predictions were used to design the laboratory experiments. Even though the laboratory fires were smaller than those in the original scenarios, the laboratory configurations could produce similar smoke concentrations. The fire experiments were conducted in the NIST, Building and Fire Research Laboratory, Large Fire Laboratory in Gaithersburg, Maryland. NCS provided the FSO units and NIST set up instrumentation to characterize smoke obscuration. The smoke obscuration measurements showed that the target transmittance levels were achieved and that desired smoke obscurations could be generated over prolonged durations. The performance of the FSO units was assessed and reported by NCS.
NTIS
Fires; Laser Outputs; Light Beams; Smoke; Space Communication

20070006645 DLA Piper Rudnick Gray Cary US, LLP, Palo Alto, CA, USA
Optical Beam Translation Device an Method utilizaing a Pivoting Optical Fiber
Bustamante, S. J.; Smith, S. B.; 17 Sep 04; 18 pp.; In English
Contract(s)/Grant(s): NSF-MBC-9118482; NIH-GM-32543
Patent Info.: Filed Filed 17 Sep 04; US-Patent-Appl-SN-10-943 709
Report No.(s): PB2007-102762; No Copyright; Avail.: CASI: A03, Hardcopy

An alignment device and method for delivering a light beam to an optical application, such as an optical trap having a pair of lenses with overlapping focal regions for trapping a particle therein. The alignment device includes a light source for generating a beam of light, a support member, an optical fiber, a collimating lens, and actuators. The optical fiber includes an input end for receiving the beam of light, and a generally rigid portion extending from the support member and terminating in a delivery end for emitting the beam of light. The collimating lens collimates the emitted beam of light. The actuators exert forces on the generally rigid portion such that it pivots about a pivot point of the optical fiber at the support member. The collimated beam of light pivots about an optical pivot point as the optical fiber pivots about the pivot point.
NTIS
Fiber Optics; Light Beams; Optical Fibers; Translating

20070006666 Associated Universities, Inc., Washington, DC, USA
Multidirectional Retroflector
Parker, D. H.; 12 Aug 04; 14 pp.; In English
Contract(s)/Grant(s): AST-0223851
Patent Info.: Filed Filed 12 Aug 04; US-Patent-Appl-SN-10-916 612
Report No.(s): PB2007-102765; No Copyright; Avail.: CASI: A03, Hardcopy

Multidirectional retroreflectors and methods of reflecting light beams from multiple directions are provided. The multidirectional retroreflectors utilize a four-mirror retroreflector with a common virtual reflection point.
NTIS
Mirrors; Patent Applications; Retroreflectors

20070006674 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Positioning Errors of Pencil-beam Interferometers for Long Trace Profilers
Yashchuk, V. V.; January 2006; 12 pp.; In English
Report No.(s): DE2006-889247; LBNL--59323; No Copyright; Avail.: Department of Energy Information Bridge

We analyze the random noise and the systematic errors of the positioning of the interference patterns in the long trace profilers (LTP). The analysis, based on linear regression methods, allows the estimation of the contributions to the positioning error of a number of effects, including non-uniformity of the detector photo-response and pixel pitch, read-out and dark signal noise, ADC resolution, as well as signal shot noise. The dependence of the contributions on pixel size and on total number of pixels involved in positioning is derived analytically. The analysis, when applied to the LTP II available at the ALS optical metrology laboratory, has shown that the main source for the random positioning error of the interference pattern is the read-out noise estimated to be (approx)0.2 rad. The photo-diode-array photo-response and pixel pitch non-uniformity determine the magnitude of the systematic positioning error and are found to be (approx)0.3 rad for each of the effects. Recommendations for an optimal fitting strategy, detector selection and calibration are provided. Following these recommendations will allow the reduction of the error of LTP interference pattern positioning to a level adequate for the slope measurement with 0.1-rad accuracy.
NTIS
Beam Splitters; Errors; Interferometers; Interferometry; Pencil Beams; Positioning

20070006681 Fermi National Accelerator Lab., Batavia, IL, USA, Cerro Tololo Inter-American Observatory, La Serena, Chile, Michigan Univ., Ann Arbor, MI, USA, University Coll., London, UK
Preliminary Optical Design for a 2.2 Degree Diameter Primt Focus Corrector for the Blanco 4 Meter Telescope
Kent, S.; Bernstein, R.; Abbott, T.; Bigelow, B.; Brooks, D.; January 2006; 10 pp.; In English
Report No.(s): DE2006-892279; FERMILAB-CONF-06-087-0CD; No Copyright; Avail.: Department of Energy Information Bridge

We describe a ve element corrector for the prime focus of the 4 meter Blanco telescope at the Cerro Tololo Inter-American Observatory (CTIO) in Chile that will be used in conjunction with a new mosaic CCD camera as part of the proposed Dark Energy Survey (DES). The corrector is designed to provide a DGat focal plane and good images in the SDSS g, r, i, and z lters. We describe the performance in conjunction with the scientic requirements of the DES, particularly with regard to ghosting and weak-lensing point spread function (PSF) calibration.
NTIS
Design Analysis; Optical Equipment; Telescopes

20070006793 McCutchen (Bingham), LLP, San Francisco, CA, USA
Surface Functionalization of Micro-Resonators
Vahala, K. J.; Yang, L.; Armani, K.; 17 Dec 04; 30 pp.; In English
Contract(s)/Grant(s): ONR-N00014-00-1-0650; NSF-DMR-0103134
Patent Info.: Filed Filed 17 Dec 04; US-Patent-Appl-SN-11-016 067
Report No.(s): PB2007-102850; No Copyright; Avail.: CASI: A03, Hardcopy

A micro-cavity resonator including a micro-cavity having a doped sol gel layer or solution applied thereto. The dopant can be various rare earth elements, such as erbium. The micro-cavity can be a spherical or disk or toroid shaped micro-cavity. Certain cavities are capable of high and ultra-high Q factors. Optical energy travels along an inner surface of the coated micro-cavity at a wavelength influenced or determined by the dopant in the coating.
NTIS
Cavity Resonators; Resonators

20070006800 Hoag (Foley), LLP, Boston, MA, USA
Optical Fluids, and Systems and Methods of Making and Using the Same
Kunz, R. R.; Switkes, M.; Sinta, R. S.; 24 Mar 03; 20 pp.; In English
Patent Info.: Filed Filed 24 Mar 03; US-Patent-Appl-SN-10-395 703
Report No.(s): PB2007-102907; No Copyright; Avail.: CASI: A03, Hardcopy

In part, the present invention is directed towards a fluid composition, and systems and methods of making and using the same, wherein the fluid composition has an absorbance of less than about 2 cm(sup-1).
NTIS
Fluidics; Photolithography

20070007450 European Research Office (US Army), London, UK
Spectral Transformation of Ultrashort Pulses in Photonic-Crystal Fibers. Appendix
Zheltikov, Aleksei; Jan 2006; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): 9800-AM-01
Report No.(s): AD-A460510; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460510

This appendix presents images of photonic-crystal fibers created under this project and photographs illustrating the performance of these fibers as supercontinuum generators and frequency shifters.
DTIC
Crystals; Spectra

20070007615 Army Aeromedical Research Lab., Fort Rucker, AL USA
Performance Effects of Mounting a Helmet-Mounted Display on the ANVIS Mount of the HGU-56P Helmet (Reprint)
Harding, Thomas H; Martin, John S; Rash, Clarence E; Sep 2006; 11 pp.; In English
Contract(s)/Grant(s): Proj-879
Report No.(s): AD-A460821; USAARL-2006-13; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460821

The U.S. Army, under the auspices of the Air Warrior Product Office, is developing a modular helmet-mounted display (HMD) for four aircraft series within its helicopter fleet. A design consideration is mounting the HMDs to the HGU-56P Aviator's Night Vision Imaging System (ANVIS) mount. This particular mount is being considered, presumably due to its inherent cost savings, as the mount is already part of the helmet. Mounting the HMD in this position may have consequences for the daylight performance of these HMDs, as well as increasing the forward weight of the HMD. The latter would have consequences for helmet weight and center-of-mass biodynamic issues. Calculations were made of the increased luminance needed as a consequence of mounting the HMD in front of an HGU-56P tinted visor as opposed to mounting it behind the visor. By mounting in front of the helmet's visor, the HMD's light output will be filtered as light coming from the outside world. Special consideration then would have to be given to the HMD's light source selection process, as not to select a source that would differentially reduce luminance by a mounted visor (e.g., laser protection visor) compared to the ambient light in the aviator's field-of-view.
DTIC
Aircraft Pilots; Center of Mass; Helmet Mounted Displays; Helmets; Imaging Techniques; Luminance; Mounting; Night Vision; Supports

20070007661 California Univ., Santa Cruz, CA USA
Multi-Frame Demosaicing and Super-Resolution of Color Images
Farsiu, Sina; Elad, Michael; Milanfar, Peyman; Jan 2006; 40 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F49620-03-1-0387
Report No.(s): AD-A460916; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460916

In the last two decades, two related categories of problems have been studied independently in the image restoration literature: super-resolution and demosaicing. A closer look at these problems reveals the relation between them, and as conventional color digital cameras suffer from both low-spatial resolution and color-filtering, it is reasonable to address them in a unified context. In this paper, we propose a fast and robust hybrid method of super-resolution and demosaicing, based on a MAP estimation technique by minimizing a multi-term cost function. The L1 norm is used for measuring the difference between the projected estimate of the high-resolution image and each low-resolution image, removing outliers in the data and errors due to possibly inaccurate motion estimation. Bilateral regularization is used for spatially regularizing the luminance component, resulting in sharp edges and forcing interpolation along the edges and not across them. Simultaneously, Tikhonov regularization is used to smooth the chrominance components. Finally, an additional regularization term is used to force similar edge location and orientation in different color channels. We show that the minimization of the total cost function is relatively easy and fast. Experimental results on synthetic and real data sets confirm the effectiveness of our method.
DTIC
Color; Color Photography; Digital Cameras; Restoration

20070008047 Texas A&M Univ., College Station, TX USA
Quantum Optical Implementation of Quantum Computing and Quantum Informatics Protocols
Scully, Marlan O; Zubairy, M S; May 31, 2006; 7 pp.; In English
Contract(s)/Grant(s): FA9550-05-1-0433
Report No.(s): AD-A460844; No Copyright; Avail.: CASI: A02, Hardcopy

An enumeration of several research efforts funded by the above award is attached. Key aspects reported on include: (a) Optically controlled delays for broadband pulses and all-optic steering; (b) Sub-wavelength atom localization: (c)Quantum microscopy; (d) Quantum lithography with classical light; (e) Quantum entanglement: Measures and generation schemes.
DTIC
Protocol (Computers); Quantum Computation; Quantum Optics

20070008282 McCutchen (Bingham), LLP, San Francisco, CA, USA
Silica Sol Gel Micro-Laser on a Substrate and Method of Fabrication
Vahala, K. J.; Yang, L.; 9 Nov 04; 19 pp.; In English
Contract(s)/Grant(s): ONR-N00014-00-1-0650
Patent Info.: Filed Filed 9 Nov 04; US-Patent-Appl-SN-10-985 593
Report No.(s): PB2007-102957; No Copyright; Avail.: CASI: A03, Hardcopy

Silica sol gel micro-lasers and methods of fabricating micro-lasers on a chip or a wafer. A silica sol gel micro-laser includes a silica sol gel optical micro-cavity, a substrate, and a support member or pillar that extends between the micro-cavity and the substrate. An outer surface or periphery of the micro-cavity extends beyond a top of the sol gel support member or is overhanging with respect to the underlying support member. Optical energy travels along an inner surface of the silica sol gel micro-cavity. Undoped silica sol gel micro-cavities can be used for Raman lasers. Sol gel micro-cavities can be doped with, for example, erbium, and can be used for erbium-doped micro-lasers that have ultra narrow line widths, for example, less than 100 Hz. Undoped and doped silica sol gel micro-lasers can have Q factors greater than 10.sup.7.
NTIS
Fabrication; Lasers; Silica Gel; Sol-Gel Processes; Substrates

20070008294 Lawrence Livermore National Lab., Livermore, CA USA
High Power 938 Nanometer Fiber Laser and Amplifier
Dawson, J. W.; Liao, Z. M.; Beach, R. J.; Drobshoff, A. D.; Payne, S. A.; 29 Sep 03; 18 pp.; In English
Contract(s)/Grant(s): DE-W-7405-ENG-48
Patent Info.: Filed Filed 29 Sep 03; US-Patent-Appl-SN-10-674 513
Report No.(s): PB2007-102954; No Copyright; Avail.: CASI: A03, Hardcopy

An optical fiber amplifier includes a length of silica optical fiber having a core doped with neodymium, a first cladding and a second cladding each with succeeding lower refractive indices, where the first cladding diameter is less than 10 times the diameter of the core. The doping concentration of the neodymium is chosen so that the small signal absorption for 816 nm light traveling within the core is less than 15 dB/m above the other fiber losses. The amplifier is optically pumped with one laser into the fiber core and with another laser into the first cladding.
NTIS
Cladding; Fiber Lasers; Light Amplifiers; Optical Fibers

20070008355 Sandia National Labs., Albuquerque, NM USA
SAR Amibuous Range Supperssion
Doerry, A. W.; Sep. 01, 2006; 16 pp.; In English
Report No.(s): DE2006-893128; SAND2006-5332; No Copyright; Avail.: Department of Energy Information Bridge

Pulsed Radar systems suffer range ambiguities, that is, echoes from pulses transmitted at different times arrive at the receiver simultaneously. Conventional mitigation techniques are not always adequate. However, pulse modulation schemes exist that allow separation of ambiguous ranges in Doppler space, allowing easy filtering of problematic ambiguous ranges.
NTIS
Pulse Radar; Range Finders; Synthetic Aperture Radar

20070008410 Lawrence Livermore National Lab., Livermore, CA USA

Quarterly Progress Report for Q2 FY06 for Complex Transient Events in Materials Studied Using Ultrafast Electron Probes and Terascale Simulation (FWP SCW0289)

Campbell, G. H.; Mar. 31, 2006; 10 pp.; In English

Report No.(s): DE2006-891064; UCRL-TR-220327; No Copyright; Avail.: Department of Energy Information Bridge

In this quarter (Q2 FY06), the DTEM underwent a substantial reconfiguration of its laser systems. The cathode laser system was changed to provide greater numbers of electrons per pulse by lengthening the time duration of the pulse to 30 ns. The greater number of electrons per pulse has allowed us to acquire high quality pulsed images and diffraction patterns. The spatial resolution in the single pulsed image has been measured at better than 20 nm. The diffraction patterns are now more comparable to conventional electron microscope operation. Examples are found in the body of the report. We summarize important achievements in the following list: 1. Instrument performance and design improvements: the laser system was changed for the cathode photoemission system (75 ns at 1053 nm wavelength converted to 30ns at 211 nm wavelength) to give longer electron pulses at the same current to yield more electrons per pulse; new specimen drive laser constructed; and new computer monitored and controlled alignment systems installed for both laser systems to facilitate laser alignment through a user friendly computer interface. 2. Experimental Progress: the spatial resolution of pulsed images was tested by imaging a cross-section of multilayer thin foils with 30 nm and 20 nm periods. Single pulse images were observed to have spatial resolution better than 20 nm. This combination of 20 nm spatial and 30 ns temporal resolution is thought to be highest combined spatial and temporal measurement ever made; and the quality of single pulse electron diffraction patterns have been improved to the point where differentiating the HCP from BCC patterns in Ti is substantially easier. The spatial coherence of the electron illumination on the specimen was improved to give much smaller diffraction spots in the pattern.

NTIS

Electron Probes; Lasers; Simulation

20070008753 University Coll., Cork, Ireland

Proceedings of the Conference on Emerging Technologies in Optical Sciences (ETOS 2004) held at University College Cork, Ireland on July 26-29, 2004

Huyet, Guillaume; Moloney, Jerome; Jul 29, 2004; 116 pp.; In English

Contract(s)/Grant(s): FA8655-04-1-5067

Report No.(s): AD-A461504; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA461504

The Final Proceedings for Conference on Emerging Technologies in Optical Sciences, 26 July 2004 - 29 July 2004 Dilute Nitrides, Generation and Propagation of Short Pulses, High Power Semiconductor Lasers , Microcavities, Photonic Crystals, Photonic Crystal Fibers, Photonic Systems, Quantum Dot Based Devices, Simulations of Photonic Devices.

DTIC

Conferences; Ireland; Universities

20070008780 New Mexico Inst. of Mining and Technology, Socorro, NM USA

MROI's Automated Alignment System

Jurgenson, C A; Buscher, D F; Creech-Eakman, M J; Haniff, C A; Young, J S; Coleman, T A; Parameswariah, C B; Seneta, E; Bakker, E J; Jan 2006; 10 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00173-01-2-C902

Report No.(s): AD-A461542; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA461542

We present an outline of the automated alignment system for the 350m baseline Magdalena Ridge Observatory Interferometer (MROI) which will manage the simultaneous alignment of its six principal optical subsystems (telescopes, beam relay trains, delay lines, beam reducing telescopes, switchyards, and beam combiners). Many of these components will be held under vacuum, will be subject to varying thermal loads and will use different coatings (optimized for either optical or near-IR wavelengths). We review the proposed architecture of our scheme and discuss the procedures, tools, and optical analyses we have used to design it.

DTIC

Alignment; Interferometers

20070008781 New Mexico Inst. of Mining and Technology, Socorro, NM USA

Project Management of an Imaging Optical Interferometer

Bakker, E J; Creech-Eakman, M J; Jan 2006; 14 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00173-01-2-C902

Report No.(s): AD-A461543; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA461543

The Magdalena Ridge Observatory Interferometer (MROI) is part of a new observatory dedicated to astronomical research. It is a 6 element optical interferometer currently in its construction phase, with a planned phase B of 10 elements. The observatory is located within 32 km from the centre of the Very Large Array (VLA) at an altitude of approximately 3230 meters. The design is optimized for faint source imaging. This makes it one of the most advanced high spatial resolution optical instruments available to the scientific community. With a staffing of up to 20 scientists and engineers, and a large fraction of the telescopes, buildings, and delay lines outsourced to industry and consortium partners, it aims for an aggressive schedule to have first fringe with 6 telescopes in late 2009. A project this size in budget, tight milestones and deadlines, requires professional management. In this paper we address the basic principles that are followed in the project management approach. We describe a generic approach and at some instances the implementation chosen at MROI.

DTIC

Imaging Techniques; Interferometers; Optical Measurement; Optical Measuring Instruments; Project Management

20070008809 New Mexico Inst. of Mining and Technology, Socorro, NM USA

Magdalena Ridge Observatory Interferometer: Status Update

Creech-Eakman, M J; Bakker, E J; Buscher, D F; Coleman, T A; Haniff, C A; Jurgenson, C A; Klinglesmith, III, D A; Parameswariah, C B; Romero, V D; Shtromberg, A V; Young, J S; Jan 2006; 13 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00173-01-2-C902

Report No.(s): AD-A461577; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA461577

The Magdalena Ridge Observatory Interferometer (MROI) is a ten element optical and near-infrared imaging interferometer being built in the Magdalena mountains west of Socorro, NM at an altitude of 3230 m. The interferometer is being designed and built by a collaboration which includes the New Mexico Institute of Mining and Technology (NMT) as the prime contractor and center for the technical team, and the University of Cambridge, Physics Department at the Cavendish Laboratory, which participates in the design and executes work packages under contract with NMT. This manuscript serves as a status update on MROI, and will present progress and milestones toward the observatory's first fringes in 2008.

DTIC

Image Processing; Infrared Imagery; Interferometers; Near Infrared Radiation; Observatories; Optical Measurement

20070009182 California Univ., Santa Cruz, CA USA

Advances and Challenges in Super-Resolution

Farsiu, Sina; Robinson, Drik; Elad, Michael; Milanfar, Peyman; Mar 15, 2004; 12 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F49620-03-I-0387; NSF-CCR-9984246

Report No.(s): AD-A462048; No Copyright; Avail.: CASI: A03, Hardcopy

Super-Resolution reconstruction produces one or a set of high-resolution images from a sequence of low-resolution frames. This article reviews a variety of Super-Resolution methods proposed in the last 20 years, and provides some insight into, and a summary of, our recent contributions to the general Super-Resolution problem. In the process, a detailed study of several very important aspects of Super-Resolution, often ignored in the literature, is presented. Specifically, we discuss robustness, treatment of color, and dynamic operation modes. Novel methods for addressing these issues are accompanied by experimental results on simulated and real data. Finally, some future challenges in Super-Resolution are outlined and discussed.

DTIC

High Resolution; Images

20070009246 Naval Research Lab., Washington, DC USA

Free-Space Optical Communications Link at 1550-nm using Multiple-Quantum-Well Modulating Retroreflectors in a Marine Environment

Rabinovich, W S; Mahon, R; Burris, H R; Gilbreath, G C; Goetz, P G; Moore, C I; Stell, M F; Vilcheck, M J; Witkowsky, J L; Swingen, L; May 2005; 13 pp.; In English

Report No.(s): AD-A462152; No Copyright; Avail.: CASI: A03, Hardcopy

A 1550-nm eye-safe, free-space optical communications link is demonstrated at rates up to 5 Mbits/s over a distance of 2 km in the Chesapeake Bay, using quantum-well-based modulating retroreflectors. Tests are conducted under various atmospheric conditions over a time period of about a year. The experimental and theoretical link budgets are compared and statistical measurements of the effects of scintillation are collected.

DTIC

Communication Networks; Data Links; Free-Space Optical Communication; Marine Environments; Modulation; Optical Communication; Quantum Wells; Retroreflectors

76
SOLID-STATE PHYSICS

Includes condensed matter physics, crystallography, and superconductivity. For related information see also *33 Electronics and Electrical Engineering*; and *36 Lasers and Masers*.

20070006675 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA, Liverpool Univ., UK

Intrabeam Scattering Studies for the ILC Damping Rings Using a New Matlab Code

Reichel, I.; Wolski, A.; January 2006; 3 pp.; In English

Report No.(s): DE2006-889249; No Copyright; Avail.: National Technical Information Service (NTIS)

A new code to calculate the effects of intrabeam scattering (IBS) has been developed in MATLAB based on the approximation suggested by K. Bane. It interfaces with the Accelerator Toolbox but can also read in lattice functions from other codes. The code has been benchmarked against results from other codes for the ATF that use this approximation or do the calculation in a different way. The new code has been used to calculate the emittance growth due to intrabeam scattering for the lattices currently proposed for the ILC Damping Rings, as IBS is a concern, especially for the electron ring. A description of the code and its user interface, as well as results for the Damping Rings, will be presented.

NTIS

Damping; Particle Accelerators; Scattering; Storage Rings (Particle Accelerators)

20070006676 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA, Liverpool Univ., UK

Tracking Studies to Determine the Required Wiggler Aperture for the ILC Damping Rings

Reichel, I.; Wolski, A.; January 2006; 3 pp.; In English

Report No.(s): DE2006-889250; No Copyright; Avail.: National Technical Information Service (NTIS)

The injection efficiency of an ILC damping ring is closely tied to its acceptance. To maximize both, one wants a physical aperture as large as possible in the wiggler magnets, as these are likely to be the limiting physical apertures in the ring. On the other hand, a small aperture in the wiggler magnets is needed to achieve the required field profile, a high magnetic field that is very linear over the whole physical aperture of the magnet. Tracking studies were done for all proposed ILC damping ring lattices to determine their required physical apertures. Although a half-aperture of 8 or 10mm had been proposed, our studies showed that, for most lattices, a 16mm half-aperture is required. For some lattices a 12mm half aperture might suffice. We present here the results of our studies, which led to adopting a 16mm half-aperture in the current ILC damping ring baseline design.

NTIS

Apertures; Damping; Wiggler Magnets

20070006677 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA

Neutrino Factories and Beta Beams

Zisman, M. S.; January 2006; 5 pp.; In English

Report No.(s): DE2006-889251; No Copyright; Avail.: National Technical Information Service (NTIS)

In this paper we briefly review the concepts of Neutrino Factories and Beta Beam facilities, and indicate the main challenges in terms of beam performance and technological developments. We also describe the worldwide organizations that

have embarked on defining and carrying out the necessary R&D on component design, beam simulations of facility performance, and benchmarking of key subsystems via actual beam tests. Currently approved subsystem tests include the Muon Ionization Cooling Experiment (MICE), under construction at Rutherford Appleton Laboratory, and the Mercury Intense Target (MERIT) experiment, to be carried out at CERN. These experiments are briefly described, and their schedules are indicated.
NTIS
Test Facilities; Neutrino Beams; Particle Accelerators; Particle Theory

20070006684 Rochester Univ., NY, USA
Low Emittance Electron Beam Studies
Tikhoplav, R.; January 2006; 139 pp.; In English
Report No.(s): DE2006-892283; No Copyright; Avail.: National Technical Information Service (NTIS)

We have studied the properties of a low emittance electron beam produced by laser pulses incident onto an rf gun photocathode. The experiments were carried out at the A0 photoinjector at Fermilab. Such beam studies are necessary for fixing the design of new Linear Colliders as well as for the development of Free Electron Lasers. An overview of the A0 photoinjector is given in Chapter 1. In Chapter 2 we describe the A0 photoinjector laser system. A stable laser system is imperative for reliable photoinjector operation. After the recent upgrade, we have been able to reach a new level of stability in the pulse-to-pulse fluctuations of the pulse amplitude, and of the temporal and transverse profiles. In Chapter 3 we present a study of transverse emittance versus the shape of the photo-cathode drive-laser pulse. For that purpose a special temporal profile laser shaping device called a pulse-stacker was developed. In Chapter 4 we discuss longitudinal beam dynamics studies using a two macro-particle bunch; this technique is helpful in analyzing pulse compression in the magnetic chicane, as well as velocity bunching effects in the rf-gun and the 9-cell accelerating cavity. In Chapter 5 we introduce a proposal for laser acceleration of electrons. We have developed a laser functioning on the TEM*01 mode, a mode with a longitudinal electric field component which is suitable for such a process. Using this technique at energies above 40 MeV, one would be able to observe laser-based acceleration.
NTIS
Electron Beams; Emittance; Free Electron Lasers; Particle Accelerators

20070006692 Texas Univ., Austin, TX, USA, Fermi National Accelerator Lab., Batavia, IL, USA
Initial Tests of an AC Dipole for the Tevatron
Miyamoto, R.; Jansson, A.; Kopp, S.; Syphers, M.; January 2006; 9 pp.; In English
Report No.(s): DE2006-892297; FERMILAB-CONF-06-165-AD; No Copyright; Avail.: Department of Energy Information Bridge

The AC dipole is a device to diagnose transverse motions of a beam. It can achieve large-amplitude oscillations without two inevitable problems of conventional kicker/pinger magnets: decoherence and emittance growth. While not the first synchrotron to operate with an AC dipole, the Tevatron can now make use of its recently upgraded BPM system, providing unprecedented resolution for use with an AC dipole, to measure both linear and nonlinear properties of the accelerator. Plans are to provide AC dipole systems for both transverse degrees of freedom. Preliminary tests have been done using an audio power amplifier with an existing vertical pinger magnet, producing oscillation amplitudes up to 2o at 150 GeV. In this paper, we will present the configuration of this system. We also show the analysis of a first few data sets, including the direct measurement of beta functions at BPM locations.
NTIS
Alternating Current; Particle Accelerators

20070006703 Rochester Univ., NY USA, Fermi National Accelerator Lab., Batavia, IL, USA
Radiation Experience with CDF Silicon Detectors
Husemann, U.; May 24, 2006; 4 pp.; In English
Report No.(s): DE2006-892261; FERMILAB-CONF-05-606-E; CDF/PUB/CDF/PUBLIC/7974; No Copyright; Avail.: Department of Energy Information Bridge

The silicon detectors of the CDF experiment at the Tevatron collider are operated in a harsh radiation environment. The lifetime of the silicon detectors is limited by radiation damage, and beam-related incidents are an additional risk. This article describes the impact of beam-related incidents on detector operation and the effects of radiation damage on electronics noise

and the silicon sensors. From measurements of the depletion voltage as a function of the integrated luminosity, estimates of the silicon detector lifetime are derived.
NTIS
Radiation Detectors; Silicon; Particle Accelerators

20070006722 Ohio State Univ., Columbus, OH, USA
Standard Model and Supersymmetric Higgs Searches at CDF
Kilminster, B.; Jan. 03, 2006; 6 pp.; In English
Report No.(s): DE2006-892266; FERMILAB-CONF-05-609-E; No Copyright; Avail.: National Technical Information Service (NTIS)

We present the results on the searches for the SM and the MSSM Higgs boson production in proton-antiproton collisions at .. s = 1.96 GeV with the CDF detector. The Higgs bosons are searched for in various production and decay channels, with data samples corresponding to 4001. Using these measurements, we set an upper limit on the production cross section times branching fraction for the Standard Model Higgs as a function of the Higgs mass, and we obtain exclusion regions in the tanb vs mass for the neutral MSSM Higgs, and branching fraction vs mass for the charged Higgs.
NTIS
Supersymmetry; Standard Model (Particle Physics); Higgs Bosons

20070006750 National Renewable Energy Lab., Golden, CO USA
Method for Low-Temperature, Hetero-Epitaxial Growth of Thin Film CSI on Amorphous and Multi-Crystalline Substrates and C-SI Devices on Amorphous, Multi-Crystalline, and Crystalline Substrates
Branz, H. M.; Ginley, D. S.; Teplin, C. W.; 15 Mar 05; 18 pp.; In English
Contract(s)/Grant(s): DE-AC36-99-C010337
Patent Info.: Filed Filed 15 Mar 05; US-Patent-Appl-SN-11-083-345
Report No.(s): PB2007-101332; No Copyright; Avail.: CASI: A03, Hardcopy

A crystalline, highly textured or biaxially textured, foreign (non-silicon) material, which is closely lattice-matched to silicon, is deposited on a glass or other amorphous or multi-crystalline substrate to provide a template for hetero-epitaxial growth of highly ordered crystalline silicon semiconductor layers on such substrates. This process enables crystalline silicon semiconductor devices, such as photovoltaic devices, transistors, and the like, on such inexpensive substrates, or to enable reduced temperature processing for some kinds of semiconductor devices, such as bottom gate transistors, on crystalline silicon substrates.
NTIS
Amorphous Materials; Crystallinity; Epitaxy; Patent Applications; Substrates; Thin Films

20070006779 Fermi National Accelerator Lab., Batavia, IL, USA, North Central Coll., Naperville, IL, USA
Residual Activation of Thin Accelerator Components
Mokhov, N. V.; Rakhno, E. I.; Rakhno, I. L.; May 18, 2006; 15 pp.; In English
Report No.(s): DE2006-892321; FERMILAB-FN-0788-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

A method to calculate residual activation of thin accelerator components is presented. A model for residual dose estimation for thick objects made of arbitrary composite materials for arbitrary irradiation and cooling times is employed in this study. A scaling procedure is described to apply the model to thin objects with linear dimensions less than a fraction of a nuclear interaction length. The scaling has been performed for various materials and corresponding factors have been determined for objects of certain shapes (slab, solid and hollow cylinder) which are important from practical standpoint and can serve as models for beam pipes, magnets and collimators. Both contact residual dose and dose attenuation in air outside the objects were considered. A comparison between calculations and measurements performed at the Fermi National Accelerator Laboratory using a 120 GeV proton beam is presented.
NTIS
Particle Accelerators; Irradiation

20070006795 Pennsylvania Univ., Philadelphia, PA, USA
Hybrid Materials and Methods for Producing the Same
Luzzi, D. E.; Smith, B. W.; 7 Mar 05; 7 pp.; In English
Contract(s)/Grant(s): DE-FC02-86ER45254; NSF-DMR98-02560

Patent Info.: Filed Filed 7 Mar 05; US-Patent-Appl-SN-11-074 222
Report No.(s): PB2007-102866; No Copyright; Avail.: CASI: A02, Hardcopy

A hybrid material is provided which comprises a first single-walled nanotube having a lumen, and a fill molecule contained within the lumen of the single-walled nanotube. A method for producing the hybrid material is also provided wherein a single-walled nanotube is contacted with a fill molecule to cause the fill molecule to enter the lumen of the single-walled nanotube.

NTIS

Nanotubes; Composite Materials

20070007270 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA

International Scoping Study of a Future Accelerator Neutrino Complex

Zisman, M. S.; January 2006; 3 pp.; In English

Report No.(s): DE2006-889252; No Copyright; Avail.: National Technical Information Service (NTIS)

The International Scoping Study (ISS), launched at NuFact05 to evaluate the physics case for a future neutrino facility, along with options for the accelerator complex and detectors, is laying the foundations for a subsequent conceptual-design study. It is hosted by Rutherford Appleton Laboratory (RAL) and organized by the international community, with participants from Europe, Japan, and the U.S. Here we cover the work of the Accelerator Working Group. For the 4-MW proton driver, linacs, synchrotrons, and Fixed-Field Alternating Gradient (FFAG) rings are considered. For targets, issues of both liquid-metal and solid materials are examined. For beam conditioning, (phase rotation, bunching, and ionization cooling), we evaluate schemes both with and without cooling, the latter based on scaling-FFAG rings. For acceleration, we examine scaling FFAGs and hybrid systems comprising linacs, dogbone RLAs, and non-scaling FFAGs. For the decay ring, we consider racetrack and triangular shapes, the latter capable of simultaneously illuminating two different detectors at different long baselines. Comparisons are made between various technical approaches to identify optimum design choices.

NTIS

Neutrinos; Particle Accelerators

20070007275 Fermi National Accelerator Lab., Batavia, IL, USA

Quick Guide to SUSY Tools

Skands, P. Z.; January 2006; 6 pp.; In English

Report No.(s): DE2006-879113; FERMILAB-CONF-06-004-T; No Copyright; Avail.: Department of Energy Information Bridge

The last decade has seen the emergence of a wide range of automated calculations for supersymmetric extensions of the Standard Model. This guide contains a brief summary of these, with the main focus on hadron collider phenomenology, as well as a brief introduction to the so-called SUSY Les Houches Accord. See also the Les Houches Web Repository for BSM Tools.

NTIS

Standard Model (Particle Physics); Hadrons

20070007701 Georgia Tech Research Inst., Atlanta, GA USA

Chip-Scale WDM Devices Using Photonic Crystals

Adibi, Ali; May 1, 2006; 20 pp.; In English

Contract(s)/Grant(s): F49620-03-1-0362; Proj-2305

Report No.(s): AD-A461016; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461016

This AFOSR-supported research was aimed at realizing several chip-scale optical devices needed as building blocks for implementing integrated optical systems. To achieve this, we developed several theoretical, fabrication, and characterization tools and procedures for photonic crystals. Some of the main achievements of the previous AFOSR-funded research at the device level are as follows: (1) Photonic crystal waveguides (PCWs) with low loss, large transmission bandwidth, and very low dispersion and distortion in their pass-band for efficient guiding of light; the bi-periodic PCW proposed and demonstrated in our research has shown the best performance among all proposed PCW structures in terms of low propagation loss and available guiding bandwidth; (2) Photonic crystal superprism-based demultiplexers for compact separation of spectral channels in an integrated platform; the focusing superprism idea proposed and experimentally demonstrated for the first time within this program carries the world record on PC demultiplexing in integrated platforms with at least two orders of magnitude smaller size (while having the same performance) compared to all existing implementations of the same structure;

(3) Theoretical prediction of very compact photonic crystal couplers with performance that cannot be achieved in other integrated platforms; (4) Theoretical investigation and demonstration of optical cavities with high quality factors. The fabrication techniques to reliably make these structures have also been optimized.
DTIC
Chips; Crystals; Integrated Optics; Waveguides; Wavelength Division Multiplexing

20070007707 New Mexico Univ., Albuquerque, NM USA
Coupled Quantum Dots and Photonic Crystals for Nanophotonic Devices
Huffaker, Diana L; Choquette, Kent D; Sep 2006; 20 pp.; In English
Contract(s)/Grant(s): F49620-03-1-0433; Proj-4113
Report No.(s): AD-A461030; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461030

To this end we worked to combine engineered QD5 with engineered PC cavities to explore and exploit simultaneous electronic and optical confinement. Technical thrusts included Nanocavity design and device development along with integration with the quantum dot (QD) active region. The first approach which we considered was to incorporate self-assembled QD5 into the starting epitaxial material, where the PC nanocavities are fabricated after growth. The PCs design and fabrication was optimized for high cavity Q and minimal cavity volume. In parallel, we developed nanopatterning capability to arbitrarily place a single QD or an ensemble of identical QUs within the PC.
DTIC
Crystals; Nanostructures (Devices); Quantum Dots

20070008330 Stanford Linear Accelerator Center, CA, USA, Stanford Univ., Stanford, CA USA
Monitoring Temperature and Fan Speed Using Ganglia and Winbond Chips
McCaffrey, C.; Sep. 27, 2006; 11 pp.; In English
Report No.(s): DE2006-892602; SLAC-TN-06-033; No Copyright; Avail.: Department of Energy Information Bridge

Effective monitoring is essential to keep a large group of machines, like the ones at Stanford Linear Accelerator Center (SLAC), up and running. SLAC currently uses Ganglia Monitoring System to observe about 2000 machines, analyzing metrics like CPU usage and I/O rate. However, metrics essential to machine hardware health, such as temperature and fan speed, are not being monitored. Many machines have a Winbond w83782d chip which monitors three temperatures, two of which come from dual CPUs, and returns the information when the sensor command is invoked. Ganglia also provides a feature, gmetric, that allows the users to monitor their own metrics and incorporate them into the monitoring system. The programming language Perl is chosen to implement a script that invokes the sensors command, extracts the temperature and fan speed information, and calls gmetric with the appropriate arguments. Two machines were used to test the script; the two CPUs on each machine run at about 65 Celsius, which is well within the operating temperature range (The maximum safe temperature range is 77-82 Celsius for the Pentium III processors being used). Installing the script on all machines with a Winbond w83782d chip allows the SLAC Scientific Computing and Computing Services group (SCCS) to better evaluate current cooling methods.
NTIS
Chips; Ganglia; Particle Accelerators; Fans

20070008331 Stanford Linear Accelerator Center, CA, USA
Optical Effects of the Wake Fields
Heifets, S.; Novokhatski, S.; Teytelman, D.; Sep. 01, 2006; 19 pp.; In English
Report No.(s): DE2006-892604; SLAC-PUB-12095; No Copyright; Avail.: National Technical Information Service (NTIS)

The authors discuss optical effects of the wake fields: synchronous phase and bunch length variation along the train of bunches, effect of the wakes on the tune and on the Twiss parameters.
NTIS
Charged Particles; Electron Beams; Optical Properties; Wakes

20070008341 Stanford Linear Accelerator Center, CA, USA, Cornell Univ., Ithaca, NY, USA, Wollongong Univ., Australia
Tests on MGB2 for Application to SRF Cavities
Tajima, T.; Canabal, A.; Zhao, Y.; Romanenko, A.; Nantista, C.; Oct. 2006; 3 pp.; In English
Report No.(s): DE2006-892967; SLAC-PUB-12149; No Copyright; Avail.: National Technical Information Service (NTIS)

Magnesium diboride (MgB(sub 2)) has a transition temperature (T(sub c)) of (approx) 40 K, i.e., about 4 times higher than niobium (Nb). Studies in the last 3 years have shown that it could have about one order of magnitude less RF surface resistance (R(sub s)) than Nb at 4 K and seems to have much less power dependence than high-T(sub c) materials such as YBCO. However, it was also found that it will depend on the way you deposit the film. The result from on-axis pulsed laser deposition (PLD) showed rapid increase in R(sub s) with higher surface magnetic fields compared to the film deposited with reactive evaporation method.
NTIS
Borides; Cavities; Magnesium; Particle Accelerators

20070008343 Consejo Superior de Investigaciones Cientificas, Madrid, Spain
Techniques for the Study of the ELectronic Properties
Fernandez-Garcia, M.; Rodriguez, J. A.; Jun. 2006; 31 pp.; In English
Report No.(s): DE2006-893009; BNL-76858-2006-BC; No Copyright; Avail.: Department of Energy Information Bridge

The electronic structure of a solid is affected by size and altered from the continuous electronic levels forming a band, characteristic of bulk or microsized solids, to discrete-like or quantized levels. This is drastically observed when the particle size goes down to the nano-meter range and is the origin of the so-called 'quantum confinement' terminology referring to this phenomenon. From a solid state point of view, electronic states of confined materials can be considered as being a superposition of bulk-like states with a concomitant increase of the oscillator strength. The valence/conduction band-width and position observables of a solid oxide are functions of the crystal potential and this, in turn, is perturbed by effect of the size in two ways; a short-range effect induced by the presence of ions with a different coordination number and bond distance, and a large-range one, induced by changes in the Madelung potential of the oxide. Theoretical analyses for oxides show a redistribution of charge when going from large periodic structures to small clusters which is roughly considered small for ionic solids and significantly important for covalent ones. Chapter 1 of this book describes the most recent theoretical frameworks employed to deal with these physical phenomena while here we will describe their influence in physico-chemical observables obtained by spectroscopical techniques.
NTIS
Electrical Properties; Electronic Structure; Oscillator Strengths

20070008345 Brookhaven National Lab., Upton, NY, USA, Consejo Superior de Investigaciones Cientificas, Madrid, Spain
Techniques for the Study of the Structural Properties
Rodriguez, J. A.; Fernandez-Garcia, M.; Martinez-Arias, A.; Hanson, J. C.; Jun. 2006; 47 pp.; In English
Report No.(s): DE2006-893010; BNL-76859-2006-BC; No Copyright; Avail.: National Technical Information Service (NTIS)

The evolution of our understanding of the behavior of oxide nanostructures depends heavily on the structural information obtained from a wide range of physical methods traditionally used in solid state physics, surface science and inorganic chemistry. In this chapter, we describe several techniques that are useful for the characterization of the structural properties of oxide nanostructures: X-ray diffraction (XRD) and scattering, X-ray absorption fine structure (XAFS), Raman spectroscopy, transmission electron microscopy (TEM), scanning tunneling microscopy (STM) and atomic force microscopy (AFM). The ultimate goal is to obtain information about the spatial arrangement of atoms in the nanostructures with precise interatomic distances and bond angles. This may not be possible for complex systems and one may get only partial information about the local geometry or morphology.
NTIS
Nanostructures (Devices); Oxides

20070008349 Brookhaven National Lab., Upton, NY, USA
First Lasing of 193 NM SASE, 4th Harmonic HGHG and ESASE at the NSLS SDL
Wang, X. J.; Shen, Y.; Watanabe, T.; Murphy, J. B.; Rose, J.; Aug. 28, 2006; 6 pp.; In English
Report No.(s): DE2006-893016; BNL-77067-2006-CP; No Copyright; Avail.: National Technical Information Service (NTIS)

The first lasing of three types of single-pass high-gain FELs, SASE at 193 nm, 4th harmonic HGHG at 199 nm and ESASE at the Source Development Lab (SDL) of Brookhaven National Laboratory (BNL) is reported. The saturation of 4th

harmonic HGHG and ESASE FELs was observed. We also observed the spectral broadening and instability of the 4th harmonic HGHG.
NTIS
Free Electron Lasers; Lasing; Particle Accelerators

20070008358 Iowa State Univ. of Science and Technology, Ames, IA USA
Soft-Lithographical Fabrication of Three-dimensional Photonic Crystals in the Optical Regime
Lee, J. H.; Aug. 09, 2005; 140 pp.; In English
Report No.(s): DE2006-892725; No Copyright; Avail.: Department of Energy Information Bridge

This dissertation describes several projects to realize low-cost and high-quality three-dimensional (3D) microfabrication using non-photolithographic techniques for layer-by-layer photonic crystals. Low-cost, efficient 3D microfabrication is a demanding technique not only for 3D photonic crystals but also for all other scientific areas, since it may create new functionalities beyond the limit of planar structures. However, a novel 3D microfabrication technique for photonic crystals implies the development of a complete set of sub-techniques for basic layer-by-layer stacking, inter-layer alignment, and material conversion. One of the conventional soft lithographic techniques, called microtransfer molding ((mu)TM), was developed by the Whitesides group in 1996. Although (mu)TM technique potentially has a number of advantages to overcome the limit of conventional photolithographic techniques in building up 3D microstructures, it has not been studied intensively after its demonstration. This is mainly because of technical challenges in the nature of layer-by-layer fabrication, such as the demand of very high yield in fabrication. After two years of study on conventional (mu)TM, We have developed an advanced microtransfer molding technique, called two-polymer microtransfer molding (2P-(mu)TM) that shows an extremely high yield in layer-by-layer microfabrication sufficient to produce highly layered microstructures. The use of two different photo-curable prepolymers, a filler and an adhesive, allows for fabrication of layered microstructures without thin films between layers. The capabilities of 2P-(mu)TM are demonstrated by the fabrication of a wide-area 12-layer microstructure with high structural fidelity. Second, we also had to develop an alignment technique. We studied the 1st-order diffracted moire fringes of transparent multilayered structures comprised of irregularly deformed periodic patterns. By a comparison study of the diffracted moire fringe pattern and detailed microscopy of the structure, we show that the diffracted moire fringe can be used as a nondestructive tool to analyze the alignment of multilayered structures. We demonstrate the alignment method for the case of layer-by-layer microstructures using soft lithography. The alignment method yields high contrast of fringes even when the materials being aligned have very weak contrasts. The imaging method of diffracted moire fringes is a versatile visual tool for the microfabrication of transparent deformable microstructures in layer-by-layer fashion. Third, we developed several methods to convert a polymer template to dielectric or metallic structures, for instance, metallic infiltration using electrodeposition, metallic coating using sputter deposition, dielectric infiltration using titania nano-slurry, and dielectric coating using atomic layer deposition of Titania.
NTIS
Crystals; Fabrication; Lithography

20070008362 Fermi National Accelerator Lab., Batavia, IL, USA, Texas Univ., Austin, TX, USA, Brookhaven National Lab., Upton, NY USA, Pittsburgh Univ., PA, USA
Operation of the NuMI Beam Monitoring System
Swaska, R. M.; Indurthy, D.; Keisler, R.; Kopp, S.; Mendoza, S.; Jun. 01, 2006; 8 pp.; In English
Report No.(s): DE2006-892421; FERMILAB-CONF-06-090-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

The NuMI (Neutrinos at the Main Injector) facility produces an intense neutrino beam for experiments. The NuMI Beam Monitoring system is four arrays of ion chambers that measure the intensity and distribution of the remnant hadron and tertiary muon beams produced in association with the neutrinos. The ion chambers operate in an environment of high particle fluxes and high radiation.
NTIS
Injectors; Neutrino Beams; Neutrinos

20070008368 Fermi National Accelerator Lab., Batavia, IL, USA, Texas Univ., Austin, TX, USA, Harvard Univ., Cambridge, MA, USA
Proposal for Continuously Variable Neutrino Beam Energy for the NuMI Facility
Kostin, M.; Kopp, S.; Messier, M.; Harris, D.; Hylen, J.; Jul. 01, 2006; 21 pp.; In English
Report No.(s): DE2006-892412; FERMILAB-TM-2353-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

The NuMI Facility was intended to be flexibly changed between 3 energies of beams, LE, ME, and HE. However, the changeover requires extensive downtime to move and realign horns and the target. We propose to implement a flexible arrangement where the target can be remotely moved in the beamline direction to change the beam energy and the horns remain fixed. In addition to having the attractive feature of keeping the horn optics fixed, the motion of the target can be performed more quickly and hence on a more frequent basis. We discuss potential increases in statistics in the high energy region, systematic cross-checks available, and the improved beam monitoring capabilities with such variable energy beams.
NTIS
Neutrino Beams; Test Facilities

20070008393 Stanford Linear Accelerator Center, CA, USA
Search for the B(0) to e(+)e(-)gamma and B(0) --\g mu(+)mu(-)gamma Decays
Aubert, B.; Jul. 23, 2006; 8 pp.; In English
Report No.(s): DE2006-892611; SLAC-PUB-12000; No Copyright; Avail.: National Technical Information Service (NTIS)
With the BABAR detector at the PEP-II asymmetric B Factory at SLAC, they present the first search for the decays B(sup 0) (yields) (ell)(sup +)(ell)(sup -)(gamma) ((ell) = e, (mu)). Using a data set of 292 fb(sup -1) collected at the (Upsilon)(4S) resonance, they find no significant signal and set the following branching fraction upper limits at 90% confidence level: (Beta)(B(sup 0) (yields) e(sup +)e(sup -)(gamma)) \h 0.7 x 10(sup -7) and (Beta)(B(sup 0) (yields) (mu)(sup +)(mu)(sup -)(gamma)) \h 3.4 x 10(sup -7).
NTIS
Linear Accelerators; Particle Accelerators; Decay; Asymmetry

20070008652 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Evaluation of Microbial Diversity in Wetland through Polymerase Chain Reaction (PCR) and Restriction Fragment Length Polymorphism (RFLP)
Joseph, Gregory K; Jun 2006; 216 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461285; AFIT/GES/ENV/06J-02; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461285
The diversity of microbial communities in wetlands has not been fully measured. These communities may offer tools to naturally remediate sites polluted with chlorinated compounds. Polmerase Chain Reaction (PCR) and Restriction Fragment Length Polymorphism (RFLP) are genomic techniques that are capable of rapidly characterizing bacteria communities and can provide valuable information about the diversity of microbial communities.
DTIC
Bacteria; Fragments; Microorganisms; Polymerization; Polymorphism; Wetlands

20070008981 California Univ., Santa Cruz, CA USA
High Performance Multi Barrier Thermionic Devices
Vashaee, Daryoosh; Shakouri, Ali; Jan 2003; 5 pp.; In English
Report No.(s): AD-A461854; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461854
Thermoelectric transport perpendicular to layers in multiple barrier superlattice structures is investigated theoretically in two limiting cases of no lateral momentum scattering and strong scattering. In the latter regime when lateral momentum is not conserved, the number of electrons participating in thermionic emission will dramatically increase. The cooling power density is calculated using Fermi-Dirac statistics, density-of-states for a finite quantum well and the quantum mechanical transmission coefficient in the superlattice. Calculation results show that metallic based superlattices with tall barriers (\g10 eV) can achieve a large power factor on the order of 0.06W/mK squared with a moderate electronic contribution to thermal conductivity of 1.8W/mK. If the lattice contribution to thermal conductivity is on the order of 1W/mK, ZT values higher than 5 can be achieved at room temperature.
DTIC
Electrons; Scattering; Superlattices; Thermal Conductivity; Thermionic Emission; Thermoelectricity

20070009068 Brown Univ., Providence, RI USA
A Spectral Vanishing Viscosity Method for Stabilizing Low-Dimensional Galerkin Systems
Sirisup, S; Karniadakis, G E; Sep 13, 2002; 25 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461766; No Copyright; Avail.: CASI: A03, Hardcopy

Low-dimensional flow dynamical systems are susceptible to instabilities after long-time integration. In this paper, we investigate the stability of such two-dimensional models constructed from Karhunen-Loeve expansions for flows past a circular cylinder. We first demonstrate that although the short-term dynamics may be predicted accurately with only a handful of modes retained, instabilities arise after a few hundred vortex shedding cycles. We then propose a dissipative model based on a spectral vanishing viscosity (SVV) diffusion convolution operator as an effective way of stabilizing low-dimensional Galerkin systems.
DTIC
Galerkin Method; Spectra; Stability; Stabilization; Viscosity

77
PHYSICS OF ELEMENTARY PARTICLES AND FIELDS

Includes quantum mechanics; theoretical physics; and statistical mechanics. For related information see also *72 Atomic and Molecular Physics, 73 Nuclear Physics*, and *25 Inorganic, Organic and Physical Chemistry*.

20070006805 Los Alamos National Lab., NM USA
Improvement of Photon Buildup Factors for Radiological Assessment
Schinners, F. G.; January 2006; 96 pp.; In English
Report No.(s): DE2006-891568; LA-14296; No Copyright; Avail.: Department of Energy Information Bridge

Slant-path buildup factors for photons between 1 keV and 10 MeV for nine radiation shielding materials (air, aluminum, concrete, iron, lead, leaded glass, polyethylene, stainless steel, and water) are calculated with the most recent cross-section data available using Monte Carlo and discrete ordinates methods. Discrete ordinates calculations use a 244-group energy structure that is based on previous research at Los Alamos National Laboratory (LANL), but extended with the results of this thesis, and its focused studies on low-energy photon transport and the effects of group widths in multigroup calculations. Buildup factor calculations in discrete ordinates benefit from coupled photon/electron cross sections to account for secondary photon effects. Also, ambient dose equivalent (herein referred to as dose) buildup factors were analyzed at lower energies where corresponding response functions do not exist in literature. The results of these studies are directly applicable to radiation safety at LANL, where the dose modeling tool Pandemonium is used to estimate worker dose in plutonium handling facilities. Buildup factors determined in this thesis will be used to enhance the code's modeling capabilities, but should be of interest to the radiation shielding community.
NTIS
Aluminum; Photons; Radiation Protection; Radiology; Shielding

20070008709 Worcester Polytechnic Inst., MA USA
Wavefunction Engineering of Spintronic devices in ZnO/MgO and GaN/AlN Quantum Structures Doped with Transition Metal Ions
Ram-Mohan, L R; Aug 2006; 24 pp.; In English
Contract(s)/Grant(s): F49620-03-1-0399
Report No.(s): AD-A461432; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461432

The electronic band structure of wurtzite semiconductor heterostructures was investigated theoretically using the envelope function formalism. I developed a Lagrangian approach for the valence bands so that the order of the derivatives appearing in the multiband picture is explicitly specified when Schrodinger's equations for the envelope functions are generated through the application of the principle of least action, via the finite element method. Boundary conditions at material interfaces were examined in detail. The theoretical results were obtained for arbitrary growth directions and the spin-orbit interaction and inversion asymmetry effects were taken into account. This is of interest for A-plane wurtzite heterostructures of ZnO/MgZnO and GaN/AlGaN systems grown on R-plane sapphire. The FEm approach gives wavefunctions and allows device modeling. Calculations for quantum wells and superlattices are presented. Results for magnetization in DMS No-doped structures were also developed.
DTIC
Doped Crystals; Magnesium Oxides; Metal Ions; Semiconductors (Materials); Transition Metals; Wave Functions

20070008917 Naval Research Lab., Washington, DC USA

InGaAs Multiple Quantum Well Modulating Retro-Reflector for Free Space Optical Communications

Rabinovich, W S; Gilbreath, G C; Goetz, Peter G; Mahon, R; Kazter, D S; Ikossi-Anasatasiou, K; Binari, S; Meeham, T J; Ferraro, M; Sokolsky, I; Vasquez, J A; Vilcheck, M J; Jan 2002; 13 pp.; In English

Report No.(s): AD-A461734; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461734

Modulating retro-reflectors provide a means for free space optical communication without the need for a laser, telescope or pointer tracker on one end of the link. These systems work by coupling a retro-reflector with an electro-optic shutter. The modulating retro-reflector is then interrogated by a cw laser beam from a conventional optical communications system and returns a modulated signal beam to the interrogator. Over the last few years the Naval Research Laboratory has developed modulating retro-reflector based on corner cubes and large area Transmissive InGaAs multiple quantum well modulators. These devices can allow optical links at speed up to about 10 Mbps. We will discuss the critical performance characteristics of such systems including modulating rate, power consumption, optical contrast ratio and operating wavelength. In addition a new modulating retro-reflector architecture based upon cat's eye retroreflectors will be discussed. This architecture has the possibility for data rates of hundreds of megabits per second at power consumptions below 100 mW.

DTIC

Free-Space Optical Communication; Indium Gallium Arsenides; Modulation; Optical Communication; Quantum Wells; Reflectors; Retroreflectors

20070008931 Naval Research Lab., Washington, DC USA

Large Aperture Quantum Well Shutters for Fast Retroreflected Optical Data Links in Free Space

Gilbreath, G C; Rabinovich, W S; Mahon, Rita; Corson, Michael R; Ferraro, Mena; Katzer, D S; Ikossi-Anatasiou, K; Meehan, Timothy; Kline, John F; Jan 1999; 8 pp.; In English; Original contains color illustrations

Report No.(s): AD-A461753; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461753

This paper reports progress on the development of a fast modulating retroreflector for a free space optical data link. A previous publication reported sustaining video over a 17 meter link using a multiple quantum well shutter with a diameter of 0.5 cm at a rate on the order of 0.5 Mbps, limited by the demonstration electronics. This work describes improvements in the device performance, which is on the order of 4 Mbps to 6 Mbps with a Bit Error Rates of 10 to the -6th over a robust optical link. This device lends itself to an array configuration for long range applications and will clearly support T1 rates of 1.54 Mbps, and higher.

DTIC

Apertures; Data Links; Quantum Wells; Retroreflectors

82
DOCUMENTATION AND INFORMATION SCIENCE

Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography. For computer program documentation see *61 Computer Programming and Software*.

20070007342 Texas Univ., Arlington, TX USA

Comparison of Graph-Based and Logic-Based Multi-Relational Data Mining

Ketkar, Nikhil S; Holder, Lawrence B; Cook, Diane J; Dec 2005; 9 pp.; In English

Contract(s)/Grant(s): F30602-01-2-0570

Report No.(s): AD-A459043; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA459043

We perform an experimental comparison of the graph-based multi-relational data mining system, Subdue, and the inductive logic programming system, CProgol, on the Mutagenesis dataset and various artificially generated Bongard problems. Experimental results indicate that Subdue can significantly outperform CProgol while discovering structurally large multi-relational concepts. It is also observed that CProgol is better at learning semantically complicated concepts and it tends to use background knowledge more effectively than Subdue. An analysis of the results indicates that the differences in the performance of the systems are a result of the difference in the expressiveness of the logic-based and the graph-based representations. The ability of graph-based systems to learn structurally large concepts comes from the use of a weaker representation whose expressiveness is intermediate between propositional and first-order logic. The use of this weaker

representation is advantageous while learning structurally large concepts but it limits the learning of semantically complicated concepts and the utilization background knowledge.
DTIC
Data Mining; Information Retrieval; Relational Data Bases

20070007354 New York Univ., New York, NY USA
Automatic Pattern Acquisition for Japanese Information Extraction
Sudo, Kiyoshi; Sekine, Satoshi; Grishman, Ralph; Jan 2001; 8 pp.; In English
Contract(s)/Grant(s): N66001-00-1-8917
Report No.(s): AD-A460210; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460210

One of the central issues for information extraction is the cost of customization from one scenario to another. Research on the automated acquisition of patterns is important for portability and scalability. In this paper, we introduce Tree-Based Pattern representation where a pattern is denoted as a path in the dependency tree of a sentence. We outline the procedure to acquire Tree-Based Patterns in Japanese from un-annotated text. The system extracts the relevant sentences from the training data based on TF/IDF scoring and the common paths in the parse tree of relevant sentences are taken as extracted patterns.
DTIC
Extraction; Information Retrieval; Japan; Pattern Recognition

20070007358 Defense Acquisition Univ., Fort Belvoir, VA USA
Redesigning Acquisition Processes: A New Methodology Based on the Flow of Knowledge and Information
Kock, Ned; Murphy, Frederic; Jul 2001; 79 pp.; In English
Report No.(s): AD-A460219; No Copyright; Avail.: CASI: A05, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460219

Current business process redesign practices, in the defense sector as well as in business in general, are based on several assumptions inherited from Taylor s scientific management method, including the key assumption that activity-flow representations should provide the basis for business process redesign. While this assumption was probably correct for most organizations in the early 1900s, it is clearly inconsistent with the fact that, currently information is what flows the most in business processes, even in manufacturing organizations. This project is based on the key assumption that the current focus of business process redesign approaches should be on information flows rather than activity flows. The main goal of this project is to develop a methodology for redesigning acquisition processes based on knowledge and information-flow analysis. The methodology, called InfoDesign, focuses on the knowledge embedded in a business process, the information processing resources involved in execution of the process, and the information flowing through the process. The InfoDesign methodology was developed and partially validated during a one-year project. The validation of the methodology was conducted as an action research study in which one acquisition process involving the U.S. Government and one key supplier was analyzed and redesigned. The results of the study support the key assumption on which InfoDesign was built that current business process redesign approaches should focus on information flows rather than activity flows.
DTIC
Acquisition; Data Processing

20070007360 Defence Research and Development Canada, Valcartier, Quebec Canada
Crisis Response Interoperability System: Enabling Multi-National and Multi-Agency Defence Against Terrorism
Roy, Jean; Dessureault, Dany; Letourneau, Francois; Oct 25, 2004; 55 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460221; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460221

No abstract available
Emergencies; Interoperability; Management Methods; Situational Awareness; Terrorism

20070007365 New York Univ., New York, NY USA
A Survey for Multi-Document Summarization
Sekine, Satoshi; Nobata, Chikashi; Jan 2003; 9 pp.; In English
Contract(s)/Grant(s): N66001-001-1-8917; IIS-0081962
Report No.(s): AD-A460234; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460234

Automatic Multi-Document summarization is still hard to realize. Under such circumstances, we believe, it is important to observe how humans are doing the same task, and look around for different strategies. We prepared 100 document sets similar to the ones used in the DUC multi-document summarization task. For each document set, several people prepared the following data and we conducted a survey. A) Free style summarization B) Sentence Extraction type summarization C) Axis (type of main topic) D) Table style summary In particular, we will describe the last two in detail, as these could lead to a new direction for multisummarization research.
DTIC
Surveys

20070007369 New York Univ., New York, NY USA
Robust Text Processing in Automated Information Retrieval
Strzalkowski, Tomek; Jan 1993; 12 pp.; In English
Contract(s)/Grant(s): N00014-90-J-1851; IRI-89-02304
Report No.(s): AD-A460240; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460240

This paper outlines a prototype text retrieval system which uses relatively advanced natural language processing techniques in order to enhance the effectiveness of statistical document retrieval. The backbone of our system is a traditional retrieval engine which builds inverted index files from pre-processed documents, and then searches and ranks the documents in response to user queries. Natural language processing is used to (1) preprocess the documents in order to extract contents-carrying terms, (2) discover inter-term dependencies and build a conceptual hierarchy specific to the database domain, and (3) process user's natural language requests into effective search queries. The basic assumption of this design is that term-based representation of contents is in principle sufficient to build an effective if not optimal search query out of any user's request. This has been confirmed by an experiment that compared effectiveness of expert-user prepared queries with those derived automatically from an initial narrative information request. In this paper we show that large-scale natural language processing (hundreds of millions of words and more) is not only required for a better retrieval, but it is also doable, given appropriate resources. We report on selected preliminary results of experiments with 500 MByte database of Wall Street Journal articles, as well as some earlier results with a smaller document collection.
DTIC
Data Processing; Information Retrieval; Texts

20070007372 SRI International Corp., Menlo Park, CA USA
Two Principles of Parse Preference
Hobbs, Sr , Jerry R; Bear, John; Apr 18, 1990; 12 pp.; In English
Contract(s)/Grant(s): N00014-85-C-0013
Report No.(s): AD-A460252; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460252

The DIALOGIC system for syntactic analysis and semantic translation has been under development for over ten years, and during that time it has been used in a number of domains in both database interface and message-processing applications. In addition, it has been tested on a number of sentences of linguistic interest. Built into the system are facilities for ranking parses according to syntactic and selectional considerations, and over the years, as various kinds of ambiguity have become apparent, heuristics have been devised for choosing the preferred parses. Our aim in this paper is first to present a compendium of many of these heuristics and secondly to propose two principles that seem to underlie the heuristics. The %first will be useful to researchers engaged in building grammars of similarly broad coverage, The second is of psychological interest and may be a guide for estimating parse preferences for newly discovered ambiguities for which we lack the experience to decide among on a more empirical basis. The mechanism for implementing parse preference heuristics is quite simple. Terminal nodes of a parse tree acquire a score (usually 0) from the lexical entry for the word sense. When a nonterminal node of a parse tree is constructed, it is given an initial score which is the sum of the scores of its child nodes. Various conditions are checked during the construction of the node and, as a result, a score of 20, 10, 3, -3,10, or -20 may be added to the initial score. The score of the parse is the score of its root node. The parses of ambiguous sentences are ranked according to their scores. Although simple, this method has been very successful. In this paper, however, rather than describe the heuristics in terms this detailed, we will describe them in terms of the preferences among the alternate structures that motivated our scoring schemes.
DTIC
Data Bases; Electric Terminals; Syntax; Translating

20070007374 SRI International Corp., Menlo Park, CA USA

A Network-Based Knowledge Representation and Its Natural Deduction System

Fikes, Richard; Hendrix, Gary G; Jul 1977; 44 pp.; In English

Contract(s)/Grant(s): DAAG29-76-C-0011; DAAG29-76-C-0012

Report No.(s): AD-A460260; TN-147; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460260

We describe a knowledge representation scheme called K-NET and a problem solving system called SNIFFER designed to answer queries using a K-NET knowledge base. K-NET uses a partitioned semantic net to combine the expressive capabilities of the first-order predicate calculus with linkage to procedural knowledge and with full indexing of objects to the relationships in which they participate. Facilities are also included for representing taxonomies of sets and for maintaining hierarchies of contexts. SNIFFER is a manager and coordinator of deductive and problem-solving processes. The basic system includes a logically complete set of natural deduction facilities that do not require statements to be converted into clause or prenex normal form. Using SNIFFER's coroutine-based control structure, alternative proofs may be constructed in pseudo-parallel and results shared among them. In addition, SNIFFER can also manage the application of specialist procedures that have specific knowledge about a particular domain or about the topology of the K-NET structures. For example, specialist procedures are used to manipulate taxonomic information and to link the system to information in external data bases.

DTIC

Knowledge Based Systems; Knowledge Representation; Problem Solving

20070007377 Mitre Corp., Bedford, MA USA

Information Management Meets the Semantic Web

Semy, Salim K; Linderman, Mark; Pulvermacher, Mary K; Nov 2003; 10 pp.; In English

Report No.(s): AD-A460265; MITRE-03-1011; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460265

Finding the right information at the right time and in the right format becomes increasingly difficult as more information from myriad producers is made available to increasingly diverse communities of information consumers. The development of approaches to effectively manage this information and facilitate automated processing will help to address the challenges of a burgeoning information environment. Approaches to help overcome these challenges continue to emerge. This paper considers the convergence of enabling technologies from two information sharing approaches - the Joint Battlespace Infosphere (JBI) and the Semantic Web. The JBI facilitates and manages information sharing between producers and consumers, while the Semantic Web defines the semantics of the universe of web-based information. This paper examines the interplay of the JBI, as an example of an information management infrastructure, and the Semantic Web. We examine several facets of information management that will benefit from the Semantic Web as well as identify issues addressed by information management that will need to be addressed for mission-critical application of the Semantic Web. Finally, this paper discusses fundamental differences between the JBI and the Semantic Web that emanate from their current application contexts. We conclude with an overall perspective on their relationship and highlight areas of future research.

DTIC

Data Management; Information Management; Internets; Semantics

20070007390 Naval Postgraduate School, Monterey, CA USA

Modeling Macro-Cognitive Influence on Information Sharing between Members of a Joint Team

Burnett, Steven F; Dec 2006; 255 pp.; In English; Original contains color illustrations

Report No.(s): AD-A460396; No Copyright; Avail.: CASI: A12, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460396

Research exploring the effectiveness of joint military teams lacks the empirical robustness found in similar multicultural team research from the business domain. This research study broadens the study of effective military teams through an assessment of the factors that influence a joint team's effectiveness by capitalizing on the business and psychological communities' exploration of successful team performance. Specifically, this research examines several key elements of poor team effectiveness identified by the business community in three empirical studies. The first study examined cultural orientation and service personality using two survey instruments: the Matsumoto Cultural Styles Questionnaire and the Neuroticism, Extraversion, Openness to Experience Five Factor Inventory (NEO FFI). The results showed that cultural and personality differences exist at significant levels between the services. The second study examined team information sharing processes in a war game environment composed of homogeneous and heterogeneous four-person teams. The results revealed that participants on heterogeneous teams, cued to the presence of cultural and personality differences among the team

members, performed as well as homogeneous teams. The third study expanded the knowledge space of the team experiment by developing an agent-based model to replicate the war game. The model accurately represented the experimental data, confirming the author's hypothesis that computational models coded with actual data sets from human experimentation are more robust than models coded with notional data sets. The results demonstrate that joint team effectiveness improves by incorporating methodologies used in the business and simulation science communities.
DTIC
Military Operations; Military Personnel; Personality

20070007396 University of Southern California, Marina del Rey, CA USA
Upper Modeling: organizing knowledge for natural language processing
Bateman, John A; Jan 1990; 9 pp.; In English
Contract(s)/Grant(s): F49620-87-C-0005; MDA903-87-C-641
Report No.(s): AD-A460405; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460405

A general, reusable computational resource has been developed within the Penman text generation project for organizing domain knowledge appropriately for linguistic realization. This resource, called the upper model, provides a domain- and task-independent classification system' that supports sophisticated natural language processing while significantly simplifying the interface between domain-specific knowledge and general linguistic resources. This paper presents the results of our experiences in designing and using the upper model in a variety of applications over the past 5 years. In particular, we present our conclusions concerning the appropriate organization of an upper model, its domain- independence, and the types of interrelationships that need to be supported between upper model and grammar and semantics.
DTIC
Data Processing; Hierarchies; Information Management; Linguistics; Mathematical Models; Natural Language (Computers); Natural Language Processing; Texts

20070007399 Carnegie-Mellon Univ., Pittsburgh, PA USA
Army ASSIP System of Systems Test Metrics Task
Sledge, Carol A; Nov 2006; 43 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8721-05-C-0003
Report No.(s): AD-A460413; CMU/SEI-2006-SR-011; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460413

The Army Strategic Software Improvement Program goal is to dramatically improve the acquisition of software- intensive systems by focusing on acquisition programs, people, and production/sustainment and by institutionalizing continuous improvement. This special report contains a briefing (slides and accompanying notes) on the results of one subtask of this effort conducted during FY06. The subtask called for three actions: (1) explore the (then) current processes and test results/metrics used to address system-of-systems integration and testing, (2) develop findings and recommendations for improvement based on this initial exploration, and (3) recommend future work to further improve the Army's system-of-systems integration and test practices. The Army is in the lead in addressing the many challenges associated with system-of-systems integration and testing, paving the way for the rest of the U.S. Department of Defense (DoD). As a result, the information contained in this report is useful to other organizations facing similar challenges.
DTIC
Computer Programming; Computer Programs; Security; Software Engineering

20070007400 Carnegie-Mellon Univ., Pittsburgh, PA USA
Attribute-Driven Design (ADD), Version 2.0
Wojcik, Rob; Bachmann, Felix; Bass, Len; Clements, Paul; Merson, Paulo; Nord, Robert; Wood, Bill; Nov 2006; 55 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8721-05-C-0003
Report No.(s): AD-A460414; CMU/SEI-2006-TR-023; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460414

This report revises the Attribute-Driven Design (ADD) method that was developed by the Carnegie Mellon Software Engineering Institute. The motivation for revising ADD came from practitioners who use the method and want ADD to be easier to learn, understand, and apply. The ADD method is an approach to defining a software architecture in which the design

process is based on the software quality attribute requirements. ADD follows a recursive process that decomposes a system or system element by applying architectural tactics and patterns that satisfy its driving quality attribute requirements. This technical report revises the steps of ADD and offers practical guidelines for carrying out each step. In addition, important design decisions that should be considered at each step are provided.
DTIC
Architecture (Computers); Computer Programs; User Requirements

20070007406 Brookhaven National Lab., Upton, NY USA
A System for Discovering Bioengineered Threats by Knowledge Base Driven Mining of Toxin Data
Swaminathan, S; Aug 2006; 52 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-1-0520
Report No.(s): AD-A460425; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460425

This project was funded to establish a Toxin Knowledge Base (TKB) which will encompass information about bacterial toxins in general and toxins relevant to biodefense, in particular. The overall goal of this project is to establish an easy to use database viz. a Knowledge Base to populate itself and expand using machine learning techniques, to make it more dynamic. It is designed to be a bioinformatics resource focused on molecular information about toxins and other virulence factors that are the natural products of biological and potential biological warfare (BW and PBW) agents. The major aim was to mine, assimilate, synthesize, analyze and disseminate genomic and structural information on BW and PBW genes and their products. Using advanced machine learning and data mining the TKB has been developed to look for motifs, to design new experiments and also to predict structure and function of molecules (including putative chimeras) for which these data are not available. TKB will use innovative computer methods to parse the literature available in public resources (web sites) to identify new and emerging toxins to be included in the database.
DTIC
Bacteria; Computer Techniques; Data Bases; Data Mining; Exploration; Information Retrieval; Knowledge Based Systems; Mining; Toxins and Antitoxins; Warfare

20070007414 Naval Postgraduate School, Monterey, CA USA
Neural Network Design on the SRC-6 Reconfigurable Computer
Bailey, Scott P; Dec 2006; 130 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460447; No Copyright; Avail.: CASI: A07, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460447

This thesis presents an approach to image classification via a Multi-Layer Perceptron (MLP) Artificial Neural Network (ANN) on the SRC-6 reconfigurable computer for use in classifying Low Probability of Intercept (LPI) radar emitters. The rationale behind the previously unexplored use of new reconfigurable computers combined with neural networks for this application is the potential for near real-time classification. Current potential near-peer competitors have access to LPI technology, so development of quick classification methods is crucial for ships to determine intent and to enable the possibility for self-defense against these types of emitters. The neural network, based on work conducted by Professor Phillip E. Pace of the Naval Postgraduate School (NPS), generates integer-cast weights by first using a sequential processor to conduct floating-point backpropagation to train the network on potential timefrequency images that allows generation of weights with lower overall Root Mean Squared (RMS) errors. The weights are then used in a parallel-processing reconfigurable computer for close to real-time classification. A second method of direct pixel comparison using Exclusive-Or (XOR) logic is presented as an alternative image classification method. Comparisons to similar representations in C++ are provided, for use in judging comparative error levels and timing between parallel and sequential processing methods.
DTIC
C (Programming Language); Classifications; Computers; Logic Design; Neural Nets; Real Time Operation; Reconfigurable Hardware

20070007417 Naval Postgraduate School, Monterey, CA USA
A Cost Benefit Analysis of Radio Frequency Identification (RFID) Implementation at the Naval Postgraduate School's Dudley Knox Library
Tiu, Joel D; Bahk, Shawn S; Dec 2006; 65 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460461; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460461

The purpose of this MBA project is to evaluate the potential of implementing Radio Frequency Identification (RFID) technology at the Naval Postgraduate School's Dudley Knox Library (DKL). DKL is an academic library supporting a graduate student population only. This study has both quantitative and qualitative analyses. A Cost Benefit Analysis (CBA) was conducted using data gathered from research which included personal interviews, site visits, and a survey questionnaire. Time and motion studies of selected library processes were conducted at DKL and a major public library. Vendors were invited to submit proposals for RFID systems to get the latest equipment available and associated cost estimates. The qualitative analysis addressed the advantages and disadvantages of an RFID system as well as privacy and other ancillary issues surrounding its implementation. This study did not attempt to quantify potential savings from collection management, an intangible benefit that could be addressed in future studies. Finally, the study presented several options to aid NPS decision makers on whether or not to implement an RFID system at DKL.
DTIC
Cost Analysis; Cost Effectiveness; Inventories; Libraries; Radio Frequencies; Schools

20070007443 Pennsylvania Univ., Philadelphia, PA USA
Converting Dependency Structures to Phrase Structures
Xia, Fei; Palmer, Martha; Jan 2001; 6 pp.; In English
Contract(s)/Grant(s): N66001-00-1-8915; NSF-89-20230-15
Report No.(s): AD-A460498; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460498

Treebanks are of two types according to their annotation schemata: phrase-structure Treebanks such as the English Penn Treebank [8] and dependency Treebanks such as the Czech dependency Treebank [6]. Long before Treebanks were developed and widely used for natural language processing, there had been much discussion of comparison between dependency grammars and context-free phrase structure grammars [5]. In this paper, we address the relationship between dependency structures and phrase structures from a practical perspective; namely, the exploration of different algorithms that convert dependency structures to phrase structures and the evaluation of their performance against an existing Treebank. This work not only provides ways to convert Treebanks from one type of representation to the other, but also clarifies the differences in representational coverage of the two approaches.
DTIC
Algorithms; Data Processing; Grammars; Natural Language (Computers)

20070007456 Pennsylvania Univ., Philadelphia, PA USA
Elements of a Computational Model of Cooperative Response Generation
Cheikes, Brant A; Webber, Bonnie L; Mar 9, 1989; 7 pp.; In English
Contract(s)/Grant(s): N0014-85-K-0018
Report No.(s): AD-A460528; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460528

If natural language question-answering (NLQA) systems are to be truly effective and useful, they must respond to queries cooperatively, recognizing and accommodating in their replies a questioner's goals, plans, and needs. This paper concerns the design of cooperative response generation (CRG) systems, NLQA systems that are able to produce integrated cooperative responses. We propose two characteristics of a computational model of cooperative response generation. First, we argue that CRG systems should be able to explicitly reason about and choose among the different response options available to them in a given situation. Second, we suggest that some choices of response content motivate others--that through a process called reflection, respondents detect the need to explain, justify, clarify or otherwise augment information they have already decided to convey.
DTIC
Information Retrieval; Information Systems; Linguistics; Mathematical Models; Natural Language (Computers); Natural Language Processing

20070007459 Pennsylvania Univ., Philadelphia, PA USA
A Simple Rule-Based Part of Speech Tagger
Brill, Eric; Jan 1992; 6 pp.; In English
Contract(s)/Grant(s): AFOSR-90-0066; DAAL03-89-C-0031
Report No.(s): AD-A460532; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460532

Automatic part of speech tagging is an area of natural language processing where statistical techniques have been more successful than rule-based methods. In this paper, we present a simple rule-based part of speech tagger which automatically acquires its rules and tags with accuracy comparable to stochastic taggers. The rule-based tagger has many advantages over these taggers, including: a vast reduction in stored information required, the perspicuity of a small set of meaningful rules, ease of finding and implementing improvements to the tagger, and better portability from one tag set, corpus genre or language to another. Perhaps the biggest contribution of this work is in demonstrating that the stochastic method is not the only viable method for part of speech tagging. The fact that a simple rule-based tagger that automatically learns its rules can perform so well should offer encouragement for researchers to further explore rule- based tagging, searching for a better and more expressive set of rule templates and other variations on the simple but effective theme described below.
DTIC
Data Processing; Marking; Natural Language (Computers)

20070007463 Naval Oceanography Command, NSTL Station, MS USA
'Surveymarine' A High Speed Hydrographic Survey Platform
Spinning, John N; Dixon, Dan G; Feb 1969; 26 pp.; In English
Report No.(s): AD-A460543; IR-69-27; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460543

Development of the HYDRA Survey System family of lightweight automated hydrographic data acquisition systems by the U. S. Naval Oceanographic Office (NAVOCEANO) has in turn generated a new requirement for an advanced family of survey platforms. To take full advantage of HYDRA's high density recording capabilities, an effective stable platform suitable for housing such equipment and operating at speeds in excess of 40 knots is essential. Those platforms showing the most promise are hydrofoils and sidewall hovercraft. NAVOCEANO has participated in several demonstrations of commercially available hovercraft and hydrofoils in addition to conducting a series of trials of its own. To date sidewall hovercraft have shown more potential as survey platforms owing to their greater range of efficient operating speeds. The intent of this report is to discuss the unique characteristics of a 51-foot sidewall hovercraft recently tested off the English Coast. This particular craft was completely fitted out with automated hydrographic data acquisition and survey control instrumentation. This report has been reviewed and is approved for release as an UNCLASSIFIED Informal Report.
DTIC
Data Acquisition; High Speed; Hydrography; Surveys

20070007467 General Electric Research and Development, Schenectady, NY USA
Tipster Shogun System (Joint GE-CMU): MUC-4 Test Results and Analysis
Krupka, George; Jaco, Paul; Mauldin, Michael; Kaufmann, Todd; Sider, Ira; Jan 1992; 5 pp.; In English
Report No.(s): AD-A460556; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460556

This paper reports on the joint GE-CMU Tipster SHOGUN customization effort for MUC-4, and analyzes the results of the TST3 and TST4 runs in comparison with the GE system. In its maiden test, the joint SHOGUN system performed very well. On the positive side, the system achieved very good overall results. On the negative side, because the system was barely ready in time for MUC-3, it was difficult to implement and test any significant modifications.
DTIC
Information Retrieval; Information Systems; Translating

20070007469 General Electric Research and Development, Schenectady, NY USA
GE-CMU: Description of the Tipster/Shogun System as Used for MUC-4
Jacobs, Paul; Krupka, George; Rau, Lisa; Kaufmann, Todd; Mauldin, Michael; Jan 1992; 4 pp.; In English
Report No.(s): AD-A460559; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460559

The GE-CMU team is developing the TIPSTER/SHOGUN system under the government-sponsored TIPSTER program, which aims to advance coverage, accuracy, and portability in text interpretation. The system will soon be tested on Japanese and English news stories in two new domains. MUC-4 served as the first substantial test of the combined system. Because the SHOGUN system takes advantage of most of the components of the GE NLTOOLSET except for the parser, this paper

supplements the NLTOOLSET system description by explaining the relationship between the two systems and comparing their performance on the examples from MUC-4.
DTIC
Information Retrieval; Information Systems; Translating

20070007475 Civil Aeromedical Inst., Oklahoma City, OK USA
The Air Traffic Control Operational Errors Severity Index: An Initial Evaluation
Bailey, Larry L; Schroeder, David J; Pounds, Julia; Apr 2005; 16 pp.; In English
Report No.(s): AD-A460573; DOT/FAA/AM-05/5; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460573

An initial evaluation of the Federal Aviation Administration's (FAA) Air Traffic Control (ATC) Operational Error (OE) Severity Index (SI) was conducted by the Civil Aerospace Medical Institute's (CAMI) Aerospace Human Factors Research Division (AAM-500). The SI is computed from data that, for the most part, can be objectively determined by post hoc investigation of OEs. Up to 100 points are assigned for varying levels of vertical separation, horizontal separation, closure rate, direction of flight paths, and the amount of controller awareness at the time of the OE. Based on the point totals, OEs are classified as follows: low (D), low moderate (C), high moderate (B), and high severity (A). This review and subsequent analyses focused on three key issues: (1) the distributional characteristics of operational errors, (2) the collision safety margin associated with SI point values, and (3) the objectivity associated with SI classifications of high moderate and high severity OEs. The authors concluded that the SI provides a rational approach for categorizing the severity of ATC Operational Errors. Although questions remained as to the SI cut scores used to categorize OEs, it was recommended that the cut scores should not be changed unless objective measures can be developed to support those changes. Seven tables and six figures are appended.
DTIC
Air Traffic Control; Air Traffic Controllers (Personnel); Classifications; Errors; Safety

20070007478 Department of Defense, Fort Meade, MD USA
Domain and Language Evaluation Results
Okurowski, Mary E; Jan 1993; 9 pp.; In English
Report No.(s): AD-A460578; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460578

The Fifth Message Understanding Conference (MUC-5) focused on the task of data extraction for two distinctly different applications, one within the domain of joint ventures (JV) and the other within the domain of microelectronics (ME) . For each application, the task could be performed in either English and/or Japanese, giving four combinations : English Joint Ventures, Japanese Joint Ventures, English Microelectronics, and Japanese Microelectronics . Interpreting the evaluation results across domains and within a single domain between languages is affected d by a number of factors. Differences in task focus, complexity, and domain technicality make it impossible to apply inferential statistics between domains . In addition, even though the task and the template design were the same across languages within a single domain, differences in the types of text sources for each language and accompanying variations in template fills and fill rules by language also make it impossible to apply inferential statistics between the language pairs . Moreover, there is considerable variation in the participants' level of effort and funding, and not all of the participants worked in multiple languages and/or multiple domains . In light of these factors, I will present descriptive statistics comparing error per response fill to address the following questions : (1) For both languages, what is the performance difference between domains? (2) Between domains, what are performance differences for the single shared object and for unattempted slots? (3) For both domains, what is the performance difference between languages? (4) For a single domain, what are representative differences at object and slot levels between English and Japanese? The discussion of domain and language difference s will center upon general factors that influence performance in information extraction.
DTIC
Data Processing; English Language; Information Retrieval; Microelectronics; Statistics

20070007480 Department of Defense, Fort Meade, MD USA
Building a Discourse-Tagged Corpus in the Framework of Rhetorical Structure Theory
Carlson, Lynn; Marcu, Daniel; Okurowski, Mary E; Jan 2001; 11 pp.; In English
Report No.(s): AD-A460581; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460581

We describe our experience in developing a discourse-annotated corpus for community-wide use. Working in the framework of Rhetorical Structure Theory, we were able to create a large annotated resource with very high consistency, using a well-defined methodology and protocol. This resource is made publicly available through the Linguistic Data Consortium to enable researchers to develop empirically grounded, discourse-specific applications.
DTIC
Data Processing; Hierarchies; Linguistics; Natural Language (Computers)

20070007487 Pennsylvania Univ., Philadelphia, PA USA
Automatic Predicate Argument Analysis of the Penn TreeBank
Palmer, Martha; Rosenzweig, Joseph; Cotton, Scott; Jan 2001; 6 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N66001-00-1-8915
Report No.(s): AD-A460592; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460592

One of the primary tasks of Information Extraction is recognizing all of the different guises in which a particular type of event can appear. For instance, a meeting between two dignitaries can be referred to as A meets B or A and B meet, or a meeting between A and B took place/was held/opened/convened/finished/dragged on or A had/presided over a meeting/conference with B There are several different lexical items that can be used to refer to the same type of event, and several different predicate argument patterns that can be used to specify the participants. Correctly identifying the type of the event and the roles of the participants is a critical factor in accurate information extraction. In this paper we refer to the specific subtask of participant role identification as predicate argument tagging. The type of syntactic and semantic information associated with verbs in Levin's Preliminary Classification of English verbs, [Levin,93] can be a useful resource for an automatic predicate argument tagging system. For instance, the meet class includes the following members, meet, consult, debate and visit, which can all be used to refer to the meeting event type described above. In addition, the following types of syntactic frames are associated with these verbs: A met/visited/debated/consulted B A met/visited/debated/consulted with B. A and B met/visited/debated/consulted (with each other). For the purposes of this paper we will only be considering sense distinctions based on different predicate argument structures. We begin by giving more information about the Levin classes and then describe the system that automatically labels the arguments in a predicate argument structure. We end by giving the results of evaluating this system versus human annotators performing the same task.
DTIC
Classifications; Hierarchies; Information Retrieval

20070007488 Massachusetts Inst. of Tech., Cambridge, MA USA
Collection of Spontaneous Speech for the ATIS Domain and Comparative Analyses of Data Collected at MIT and TI
Polifroni, Joseph; Seneff, Stephanie; Zue, Victor W; Jan 1991; 7 pp.; In English
Contract(s)/Grant(s): N00014-89-J-1332
Report No.(s): AD-A460594; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460594

As part of our development of a spoken language system in the ATIS domain, we have begun a small-scale effort in collecting spontaneous speech data. Our procedure differs from the one used at Texas Instruments (TI) in many respects, the most important being the reliance on an existing system, rather than a wizard, to participate in data collection. Over the past few months, we have collected over 3,600 spontaneously generated sentences from 100 subjects. This paper documents our data collection process, and makes some comparative analyses of our data with those collected at TI. The advantages as well as disadvantages of this method of data collection will be discussed.
DTIC
Data Acquisition; Speech

20070007490 General Electric Research and Development, Schenectady, NY USA
GE-CMU: Description of the Shogun System Used for MUC-5
Jacobs, Paul S; Krupka, George; Rau, Lisa; Mauldin, Michael L; Mitamura, Teruko; Jan 1993; 13 pp.; In English
Report No.(s): AD-A460596; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460596

This paper describes the GE-CMU TIPSTER/SHOGUN system as configured for the TIPSTER 24-month (MUC-5) benchmark, and gives details of the system's performance on the selected Japanese and English texts. The SHOGUN system

is a distillation of some of the key ideas that emerged from previous benchmarks and experiments, emphasizing a simple architecture in which the focus is on detailed corpus-based knowledge . This design allowed the project to meet its goal of achieving advances in coverage and accuracy while showing consistently good performance across languages and domains.
DTIC
Data Processing; Extraction; Information Retrieval; Knowledge Based Systems; Linguistics; Messages; Natural Language (Computers); Natural Language Processing; Texts

20070007492 Maryland Univ., College Park, MD USA
Rapidly Retargetable Interactive Translingual Retrieval
Levow, Gina-Anne; Oard, Douglas W; Resnik, Philip; Jan 2001; 6 pp.; In English
Contract(s)/Grant(s): N66001-97-C-8540; N66001-00-2-8910
Report No.(s): AD-A460598; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA460598

This paper describes a system for rapidly retargetable interactive translingual retrieval. Basic functionality can be achieved for a new document language in a single day, and further improvements require only a relatively modest additional investment. We applied the techniques first to search Chinese collections using English queries, and have successfully added French, German, and Italian document collections. We achieve this capability through separation of language-dependent and language-independent components and through the application of asymmetric techniques that leverage an extensive English retrieval infrastructure.
DTIC
Information Retrieval; Machine Translation; On-Line Systems

20070007495 Mitre Corp., Bedford, MA USA
MITRE-Bedford: Description of the ALEMBIC System as Used for MUC-4
Aberdeen, John; Burger, John; Connolly, Dennis; Roberts, Susan; Vilain, Marc; Jan 1992; 9 pp.; In English
Report No.(s): AD-A460609; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460609

The ALEMBIC text understanding system fielded at MUC-4 by MITRE Bedford is primarily based on natural language techniques . ALEMBIC is a research prototype that is intended to explore several major areas of investigation : 1)Error recovery, involving primarily issues of semi-parsing and recovery of plausible attachments; 2) Robustness, involving primarily issues of uncertain reasoning and tractable inference; 3)Self-extensibility, focusing primarily on machine learning of natural language and user - configurable semantics; and 4) System integration, through SGML (the Standard Generalized Markup Language), both at the level of meaning analysis and at the overall application level. This investigation is part of an internally-funded research initiative towards processing open source texts. The system's underlying architecture follows a task breakdown used in several other systems. Processing occurs in three distinct phases: preprocessing, natural language analysis, and application-specific output generation . One of the ways ALEMBIC differs from other MUC systems, however, is in exploiting SGML as the interchange lingua franca between these three processing phases. The intention is to allow system modules whose invocation occurs early in the analysis of a document to record processing results directly in the document through SGML markup . This information then becomes available to subsequent modules as meta-data.
DTIC
Linguistics; Natural Language Processing

20070007496 Massachusetts Inst. of Tech., Cambridge, MA USA
Development and Preliminary Evaluation of the MIT ATIS System
Seneff, Stephanie; Glass, James; Goddeau, David; Goodine, David; Hirschman, Lynette; Leung, Hong; Phillips, Michael; Polifroni, Joseph; Zue, Victor; Jan 1991; 7 pp.; In English
Contract(s)/Grant(s): N00014-89-J-1332
Report No.(s): AD-A460610; H91-1014; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460610

This paper represents a status report on the MIT ATIS system. The most significant new achievement is that we now have a speech-input mode. It is based on the MIT SUMMIT system using context independent phone models, and includes a word-pair grammar with perplexity 92 (on the June-90 test set). In addition, we have completely redesigned the back-end component, in order to emphasize portability and extensibility. The parser now produces an intermediate semantic frame

representation, which serves as the focal point for all back-end operations, such as history management, text generation, and structured query language (SQL) query generation. Most of those aspects of the system that are tied to a particular domain are now entered through a set of tables associated with a small artificial language for decoding them. We have also improved the display of the database table, making it considerably easier for a subject to comprehend the information given. We report here on the results of the official DARPA February-91 evaluation, as well as on results of an evaluation on data collected at MIT, for both speech input and text input.
DTIC
Linguistics; Natural Language Processing; Speech Recognition

20070007510 BBN Systems and Technologies Corp., Cambridge, MA USA
BBN: Description of the PLUM System as Used for MUC-5
Weischedel, Ralph; Ayuso, Damaris; Boisen, Sean; Fox, Heidi; Ingria, Robert; Matsukawa, Tomoyoshi; Papageorgiou, Constantine; MacLaughlin, Dawn; Kitagawa, Masaichiro; Saki, Tsutomu; Abe, June; Hosihi, Hiroto; Miyamoto, Yoichi; Jan 1993; 16 pp.; In English
Contract(s)/Grant(s): F30602-91-C-0051
Report No.(s): AD-A460639; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460639

Traditional approaches to the problem of extracting data from texts have emphasized hand-crafted linguistic knowledge. In contrast, BBN's PLUM system (Probabilistic Language Understanding Model) was developed as part of an ARPA-funded research effort on integrating probabilistic language models with more traditional linguistic techniques. Our research and development goals are: * more rapid development of new applications, * the ability to train (and re-train) systems based on user markings of correct and incorrect output, * more accurate selection among interpretations when more than one is found, and * more robust partial interpretation when no complete interpretation can be found. We began this research agenda approximately three years ago. During the past two years, we have evaluated much of our effort in porting our data extraction system (PLUM) to a new language (Japanese) and to two new domains. Three key design features distinguish PLUM: statistical language modeling, learning algorithms and partial understanding. The first key feature is the use of statistical modeling to guide processing. For the version of PLUM used in MUC-5, part of speech information was determined by using well-known Markov modeling techniques embodied in BBN's part-of-speech tagger POST [5]. We also used a correction model, AMED [3], for improving Japanese segmentation and part-of-speech tags assigned by JUMAN. For the microelectronics domain, we used a probabilistic model to help identify the role of a company in a capability (whether it is a developer, user, etc.). Statistical modeling in PLUM contributes to portability, robustness, and trainability. The second key feature is our use of learning algorithms both to obtain the knowledge bases used by PLUM's processing modules and to train the probabilistic algorithms. A third key feature is partial understanding. All components of PLUM are designed to operate on partially interpretable input.
DTIC
Data Processing; Information Retrieval; Knowledge Based Systems; Mathematical Models; Messages; Texts; Translating

20070007516 New York Univ., New York, NY USA
Discriminative Slot Detection Using Kernel Methods
Zhao, Shubin; Meyers, Adam; Grishman, Ralph; Jan 2004; 8 pp.; In English
Contract(s)/Grant(s): N66001-001-1-8917
Report No.(s): AD-A460647; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460647

Most traditional information extraction approaches are generative models that assume events exist in text in certain patterns and these patterns can be regenerated in various ways. These assumptions limited the syntactic clues being considered for finding an event and confined these approaches to a particular syntactic level. This paper presents a discriminative framework based on kernel SVMs that takes into account different levels of syntactic information and automatically identifies the appropriate clues. Kernels are used to represent certain levels of syntactic structure and can be combined in principled ways as input for an SVM. We will show that by combining a low level sequence kernel with a high level kernel on a GLARF dependency graph, the new approach outperformed a good rule-based system on slot filler detection for MUC-6.
DTIC
Discriminant Analysis (Statistics); Information Retrieval; Kernel Functions; Mathematical Models; Slots

20070007517 Unisys Corp., Paoli, PA USA
Unisys: MUC-3 Test Results and Analysis
Weir, Carl; McEntire, Robin; Silk, Barry; Finin, Tim; Jan 1991; 5 pp.; In English
Contract(s)/Grant(s): MDA-903-89-C-0041
Report No.(s): AD-A460648; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460648

The Unisys MUC-3 system is based on a three-tiered approach to text processing in which a novel an d quite powerful knowledge-based form of information retrieval plays a central role. The main components of this approach are as follows : 1. A Keyword-Based Information Retrieval Component - This component predicts the occurrence of types of events in texts based on the presence of key words and phrases. 2. A Knowledge-Based Information Retrieval Component - This component, called KBIRD in the Unisys MUC-3 system, performs the following tasks: Based on the co-occurrence of the predictions made by the keyword-based analysis component and expressions and concepts discovered in a given text, it predicts the likely occurrence of additional event types. It locates instances of predicted event types in texts. It identifies possible slot values for located instances of events. 3. A Linguistic Analysis Component - Although a natural language processing component was included in the design of the Unisys MUC-3 system as a third level of text analysis, not enough time was available during the MUC-3 development cycle both to develop a knowledge-based information retrieval component and to port the Unisys Pundit text-processing system to the MUC - 3 terrorist domain. A decision was made to focus on developing the knowledge-based information retrieval component and postpone the integration of Pundit until MUC-4. 4. A Template Generation Component - An application-specific Prolog program was written to merge templates describing the same event, and to select the most likely slot values for templates in cases where multiple slot values were proposed.
DTIC
Data Processing; Information Retrieval; Knowledge Based Systems; Natural Language (Computers); Texts

20070007519 University of Southern California, Los Angeles, CA USA
Using Unsupervised Link Discovery Methods to Find Interesting Facts and Connections in a Bibliography Dataset
Lin, Shou-de; Chalupsky, Hans; Jan 2003; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-01-2-0583
Report No.(s): AD-A460650; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460650

ABSTRACT This paper describes a submission to the Open Task of the 2003 KDD Cup. For this task contestants were asked to devise their own questions about the HEP-Th bibliography dataset, and the most interesting result would be selected as the winner. Instead of taking a more traditional approach such as starting with a inspection of the data, formulating questions or hypotheses interesting to us and then devising an analysis and approach to answer these questions, we tried to go a different route: can we develop a program that automatically finds interesting facts and connections in the data? To do this we developed a set of unsupervised link discovery methods that compute interestingness based on a notion of rarity and abnormality . The experiments performed on the HEP-Th dataset show that our approaches are able to automatically uncover interesting hidden connections (e.g. significant relationships between people) and unexpected facts (e.g. citation loops) without the support of any prerequisite knowledge or training examples. The interestingness of some of our results is self-evident. For others we were able to verify them by looking for supporting evidence on the World-Wide- Web, which shows that our methods can find connections between entities that actually are interestingly connected in the real world in an unsupervised way.
DTIC
Bibliographies; Hypotheses

20070007524 BBN Systems and Technologies Corp., Cambridge, MA USA
BBN: Description of the PLUM System as Used for MUC-6
Weischedel, Ralph; Ayuso, Damaris; Bikel, Daniel; Bobrow, Robert; Boisen, Sean; Burstein, Mark; Ferguson, William; Fox, Heidi; Hyde, Clinton; Ingria, Robert; Jan 1995; 16 pp.; In English
Contract(s)/Grant(s): DABT63-94-C-0062
Report No.(s): AD-A460656; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460656

This paper provides a quick summary of our technical approach, which has been developing since 1991 and was first fielded in MUC-3. First a quick review of what is new is provided, then a walk through of system components. Perhaps most interesting is out analysis, following the walk through, of what we learned through MUC-6 and of what directions we would

take now to break the performance barriers of current information extraction technology.
DTIC
Data Processing; Information Retrieval; Knowledge Based Systems; Mathematical Models; Messages; Texts; Translating

20070007527 General Accounting Office, Washington, DC USA
DOD's High-Risk Areas. Progress Made Implementing Supply Chain Management Recommendations, but Full Extent of Improvement Unknown
Jan 2007; 165 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460664; GAO-07-234; No Copyright; Avail.: CASI: A08, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460664

DOD's success in improving supply chain management is closely linked with its overall defense business transformation efforts and completion of a comprehensive, integrated logistics strategy. Our prior reviews and recommendations have addressed business management problems that adversely affect the economy, efficiency, and effectiveness of DOD s operations, and that have resulted in a lack of adequate accountability across several of DOD s major business areas. We have concluded that progress in DOD s overall approach to business transformation identified as a high-risk area in 2005 is needed to confront other high-risk areas, including supply chain management. We have made a number of recommendations to address defense business transformation, including strengthening the management of DOD s business systems modernization through the adoption of enterprise architecture and investment management best practices. In response, DOD has taken several actions intended to advance transformation, such as establishing governance structures like the Business Transformation Agency and developing an Enterprise Transition Plan aligned with its business enterprise architecture. As a separate effort, DOD has been developing a strategy to guide logistics programs and initiatives across the department. Called the To Be logistics roadmap, this strategy would identify the scope of logistics problems and capability gaps to be addressed and include specific performance goals, programs, milestones, resources, and metrics to guide improvements in supply chain management and other areas of DOD logistics. DOD has not established a target date for completing the To Be logistics roadmap. According to DOD officials, its completion is pending the results of the department s ongoing test of new concepts for managing logistics capabilities. Initial results of this test are expected to be available in the spring of 2007.
DTIC
Logistics Management; Organizations; Systems Integration

20070007529 BBN Systems and Technologies Corp., Cambridge, MA USA
BBN's PLUM Probabilistic Language Understanding System
Weischedel, Ralph; Ayuso, Damaris; Boisen, Sean; Fox, Heidi; Matsukawa, Tomoyoshi; Papageorgiou, Constantine; MacLaughlin, Dawn; Kitawa, Masaichiro; Saki, Tsutomu; Abe, June; Hosihi, Hiroto; Miyamoto, Yoichi; Miller, Scott; Jan 1993; 14 pp.; In English
Contract(s)/Grant(s): F30602-91-C-0051
Report No.(s): AD-A460668; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460668

Traditional approaches to the problem of extracting data from texts have emphasized hand-crafted linguistic knowledge In contrast, BBN's PLUM system (Probabilistic Language Understanding Model) was developed as part of an ARPA-funded research effort on integrating probabilistic language models with more traditional linguistic techniques. Our research and development goals are: * Achieving high performance in objective evaluations, such as the Tipster evaluations. * Reducing human effort in porting the natural language algorithms to new domains and to new languages. * Providing technology that is scalable to realistic applications. We began this research agenda approximately three years ago. During the past two years, we have ported our data extraction system (PLUM) to a new language (Japanese) and to two new domains.
DTIC
Data Processing; Information Retrieval; Knowledge Based Systems; Mathematical Models; Messages; Texts; Translating

20070007530 University of Southern California, Marina del Rey, CA USA
Electric Elves: Immersing an Agent Organization in a Human Organization
Pynadath, David V; Tambe, Milind; Arens, Yigal; Chalupsky, Hans; Gil, Yolanda; Knoblock, Craig; Lee, Haeyoung; Lerman, Kristina; Oh, Jean; Ramachandran, Surya; Jan 2000; 6 pp.; In English
Contract(s)/Grant(s): F30602-98-2-0108; F30602-97-C-0068
Report No.(s): AD-A460670; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460670

Future large-scale human organizations will be highly agentized, with software agents supporting the traditional tasks of information gathering, planning, and execution monitoring, as well as having increased control of resources and devices (communication and otherwise). As these heterogeneous software agents take on more of these activities, they will face the additional tasks of interfacing with people and sometimes acting as their proxies. Dynamic teaming of such heterogeneous agents will enable organizations to act coherently, to robustly attain their mission goals, to react swiftly to crises, and to dynamically adapt to events. Advances in this agentization could potentially assist all organizations, including the military, civilian disaster response organizations, corporations, and universities and research institutions. Within an organization, we envision that agent-based technology will facilitate (and sometimes supervise) all collaborative activities. For a research institution, agentization may facilitate such activities as meeting organization, paper composition, software development, and deployment of people and equipment for out-of-town demonstrations. For a military organization, agentization may enable the teaming of military units and equipment for rapid deployment, the monitoring of the progress of such deployments, and the rapid response to any crises that may arise. To accomplish such goals, we envision the presence of agent proxies for each person within an organization. Thus, for instance, if an organizational crisis requires an urgent deployment of a team of people and equipment, then agent proxies could dynamically volunteer for team membership on behalf of the people or resources they represent, while also ensuring that the selected team collectively possesses sufficient resources and capabilities.
DTIC

Computer Programs; Heterogeneity; Interprocessor Communication; Organizations; Submerging

20070007531 Library of Congress, Washington, DC USA

The Protection of Classified Information: The Legal Framework

Elsea, Jennifer K; Dec 21, 2006; 7 pp.; In English; Original contains color illustrations

Report No.(s): AD-A460675; CRS-RS21900; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460675

Recent incidents involving leaks of classified information have heightened interest in the legal framework that governs security classification, access to classified information, and penalties for improper disclosure. Classification authority has generally rested with the executive branch, although Congress has enacted legislation regarding the protection of certain sensitive information. While the Supreme Court has stated that the President has inherent constitutional authority to control access to sensitive information relating to the national defense or to foreign affairs, no court has found that Congress is without authority to legislate in this area. This report provides an overview of the relationship between executive and legislative authority over national security information, and summarizes the current laws and regulations that form the legal framework protecting classified information.
DTIC

Protection

20070007533 BBN Systems and Technologies Corp., Cambridge, MA USA

BBN: Description of the PLUM System as Used for MUC-3

Weischedel, Ralph; Ayuso, Damaris; Boisen, Sean; Ingria, Robert; Palmucci, Jeff; Jan 1991; 8 pp.; In English

Contract(s)/Grant(s): F30602-87-D-0093; F30602-91-C-0051

Report No.(s): AD-A460678; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460678

Traditional approaches to the problem of extracting data from texts have emphasized handcrafted linguistic knowledge. In contrast, BBN's PLUM system (Probabilistic Language Understanding Model) was developed as part of a DARPA-funded research effort on integrating probabilistic language models with more traditional linguistic techniques. Our research and development goals are * more rapid development of new applications, * the ability to train (and re-train) systems based on user markings of correct and incorrect output, * more accurate selection among interpretations when more than one is found, and * more robust partial interpretation when no complete interpretation can be found. We have previously performed experiments on components of the system with texts from the Wall Street Journal, however, the MUC-3 task is the first end-to-end application of PLUM. MI components except parsing were developed in the last 5 months, and cannot therefore be considered fully mature. The parsing component, the MIT Fast Parser [4], originated outside BBN and has a more extensive history prior to MUC-3. A central assumption of our approach is that in processing unrestricted text for data extraction, a non-trivial amount of the text will not be understood. As a result, all components of PLUM are designed to operate on partially understood input, taking advantage of information when available, and not failing when information is unavailable.
DTIC

Data Processing; Information Retrieval; Knowledge Based Systems; Mathematical Models; Messages; Texts; Translating

20070007536 BBN Systems and Technologies Corp., Cambridge, MA USA

BBN PLUM: MUC-4 Test Results and Analysis

Weischedel, Ralph; Ayuso, Damaris; Boisen, Sean; Fox, Heidi; Gish, Herbert; Ingria, Robert; Jan 1992; 8 pp.; In English

Contract(s)/Grant(s): F30602-91-C-0051

Report No.(s): AD-A460688; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460688

Our mid-term to long-term goals in data extraction from text for the next one to three years are to achieve much greater portability to new languages and new domains, greater robustness, and greater scalability. The novel aspect to our approach is the use of learning algorithms and probabilistic models to learn the domain-specific and language. specific knowledge necessary for a new domain and new language. Learning algorithms should contribute to scalability by making it feasible to deal with domains where it would be infeasible to invest sufficient human effort to bring a system up. Probabilistic models can contribute to robustness by allowing for words, constructions, and forms not anticipated ahead of time and by looking for the most likely interpretation in context. We began this research agenda approximately two years ago. During the last twelve months, we have focused much of our effort on porting our data extraction system (PLUM) to a new language (Japanese) and to two new domains. During the next twelve months, we anticipate porting PLUM to two or three additional domains. For any group to participate in MUC is a significant investment. To be consistent with our mid-term and long- term goals, we imposed the following constraints on ourselves in participating in MUC-4: * We would focus our effort on semi-automatically acquired knowledge. * We would minimize effort on handcrafted knowledge, and most generally. * We would minimize MUC-specific effort. Though the three self-imposed constraints meant our overall scores on the objective evaluation were not as high as if we had focused on handtuning and handcrafting the knowledge bases, MUC-4 became a vehicle for evaluating our progress on the long-term goals.

DTIC

Data Processing; Information Retrieval; Knowledge Based Systems; Mathematical Models; Messages; Texts; Translating

20070007546 Library of Congress, Washington, DC USA

Restructuring EPA's Libraries: Background and Issues for Congress

Bearden, David M; Esworthy, Robert; Jan 3, 2007; 7 pp.; In English; Original contains color illustrations

Report No.(s): AD-A460707; CRS-RS22533; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460707

The closing of several libraries administered by the Environmental Protection Agency (EPA) has raised numerous issues. The President's FY2007 budget included a $2.5 million reduction for EPA's libraries, $2.0 million of which was attributed mainly to these closures. EPA reports that the closings are part of its efforts to restructure its libraries to respond to the increasing use of the Internet to access its collections. Although EPA plans to digitize certain materials, some items may be archived or discarded. Members of Congress, library professional associations, and public interest groups have questioned the continued availability of EPA's collections as the agency restructures its libraries. The closing of EPA's libraries received increasing attention toward the end of the 109th Congress, including a request for the Government Accountability Office (GAO) to examine the agency's library restructuring plan. However, the funding and operation of the libraries were not mentioned in the FY2007 appropriations bill that would have funded EPA (H.R. 5386). This report examines EPA's plan to restructure its libraries and discusses relevant issues.

DTIC

Closures; Environment Protection; Federal Budgets; Libraries; United States

20070007552 BBN Systems and Technologies Corp., Cambridge, MA USA

BBN PLUM: MUC-3 Test Results and Analysis

Weischedel, Ralph; Ayuso, Damaris; Boisen, Sean; Ingria, Robert; Palmucci, Jeff; Jan 1991; 7 pp.; In English

Contract(s)/Grant(s): F30602-87-D-0093; F30602-91-C-0051

Report No.(s): AD-A460729; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460729

Perhaps the most important facts about our participation in MUC-3 reflect our starting point and goals. In March, 1990, we initiated a pilot study on the feasibility and impact of applying statistical algorithms in natural language processing. The experiments were concluded in March, 1991 and lead us to believe that statistical approaches can effectively improve knowledge-based approaches [Weishedel, et al., 1991a, Weischedel, Meteer, and Schwartz, 1991]. Due to nature of that effort, we had focused on many well-defined algorithm experiments. We did not have a complete message processing system; nor was the pilot study designed to create an application system. For the Phase I evaluation, we supplied a module to New York

University. At the time of the Phase I Workshop (12-14 February 1991) we decided to participate in MUC with our own entry. The Phase I Workshop provided invaluable insight into what other sites were finding successful in this particular application. On 25 February, we started an intense effort not just to be evaluated on the FBIS articles, but also to create essential components (e.g., discourse component and template generator) and to integrate all components into a complete message processing system. Although the timing of the Phase II test (6-12 May) was hardly ideal for evaluating our site's capabilities, it was ideally timed to serve as a benchmark prior to starting a four year plan for research and development in message understanding. Because of this, we were determined to try alternatives that we believed would be different than those employed by other groups, wherever time permitted. These are covered in the next section.Our results were quite positive, given these circumstances. Our max-tradeoff version achieved 45% recall and 52% precision with 22% overgenerating (See Figure 2). PLUM can be run in several modes, trading off recall versus precision and overgeneration.
DTIC
Information Retrieval; Knowledge Based Systems; Mathematical Models; Message Processing; Messages; Natural Language (Computers); Translating

20070007560 Library of Congress, Washington, DC USA
Paperwork Reduction Act Reauthorization and Government Information Management Issues
Relyea, Harold C; Jan 4, 2007; 26 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460744; CRS-RL30590; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460744

Replacing the ineffective Federal Reports Act of 1942, the Paperwork Reduction Act of 1980 (PRA) was enacted largely to relieve the public of the mounting information collection and reporting requirements of the federal government. It also promoted coordinated information management activities on a government-wide basis by the director of the Office of Management and Budget and prescribed information management responsibilities for the executive agencies. The management focus of the PRA was sharpened with the 1986 amendments which refined the concept of 'information resources management' (IRM), defined as 'the planning, budgeting, organizing, directing, training, promoting, controlling, and managing activities associated with the burden, collection, creation, use, and dissemination of information by agencies, and includes the management of information and related resources such as automatic data processing equipment.' This key term and its subset concepts received further definition and explanation in the PRA of 1995, making IRM a tool for managing the contribution of information activities to program performance, and for managing related resources, such as personnel, equipment, funds, and technology. The PRA of 1995 authorized appropriations for the Office of Information and Regulatory Affairs (OIRA), located within OMB, through FY2001 (44 U.S.C. 3520). After a lapse of four years, reauthorization of OIRA appropriations got underway in March 2006 with an initial overview hearing on the Paperwork Reduction Act by the House Subcommittee on Regulatory Affairs. A second hearing by the subcommittee was held in July, but no further action, including the introduction of reauthorizing legislation, occurred before the final adjournment of the 109th Congress. A return to reauthorizing the Paperwork Reduction Act awaits the 110th Congress. This report will be updated as events warrant.
DTIC
Information Management; Law (Jurisprudence); Paper (Material)

20070007573 BBN Systems and Technologies Corp., Cambridge, MA USA
BBN HARC and DELPHI Results on the ATIS Benchmarks - February 1991
Austin, S; Ayuso, D; Bates, M; Bobrow, R; Ingria, R; Makhoul, J; Placeway, P; Schwartz, R; Stallard, D; Feb 1991; 5 pp.; In English
Contract(s)/Grant(s): N00014-89-C-0008
Report No.(s): AD-A460763; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460763

This paper presents the test results of running BBN's HARC spoken language system and DELPHI natural language understanding system on the ATIS benchmarks. We give a brief system overview, and review the major changes that have been made in Delphi since the last DARPA SLS workshop. We will briefly discuss the development and training precess, and then present our test results and an analysis of their meaning.
DTIC
Delphi Method (Forecasting); Information Retrieval; Knowledge Based Systems; Natural Language (Computers); Natural Language Processing; Speech Recognition

20070007574 Massachusetts Univ., Amherst, MA USA
Aspects of Sentence Retrieval
Murdock, Vanessa G; Sep 2006; 172 pp.; In English
Contract(s)/Grant(s): HR0011-06-C-0023; MDA904-01-C-0984
Report No.(s): AD-A460764; No Copyright; Avail.: CASI: A08, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460764

Sentence Retrieval is the task of retrieving a relevant sentence in response to a query, a question, or a reference sentence. Tasks such as question answering, summarization, novelty detection, and information provenance make use of a sentence-retrieval module as a preprocessing step. The performance of these systems is dependent on the quality of the sentence-retrieval module. Other tasks such as information extraction and machine translation operate on sentences, either using them as training data, or as the unit of input or output (or both), and may benefit from sentence retrieval to build a training corpus, or as a post-processing step. In this thesis we begin by demonstrating that because sentences are much smaller than documents, the performance of typical document retrieval systems on the retrieval of sentences is significantly worse. We propose several solutions to the problem of sentence retrieval, and investigate these solutions the application areas of sentence retrieval for question answering, novelty detection, and information provenance. The context of a sentence affects its meaning, and we demonstrate that smoothing from the local context of the sentence improves retrieval when the collection to be retrieved from contains many documents of unknown relevance. We show that statistical translation models are appropriate for tasks where the sentence to be retrieved has many terms in common with the query, but still benefits from the addition of related terms and synonyms. We show that the family of language modeling approaches, which includes statistical translation models, is not effective for discriminating between sentences that uses the same vocabulary to express the same information, and sentences that use the same vocabulary to express new information. Finally, we demonstrate a conditional model for sentence retrieval for question answering, and show that it outperforms both the translation approaches and the baseline language-modeling approach.
DTIC
Analogies; Information Retrieval; Machine Translation; Mathematical Models; Sentences

20070007582 BBN Systems and Technologies Corp., Cambridge, MA USA
BBN BYBLOS and HARC February 1992 ATIS Benchmark Results
Kubala, Francis; Barry, Chris; Bates, Madeleine; Bobrow, Robert; Fung, Pascale; Ingria, Robert; Makhoul, John; Nguyen, Long; Schwartz, Richard; Stallard, David; Feb 1992; 7 pp.; In English
Contract(s)/Grant(s): N00014-89-C-0008
Report No.(s): AD-A460781; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460781

We present results from the February ′92 evaluation on the ATIS travel planning domain for HARC, the BBN spoken language system (SLS). In addition, we discuss in detail the individual performance of BYBLOS, the speech recognition (SPREC) component. In the official Scoring, conducted by NIST, BBN's HARC system produced a weighted SLS score of 43.7 on all 687 evaluable utterances in the test set. This was the lowest error achieved by any of the 7 systems evaluated. For the SPREC evaluation BBN's BYBLOS system achieved a word error rate of 6.2% on the same 687 utterances and 9.4% on the entire test set of 971 utterances. These results were significantly better than any other speech system evaluated.
DTIC
Knowledge Based Systems; Natural Language (Computers); Speech Recognition; Translating; Voice Communication

20070007613 Georgetown Univ., Washington, DC USA
Medical Vanguard Diabetes Management Project
Mun, Seong K; Sep 2005; 43 pp.; In English
Contract(s)/Grant(s): W81XWH-04-2-0002
Report No.(s): AD-A460818; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA460818

The Medical Vanguard Diabetes Management Project was designed to deploy an Internet based diabetes management system, MyCareTeam, into a number of existing diverse clinical environments and evaluate how such a stand-alone clinical information system can be integrated into diabetes management program. The diverse environments include the High-Risk Pregnancy Clinic at the National Naval Medical Center and Native American Communities throughout the USA. The GAO Report 'Executive Guide: Measuring Performance and Demonstrating Results of Information Technology Investments' (GAO/AIMD-98-89) will be used as the basis for the evaluation of the technology implementation. Enrollment of patients is

set to start in two Native Communities, and the IRB process almost complete in two others. The processes required to implement this technology into diverse communities will be studied. This project has two primary specific aims: clinical deployment and deployment evaluation.
DTIC
Deployment; Diseases; Management Systems; Medical Services; Metabolic Diseases; Telemedicine; Vanguard Project

20070007646 BBN Systems and Technologies Corp., Cambridge, MA USA
BBN: Description of the PLUM System as Used for MUC-4
Ayuso, Damaris; Boisen, Sean; Fox, Heidi; Gish, Herb; Ingria, Robert; Weischedel, Ralph; Jan 1992; 9 pp.; In English
Contract(s)/Grant(s): F30602-91-C-0051
Report No.(s): AD-A460888; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460888

Traditional approaches to the problem of extracting data from texts have emphasized hand-rafted linguistic knowledge. In contrast, BBN's PLUM system (Probabilistic Language Understanding Model) was developed as part of a DARPA-funded research effort on integrating probabilistic language models with more traditional linguistic techniques. Our research and development goals are * more rapid development of new applications, * the ability to train (and re-train) systems based on user markings of correct and incorrect output, * more accurate selection among interpretations when more than one is found, and * more robust partial interpretation when no complete interpretation can be found. A central assumption of our approach is that in processing unrestricted text for data extraction, a non-trivial amount of the text will not be understood. As a result, all components of PLUM are designed to operate on partially understood input, taking advantage of information when available, and not failing when information is unavailable. We had previously performed experiments on components of the system with texts from the Wall Street Journal, however, the MUC-3 task was the first end-to-end application of PLUM. Very little hand-tuning of knowledge bases was done for MUC-4; since MUC-3, the system architecture as depicted in figure 1 has remained essentially the same. In addition to participating in MUC-4, since MUC-3 we focused on porting to new domains and a new language, and on performing various experiments designed to control recall/precision tradeoffs. To support these goals, the preprocessing component and the fragment combiner were made declarative; the semantics component was generalized to use probabilities on word senses; we expanded our treatment of reference; we enlarged the set of system parameters at all levels; and we created a new probabilistic classifier for text relevance which filters discourse events.
DTIC
Data Processing; Information Retrieval; Knowledge Based Systems; Mathematical Models; Messages; Texts; Translating

20070007650 Department of Defense, Washington, DC USA
The Form is the Substance: Classification of Genres in Text
Dewdney, Nigel; VanEss-Dykema, Carol; MacMillan, Richard; Jan 2001; 9 pp.; In English
Report No.(s): AD-A460898; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460898

Categorization of text in IR has traditionally focused on topic. As use of the Internet and e-mail increases. categorization has become a key area of research as users demand methods of prioritizing documents. This work investigates text, classification by format style, i.e. 'genre',. and demonstrates. by complementing topic classification. that it can significantly improve retrieval of information. The paper compares use of presentation features to word features and the combination thereof, using Naive Bayes, C4.5 and SVM classifiers. Results show use of combined feature sets with SVM yields 92% classification accuracy in sorting seven genres.
DTIC
Classifications; Format; Texts

20070007651 Mississippi State Univ., Mississippi State, MS USA
(Almost) Automatic Semantic Feature Extraction from Technical Text
Agarwal, Rajeev; Jan 1994; 7 pp.; In English
Contract(s)/Grant(s): IRI-9314963
Report No.(s): AD-A460899; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460899

Acquisition of semantic information is necessary for proper understanding of natural language text. Such information is often domain-specific in nature and must be acquired from the domain. This causes a problem whenever a natural language

processing (NLP) system is moved from one domain to another. The portability of an NLP system can be improved if these semantic features can be acquired with limited human intervention. This paper proposes an approach towards (almost) automatic semantic feature extraction.
DTIC
Natural Language (Computers); Pattern Recognition; Semantics; Texts

20070007666 Johns Hopkins Univ., Baltimore, MD USA
Inducing Multilingual Text Analysis Tools via Robust Projection across Aligned Corpora
Yarowsky, David; Ngai, Grace; Wicentowski, Richard; Jan 2001; 9 pp.; In English
Contract(s)/Grant(s): N00014-01-1-0685
Report No.(s): AD-A460922; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460922

This paper describe system and set of automatically inducing stand-alone monolingual part-of-speech taggers, base noun-phrase bracketers, named-entity taggers and morphological analyzers for an arbitrary foreign language. Case studies include French, Chinese, Czech and Spanish. Existing text analysis tools for English are applied to bilingual text corpora and their output projected onto the second language via statistically derived word alignments. Simple direct annotation projection is quite noisy, however, even with optimal alignments. Thus this paper presents noise-robust tagger, bracketer and lemmatizer training procedures capable of accurate system bootstrapping form noisy and incomplete initial projections. Performance of the induced stand-alone part-of-speech tagger applied to French achieves 96% core part-of-speech (POS) tag accuracy, and the corresponding induced noun-phrase bracketer exceeds 91% lemmatization accuracy on the complete French verbal system. This achievement is particularly noteworthy in that it required absolutely no hand-annotated training data in the given language, and virtually no language-specific knowledge or resources beyond raw text. Performance also significantly exceeds that obtained by direct annotation projection.
DTIC
Data Processing; Knowledge Based Systems; Natural Language (Computers); Texts; Translating

20070007667 Department of Defense, Fort Meade, MD USA
Corpora and Data Preparation
Carlson, Lynn; Onyshkevych, Boyan; Okurowski, Mary E; Jan 1993; 6 pp.; In English
Report No.(s): AD-A460923; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460923

The data selection and data preparation efforts which led to the TIPSTER and Fifth Message Understanding Conference (MUC-5) evaluation corpora involved substantial effort, time and resources. The Government commitment to these selection and preparation efforts stems from four TIPSTER Program objectives: (1) to provide training data that would promote the development of information extraction technology, (2) to provide accurate test data to evaluate and baseline system performance in an objective manner, (3) to provide a baseline for human performance to understand and interpret machine performance, and (4) to support the larger Natural Language Processing community by making available a unique set of texts and templates in multiple domains and languages under ARPA support. This commitment was demonstrated through the managerial, technical, and administrative support to these efforts from various Government agencies, as well as through the contractual efforts with the Institute for Defense Analyses for data preparation and New Mexico State University for software tool development.
DTIC
Data Management; Data Processing; Information Retrieval; Knowledge Based Systems; Messages; Texts; Translating

20070007668 Swedish Defence Research Establishment, Stockholm, Sweden
Network Based Defence Logic -From an Innovation Point of View-
Heickero, Roland; Jun 2005; 11 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460924; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460924

The focus on a network based defence (NBD) is one of the most fundamental changes in the Swedish armed forces since the days of Carolus XII in the early eighteenth century. The transformation will affect not only the military structure but also defence industry, research agencies as well as the work of the Ministry of Defence as a whole. With a network centric approach it will in future be possible to act in new environments and places with new partners and with new behaviours. The reasoning

supporting NBD is built on flexibility and increased degrees of freedom. One goal is to use current and future resources and technologies in new ways and combinations in order to gain greater operational effects and advantages at a lower total cost than before. The ability to innovate will be the key success factor in the introduction of network based defence. As there will always be scarce resources available for defence, it is more important than ever to optimise the outcomes and effects. The prerequisite for the new logic is multi finality, i.e. there are several opportunities and possible paths to achieve goals, which is also forms the basis for flexibility. A fruitful way to study the change of military structure is to use a theoretical framework based on innovation and multi finality. The questions to be addressed are: what is really new with NBD in relation to earlier concepts and what would a method built on network centric logic look like? This paper first discusses the relationship between innovation and the network centric logic and then goes on to discuss an analytical approach built on combinatorial methods with value chains which is used to explain the idea of multi finality. In conclusion, different aspects of the combinatorial method are discussed. The overall purpose of using such an approach is to transfer knowledge and experience from the research arena into the military arena in order to exploit the full potential of future defence systems.
DTIC
Combinatorial Analysis; Computers; Interoperability; Logic Design

20070007669 SRI International Corp., Menlo Park, CA USA
Team User's Guide
Shinkle, Lorna; Nov 1984; 68 pp.; In English
Contract(s)/Grant(s): N00030-83-C-0109
Report No.(s): AD-A460927; SRI-TR-343; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460927

TEAM (Transportable English Data Access Medium) is a transportable natural-language (NL) interface to a database. It is a tool of considerable power that enables the user to retrieve data and elicit answers to queries by asking questions and giving commands in English instead of a formal query language. Moreover, TEAM is not limited to any particular database, but can be adapted to demonstrate natural-language retrieval in a broad variety of application domains. The prototype TEAM software described herein was developed by the Artificial Intelligence Center of SRI International to demonstrate the system's capabilities and adaptive potential. This user's guide is designed to assist new TEAM users to learn about the concepts and tasks involved in retrieving data and in preparing a demonstration for a new application area. An effort has been made to illustrate some of the problems TEAM must solve in translating an English question into a database query. However, the necessarily limited scope of this guide cannot include a discussion of all the natural-language-processing issues addressed by the system; our emphasis is on a practical, rather than theoretical, understanding of the concepts. Similarly, while this guide cannot cover every detail of creating a new demonstration for TEAM, it does provide a thorough introduction to the procedure to be followed and explains how to use the on-line 'help' provided by the system.
DTIC
Computer Techniques; Information Retrieval; Manuals; Natural Language (Computers)

20070007670 Maryland Univ., College Park, MD USA
Hedge Trimmer: A Parse-and-Trim Approach to Headline Generation
Dorr, Bonnie; Zajic, David; Schwartz, Richard; Jan 2003; 9 pp.; In English
Contract(s)/Grant(s): N66001-97-C-8540
Report No.(s): AD-A460929; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460929

This paper presents Hedge Trimmer a HEaDline GEneration system that creates a headline for a newspaper story using linguistically-motivated heuristics to guide the choice of a potential headline. We present feasibility tests used to establish the validity of an approach that constructs a headline by selecting words in order from a story. In addition we describe experimental results that demonstrate the effectiveness of our linguistically-motivated approach over a HMM-based model using both human evaluation and automatic metrics for comparing the two approaches.
DTIC
Data Processing; Linguistics

20070007671 SRI International Corp., Menlo Park, CA USA
The Representation of Adverbs, Adjectives and Events in Logical Form
Croft, William; Dec 1984; 32 pp.; In English
Contract(s)/Grant(s): F49620-82-K-0031; NOOO39-80-C-0575
Report No.(s): AD-A460930; SRI-TR-344; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460930

The representation of adjectives and their adverbial counterparts in logical form raises a number of issues in the relation of (morpho)syntax to semantics, as well as more specific problems of lexical and grammatical analysis. This paper addresses those issues which have bearing on the relation of properties to events. It is argued that attributes and context play only an indirect role in the relation between properties and events. The body of the paper addresses the criteria for relating surface forms to logical form representations and offers an unified analysis of adjectives and their adverbial counterparts in logical form while maintaining a clear distinction between operators and predicates; this requires the postulation of a factive sentential operator and the relaxation of the one-to-one syntax-semantics correspondence hypothesis. Criteria for determining the number of arguments for a predicate are established and are used for the analyses of phenomena such as passive-sensitivity, lexical derivational patterns, and gradability.
DTIC
Grammars; Semantics; Syntax

20070007675 Florida Inst. for Human and Machine Cognition, Inc., Pensacola, FL USA
Stochastic Language Generation in a Dialogue System: Toward a Domain Independent Generator
Chambers, Nathanael; Allen, James; Jan 2004; 11 pp.; In English
Contract(s)/Grant(s): 5-23236
Report No.(s): AD-A460935; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460935

Until recently. surface generation in dialogue systems has served the purpose of simply providing a backend to other areas of research. The generation component of such systems usually consists of templates and canned text, providing inflexible, unnatural output. To make matters worse, the resources are typically specific to the domain in question and not portable to new tasks. In contrast, domain-independent generation systems typically require large grammars, full lexicons, complex collocational information, and much more. Furthermore, these frameworks have primarily been applied to text applications and it is not clear that the same systems could perform well in a dialogue application. This paper explores the feasibility of adapting such systems to create a domain-independent generation component useful for dialogue systems. It utilizes the domain independent semantic form of The Rochester Interactive Planning System (TRIPS) with a domain independent stochastic surface generation module. We show that a written text language model can be used to predict dialogue utterances from an over-generated word forest. We also present results from a human oriented evaluation in an emergency planning domain.
DTIC
Data Processing; Knowledge Based Systems; Semantics; Stochastic Processes; Texts; Translating

20070007676 Memphis Univ., Memphis, TN USA
Utterance Classification in Auto Tutor
Olney, Andrew; Louwerse, Max; Matthews, Eric; Marineau, Johanna; Hite-Mitchell, Heather; Graesser, Arthur; Jan 2003; 9 pp.; In English
Contract(s)/Grant(s): N00014-00-1-0600; SBR-9720314
Report No.(s): AD-A460937; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460937

This paper describes classification of typed student utterances within AutoTutor, an intelligent tutoring system. Utterances are classified to one of 18 categories including 16 question categories. The classifier presented uses part of speech tagging, cascaded finite state transducers, and simple disambiguation rules. Shallow NLP is well suited to the task: session log file analysis reveals significant classification of eleven question categories, frozen expressions, and assertions.
DTIC
Classifications; Computer Programs; Natural Language (Computers); Students

20070007688 Echelon 4, LLC, Mequon, WI USA

Scale-free Enterprise Command & Control

Bayne, Jay; Paul, Raymond; Jun 16, 2005; 40 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8750-04-C-0084

Report No.(s): AD-A460955; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460955

We are interested in the structure of enterprise governance in federated systems capable of supporting simultaneous, unified and time-bound objectives of self-directed (unilateral) and group-directed (multilateral) decision and control. Our solution requires a set of scale-free joint enterprise command and control (JEC2) services that provide allied teams of commanders, planners and operations personnel with collaborative, grid-based and realtime situation assessment, plan generation, and plan execution services. By scale-free we are referring to the ability of a system or service to scale from small to large applications a design that is essentially independent of the scale of its deployment. The foundation of our unified JEC2 system depends on a coherent and scale-free view of an enterprise and characteristics of its underlying dynamic structure. Characteristics of unified JEC2 must, in addition, identify specific roles and responsibilities of the principal enterprise management actors. This paper, a companion of other ICCRTS papers, introduces our JEC2 enterprise command framework (ECF), a scale-free C2 system supporting unilateral and multilateral (collaborative) behavior among distributed federated systems [of systems].

DTIC

Command and Control; Interoperability

20070007693 Program Executive Office Integrated Warfare Systems, Washington, DC USA

Management and Introduction of Technology - An OSD Office of Technology Transition Perspective for Effects Based Support in the New Security Environment

Bryant, Russell E; Jun 2005; 53 pp.; In English; Original contains color illustrations

Report No.(s): AD-A460963; ICCRTS-009; No Copyright; Avail.: CASI: A04, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA460963

In the day-to-day office arena, routines are regularly impacted with requests for nominations for many different development programs. A Program Manager may consider these calls and requests for nominations as an additional burden on their already taxed and stretched thin schedule of time and resources. Even so, these programs play an integral part in reducing and sharing risks, leveraging scarce resources from several sources, and potentially leading to development and delivery of new and/or improved capabilities to the war fighters faster and at less total ownership cost (TOC) for them and the Nation. This paper will present an OSD architectural overview of how the Office of Technology Transition programs fit together and assist not only the war fighter, but our Services Program Managers (and the Services), along with our industrial and commercial partners. These programs collectively reduce and restructure risks, leverage resources and ideas from multiple sources, and are all aimed at delivery of increased capabilities (and reduced costs) to the number one customer, the front line war fighters. More importantly, these programs are additional avenues and paths for development and introduction of new technologies, even if most of them are NOT directly identified within specific budget lines and program elements. These programs are the door openers for getting to that point of making contributions to the war fighters, while at the same time allowing our scientists and engineers to perform in their areas of expertise.

DTIC

Management Systems; Military Technology; Research and Development; Security; Technology Transfer

20070008016 Carnegie-Mellon Univ., Pittsburgh, PA USA

Locality in Search Engine Queries and Its Implications for Caching

Xie, Yinglian; O'Hallaron, David; May 2001; 22 pp.; In English

Contract(s)/Grant(s): F30602-96-1-0287; NSF-CMS-9980063

Report No.(s): AD-A458510; CMU-CS-01-128; No Copyright; Avail.: CASI: A03, Hardcopy

Caching is a popular technique for reducing both server load and user response time in distributed systems. In this paper, the authors are interested in the question of whether caching might be effective for search engines as well. They study two real search engine traces by examining query locality and its implications for caching. The two search engines studied are Vivisimo and Excite. Their trace analysis results show that queries have significant locality, with query frequency following a Zipf distribution. Very popular queries are shared among different users and can be cached at servers or proxies, while 16% to 22% of the queries are from the same users and should be cached at the user side. Multiple-word queries are shared less often and should be cached mainly at the user side. If caching is to be done at the user side, short-term caching for hours will

be enough to cover query temporal locality, while server/proxy caching should be based on longer periods such as days. Most users have small lexicons when submitting queries. Frequent users who submit many search requests tend to reuse a small subset of words to form queries. Thus, with proxy or user side caching, prefetching based on user lexicon looks promising.
DTIC
Client Server Systems; Data Management; Information Retrieval; Internets; Workloads (Psychophysiology)

20070008026 Massachusetts Univ., Amherst, MA USA
A Bayesian Blackboard for Information Fusion
Sutton, Charles; Morrison, Clayton T; Cohen, Paul R; Moody, Joshua; Adibi, Jafar; Jan 2004; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-01-2-0580
Report No.(s): AD-A459893; No Copyright; Avail.: CASI: A02, Hardcopy

A Bayesian blackboard is just a conventional, knowledge-based blackboard system in which knowledge sources modify Bayesian networks on the blackboard. As an architecture for intelligence analysis and data fusion this has many advantages: the blackboard is a shared workspace or 'corporate memory' for collaborating analysts; analyses can be developed over long periods of time with information that arrives in dribs and drabs; the computer's contribution to analysis can range from data-driven statistical algorithms up to domain-specific, knowledge-based inference; and perhaps most important, the control of intelligence-gathering in the world and inference on the blackboard can be rational, that is, grounded in probability and utility theory. The Bayesian blackboard architecture presented here, called AIID, serves both as a prototype system for intelligence analysis and as a laboratory for testing mathematical models of the economics of intelligence analysis.
DTIC
Bayes Theorem; Intelligence; Knowledge Based Systems; Multisensor Fusion; Neural Nets

20070008034 SRI International Corp., Menlo Park, CA USA
A D-Ladder User's Guide
Sagalowicz, Daniel; Sep 1980; 43 pp.; In English
Contract(s)/Grant(s): N00039-79-C-0118; ARPA ORDER-3175.28
Report No.(s): AD-A460507; TN-224; No Copyright; Avail.: CASI: A03, Hardcopy

D-LADDER (DIAMOND-based Language Access to Distributed Data with Error Recovery) is a computer system designed to provide answers to questions posed at the terminal in a subset of natural language regarding a distributed data base of naval command and control information. The system accepts natural-language questions about the data. For each question D-LADDER plans a sequence of appropriate queries to the data base management system, determines on which machines the queries are to be processed, establishes links to those machines over the ARPANET, monitors the processing of the queries and recovers from certain errors in execution, and prepares a relevant answer to the original question. This user's guide is intended for the person who knows how to log in to the host operating system, as well as how to enter and edit a line of text. It does not explain how D-LADDER works, but rather how to use it on a demonstration basis.
DTIC
Information Systems; Ladders; Natural Language (Computers)

20070008040 Massachusetts Univ., Amherst, MA USA
University of Massachusetts: Description of the CIRCUS System as Used for MUC-3
Lehnert, Wendy; Cardie, Claire; Fisher, David; Riloff, Ellen; Williams, Robert; Jan 1991; 12 pp.; In English
Contract(s)/Grant(s): N00014-86-K-0764; MDA903-89-C-0041
Report No.(s): AD-A460608; UM-CS-1991-059; No Copyright; Avail.: CASI: A03, Hardcopy

In 1988 Professor Wendy Lehnert completed the initial implementation of a semantically-oriented sentence analyzer named CIRCUS. The original design for CIRCUS was motivated by two basic research interests : (1) we wanted to increase the level of syntactic sophistication associated with semantically-oriented parsers, and (2) we wanted to integrate traditional symbolic techniques in natural language processing with connectionist techniques in an effort to exploit the complementary strengths of these two computational paradigms. We believed we had constructed a robust text skimmer that was semantically oriented but nevertheless able to use syntactic knowledge as needed. We felt that the MUC-3 evaluation required selective concept extraction capabilities of just the sort we had been developing.
DTIC
Linguistics; Natural Language Processing

20070008042 SRI International Corp., Menlo Park, CA USA
Transportability and Generality in a Natural-Language Interface System
Martin, Paul; Appelt, Douglas; Pereira, Fernando C; Nov 1983; 22 pp.; In English
Contract(s)/Grant(s): N00039-80-C-0645
Report No.(s): AD-A460623; No Copyright; Avail.: CASI: A03, Hardcopy

This paper describes the design of a transportable natural language (NL) interface to databases and the constraints that transportability places on each component of such a system. By a transportable NL system, the authors mean an NL processing system that is constructed so that a domain expert (rather than an artificial intelligence (AI) or linguistics expert) can move the system to a new application domain. After discussing the general problems presented by transportability, this paper describes TEAM (an acronym for Transportable English database Access Medium), a demonstrable prototype of such a system. The discussion of TEAM shows how domain-independent and domain-dependent information can be separated in the different components of a NL interface system, and presents one method of obtaining domain-specific information from a domain expert.
DTIC
Data Bases; Graphical User Interface; Information Retrieval; Natural Language (Computers)

20070008119 Naval Academy, Annapolis, MD USA
Establishing Correspondence Among Shared Information and Tasks
Childers, Candace M; Jun 7, 2005; 49 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460451; USNA-CS-TR-2005-06; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA460451

Creating interoperability among heterogenenous systems enhances our military's warfighting capabilities. Differences in hardware, languages, and data models make interoperability hard to achieve. The Object-Oriented Method for Interoperability (OOMI) resolves modeling differences among systems through construction of a Federal Interoperability Object Model (FIOM) used to capture information and tasks shared among systems. The FIOM is constructed in either a bottom-up or top-down fashion using the OOMI Integrated Development Environment (OOMI IDE) and includes both component system and standard representations of the shared tasks and information. When constructing a federation of interoperable systems, a correspondence must first be established among shared tasks and information before data modeling differences can be resolved. The OOMI IDE uses both semantic and syntactic correlation methodologies for establishing such correspondences. Syntactic correlation is performed using neural networks. Syntactic data concerning the structure and signature of shared information and tasks is used to create discriminator vectors for objects being compared. Neural Networks are used to compare these discriminator vectors to determine the degree of similarity among objects. A ranking of the scores returned from the neural network comparison is used to assist an interoperability engineer in identifying corresponding objects for which modeling differences can be resolved.
DTIC
Information Systems; Interoperability

20070008124 University of Southern California, Marina del Rey, CA USA
Statistical QA - Classifier vs. Re-Ranker: What's the Difference
Ravichandran, Deepak; Hovy, Eduard; Och, Franz J; Jan 2003; 8 pp.; In English
Contract(s)/Grant(s): MDA908-02-C-007
Report No.(s): AD-A460400; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460400

In this paper, we show that we can obtain a good baseline performance for Question Answering (QA) by using only 4 simple features. Using these features, we contrast two approaches used for a Maximum Entropy based QA system. We view the QA problem as a classification problem and as a reranking problem. Our results indicate that the QA system viewed as a reranker clearly outperforms the QA system used as a classifier. Both systems are trained using the same data.
DTIC
Classifications; Classifiers; Information Retrieval; Natural Language (Computers); Ranking

20070008126 International Business Machines Corp., Yorktown Heights, NY USA
Semantic Lexicon Construction: Learning from Unlabeled Data via Spectral Analysis
Ando, Rie K; Jan 2004; 9 pp.; In English
Report No.(s): AD-A460254; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460254

This paper considers the task of automatically collecting words with their entity class labels, starting from a small number of labeled examples (seed words). We show that spectral analysis is useful for compensating for the paucity of labeled examples by learning from unlabeled data. The proposed method significantly outperforms a number of methods that employ techniques such as EM and co-training. Furthermore, when trained with 300 labeled examples and unlabeled data, it rivals Naive Bayes classifiers trained with 7500 labeled examples.
DTIC
Marking; Spectrum Analysis

20070008128 International Business Machines Corp., Yorktown Heights, NY USA
Accelerating Corporate Research in the Development, Application and Deployment of Human Language Technologies
Ferrucci, David; Lally, Adam; Jan 2003; 9 pp.; In English
Contract(s)/Grant(s): MDA904-01-C-0988
Report No.(s): AD-A460607; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460607

IBM Research has over 200 people working on Unstructured Information Management (UIM) technologies with a strong focus on HLT. Spread out over the globe they are engaged in activities ranging from natural language dialog to machine translation to bioinformatics to open-domain question answering. An analysis of these activities strongly suggested that improving the organization's ability to quickly discover each other's results and rapidly combine different technologies and approaches would accelerate scientific advance. Furthermore, the ability to reuse and combine results through a common architecture and a robust software framework would accelerate the transfer of research results in HLT into IBM's product platforms. Market analyses indicating a growing need to process unstructured information, specifically multi-lingual, natural language text, coupled with IBM Research's investment in HLT, led to the development of middleware architecture for processing unstructured information dubbed UIMA. At the heart of UIMA are powerful search capabilities and a data-driven framework for the development, composition and distributed deployment of analysis engines. In this paper we give a general introduction to UIMA focusing on the design points of its analysis engine architecture and we discuss how UIMA is helping to accelerate research and technology transfer.
DTIC
Data Processing; Deployment; Information Management; Organizations

20070008142 Southern Methodist Univ., Dallas, TX USA
Answer Mining from On-Line Documents
Pasca, Marius; Harabagiu, Sanda M; Jan 2001; 9 pp.; In English
Contract(s)/Grant(s): CCR-9983600
Report No.(s): AD-A460697; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460697

Mining the answer of a natural language open-domain question in a large collection of on-line documents is made possible by the recognition of the expected answer type in relevant text passages. If the technology of retrieving texts where the answer might be found is well developed, few studies have been devoted to the recognition of the answer type. This paper presents a unified model of answer types for open-domain Question/Answering that enables the discovery of exact answers. The evaluation of the model performed on real-world questions. considers both the correctness and the coverage of the answer types as well as their contribution to answer precision.
DTIC
Information Retrieval; Mining; Natural Language (Computers); On-Line Systems

20070008161 SRI International Corp., Menlo Park, CA USA
SRI International: Description of the FASTUS System Used for MUC-4
Hobbs, Jerry R; Appelt, Douglas; Tyson, Mabry; Bear, John; Israel, David; Jan 1992; 9 pp.; In English
Contract(s)/Grant(s): N00014-90-C-0220
Report No.(s): AD-A460962; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460962

FASTUS is a (slightly permuted) acronym for Finite State Automaton Text Understanding System. It is a system for extracting information from free text in English, and potentially other languages as well, for entry into a database, and potentially for other applications. It works essentially as a cascaded, nondeterministic finite state automaton. It is an

information extraction system, rather than a text understanding system. This distinction is important. In information extraction, only a fraction of the text is relevant. In the case of the MUC-4 terrorist reports, probably only about 10% of the text is relevant. There is a pre-defined, relatively simple, rigid target representation that the information is mapped into. The subtle nuances of meaning and the writer's goals in writing the text are of no interest. This contrasts with text understanding, where the aim is to make sense of the entire text, where the target representation must accommodate the full complexities of language, and where we want to recognize the nuances of meaning and the writer's goals. The MUC evaluations are information extraction tasks, not text understanding tasks, The TACITUS system that was used for MUC-3 in 1991 is a text-understanding system [1]. Using it for the information extraction task gave us a high precision, the highest of any of the sites. However, our recall was mediocre, and the system was extremely slow. Our motivation in building the FASTUS system was to have a system that was more appropriate to the information extraction task.
DTIC
Information Retrieval; Automatic Control; Texts

20070008164 SRI International Corp., Menlo Park, CA USA
The Core Knowledge System
Strat, Thomas M; Smith, Grahame B; Oct 1987; 73 pp.; In English
Contract(s)/Grant(s): N00039-83-K-0656
Report No.(s): AD-A460859; TN-426; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460859

This document contains an in-depth description of the Core Knowledge System (CKS)-an integrative environment for the many functions that must be performed by sensor-based autonomous and semi-autonomous systems. The CKS itself has been designed to support a wide variety of potential applications. However, special attention has been given to assuring its relevance to a particular application that of an autonomous land vehicle operating in an unconstrained outdoor environment. The functionality provided by the system is described, along with discussions of the various design decisions and their associated trade-offs where applicable. This paper is not intended to serve as a user's manual, rather its purpose is to describe the CKS in sufficient detail to allow the reader to ascertain its relevance to a particular application and to provide a technical critique of its strengths and weaknesses. Chapter 2 contains a complete overview of the goals and architecture of the CKS and the services it provides. It is a slightly revised version of a paper that appeared in the proceedings of the DARPA Image Understanding Workshop held in February 1987 [7]. The remaining chapters examine specific areas in more detail, amplifying important notions and providing examples where appropriate. Chapter 12 describes a scenario that illustrates the envisioned role of the CKS in a complex, sensor- based system. The final chapter gives the current status of the CKS, including its implementation and the directions of ongoing research.
DTIC
Knowledge Based Systems; Sensors; Autonomy

20070008166 Army Command and General Staff Coll., Fort Leavenworth, KS USA
Defensive Operations in the Media Battlespace: Operation Iraqi Freedom
Proctor, Patrick E; Dec 15, 2006; 138 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460784; No Copyright; Avail.: CASI: A07, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460784

In Operation Iraqi Freedom, various insurgent and terrorist groups have demonstrated the capability to use small, relatively insignificant tactical attacks to have a dramatic effect on the will of the American public to prosecute the war. This thesis investigates this enemy capability, the media system in which it operates, and the ability of the US military to combat this capability. It finds that the enemy operates at the event and collection level of the media system, producing pictures and data, generating events, and controlling access to influence news stories about the operational area. It also finds that the current method of media coverage in Iraq is the result of reporters, stringers, and media outlets, driven by their respective interests, arriving at the solution that strikes the best balance between cost, entertainment, and accuracy. This thesis finds that doctrinal separations exist between information operations and public affairs, that media is not seen as an operational problem, and that there are extra-doctrinal and cultural impediments to facilitating the media. This thesis recommends remedies, including facilitating media outlet operations in the operational area, facilitating reporters' coverage of the war, and reforming the role of public affairs in joint operations.
DTIC
Iraq; Military Operations; Multimedia

20070008254 Fish and Richarson P.C., Minnesapolis, MN, USA
Topic Specific Language Models Built From Large Numbers of Documents
Sethy, A.; Georgious, P.; Narayanan, S.; 17 Mar 06; 8 pp.; In English
Contract(s)/Grant(s): N6600L02-C-6023
Patent Info.: Filed Filed 17 Mar 06; US-Patent-Appl-SN-11-384-226
Report No.(s): PB2007-101411; No Copyright; Avail.: CASI: A02, Hardcopy

Forming and/or improving a language model based on data from a large collection of documents, such as web data. The collection of documents is queried using queries that are formed from the language model. The language model is subsequently improved using the information thus obtained. The improvement is used to improve the query. As data is received from the collection of documents, it is compared to a rejection model, that models what rejected documents typically look like. Any document that meets the test is then rejected. The documents that remain are characterized to determine whether they add information to the language model, whether they are relevant, and whether they should be independently rejected. Rejected documents are used to update the rejection model; accepted documents are used to update the language model. Each iteration improves the language model, and the documents may be analyzed again using the improved language model.
NTIS
Language Programming; Mathematical Models; Iteration

20070008297 Multidisciplinary Center for Earthquake Engineering Research, Buffalo, NY, USA
White Paper on the SDR Grand Challenges for Disaster Reduction
Bruneau, M.; Filiatrault, A.; Lee, G.; O'Rourke, T.; Reinhorn, A.; Dec. 05, 2006; 46 pp.; In English
Contract(s)/Grant(s): EEC-9701471
Report No.(s): PB2007-105144; MCEER-05-SP09; No Copyright; Avail.: National Technical Information Service (NTIS)

This White Paper volunteers the perspectives of MCEERs Executive Committee on factors to consider in the formulation of a national research strategy for disaster loss reduction. It is a commentary on the Grand Challenges for Disaster Reduction report, published by the Subcommittee on Disaster Reduction (SDR) of the National Science and Technology Council Committee on Environment and Natural Resources. In the paper, MCEER advocates that a critical part of this research effort should focus on the mitigation of, and response to, the impact of extreme events on critical facilities and lifelines. The failure of these key infrastructure systems is the cause of most of the disruption during and following disasters. In this context, national needs require that solutions be integrated across various hazards. However, the objective to achieve a synergy of solutions across the continuum of hazards is something that has just barely begun to be exploited or even investigated.
NTIS
Disasters; Earthquakes; Losses

20070008311 Sandia National Labs., Albuquerque, NM USA, Maryland Univ., College Park, MD, USA, Center for Computing Sciences, Bowie, MD, USA
QCS : A System for Querying, Clustering, and Summarizing Documents
Dunlavy, D. M.; Oleary, D. P.; Conroy, J. M.; Schlesinger, J. D.; Oct. 01, 2006; 52 pp.; In English
Report No.(s): DE2006-893129; SAND2006-5000; No Copyright; Avail.: Department of Energy Information Bridge

Information retrieval systems consist of many complicated components. Research and development of such systems is often hampered by the difficulty in evaluating how each particular component would behave across multiple systems. We present a novel hybrid information retrieval system--the Query, Cluster, Summarize (QCS) system--which is portable, modular, and permits experimentation with different instantiations of each of the constituent text analysis components. Most importantly, the combination of the three types of components in the QCS design improves retrievals by providing users more focused information organized by topic. We demonstrate the improved performance by a series of experiments using standard test sets from the Document Understanding Conferences (DUC) along with the best known automatic metric for summarization system evaluation, ROUGE. Although the DUC data and evaluations were originally designed to test multidocument summarization, we developed a framework to extend it to the task of evaluation for each of the three components: query, clustering, and summarization. Under this framework, we then demonstrate that the QCS system (end-to-end) achieves performance as good as or better than the best summarization engines. Given a query, QCS retrieves relevant documents, separates the retrieved documents into topic clusters, and creates a single summary for each cluster. In the current implementation, Latent Semantic Indexing is used for retrieval, generalized spherical k-means is used for the document clustering, and a method coupling sentence 'trimming', and a hidden Markov model, followed by a pivoted QR decomposition, is used to create a single extract summary for each cluster. The user interface is designed to provide access to detailed information in a compact and useful format. Our system demonstrates the feasibility of assembling an effective IR

system from existing software libraries, the usefulness of the modularity of the design, and the value of this particular combination of modules.
NTIS
Information Retrieval; Query Languages; Systems Analysis; Computer Systems Design

20070008453 Pennsylvania Univ., Philadelphia, PA USA
Facilitating Treebank Annotation Using a Statistical Parser
Chiou, Fu-Dong; Chiang, David; Palmer, Martha; Jan 2001; 5 pp.; In English
Contract(s)/Grant(s): N66001-00-1-8915; MDA904-97-C-0307
Report No.(s): AD-A460488; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460488

Corpora of phrase-structure-annotated text, or treebanks, are useful for supervised training of statistical models for natural language processing, as well as for corpus linguistics. Their primary drawback, however, is that they are very time-consuming to produce. To alleviate this problem, the standard approach is to make two passes over the text: first, parse the text automatically, then correct the parser output by hand. In this paper we explore three questions: How much does an automatic first pass speed up annotation? Does this automatic first pass affect the reliability of the final product? What kind of parser is best suited for such an automatic first pass? We investigate these questions by an experiment to augment the Penn Chinese Treebank [15] using a statistical parser developed by Chiang [3] for English. This experiment differs from previous efforts in two ways: first, we quantify the increase in annotation speed provided by the automatic first pass (70 100%); second, we use a parser developed on one language to augment a corpus in an unrelated language.
DTIC
Automata Theory; Data Processing; Grammars; Mathematical Models; Natural Language (Computers); Parsing Algorithms

20070008454 Bolt, Beranek, and Newman, Inc., Cambridge, MA USA
Flexible Data Entry for Information Warning and Response Systems
Mulvehill, Alice M; Reilly, James; Krisler, Brian; Jun 2005; 21 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460504; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460504

A suite of information technologies that can support the Command and Control (C2) who are required to detect, track, collect, and analyze a variety of incidents. To provide the means for fusing information from a variety of data sources that are associated with the detection and tracking of chemical and biological attacks, both overt and covert. Also have the detailed capabilities to model effective nuclear, biological and chemical hazards. Display and update of situation awareness. Capable of handling information fusion, and analysis including incident detection and tracking.
DTIC
Command and Control; Data Acquisition; Data Systems; Flexibility; Information Systems; Multisensor Fusion; Systems Integration; Warning Systems

20070008456 Evidence Based Research, Inc., Vienna, VA USA
Modeling the Creation of Actionable Knowledge within a Joint Task Force Command System (Project GNOSIS)
Leedom, Dennis K; Aug 2006; 121 pp.; In English
Contract(s)/Grant(s): FA8650-04-C-6458; Proj-3005
Report No.(s): AD-A460815; No Copyright; Avail.: CASI: A06, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460815

The conceptual and software architecture for an organizational sensemaking toolkit was successfully completed, satisfying the development goal of this SBIR effort. The toolkit enables an analyst to examine how an organization, a body of collaborating individuals operating in different roles, accomplishes sensemaking during the course of developing the organizational product. The analyst can manipulate various variables to ascertain what knowledge is created and how it impacts operational performance of the organization. The sensemaking toolkit was exercised in the context of a Joint Task Force organization using an effects-based operational process. Two parametric studies were performed. One study illustrated how differences in the contextual knowledge level of individuals in senior positions can impact organizational knowledge creation and its impact on operational products. The second study illustrated how differences in 'social currency' of key staff

positions impacts knowledge creation in product development and how this impacts the operational product.
DTIC
Information Management; Models

20070008466 Edinburgh Univ., UK
Robustness Versus Fidelity in Natural Language Understanding
Core, Mark G; Moore, Johanna D; Jan 2004; 9 pp.; In English
Contract(s)/Grant(s): N00014-99-1-0165
Report No.(s): AD-A460978; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460978

A number of issues arise when trying to scale-up natural language understanding (NLU) tools designed for relatively simple domains (e.g. flight information) to domains such as medical advising or tutoring where deep understanding of user utterances is necessary. Because the subject matter is richer, the range of vocabulary and grammatical structures is larger meaning NLU tools are more likely to encounter out-of-vocabulary words or extra-grammatical utterances. This is especially true in medical advising and tutoring where users may not know the correct vocabulary and use common sense terms or descriptions instead. Techniques designed to improve robustness (e.g., skipping unknown words, relaxing grammatical constraints, mapping unknown words to known words) are effective at increasing the number of utterances for which an NLU sub-system can produce a semantic interpretation. However, such techniques introduce additional ambiguity and can lead to a loss of fidelity (i.e., a mismatch between the semantic interpretation and what the language producer meant). To control this trade-off, we propose semantic interpretation confidence scores akin to speech recognition confidence scores and describe our initial attempt to compute such a score in a modularized NLU sub-system.
DTIC
Natural Language (Computers); Robustness (Mathematics)

20070008469 Army Communications-Electronics Command, Fort Monmouth, NJ USA
Intelligent Agent Technology in Command and Control Environment
Dawidowicz, Edward; Jan 1999; 7 pp.; In English
Report No.(s): AD-A460983; XA-AMSEL-RD-C2; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460983

The Intelligent Agent (IA) technology has applications in the following areas of military Command and Control (C2): logistics, combat planning, and battle plan execution monitoring. C2 information extraction should not rely on using simple database queries, since the amount of data available to the commander on the modern battlefield can be overwhelming. To make informed decisions, the commander must have immediate access to specific information in real time. Therefore, the available data must be parsed in such a way as to extract only the specific information required by the commander. The ever-increasing volume of data in the C2 environment thus requires the use of IAs to extract relevant information for the commander in real time. This paper describes an application of IA in assisting a decision-maker (i.e., the military commander), by extracting needed information from a large amount of data and triggering an alarm when certain critical conditions are reached. The open architecture proposed here not only allows effective IA implementation but also the expansion of future IA applications, as needs demand.
DTIC
Command and Control; Decision Support Systems; Expert Systems; Information Retrieval; Real Time Operation

20070008476 SRI International Corp., Menlo Park, CA USA
The Path-Indexing Method for Indexing Terms
Stickel, Mark E; Oct 1989; 28 pp.; In English
Contract(s)/Grant(s): N00039-88-C-0248
Report No.(s): AD-A460990; SRI-TR-473; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460990

The path-indexing method for indexing first-order predicate calculus terms is a refinement of the standard coordinate-indexing method. Path indexing offers much faster retrieval at a modest cost in space. Path indexing is compared with discrimination-net and codeword indexing. While discrimination-net indexing may often be the preferred method for

maximum speed, path indexing is an effective alternative if discrimination-net indexing requires too much space or in certain cases in which discrimination-net indexing performs particularly poorly.
DTIC
Artificial Intelligence; Information Retrieval; Terms

20070008482 New Mexico State Univ., Las Cruces, NM USA
CRL/Brandeis: Description of the DIDEROT System as Used for MUC-5
Cowie, Jim; Guthrie, Louise; Jin, Wang; Wang, Rong; Wakao, Takahiro; Pustejovsky, James; Waterman, Scott; Jan 1993; 20 pp.; In English
Contract(s)/Grant(s): MDA904-91-C-9328
Report No.(s): AD-A461000; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461000

This report describes the major developments over the last six months in completing the Diderot information extraction system for the MUC-5 evaluation. Diderot is an information extraction system built at CRL and Brandeis University over the past two years. It was produced as part of our efforts in the Tipster project. The same overall system architecture has been used for English and Japanese and for the micro-electronics and joint venture domains. The past history of the system is discussed and the operation of its major components described. A summary of scores at the 24 month workshop is given and the performance of the system on the texts selected for the system walk through is discussed.
DTIC
Conferences; Extraction; Information Retrieval; Messages; Natural Language (Computers)

20070008483 New Mexico State Univ., Las Cruces, NM USA
CRL/Brandeis: The DIDEROT System
Cowie, Jim; Guthrie, Louise; Jin, Wang; Ogden, William; Pustejovsky, James; Wang, Rong; Wakao, Takahiro; Waterman, Scott; Wilks, Yorick; Jan 1993; 18 pp.; In English
Contract(s)/Grant(s): MDA904-91-C-9328
Report No.(s): AD-A461001; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461001

Diderot is an information extraction system built at CRL and Brandeis University over the past two years. It was produced as part of our efforts in the Tipster project. The same overall system architecture has been used for English and Japanese and for the micro-electronics and joint venture domains. The past history of the system is discussed and the operation of its major components described. A summary of scores at the 24 month workshop is given. Because of the emphasis on different languages and different subject areas the research has focused on the development of general purpose, re-usable techniques. The CRL/Brandeis group have implemented statistical methods for focusing on the relevant parts of texts, programs which recognize and mark names of people, places and organizations and also dates. The actual analysis of the critical parts of the texts is carried out by a parser controlled by lexical structures for the ′key' words in the text. To extend the system's coverage of English and Japanese some of the content of these lexical structures was derived from machine readable dictionaries. These were then enhanced with information extracted from corpora.
DTIC
Conferences; Extraction; Information Retrieval; Messages; Natural Language (Computers)

20070008484 New Mexico State Univ., Las Cruces, NM USA
CRL/NMSU and Brandeis: Description of the MucBruce System as Used for MUC-4
Cowie, Jim; Guthrie, Louise; Wilks, Yorick; Pustejovsky, James; Waterman, Scott; Jan 1992; 11 pp.; In English
Contract(s)/Grant(s): MDA904-91-C-9328
Report No.(s): AD-A461003; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461003

Through their involvement in the Tipster project the Computing Research Laboratory at New Mexico State University and the Computer Science Department at Brandeis University are developing a method for identifying articles of interest and extracting and storing specific kinds of information from large volumes of Japanese and English texts. We intend that the method be general and extensible. The techniques involved are not explicitly tied to these two languages nor to a particular subject area. Development for Tipster has been going on since September, 1992. The system we have used for the MUC-4 tests has only implemented some of the features we plan to include in our final Tipster system. It relies intensively on statistics and

on context-free text marking to generate templates. Some more detailed parsing has been added for a limited lexicon, but lack of fuller coverage places an inherent limit on its performance. Most of the information produced in our MUC templates is arrived at by probing the text which surrounds ′significant' words for the template type being generated, in order to find appropriately tagged fillers for the template fields.
DTIC
Conferences; Extraction; Information Retrieval; Messages; Natural Language (Computers)

20070008491 Air Force Research Lab., Rome, NY USA
The Interactive Data Wall
Jedrysik, Peter A; Moore, Jason; Brykowytch, Mark; Sweed, Richard; Jan 1999; 17 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461019; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461019

The increasingly complex battlefield environment drives the requirement for the presentation and interactive control of the endless stream of information arriving from a diverse collection of sensors deployed on a variety of platforms. At best, the situational awareness picture is fragmented without the benefit of data fusion and correlation to present a true picture of the battlespace from all information sources. Collaboration and interaction is also needed for operators within a control center and among remote geographic locations. The need to display and manipulate real-time multimedia data in a battlefield operations control center is critical to the Joint Commander directing air, land, naval and space assets. The Interactive DataWall being developed by the Advanced Displays and Intelligent Interfaces (ADII) technology team of the Information Directorate of the Air Force Research Laboratory (AFRL/IF) in Rome, New York is a strong contender for solving the information management problems facing the 21st century military commander. It provides an ultra high-resolution large screen display with wireless interaction. Commercial off-the-shelf technology has been combined with specialized hardware and software developed in-house to provide a unique capability for multimedia data display and control.
DTIC
Command and Control; Data Management; Multisensor Fusion; Walls

20070008501 SRI International Corp., Menlo Park, CA USA
Building and Using Scene Representation in Image Understanding
Baker, H H; Sep 1993; 14 pp.; In English
Contract(s)/Grant(s): DACA76-85-C-0004; DACA76-90-C-0021
Report No.(s): AD-A461044; SRI-TR-526; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461044

The task of having computers able to understand their environments through direct imaging has proved to be formidable. With its beginnings about 30 years ago (1). the field of computer vision has grown as a major part of the pursuit for artificial intelligence. Most elements of this pursuit language understanding, reasoning and planning, speech - are very difficult challenges, but vision, with its high dimensionality of space, time, scale, color, dynamics, and so forth, may be the most challenging. Early attempts to develop computer vision focused on restricted situations in which it was feasible to provide the computer with fairly complete descriptions of what it would encounter. In such cases, single images provided the sensory information for analysis. As the domains of application grew, the requirements for more competent descriptions of the world increased. Dealing with three-dimensional (3D) dynamic structures (the real world) from 3D dynamic platforms (we humans) calls for greater capabilities on both the analysis and synthesis sides of the issue. The analysis side is the processing of sensory data for such tasks as recognition and navigation, and a number of techniques are discussed here for dealing wlth these two-, three-, and higher-dimensional data. The synthesis side is the construction of ′internal' descriptions of what is seen in the environment - constructed now so that they may be used subsequently for the above tasks. This latter issue is the underlying theme we pose in this paper - developing representations from vision that will later enable effective automated operation in our 3D dynamic environments.
DTIC
Artificial Intelligence; Autonomy; Computer Vision; Data Processing; Scene Analysis

20070008505 SRI International Corp., Menlo Park, CA USA

The TACITUS System: The MUC-3 Experience

Hobbs, Jerry R; Appelt, Douglas E; Bear, John S; Tyson, Mabry; Magerman, David; Oct 1991; 29 pp.; In English

Contract(s)/Grant(s): N00014-85-C-0013; N00014-90-C-0220

Report No.(s): AD-A461049; SRI-TN-511; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461049

SRI International has been engaged in research on text understanding for a number of years. The Naval Ocean Systems Center (NOSC) has sponsored three workshops in recent years for evaluating text understanding systems. SRI participated in the first Message Understanding Conference (MUC-1) in June 1987 as an observer, and subsequently as a participant. Our system was evaluated in the second and third workshops, MUC-2 and MUC-3. For MUC-2, the task that the systems had to perform was to extract information for database entries saying who did what to whom, when, where, and with what result. The application domain for MUC-3 was news articles on terrorist activities in Latin America. The task was similar to that in MUC-2, though somewhat more information had to be extracted. The principal measures in the MUC-3 evaluation were recall and precision. Recall is the number of answers the system got right divided by the number of possible right answers. It measures how comprehensive the system is in its extraction of relevant information. Precision is the number of answers the system got right divided by the number of answers the system gave. It measures the system's accuracy. The system SRI used for these evaluations is called TACITUS. TACITUS is a system for interpreting natural language texts that has been under development since 1985. It has a preprocessor and postprocessor currently tailored to the MUC-3 application. It performs a syntactic analysis of the sentences in the text, using a fairly complete grammar of English, producing a logical form in first-order predicate calculus. Pragmatics problems are solved by abductive inference in a pragmatics, or interpretation, component.

DTIC

Data Processing; Natural Language (Computers); Texts

20070008513 Center for Nonproliferation Studies, Monterey, CA USA

Manned Gaming and Simulation Relating to Terrorism and Weapons of Mass Destruction: A Review of the Literature

Abhayaratne, Praveen; Ackerman, Gary; Mitchell, Jennifer; Apr 17, 2004; 115 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DTRA01-00-D-0002

Report No.(s): AD-A461060; No Copyright; Avail.: CASI: A06, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461060

It is within this context that the Advanced Systems and Concepts Office of the Defense Threat Reduction Agency (DTRA/ASCO) commissioned the WMD Terrorism Research Project at the Center for Nonproliferation Studies (CNS) to undertake a literature review of manned gaming and simulations of terrorist threats that involve WMD. The review was conducted mainly on the basis of open-source literature, but also includes some sources categorized 'For Official Use Only'. No classified sources were consulted in compiling this report. The primary goal of this project was to collect as much of the open source literature on manned gaming and simulations of terrorism involving WMD as possible, organize these data, and present them in an accessible format. In the course of the project, project investigators supplemented these goals by abstracting and analyzing certain aspects of these manned simulations.

DTIC

Destruction; Games; Simulation; Surveys; Terrorism

20070008515 Carnegie-Mellon Univ., Pittsburgh, PA USA

Using Unlabeled Data to Improve Text Classification

Nigam, Kamal P; May 2001; 138 pp.; In English

Contract(s)/Grant(s): F33615-93-1-1330; SBR-9720374

Report No.(s): AD-A461063; CMU-CS-01-126; No Copyright; Avail.: CASI: A07, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461063

One key difficulty with text classification learning algorithms is that they require many hand-labeled examples to learn accurately. This dissertation demonstrates that supervised learning algorithms that use a small number of labeled examples and many inexpensive unlabeled examples can create high-accuracy text classifiers. By assuming that documents are created by a parametric generative model, Expectation-Maximization (EM) finds local maximum a posteriori models and classifiers from all the data -- labeled and unlabeled. These generative models do not capture all the intricacies of text; however on some domains this technique substantially improves classification accuracy, especially when labeled data are sparse. Two problems

arise from this basic approach. First, unlabeled data can hurt performance in domains where the generative modeling assumptions are too strongly violated. In this case the assumptions can be made more representative in two ways: by modeling sub-topic class structure, and by modeling super-topic hierarchical class relationships. By doing so, model probability and classification accuracy come into correspondence, allowing unlabeled data to improve classification performance. The second problem is that even with a representative model, the improvements given by unlabeled data do not sufficiently compensate for a paucity of labeled data. Here, limited labeled data provide EM initializations that lead to low-probability models. Performance can be significantly improved by using active learning to select high-quality initializations, and by using alternatives to EM that avoid low-probability local maxima.
DTIC
Algorithms; Classifications; Data Processing; Expectation; Texts

20070008516 Space and Naval Warfare Systems Command, San Diego, CA USA
The Virtual Information Center Technologies for Open-Source Requirements (VICTOR) Project: Emerging HCI Concepts
Moore, Ronald A; Averett, M G; Clarkson, Jeff; Jan 2000; 7 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461064; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461064

Regional and theater military operations have increasingly found open-source information to be a useful supplement to traditional data sources. Open-source information includes a wide variety of public data that can be readily acquired from news broadcasts, web sites, on-line databases, information brokers, email, etc. The VICTOR project is a technology demonstration initiative with the objective of developing human-centric decision support principles for information processing to support on-line open-source information analysis by leveraging existing / evolving capabilities. Observations, interviews, and product assessments were conducted at USCINCPAC to determine user requirements and current work processes. Based on this, we are developing a set of tools that are customized to address the cognitive tasks performed by open-source information analysts. An innovative development approach is being employed that provides access to a variety of relevant COTS/GOTS software through a consistent human-computer interface and that adapts these tools to the users specific tasks. This approach enables extremely rapid, low cost development that stays abreast of the latest technology, while unburdening users from excessive system integration and training.
DTIC
Data Processing; Information; User Requirements; Virtual Reality

20070008527 Carnegie-Mellon Univ., Pittsburgh, PA USA
LOCI: Fast Outlier Detection Using the Local Correlation Integral
Papadimitriou, Spiros; Kitagawa, Hiroyuki; Gibbons, Phillip B; Faloutsos, Christos; Nov 2002; 29 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N66001-00-1-8936
Report No.(s): AD-A461085; CMU-CS-02-188; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461085

Outlier detection is an integral part of data mining and has attracted much attention recently [BKNS00, JTH01, KNT00]. In this paper, we propose a new method for evaluating outlier-ness, which we call the Local Correlation Integral (LOCI). As with the best previous methods, LOCI is highly effective for detecting outliers and groups of outliers (a.k.a. micro-clusters). In addition, it offers the following advantages and novelties: (a) It provides an automatic, data-dictated cut-off to determine whether a point is an outlier in contrast, previous methods force users to pick cut-offs, without any hints as to what cut-off value is best for a given dataset. (b) It can provide a LOCI plot for each point; this plot summarizes a wealth of information about the data in the vicinity of the point, determining clusters, micro-clusters, their diameters and their inter-cluster distances. None of the existing outlier-detection methods can match this feature, because they output only a single number for each point: its outlierness score. (c) Our LOCI method can be computed as quickly as the best previous methods. (d) Moreover, LOCI leads to a practically linear approximate method, aLOCI (for approximate LOCI), which provides fast highly-accurate outlier detection. To the best of our knowledge, this is the first work to use approximate computations to speed up outlier detection. Experiments on synthetic and real world data sets show that LOCI and aLOCI can automatically detect outliers and micro-clusters, without user-required cut-offs, and that they quickly spot both expected and unexpected outliers.
DTIC
Correlation; Data Mining; Information Retrieval; Integrals; Outliers (Statistics)

20070008533 Carnegie-Mellon Univ., Pittsburgh, PA USA

Integrating Multiple Knowledge Sources for Utterance-Level Confidence Annotation in the CMU Communicator Spoken Dialog System

Bohus, Dan; Rudnicky, Alex; Nov 2002; 31 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N66001-99-1-8905

Report No.(s): AD-A461099; CMU-CS-02-190; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461099

In the recent years, automated speech recognition has been the main drive behind the advent of spoken language interfaces, but at the same a time a severe limiting factor in the development of these systems. We believe that increased robustness in the face of recognition errors can be achieved by making the systems aware of their own misunderstandings, and employing appropriate recovery techniques when breakdowns in interacted occur. In this paper we address the first problem: the development of an utterance-level confidence annotator for a spoken dialog system. After a brief introduction to the CMU Communicator spoken dialog system (which provided the target platform for the developed annotator), we cast the confidence annotation problem as a machine learning classification task, and focus on selecting relevant features and on empirically identifying the best classification techniques for this task. The results indicate that significant reductions in classification error rate can be obtained using several different classifiers. Furthermore, we propose a data driven approach to assessing the impact of the errors committed by the confidence annotator on dialog performance, with a view to optimally fine-tuning the annotator. Several models were constructed, and the resulting error costs were in accordance with our intuition. We found, surprisingly, that, at least for a mixed-initiative spoken dialog system as the CMU Communicator, these errors trade-all equally over a wide operating characteristic range.

DTIC

Classifications; Human-Computer Interface; Speech; Speech Recognition

20070008557 Carnegie-Mellon Univ., Pittsburgh, PA USA

Acquiring Domain-Specific Planners by Example

Winner, Elly; Veloso, Manuel; Jan 2003; 40 pp.; In English

Contract(s)/Grant(s): F30602-00-2-0549

Report No.(s): AD-A461131; CMU-CS-03-101; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA461131

Intelligent problem solving requires the ability to select actions autonomously from a specific state to reach objectives. Planning algorithms provide approaches to look ahead and select a complete sequence of actions. Given a domain description consisting of preconditions and effects of the actions the planner can take, an initial state, and a goal, a planning program returns a sequence of actions to transform the initial state into a state in which the goal is satisfied. Classical planning research has addressed this problem in a domain-independent manner--the same algorithm generates a complete plan for any domain specification. This feature comes at a cost which domain-independent planners incur either in high search efforts or in tedious hand-coded domain knowledge. Previous approaches to efficient general-purpose planning have focused on reducing the search involved in an existing general-purpose planning algorithm. An interesting alternative is to use example plans in a particular domain to demonstrate how to solve problems in that domain and to use that information to solve new problems independently of a domain-independent planner. Others have used example plans for case based planning, but the retrieval and adaptation mechanisms were still domain-independent and efficiency issues were still a concern. In my thesis, I propose to introduce algorithms to extract complex, repeating processes, in the form of domain-specific planning programs, from example plans. I will investigate the application of these learned programs to modelling agent preferences and choices. I will also investigate how the programs can be used, extended, and repaired dynamically as an agent encounters new problems and acquires new experience. Finally, I will compare the template-based planning paradigm to existing general-purpose and domain-specific planning programs with a full evaluation on new and existing planning domains.

DTIC

Algorithms; Object-Oriented Programming; Problem Solving

20070008562 Carnegie-Mellon Univ., Pittsburgh, PA USA

Decentralized Storage Consistency via Versioning Servers

Goodson, Garth R; Wylie, Jay J; Ganger, Gregory R; Reiter, Michael K; Sep 2002; 19 pp.; In English

Contract(s)/Grant(s): F49620-01-1-0433; F30602-99-2-0539

Report No.(s): AD-A461137; CMU-CS-02-180; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461137

This paper describes a consistency protocol that exploits versioning storage-nodes. The protocol provides linearizability with the possibility of read aborts in an asynchronous system that may suffer client and storage-node crash failures. The protocol supports both replication and erasure coding (which precludes post hoc repair of partial-writes), and avoids the excess work of two-phase commits. Versioning storage-nodes allow the protocol to avoid excess communication in the common case of no write sharing and no failures of writing clients.
DTIC
Computer Storage Devices; Consistency; Data Storage; Synchronism

20070008569 Aptima, Inc., Woburn, MA USA
Conceptual Description: The Sophisticated Automatic Policy-Generation Executor (SAGE) Tool
Poirier, John; MacMillan, Jean; Hess, Kathleen; Freeman, Jared; Serfaty, Daniel; Jan 2000; 23 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461152; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461152

This paper describes a concept for a tool (the SAGE: Sophisticated Automatic policy-Generation Executor) that will provide semi-automatic development and implementation of information policy to assist military commanders in meeting their operational requirements. The concepts presented here address the problem of deriving organizational information management policies from mission concepts and provide a mechanism for commanders and their staffs to articulate information policies appropriate to their roles and echelons within the organization. It is suggested that generation of these information policies can be facilitated by a web-based wizard. This wizard (the SAGE) would assist the commander and staff in completing task templates relevant to mission concepts and plans, and then derive information policy elements for review and execution. The tool would retrieve and fill out existing task templates to the degree feasible and query users only to the point that gaps in task templates need to be filled. The tool would also monitor for changes in operational circumstance to trigger adaptation of supporting information management policies. A generic example of the method and a conceptual case study approach are provided. Additional applications of the concept to support information assurance activities, e.g., intrusion detection and response, are also explored.
DTIC
Information Systems; Policies

20070008573 Naval Undersea Warfare Center, Newport, RI USA
What Makes Decision Tasks Difficult?
Kirschenbaum, Susan S; Jan 1999; 10 pp.; In English
Report No.(s): AD-A461162; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461162

Multi-method investigations of information gathering behavior for decision making in the submarine environment are reported. The two-pronged focus of these studies was classification of task difficulty and investigations of the effects of different difficulty classes on information gathering and decision making. Experimental methods included interviews, questionnaires, computer-assisted process tracing, verbal protocols, and interactive simulations. Results both help assess the strengths and weaknesses of each method and provide support for an information clustering hypothesis. These results suggest a new approach for the design of complex decision support interfaces.
DTIC
Decision Support Systems; Information Systems

20070008578 Carnegie-Mellon Univ., Pittsburgh, PA USA
On the Language Inclusion Problem for Timed Automata: Closing a Decidability Gap
Ouaknine, Joel; Worrell, James; Nov 2003; 21 pp.; In English
Contract(s)/Grant(s): N00014-01-1-0796
Report No.(s): AD-A461167; CMU-CS-03-207; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461167

We consider the language inclusion problem for timed automata: given two timed automata A and B, are all the timed traces accepted by B also accepted by A? While this problem is known to be undecidable, we show here that it becomes decidable if A is restricted to having at most one clock. This is somewhat surprising, since it is well-known that there exist timed automata with a single clock that cannot be complemented. The crux of our proof consists in reducing the language

inclusion problem to a reachability question on an infinite graph; we then construct a suitable well-quasi-order on the nodes of this graph, which ensures the termination of our search algorithm. We also show that the language inclusion problem is decidable if the only constant appearing among the clock constraints of A is zero. Moreover, these two cases are essentially the only decidable instances of language inclusion, in terms of restricting the various resources of timed automata.
DTIC
Automata Theory; Decision Making

20070008584 Carnegie-Mellon Univ., Pittsburgh, PA USA
News and Trading Rules
Thomas, James D; Jan 2003; 213 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-02-1-0438; N00014-96-1-1222
Report No.(s): AD-A461174; CMU-CS-03-123; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461174

AI has long been applied to the problem of predicting financial markets. While AI researchers see financial forecasting as a fascinating challenge, predicting markets has powerful implications for financial economics -- in particular the study of market efficiency. Recently economists have turned to AI for tools, using genetic algorithms to build trading strategies, and exploring the returns those strategies generate of evidence of market inefficiency. The primary aim of this thesis is to take this basic approach, and put the artificial intelligence techniques used on a firm footing, in two ways: first, by adapting AI techniques to the stunning amount of noise in financial data; second, by introducing a new source of data untapped by traditional forecasting methods: news. I start with practitioner-developed technical analysis constructs, systematically examining their ability to generate trading rules profitable on a large universe of stocks. Then, I use these technical analysis constructs as the underlying representation for a simple trading rule learner, with close attention paid to limiting search and representation to fight overfitting. In addition, I explore the use of ensemble methods to improve performance. Finally, I introduce the use of textual data from internet message boards and news stories, studying their use both in isolation as well as augmenting numerical trading strategies.
DTIC
Artificial Intelligence; Economics; Finance; Market Research

20070008592 Carnegie-Mellon Univ., Pittsburgh, PA USA
Self-*Storage: Brick-based storage with automated administration
Ganger, Gregory R; Strunk, John D; Klosterman, Andrew J; Aug 2003; 21 pp.; In English
Report No.(s): AD-A461187; CMU-CS-03-178; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461187

This white paper describes a new project exploring the design and implementation of self-* storage systems: self-organizing, self-configuring, self-tuning, self-healing, self-managing systems of storage bricks. Borrowing organizational ideas from corporate structure and automation technologies from Artificial Intelligence and control systems, we hope to dramatically reduce the administrative burden currently faced by data center administrators. Further, compositions of lower cost components can be utilized, with available resources collectively used to achieve high levels of reliability, availability, and performance.
DTIC
Bricks; Computer Storage Devices; Data Storage

20070008616 Colorado Univ., Boulder, CO USA
Harvest User's Manual
Hardy, Darren R; Schwartz, Michael F; Oct 1994; 50 pp.; In English
Contract(s)/Grant(s): DABT63-93-C-0052; F49620-93-1-0082
Report No.(s): AD-A461230; CU-CS-743-94; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461230

HARVEST is an information discovery and access system [4]. It addresses three critical problems to help users reap the growing collection of information accessible via the World Wide Web [2]. First, it provides an efficient and flexible means of indexing widely distributed information, to support resource discovery. Second, it provides network-adaptive means of caching and replicating heavily accessed information, to prevent bottlenecks. Third, it provides support for accessing and manipulating complex data. A key goal of Harvest is to provide a flexible system that can be configured in various ways to

create many types of indexes, making very efficient use of Internet servers, network links, and index space on disk. Our measurements indicate that Harvest can reduce server load by a factor of 6,600, network traffic by a factor of 59, and index space requirements by a factor of 43 when building indexes, compared with previous systems, such as Archie, WAIS, and the World Wide Web Worm [3]. Harvest also allows users to extract structured (attribute-value pair) information from many different information formats and build indexes that allow these attributes to be referenced (e.g., all documents with a certain regular expression in the title field).
DTIC
Data Links; Internets; Manuals; Networks; User Manuals (Computer Programs)

20070008670 Naval Postgraduate School, Monterey, CA USA
Information Security
Buddenberg, Rex; Apr 2002; 9 pp.; In English
Report No.(s): AD-A461312; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461312

Security in information systems is a complex problem. Single solutions to complex problems don't exist, and matching the appropriate solution (or more accurately, a set of solutions) to a requirement is necessary. This paper provides a list of definitions of information security-related terms; reviews ISO 7498-2, the security architecture reference model; presents an organizing matrix; discusses application layer security, enclave protection, link protection, and the Department of Defense's most recent (March 2002) 'Overarching Wireless Policy"; and presents examples of problems that can occur (e.g., credit card transactions over the internet and the Walker insider attack against the Navy' worldwide communications system). The author concludes that the higher up the matrix one can solve a security problem, the better. In particular, if one can solve confidentiality problems at the application layer, one can use the general purpose network. None of the solutions are mutually exclusive. It's entirely possible to solve the confidentiality problem with end-to-end secure e-mail, communicate entirely within a closed enclave (carefully firewalled or air-gapped to keep out outsiders), and use link encryption to frustrate traffic analysis by eavesdroppers. When one considers acquiring information systems, one wants to express the lower layer requirements to the 'plumbers' -- those who build and provision the network -- and the top-layer requirements to the application designers. Mixing these signals (graphically visualized as crossing the matrix diagonally) results in asking the right requirements, but of the wrong providers. Most importantly, the specific security requirements must be properly matched with a solution that directly targets the requirement. In the matrix presented, this is visually illustrated by horizontal lines between problem and solution; diagonal traces indicate a mismatch.
DTIC
Computer Information Security; Computer Networks; Security

20070008671 Naval Postgraduate School, Monterey, CA USA
What's Wrong with DoD's So-Called Information Architectures and What We Ought to be Doing about It
Buddenberg, Rex; Mar 2000; 12 pp.; In English
Report No.(s): AD-A461314; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461314

The Department of Defense (DoD) needs information interoperability. That is, the components of multiple programs, services, and allies need to work together. This paper accepts without further argument that improved information systems can improve combat power, including the deterrent capability that combat power confers. The paper also recognizes that the list of other programs that one must be interoperable with is indefinitely long. Therefore, an open-ended solution is a fundamental requirement. This leads one directly to the need for an information systems architecture. DoD needs a common design vision that each program manager or procurement agent works to fit into. Defining and articulating such an architecture is the purpose of this paper. The following topics are discussed: large information systems; what's wrong with the current architecture and how did DoD get into this mess?; measures of effectiveness; network centric architecture; end system-network interfaces ;management interfaces; public key infrastructure; quality of service; and the need for modularization.
DTIC
Architecture (Computers); Defense Program; Design Analysis; Information Systems; Internets; Interoperability; Management Planning

20070008675 Defense Information Systems Agency, Falls Church, VA USA
Laying the Foundation for Coalition Interoperability through NATO's C3 Technical Architecture
Moxley, Frederick I; Simon, Lucien; Wells, Elbert J; Jan 2000; 8 pp.; In English
Report No.(s): AD-A461323; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461323

Current projections indicate that in the future, the ability to share information between military systems will ultimately determine whether or not a mission will be a success or a failure. Based on the probability that conflicts will continue to occur involving allied command structures that utilize diverse information systems, it has been surmised that information interoperability will be the crucial factor for success when conducting future combined and joint military operations. This paper describes an architectural approach that lays the structural foundation necessary to attain interoperability between diverse C3 systems, and it provides the rationale as to why this approach has been proposed for use throughout NATO. Interoperability has long been an elusive and sought-after goal, especially within the realm of coalition information systems. A well-defined architectural approach can lay the structural foundation necessary to attain interoperability for diverse military information systems in the future. When all five volumes of the NATO C3 Technical Architecture (NC3TA) are finalized, it is anticipated that the structural foundation will be in place for the building of future coalition systems for years to come.
DTIC
Command and Control; Information Systems; Interoperability; Military Operations; North Atlantic Treaty Organization (NATO)

20070008707 Army Cold Regions Research and Engineering Lab., Hanover, NH USA
Instrumenting an All-Terrain Vehicle for Off-Road Mobility Analysis
Wesson, Kyle D; Parker, Michael W; Coutermarsh, Barry C; Shoop, Sally A; Stanley, Jesse M; Jan 2007; 56 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461425; ERDC/CRREL TR-07-1; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461425

With small mobile vehicles, even robots, becoming increasingly important for military operations, Cold Regions Research and Engineering Laboratory (CRREL) researchers set out to instrument an all-terrain vehicle (ATV) with mobility sensors to obtain and understand small-vehicle mobility data in all seasons. Extensive mobility research has already been performed at CRREL on the CRREL Instrumented Vehicle (CIV), which collects mobility data with large and expensive vehicle performance sensors. However, a small vehicle such as an ATV is not suited to carry large data collection instruments. In an effort to overcome cost and size limitations while maintaining functionality, an ATV was instrumented with lowcost sensors to collect mobility data comparable to the CIV. At the U.S. Army's Ethan Allen Firing Range, ATV mobility performance tests, such as coast down and drawbar tests, were performed alongside the CIV for comparison, while cross range test runs were performed to demonstrate the system's capabilities. This paper presents one option for researchers looking to instrument a small-vehicle with mobility performance sensors, describes the testing methodology and results, and offers a comparison to the CIV. Low-cost, portable vehicle mobility instrumentation systems would allow for accurate vehicle simulations and mobility awareness that can be used in situ by the warfighter and lead to further applications of all-terrain vehicles in force protection and border patrol scenarios.
DTIC
Data Acquisition; Detectors; Mobility; Roads; Terrain; Traffic

20070008726 George Mason Univ., Fairfax, VA USA
Performance Prediction of a Network-Centric Warfare System
Shin, Insub; Levis, Alexander H; Jan 2000; 15 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F49620-98-1-0179
Report No.(s): AD-A461462; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461462

When a system consisting of sub-systems is used for a time critical mission, the delays associated with the network connecting these sub-systems may play a critical role in battle management. Consequently, the combined models must be able to represent the network delay properly. In this paper, the architecture of a system is layered into two levels: a functional layer and a physical layer. Both architectural layers are developed as executable models: the functional executable model in a Colored Petri net and the physical executable model in a queueing net. Both layered executable models are synthesized to develop a performance prediction model. The message-passing pattern is generated from the Petri net using a state space

analysis technique. Then, the queueing net model processes these messages preserving the message-passing pattern. Once the network delays are measured, the delay values are inserted into the Petri net model. The example in this paper shows how a small network delay in a C3 system affects the outcome of a time critical mission. It also illustrates design choices and how to develop tactics to resolve the tolerance of the network delays.
DTIC
Architecture (Computers); Command and Control; Message Processing; Performance Prediction; Warfare

20070008733 Stanford Univ., CA USA
Intercultural Knowledge Flows in Edge Organizations: Trust as an Enabler
Gavrieli, Dana A; Scott, W R; Jun 2005; 48 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461476; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461476

This paper investigates the dynamics of intercultural knowledge flows in Edge Organizations. We seek to understand how cultural differences and dynamic environments affect Edge and other organizational forms where knowledge flows are critical. Drawing on the organizational studies, social psychological, and sociological literatures, we examine how the Edge form accommodates and exacerbates cultural differences (e.g., across military services and coalition partners) and knowledge flows. A major factor that emerges as an enabler of knowledge flows, especially in dynamic environments such as those in which Edge organizations operate, is trust. While trust holds great promise in enabling knowledge flows in Edge organizations, it is very challenging to achieve. The two conditions necessary for trust a long history of acquaintance and similarity among constituents are often missing in Edge organizations. Given that trust is crucial to efficient functioning, we view this as a serious problem and set out to better understand how trust can be generated in Edge organizations. In this paper, we lay out the theoretical grounding for our efforts and begin to sketch an agenda for research in the coming months.
DTIC
Information Management; Military Operations; Organizations

20070008754 USAF Counterproliferation Center, Maxwell AFB, AL USA
A Message Not Yet Sent: Using Strategic Communications to Combat Weapons of Mass Destruction Threats
Estes, Richard H; Jul 2006; 67 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461505; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461505

The invasion and occupation of Iraq was a strong message sent by the USA to the world. The message was this: 'We can take down your country for just about any reason we want to. And if you purport to have weapons of mass destruction, that's a pretty good reason.' The USA may never know precisely how effective this message was. It may have convinced some nations, like Libya, to stop their weapons of mass destruction (WMD) programs. But the USA may never know which states or organizations decided to drop (or not start) a clandestine program as a result of its actions. These actions, by themselves, probably had a good effect in places like Libya, but an optimal strategic communications campaign would have used both words and actions effectively. A strategic communications campaign, while it benefits from a demonstration of the will to back up words with force, should be well-articulated and needs to be repeated over a period of time. Many critics have made the case that the U.S. invasion of Iraq, along with the virtual collapse of international support for the USA prior to the invasion, and some questionable actions by U.S. occupiers, have badly tarnished the image of the USA abroad, especially in the Arab world. The USA turned heads with its message of willingness to use force, but failed utterly in communicating the righteousness of its cause. The critical element missing was a coherent message -- using precise and planned words, together with other instruments of influence, to explain to the world why the USA was worthy of being followed -- and if not followed, at least understood. What was missing was a coherent strategic communications campaign for the USA -- a campaign that needed to be in place long before any invasion. This paper addresses the need for a strategic communications campaign to combat threats of weapons of mass destruction.
DTIC
Combat; Defense Program; Destruction; Messages

20070008764 Colorado Univ., Boulder, CO USA
Optimization of Dynamic Query Evaluation Plans
Cole, Richard L; Graefe, Goetz; Dec 1993; 28 pp.; In English
Contract(s)/Grant(s): IRI-8996270; IRI-8912618
Report No.(s): AD-A461520; CU-CS-671-93; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461520

Traditional query optimizers assume accurate knowledge of run-time parameters such as selectivities and resource availability during plan optimization, i.e., at compile-time. In reality, however, this assumption is often not justified. Therefore, the 'static' plans produced by traditional optimizers may not be optimal for many of their actual run-time invocations. Instead, we propose a novel optimization model that assigns the bulk of the optimization effort to compile-time and delays carefully selected optimization decisions until run-time. Our previous work defined the run-time primitives, 'dynamic plans' using 'choose-plan' operators, for executing such delayed decisions, but did not solve the problem of constructing dynamic plans at compile-time. The present paper introduces techniques that solve this problem. Experience with a working prototype optimizer demonstrates (i) that the additional optimization and start-up overhead of dynamic plans compared to static plans is dominated by their advantage at run-time, (ii) that dynamic plans are as robust as the 'brute-force' remedy of run-time optimization, i.e., dynamic plans maintain their optimality even if parameters change between compile-time and run-time, and (iii) that the start-up overhead of dynamic plans is significantly less than the time required for complete optimization at run-time. In other words, our proposed techniques are superior to both techniques considered to-date, namely compile-time optimization into a single static plan as well as run-time optimization. Finally, we believe that the concepts and technology described can be transferred to most commercial query optimizers in order to improve the performance of embedded quenes with host variables in the query predicate.
DTIC
Computer Programs; Information Retrieval; Optimization

20070008769 Maryland Univ. Baltimore County, Catonsville, MD USA
On Mining Web Access Logs
Joshi, Anupam; Krishnapuram, Raghu; May 2000; 8 pp.; In English
Contract(s)/Grant(s): N00014-96-1-0439
Report No.(s): AD-A461525; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461525
The proliferation of information on the world wide web has made the personalization of this information space a necessity. One possible approach to web personalization is to mine typical user profiles from the vast amount of historical data stored in access logs. In the absence of any a priori knowledge, unsupervised classification or clustering methods seem to be ideally suited to analyze the semi-structured log data of user accesses. In this paper, we define the notion of a user session , as well as a dissimilarity measure between two web sessions that captures the organization of a web site. To extract a user access profile, we cluster the user sessions based on the pair-wise dissimilarities using a robust fuzzy clustering algorithm that we have developed. We report the results of experiments with our algorithm and show that this leads to extraction of interesting user profiles. We also show that it outperforms association rule based approaches for this task.
DTIC
Information Retrieval; Information Systems; Internets; Mining

20070008776 Swedish Defence Research Establishment, Stockholm, Sweden
Some Thoughts on the Application of Military Theory to Information Operations and Network Centric Warfare
Heickero, Roland; Jun 2006; 27 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461536; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461536
The transformation into a world based on communication and information leads to Information Operations (IO) becoming more important than ever. Thus, there is a need to develop new methodologies for successful IO that take into account the change towards network-enabling warfare capabilities. In a network-centric warfare approach it is important to understand the opponents' network structure and communication system and how they use these resources. Equally important is to understand one's own network structure in terms of strengths and weaknesses. Every type of network has it own vulnerabilities in the form of vital nodes, links, and platforms, regardless of whether it is a communications, organizational, or biological network. If one understand one's own structure as well as that of one's opponents, the chances of effective IO increase greatly. A fruitful way forward is to use theories based on center of gravity (CoG) and critical vulnerabilities (CV). This paper first discusses the logic of networks in general terms and then considers different types of networks and their respective abilities to resist attacks of different kinds due to center of gravity and critical vulnerabilities. Twenty briefing charts summarize the presentation.
DTIC
Center of Gravity; Communication Networks; Computer Networks; Military Operations; Vulnerability; Warfare

20070008783 Space and Naval Warfare Systems Center, San Diego, CA USA
Enterprise Dynamic Access Control (EDAC)
Fernandez, Richard; Jun 2005; 41 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461545; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461545

The Enterprise Access Control (EDAC) represents an access control model that adheres to the basic principles of Role-Based Access Control (RBAC) standard published by the National Institute of Standards and Technology (NIST). The EDAC accommodates complex and scalable access control situations many government agencies and civilian organizations are experiencing when managing resource access. Access control is the process that evaluates resource access. Resources can represent software applications, web services and even facility access. An effective access control model should be capable of evaluating resource access based on user characteristics and environmentals. Currently Access Control Lists (ACL) and groups represent static listings of individual names allowed access to resources.
DTIC
Access Control; Control; Dynamic Control; Hierarchies; Numerical Control

20070008810 Naval Postgraduate School, Monterey, CA USA
Two Theories of Process Design for Information Superiority: Smart Pull vs. Smart Push
Hayes-Roth, Rick; Jun 2006; 39 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461578; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA461578

This paper examines how information should flow among networked entities in Network-Centric Operations and Warfare (NCOW). In particular, should the entities actively seek, acquire, and process relevant information, or should they wait to react to information that others send to them? In short, should they pull information, or should they rely upon others to push information to them? In most tactical contexts, 'smart push' will improve efficiency by orders of magnitude compared to 'smart pull.' This analysis reveals that efficient information processing chains require a general capability to watch for key events. Humans and the computer applications supporting them will use this capability to detect events matching conditions of interest they specify. This capability plays a key role in transforming networks into integrated value chains. Where traditional networks aim at supporting unregulated exchanges for data bit flows best suited to random access and unpredictable process sequences, the capability to delegate condition monitoring enables one to transform networks into conveyers of timely, valuable information. To maximize efficiency, one must use processes in which each successive step receives information just as valuable as its input. Thus, condition monitoring and its associated 'smart push' constitute a required foundation for the efficient process chains needed to achieve information superiority. Seventeen briefing charts summarize the presentation.
DTIC
Command and Control; Data Processing; Decision Making; Information Flow; Logistics; Network Analysis

20070008852 Army Research Lab., Aberdeen Proving Ground, MD USA
Data Replication in Low Bandwidth Military Environments - State of the Art Review
Gibb, Allan; Chamberlain, Sam; Jan 2000; 10 pp.; In English
Report No.(s): AD-A461628; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461628

Modern armies are undergoing a revolution in the way information is managed on the battlefield. Voice-based command, control, and communication systems are being complemented by, and in some cases replaced by (in whole or in part) digital command, control and communication systems. Digital systems offer the promise of increased battlefield awareness through a more systematic and automated distribution of relevant data than is possible with a voice-based communication system. To deliver on this promise, the communication backbone must be capable of distributing digital data among participating command and control nodes with no errors and a timeliness appropriate to the operational scenario. To maintain information superiority, important information must be passed quickly enough to permit the friendly commander to stay within, and act within, the decision cycle of the enemy commander. On the tactical battlefield, the low data throughput and unreliable connectivity of wireless communication links make it difficult to replicate enough data in a timely way to satisfy this objective. This paper reviews the state of the art of data replication mechanisms within a low bandwidth wireless military environment as revealed at a workshop sponsored by The Technical Cooperation Program (TTCP), Command, Control, Communications, and Intelligence (C3I) Group, Technical Panel 10 (TP-10) that was held at Fort Leavenworth, Kansas, 20-22 April, 1999.
DTIC
Bandwidth; Command and Control; Communication Networks; Data Bases; Digital Systems; Low Frequencies; Wireless Communication

20070008942 SRI International Corp., Menlo Park, CA USA

Inferring Domain Plans in Question-Answering

Pollack, Martha E; Dec 1, 1986; 219 pp.; In English

Contract(s)/Grant(s): N00039-84-K-0078; N00014-85-C-0013

Report No.(s): AD-A461778; SRI-TN-403; No Copyright; Avail.: CASI: A10, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461778

The importance of plan inference in models of conversation has been widely noted in the computational-linguistics literature, and its incorporation in question-answering systems has enabled a range of cooperative behaviors. The plan inference process in each of these systems, however, has assumed that the questioner (Q), whose plan is being inferred, and the respondent (R), who is drawing the inference, have identical beliefs about the actions in the domain. I demonstrate that this assumption is too strong and that it often results in failure not only of the plan-inference process, but also of the communicative process that plan inference is meant to support. In particular, it precludes the principled generation of appropriate responses to queries that arise from invalid plans. I present a model of plan inference in conversation that distinguishes between the beliefs of the questioner and the beliefs of the respondent. This model rests on an account of plans as mental phenomena: 'having a plan' is analyzed as having a particular configuration of beliefs and intentions. Judgements that a plan is invalid are associated with particular discrepancies between the beliefs that R ascribes to Q, when R believes that Q has some particular plan, and the beliefs that R herself holds. I define several types of invalidities from which a plan may suffer, relating each to a particular type of belief discrepancy, and show that the types of any invalidities judged to be present in the plan underlying a query can affect the content of a cooperative response. The plan inference model has been implemented in SPIRIT, a System for Plan Inference that Reasons about Invalidities Too, which reasons about plans underlying queries in the domain of computer mail.

DTIC

Artificial Intelligence; Inference

20070008975 Colorado Univ., Boulder, CO USA

Harvest: A Scalable, Customizable Discovery and Access System

Bowman, C M; Danzig, Peter B; Hardy, Darren R; Manber, Udi; Schwartz, Michael F; Jul 1994; 33 pp.; In English

Contract(s)/Grant(s): DABT63-93-C-0052; F49620-93-1-0082

Report No.(s): AD-A461844; CU-CS-732-94; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461844

Rapid growth in data volume user base and data diversity render Internet-accessible information increasingly difficult to use effectively. In this paper we introduce Harvest, a system that provides a set of customizable tools for gathering information from diverse repositories, building topic-specific content indexes, flexibly searching the indexes, widely replicating them, and caching objects as they are retrieved across the Internet. The system interoperates with Mosaic and with HTTP, FTP, and Gopher information resources. We discuss the design and implementation of each subsystem and provide measurements indicating that Harvest can reduce server load, network traffic and index space requirements significantly compared with previous indexing systems. We also discuss a half dozen indexes we have built using Harvest, underscoring both the customizability and scalability of the system.

DTIC

Information Retrieval; Internets

20070009010 Space and Naval Warfare Systems Command, San Diego, CA USA

A Basis for Joint Interoperability

Hamilton, Jr , John A; Murtagh, Jeanne L; Deal, John C; Jan 1999; 12 pp.; In English; Original contains color illustrations

Report No.(s): AD-A461922; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461922

How can the Services benefit from a more detailed description of the basis for joint interoperability? Without interoperable systems, we cannot truly have 'joint operations.' Instead, we have a collection of forces from more than one service -- and possibly even from more than one country -- conducting independent operations in the same geographical area. We cannot work together in a cooperative, coordinated, mutually supportive effort to win on the battlefield if we cannot communicate, and communication is dependent on interoperable systems. The Joint Technical Architecture (JTA) was developed to provide DOD systems with the basis for the seamless interoperability necessary to ensure that we can truly conduct joint operations. This paper describes the three architectural components (views) of the JTA, and then proposes additional detail for one of these three components. Our goal is to help improve interoperability of joint forces by providing

a more detailed description of the requirements which must be considered when new systems are being developed. This work is the result of engineering support conducted by the Joint Forces Program Office under the direction of the US Atlantic Command J6.
DTIC
Interoperability; Military Operations

20070009011 Space and Naval Warfare Systems Command, San Diego, CA USA
Developing and Fielding Information Dominance
Byram, Judith K; Harris, James P; Jan 2002; 17 pp.; In English
Report No.(s): AD-A461923; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461923

This paper describes the process improvements that comprise the Space and Naval Warfare Systems Command's Horizontal Integration Initiative. It tells how these process improvements are leading to improved C4ISR capability, sustainability, and cost effectiveness as the System Command fields successive Blocks of its horizontally integrated product line: 'IT-21'. The process improvements represent a holistic view of end to end capabilities: commonality in hardware, software, and data structure; tight configuration management; built in ILS; and rigorous testing to horizontally integrate shipboard C4ISR designs. The paper recounts how these improvements became the foundation for SPAWAR's IT-21 re-engineering initiative; and discusses development and fielding plans for the Fleet's first fully integrated C4ISR architecture: IT-21 - Block 1. An organizational overview of the IT-21 Block 1 architecture, within its functional enclaves (GENSER, SCI, UNCLAS, Networks, Transport), lists key features of the end to end design package. As Block 1 readies for delivery in 2003, development of its successor architecture, IT-21 Block 2, is already underway. The features of the IT-21 Block 2 design process - requirements analysis, technology insertion, interface planning, and cost/benefit analysis - provide insight into the dynamics which will shape Navy C4ISR in years to come.
DTIC
Command and Control; Dominance; Systems Integration

20070009013 Office of Naval Research, Arlington, VA USA
Structure of the Global Nanoscience and Nanotechnology Research Literature
Kostoff, Ronald N; Koytcheff, Ray; Lau, Clifford G; Jan 2006; 1492 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461930; No Copyright; Avail.: CASI: A99, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461930

Text mining was used to extract technical intelligence from the open source global nanotechnology and nanoscience research literature. An extensive nanotechnology/ nanoscience-focused query was applied to the Science Citation Index/ Social Science Citation Index (SCI/ SSCI) databases. The nanotechnology/ nanoscience research literature technical structure (taxonomy) was obtained using computational linguistics, document clustering, and factor analysis. The nanotechnology/ nanoscience research literature infrastructure (prolific authors, key journals/ institutions/ countries, most cited authors/ journals/ documents) for each of the clusters generated by the document clustering algorithm was obtained using bibliometrics. Another novel addition was the use of phrase auto-correlation maps to show technical thrust areas based on phrase co-occurrence in Abstracts, and the use of phrase-phrase cross-correlation maps to show technical thrust areas based on phrase relations due to the sharing of common co-occurring phrases. The use of factor matrices quantified further the strength of the linkages among institutions and among countries, and validated the copublishing networks shown graphically on the maps. The ~400 most cited nanotechnology papers since 1991 were grouped, and their characteristics generated. Whereas the main analysis provided technical thrusts of all nanotechnology papers retrieved, analysis of the most cited papers allowed their unique characteristics to be displayed.
DTIC
Information Retrieval; Nanotechnology; Surveys

20070009039 Texas Univ., Arlington, TX USA
Qualitative Comparison of Graph-Based and Logic-Based Multi-Relational Data Mining: A Case Study
Ketkar, Nikhil S; Holder, Lawrence B; Cook, Diane J; Aug 2005; 9 pp.; In English
Contract(s)/Grant(s): F30602-01-2-0570
Report No.(s): AD-A459038; No Copyright; Avail.: CASI: A02, Hardcopy

The goal of this paper is to generate insights about the differences between graph-based and logic-based approaches to

multi-relational data mining by performing a case study of the graph-based system, Subdue and the inductive logic programming system, CProgol. We identify three key factors for comparing graph-based and logic-based multi-relational data mining; namely, the ability to discover structurally large concepts, the ability to discover semantically complicated concepts and the ability to effectively utilize background knowledge. We perform an experimental comparison of Subdue and CProgol on the Mutagenesis domain and various artificially generated Bongard problems. Experimental results indicate that Subdue can significantly outperform CProgol while discovering structurally large multi-relational concepts. It is also observed that CProgol is better at learning semantically complicated concepts and it tends to use background knowledge more effectively than Subdue.
DTIC
Data Mining; Information Retrieval; Relational Data Bases

20070009065 Boston Univ., Boston, MA USA
Learning Euclidean Embeddings for Indexing and Classification
Athitsos, Vassilis; Alon, Joni; Sclaroff, Stan; Kollios, George; Apr 12, 2004; 19 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-03-1-0108; IIS-0208876
Report No.(s): AD-A461760; TR-2004-014; No Copyright; Avail.: CASI: A03, Hardcopy

BoostMap is a recently proposed method for efficient approximate nearest neighbor retrieval in arbitrary non-Euclidean spaces with computationally expensive and possibly non-metric distance measures. Database and query objects are embedded into a Euclidean space, in which similarities can be rapidly measured using a weighted Manhattan distance. The key idea is formulating embedding construction as a machine learning task, where AdaBoost is used to combine simple, ID embeddings into a multidimensional embedding that preserves a large amount of the proximity structure of the original space. This paper demonstrates that, using the machine learning formulation of BoostMap, we can optimize embeddings for indexing and classification, in ways that are not possible with existing alternatives for constructive embeddings, and without additional costs in retrieval time. First, we show how to construct embeddings that are query-sensitive, in the sense that they yield a different distance measure for different queries, so as to improve nearest neighbor retrieval accuracy for each query. Second, we show how to optimize embeddings for nearest neighbor classification tasks, by tuning them to approximate a parameter space distance measure, instead of the original feature-based distance measure.
DTIC
Classifications; Data Bases; Embedding; Euclidean Geometry; Information Retrieval

20070009096 Colorado Univ., Boulder, CO USA
Squirrel Phase 1: Generating Data Integration Mediators that Use Materialization
Zhou, Gang; Hull, Richard; King, Roger; Nov 30, 1995; 28 pp.; In English
Contract(s)/Grant(s): BAA-92-1092; NSF-IRI-931832
Report No.(s): AD-A461916; CU-CS-793-95; No Copyright; Avail.: CASI: A03, Hardcopy

This paper presents a framework for data integration that is based on using 'squirrel integration mediators' that use materialization to support integrated views over multiple databases. These mediators generalize techniques from active databases to provide incremental propagation of updates to the materialized views. A framework based on 'View Decomposition Plans' for optimizing the support of materialized integrated views is introduced. The paper describes the Squirrel prototype currently under development, which can generate Squirrel mediators based on high-level specifications. The integration of information by Squirrel-generated mediators is expressed primarily through an extended version of a standard query language, that can refer to data from multiple information sources. The Squirrel framework also provides efficient support for the problem of 'object matching', that is, determining when object representations (e.g., OIDs) in different databases correspond to the same object-in-the-world, even if a universal key is not available. To establish a context for the research, the presents a taxonomy that surveys a broad variety of approaches to supporting and maintaining integrated views.
DTIC
Data Bases; Data Integration; Data Management; Squirrels

20070009109 Colorado Univ., Boulder, CO USA
Information Access in Complex, Poorly Structured Information Spaces
Fischer, Gerhard; Stevens, Curt; Feb 1990; 25 pp.; In English
Contract(s)/Grant(s): MDA903-86-CO143
Report No.(s): AD-A461952; CU-CS-461-90; No Copyright; Avail.: CASI: A03, Hardcopy

This research extends our previous efforts on information access (centered around the HELGON system) by choosing an information space which is less structured than the information store represented by HELGON. The domain studied is the News system available on computers. The amount of information distributed and made available through News creates a serious information overload. The conceptual framework behind this research effort explores (a) the relationship between situation models and system model (specifically the question how the system model can be restructured over time to get closer to an individual user's situation model) (b) the role of structure in dealing with large information spaces (specifically: where does it come from, who is willing to generate it, whose structure is it?). The innovative system building effort (instantiating the conceptual framework as well as extending it) is centered around the INFOSCOPE system which focuses on the following issues: (a) it allows users to construct virtual newsgroups to reduce the size of the information space (b) it supports the restructuring of the information space at read time according to individual semantics (c) it makes no assumption that senders of a message do any extensive structuring and allows users to impose their own semantics (d) it incorporates agents which assist users (based on information accumulated in a user model) in suggesting better ways to deal with the information space and in restructuring it. The approach taken by INFOSCOPE differs from other approaches which require more upfront structuring. We believe that INFOSCOPE has major advantages in realistic working environments where people are unwilling to spend time and effort on tasks which are of no benefit to them. INFOSCOPE is an operational system and will be used as a general tool in our research group -- providing us with the opportunity to conduct longitudinal studies in a realistic setting.
DTIC
Computer Networks; Human-Computer Interface; Information Management; Information Systems

20070009127 USA Central Command, MacDill AFB, FL USA
Interoperability Senior Steering Group Efforts to Build a Global Data Network for Joint Coalition Warfighting
Boardman, Jill L; Jan 2002; 13 pp.; In English; Original contains color illustrations
Report No.(s): AD-A461974; No Copyright; Avail.: CASI: A03, Hardcopy

Joint warfighting operations demand responsive information exchange across combined forces and unified commands for planning, unity of effort, decision superiority, and decisive global operations. In a concerted endeavor with the other warfighting theater commands, and supported by the Office of the Assistant Secretary of Defense/Command, Control, Computers, and Intelligence and the National Security Agency, U.S. Central Command is fielding a global multinational information sharing network called Combined Enterprise Regional Information Exchange System (CENTRIXS). CENTRIXS is web-centric and uses commercial-off-the-shelf equipment. Implementation is focused on fielding core information services first: e-mail with attachments, web-browser-based data access, and file sharing (e.g., office documents, txt, PDF, image files). Other required services, including collaboration and near-real time data access, are enabled as the network matures. To the extent possible, CENTRIXS will subsume and consolidate existing stove-piped coalition networks as part of a single, unified system. Over 32 coalition nations are now operating on CENTRIXS globally. Gateways are operational at USCENTCOM Navy, Army, and Air Force component task forces and five deployed force sites, including three for Special Operations. The initial USEUCOM gateway is operational and the USPACOM gateway is in progress.
DTIC
Computer Networks; Information Systems; Intelligence; Internets; Interoperability; Military Operations

20070009242 Naval Research Lab., Washington, DC USA
Model-Driven Agile Development of Reactive Multi-Agent Systems
Kirby Jr, James; Jan 2006; 7 pp.; In English
Report No.(s): AD-A462146; No Copyright; Avail.: CASI: A02, Hardcopy

The Sage development method and associated tool set support an incremental, iterative, model-driven process to build and maintain high assurance, reactive multi-agent systems. A set of interconnected models provide documentation supporting high assurance certification efforts, maintenance, and reuse. Tools can analyze the models for important classes of errors, and generate complete multi-agent systems.
DTIC
Computer Programming; Computer Techniques; Reactivity; Software Engineering

20070009247 State Univ. of New York, Stony Brook, NY USA
Generating Optimized Code from SCR Specifications
Rothamel, Tom; Liu, Yanhong A; Heitmeyer, Constance L; Leonard, Elizabeth I; Jan 2006; 11 pp.; In English
Contract(s)/Grant(s): N00014-04-1-0722
Report No.(s): AD-A462154; No Copyright; Avail.: CASI: A03, Hardcopy

A promising trend in software development is the increasing adoption of model-driven design. In this approach, a developer first constructs an abstract model of the required program behavior in a language, such as Statecharts or Stateflow, and then uses a code generator to automatically transform the model into an executable program. This approach has many advantages typically, a model is not only more concise than code and hence more understandable, it is also more amenable to mechanized analysis. Moreover, automatic generation of code from a model usually produces code with fewer errors than hand-crafted code. One serious problem, however, is that a code generator may produce inefficient code. To address this problem, this paper describes a method for generating efficient code from SCR (Software Cost Reduction) specifications. While the SCR tabular notation and tools have been used successfully to specify, simulate, and verify numerous embedded systems, until now SCR has lacked an automated method for generating optimized code. This paper describes an efficient method for automatic code generation from SCR specifications, together with an implementation and an experimental evaluation. The method first synthesizes an execution-flow graph from the specification, then applies three optimizations to the graph, namely, input slicing, simplification, and output slicing, and then automatically generates code from the optimized graph. Experiments on seven benchmarks demonstrate that the method produces significant performance improvements in code generated from large specifications. Moreover, code generation is relatively fast, and the code produced is relatively compact.
DTIC
Coders; Coding; Computer Programming; Models; Software Development Tools; Software Engineering

20070009249 Illinois Univ., Urbana-Champaign, IL USA
SNIF-ACT: A Cognitive Model of User Navigation on the World Wide Web
Fu, Wai-Tat; Pirolli, Peter; Jan 3, 2007; 68 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-96-C-0097; MDA904-03-C-0404
Report No.(s): AD-A462156; No Copyright; Avail.: CASI: A04, Hardcopy

We describe the development of a computational cognitive model that explains navigation behavior on the World Wide Web (WWW). The model, called SNIF-ACT (Scent-based Navigation and Information Foraging in the ACT cognitive architecture), is motivated by Information Foraging Theory (IFT), which quantifies the perceived relevance of a Web link to a user goal by a spreading activation mechanism. The model assumes that users evaluate links on a Web page sequentially, and decide to click on a link or to go back to the previous page by a Bayesian satisficing model (BSM) that adaptively evaluates and selects actions based on a combination of previous and current assessments of the relevance of link texts to information goals. The model was tested against data collected from novice users engaged in unfamiliar information-seeking tasks. SNIF-ACT 1.0 utilizes the measure of utility, called information scent, derived from IFT to predict rankings of links on different Web pages. The model was tested against a detailed set of protocol data collected from eight subjects as they engaged in two information-seeking tasks using the WWW. The model provided a good match to subjects link selections and decisions to leave a Web site, and thus provided support for the use of information scent as a psychological measure of the perceived relevance of link text to information goals. In SNIF-ACT 2.0, we include an adaptive link selection mechanism that sequentially evaluates links on a Web page according to their position. The mechanism was derived based on a rational analysis of link selection on a Web page. The mechanism allowed the model to dynamically update the evaluation of actions (e.g., to follow a link or leave a Web site) based on sequential assessments of link texts on a Web page, and to decide when to leave a page based on experiences with previous pages. SNIF-ACT 2.0 was validated on a data set obtained from 74 subjects. Monte Carlo simulations of the model showed that SNIF-ACT 2
DTIC
Internets; Mathematical Models; Navigation; World Wide Web

20070009258 National Security Space Architect, Alexandria, VA USA
Architecting Information Management: a Key Enabler for Information Superiority
Mitchell, Howard J; Johnson, Kim A,; Jenkins, Steven S; Axup, Peter R; Jan 2000; 10 pp.; In English; Original contains color illustrations
Report No.(s): AD-A462168; No Copyright; Avail.: CASI: A02, Hardcopy

The National Security Space Architect (NSSA) is conducting the Mission Information Management (MIM) Architecture Study. MIM aims to develop an architecture for information management, a key tenet to information superiority, for 2015 and beyond. This paper begins with an overview of the NSSA and its functional relationships within DoD and the Intelligence Community, and gives a brief description of key MIM 1999 findings to date. The paper then describes the two closely related architecture development studies (Communications Architecture (CA) and Information Management Architecture (IMA))

being executed in 2000 and 2001, showing their definition, structure, activities and schedule.
DTIC
Information Systems; Telecommunication

20070009272 Library of Congress, Washington, DC USA
Patent Reform: Issues in the Biomedical and Software Industries
Schacht, Wendy H; Apr 7, 2006; 17 pp.; In English
Report No.(s): AD-A462185; CRS-RL33367; No Copyright; Avail.: CASI: A03, Hardcopy

Congress currently is considering reform of the existing patent system. This interest in patent policy reflects a recognition of the increasing importance of intellectual property to U.S. innovation. Patent ownership is perceived as an incentive to the technological advancement that leads to economic growth. As such, the number of patent applications and grants has grown significantly, as have the type and breadth of inventions that can be patented. Along with the expansion in the number and range of patents, there are growing concerns over whether the current system is working efficiently and effectively. Several recent studies recommend patent reform. Other experts maintain that major alterations in existing law are unnecessary and that, while not perfect, the patent process can, and is, adapting to technological progress. Thus far in the 109th Congress, two bills, H.R. 2795 and H.R. 5096, have been introduced which, if enacted, would make significant alterations in current patent law. At the present time, the patent laws provide a system under which all inventions are subject to the same requirements of patentability regardless of the technical field in which they arose. However, inventors and innovative companies in different industries tend not to hold identical views concerning the importance of patents, reflecting varying experiences with the patent system. Innovators in biomedical industries tend to see patent protection as critically important as a way to prohibit competitors from appropriating the results of a company' s research and development efforts. Typically only a few, often one or two, patents cover a particular drug. In contrast, the nature of software development is such that inventions often are cumulative and new products generally embody numerous patentable inventions. As a result, it may be expected that distinct industries might react differently to the various patent reform proposals currently under consideration by Congress.
DTIC
Industries; Patents

20070009309 Human Resources Research Organization, Fort Knox, KY USA
Performance Analysis and Training for Digital Command Staff: Training for the Battle Command Rengineering III
Campbell, Charlotte H; Deatz, Richard C; Quinkert, Kathleen A; Jan 2000; 17 pp.; In English
Report No.(s): AD-A462254; No Copyright; Avail.: CASI: A03, Hardcopy

The transition to the digital Army of Force XXI and beyond is characterized by challenges to how the Army will train, maintain, and operate as an information age force. In response to the concerns and issues resulting from digitization, the U. S. Army Research Institute for the Behavioral and Social Sciences (ARI), Armored Forces Research Unit, is engaged in the design and development of training and performance evaluation techniques to support Force XXI digital capabilities. This paper summarizes an ARI project that addressed training for leaders and staffs of future digital environments. Based on learning and performance research on team training and operations in digital environments, a training support package for a future-battlefield experiment was constructed. Coordination between ARI and the Mounted Maneuver Battlespace Laboratory (MMBL) at Fort Knox, Kentucky enabled the two organizations to work together as a team to accomplish multiple goals. Observations and data collection during implementation of the training led to formulation of a series of lessons learned on training content and training structure. These lessons are addressed to several audiences, including developers of future staff training and researchers conducting future systems experiments and training.
DTIC
Digital Systems; Education; Information Systems; Military Operations; Reliability Analysis

20070009318 Army Communications-Electronics Command, Fort Monmouth, NJ USA
Simulation & C2 Information Systems Connectivity Experiments (SINCE)
Mayk, Israel; Jan 2003; 44 pp.; In English; Original contains color illustrations
Report No.(s): AD-A462274; No Copyright; Avail.: CASI: A03, Hardcopy

This presentation describes the goals and implementation approach of the US national programs supporting Transformation efforts for multi-national command and control (via a bilateral approach (US and Germany). In the conduct of the SINCE program, both the US and Germany will be typing together appropriate Command and Control Information Systems (C2IS) and Modeling and Simulation (M&S) systems as necessary to support these experimentation activities. These

experiments will focus on the conduct of collaborative Mission Planning and Execution Management activities as needed to support coalition force operations.
DTIC
Command and Control; Information Systems; Simulation

88
SPACE SCIENCES (GENERAL)

Includes general research topics related to the natural space sciences. For specific topics in space sciences see *categories 89 through\f93*.

20070006727 NASA Johnson Space Center, Houston, TX, USA
Use of Cautions and Warnings within International Space Station Procedures: When Too Much Information Becomes Risky
Rando, Cynthia M.; Patel, Devanshi G.; Duvall, Laura E.; [2007]; 3 pp.; In English; Human Factors and Ergonomics Society 51st Annual Meeting, 1-5 Oct. 2007, Baltimore, MD, USA; Copyright; Avail.: CASI: A01, Hardcopy

Working on the International Space Station (ISS) has uncovered several challenges in the prevention of human error and desensitization to hazard advisories. Although human centered design strives to eliminate accidents, there are still many unknowns in long term space habitation. Specifically, during the last thirteen ISS Expeditions, the crew has indicated that cautions and warnings (C&Ws) were used inappropriately within procedures. Human factors and safety personnel reviewed all comments made during ISS debriefs and a sample set of procedures. Findings included: no human factors input in procedure development, inconsistencies in procedure development, unclear C&W standards, and overuse and misuse of C&Ws throughout procedures. A usability evaluation was conducted to assess C&W intuitiveness for a specific set of C&W s: Touch Temperature, Shock, Electrostatic Discharge, Rack Rotation, and Foreign Object Debris. This work focuses on the review findings, usability evaluation results, recommendations to NASA, final implementation and application to industry.
Author
Human Factors Engineering; International Space Station; Prevention; Safety; Human Performance; Hazards; Desensitizing

20070008093 NASA Goddard Space Flight Center, Greenbelt, MD, USA
STEREO Space Weather and the Space Weather Beacon
Biesecker, D. A.; Webb, D F.; SaintCyr, O. C.; [2007]; 17 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

The Solar Terrestrial Relations Observatory (STEREO) is first and foremost a solar and interplanetary research mission, with one of the natural applications being in the area of space weather. The obvious potential for space weather applications is so great that NOAA has worked to incorporate the real-time data into their forecast center as much as possible. A subset of the STEREO data will be continuously downlinked in a real-time broadcast mode, called the Space Weather Beacon. Within the research community there has been considerable interest in conducting space weather related research with STEREO. Some of this research is geared towards making an immediate impact while other work is still very much in the research domain. There are many areas where STEREO might contribute and we cannot predict where all the successes will come. Here we discuss how STEREO will contribute to space weather and many of the specific research projects proposed to address STEREO space weather issues. We also discuss some specific uses of the STEREO data in the NOAA Space Environment Center.
Author
Space Weather; Solar Observatories; Real Time Operation; Forecasting; Aerospace Environments

89
ASTRONOMY

Includes observations of celestial bodies; astronomical instruments and techniques; radio, gamma-ray, x-ray, ultraviolet, and infrared astronomy; and astrometry.

20070007339 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Total Solar Eclipse of 2006 March 29
Espenak, F.; Anderson, J.; November 2004; 86 pp.; In English; Original contains color and black and white illustrations
Report No.(s): NASA/TP-2004-212762; Rept-2004-02770-0; Copyright; Avail.: CASI: A05, Hardcopy

On 2006 March 29, a total eclipse of the Sun will be visible from within a narrow corridor which traverses half the Earth. The path of the Moon's umbral shadow begins in Brazil and extends across the Atlantic, northern Africa, and central Asia where it ends at sunset in western Mongolia. A partial eclipse will be seen within the much broader path of the Moon's penumbral shadow, which includes the northern two thirds of Africa, Europe, and central Asia.Detailed predictions for this event are presented and include besselian elements, geographic coordinates of the path of totality, physical ephemeris of the umbra, topocentric limb profile corrections, local circumstances for approximately 350 cities, maps of the eclipse path, weather prospects, the lunar limb profile, and the sky during totality. Information on safe eclipse viewing and eclipse photography is included.
Author
Solar Eclipses; Ephemerides; Sun; Coordinates; Lunar Limb

20070008228 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Suzaku Study of the Interstellar Medium of the Small Magellenic Cloud
Kilbourne, C.; [2006]; 1 pp.; In English; The Extreme Universe in the Suzaku Era, 3-10 Dec. 2006, Kyoto, Japan; No Copyright; Avail.: Other Sources; Abstract Only

Suzaku was used to observe a region of the Small Magellenic Cloud devoid of bright point sources in order to study the hot interstellar medium in that galaxy. This hot, ionized gas presumably has its origin in supernovae and the winds of massive stars. Using Suzaku XIS data, we determined the temperature and abundances of this gas. A higher Ne abundance than O and Fe was determined, which is consistent with surveys of SMC super-nova remnants.
Author
Interstellar Matter; Supernovae; Ionized Gases; High Temperature Gases; Massive Stars; Point Sources

20070008251 Sandia National Labs., Albuquerque, NM USA, Sala and Associates, Corrales, NM, USA
Methodology Assessment and Recommendations for the Mars Science Laboratory Launch Safety Analysis
Bessette, G. C.; Bixler, N. E.; Hewson, J. C.; Robinson, D. G.; Potter, D. L.; Sep. 2006; 89 pp.; In English
Report No.(s): DE2006-893553; SAND2006-4563; No Copyright; Avail.: National Technical Information Service (NTIS)

The Department of Energy has assigned to Sandia National Laboratories the responsibility of producing a Safety Analysis Report (SAR) for the plutonium-dioxide fueled Multi-Mission Radioisotope Thermoelectric Generator (MMRTG) proposed to be used in the Mars Science Laboratory (MSL) mission. The National Aeronautic and Space Administration (NASA) is anticipating a launch in fall of 2009, and the SAR will play a critical role in the launch approval process. As in past safety evaluations of MMRTG missions, a wide range of potential accident conditions differing widely in probability and seventy must be considered, and the resulting risk to the public will be presented in the form of probability distribution functions of health effects in terms of latent cancer fatalities. The basic descriptions of accident cases will be provided by NASA in the MSL SAR Databook for the mission, and on the basis of these descriptions, Sandia will apply a variety of sophisticated computational simulation tools to evaluate the potential release of plutonium dioxide, its transport to human populations, and the consequent health effects. The first step in carrying out this project is to evaluate the existing computational analysis tools (computer codes) for suitability to the analysis and, when appropriate, to identify areas where modifications or improvements are warranted. The overall calculation of health risks can be divided into three levels of analysis. Level A involves detailed simulations of the interactions of the MMRTG or its components with the broad range of insults (e.g., shrapnel, blast waves, fires) posed by the various accident environments. There are a number of candidate codes for this level; they are typically high resolution computational simulation tools that capture details of each type of interaction and that can predict damage and plutonium dioxide release for a range of choices of controlling parameters. Level B utilizes these detailed results to study many thousands of possible event sequences and to build up a statistical representation of the releases for each accident case. A code to carry out this process will have to be developed or adapted from previous MMRTG missions. Finally, Level C translates the release (or 'source term') information from Level B into public risk by applying models for atmospheric transport and the health consequences of exposure to the released plutonium dioxide. A number of candidate codes for this level of analysis are available. This report surveys the range of available codes and tools for each of these levels and makes recommendations for which choices are best for the MSL mission. It also identities areas where improvements to the codes are needed. In some cases a second tier of codes may be identified to provide supporting or clarifying insight about particular issues. The main focus of the methodology assessment is to identify a suite of computational tools that can produce a high quality SAR that can be successfully reviewed by external bodies (such as the Interagency Nuclear Safety Review Panel) on the schedule established by NASA and DOE.
NTIS
Launching; Mars Missions; Safety; Thermoelectric Generators

20070008411 Stanford Linear Accelerator Center, CA, USA, San Francisco State Univ., CA, USA
Catalog of Candidate High-redshift Blazars for GLAST
Arias, T. M.; Aug. 25, 2006; 11 pp.; In English
Report No.(s): DE2006-892606; SLAC-TN-06-025; No Copyright; Avail.: Department of Energy Information Bridge

High-redshift blazars are promising candidates for detection by the Gamma-ray Large Area Space Telescope (GLAST). GLAST, expected to be launched in the Fall of 2007, is a high-energy gamma-ray observatory designed for making observations of celestial gamma-ray sources in the energy band extending from 10 MeV to more than 200 GeV. It is estimated that GLAST will find several thousand blazars. The motivations for measuring the gamma-ray emission from distant blazars include the study of the high-energy emission processes occurring in these sources and an indirect measurement of the extragalactic background light. In anticipation of the launch of GLAST we have compiled a catalog of candidate high-redshift blazars. The criteria for sources chosen for the catalog were: high radio emission, high redshift, and a flat radio spectrum. A preliminary list of 307 radio sources brighter than 70mJy with a redshift z (ge) 2.5 was acquired using data from the NASA Extragalactic Database. Flux measurements of each source were obtained at two or more radio frequencies from surveys and catalogs to calculate their radio spectral indices (alpha). The sources with a flat-radio spectrum ((alpha) (le) 0.5) were selected for the catalog, and the final catalog includes about 200 sources.
NTIS
Blazars; Catalogs (Publications); Gamma Ray Telescopes; Hubble Space Telescope; Red Shift; Telescopes

20070008782 Naval Research Lab., Washington, DC USA
Fast Computation of the Narcissus Reflection Coefficient for the Herschel Far-Infrared/Submillimeter-Wave Cassegrain Telescope
Lucke, Robert L; Fischer, Jacqueline; Polegre, Arturo M; Beintema, Douwe A; Oct 1, 2005; 10 pp.; In English
Report No.(s): AD-A461544; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461544

Placement of a scatter cone at the center of the secondary of a Cassegrain telescope greatly reduces Narcissus reflection. To calculate the remaining Narcissus reflection, a time-consuming physical optics code such as GRASP8 is often used to model the effects of reflection and diffraction. Fortunately, the Cassegrain geometry is sufficiently simple that a combination of theoretical analysis and Fourier propagation can yield rapid, accurate results at submillimeter wavelengths. We compare these results with those from GRASP8 for the heterodyne instrument for the far-infrared on the Herschel Space Observatory and confirm the effectiveness of the chosen scatter cone design.
DTIC
Cassegrain Optics; Far Infrared Radiation; Reflectance; Submillimeter Waves; Telescopes

20070008785 George Mason Univ., Fairfax, VA USA
Simulation of HEAO 3 Background
Graham, B L; Phlips, B F; Kroeger, R A; Kurfess, J D; Jan 2007; 6 pp.; In English
Report No.(s): AD-A461547; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461547

A Monte Carlo technique for modeling background in space-based gamma-ray telescopes has been developed. The major background components included in this modeling technique are the diffuse cosmic gamma-ray flux, the Earth's atmospheric flux, the decay of nuclei produced by spallation of cosmic rays, trapped protons and their secondaries, the decay of nuclei produced by neutron capture, and the de-excitation of excited states produced by inelastic scattering of neutrons. The method for calculating the nuclear activation and decay component of the background combines the low Earth orbit proton and neutron spectra, the spallation cross sections from Alice91, nuclear decay data from the National Nuclear Data Center's (NNDC) Evaluated Nuclear Structure Data File (ENSDF) database, and three-dimensional gamma-ray and beta transport with Electron Gamma-ray Shower version 4 (EGS4). This Monte Carlo code handles the following decay types: electron capture, Beta-Beta+, meta-stable isotopes and short lived intermediate states, and isotopes that have branchings to both Beta- and Beta+. Actual background from the HEAO 3 space instrument is used to validate the code.
DTIC
Astronomical Observatories; HEAO 3; Monte Carlo Method; Simulation

20070008999 Naval Research Lab., Washington, DC USA

Search for Fast Galactic Gamma Ray Pulsars

Hertz, P; Grove, J E; Kurfess, J D; Johnson, W N; Strickman, M S; Matz, S; Ulmer, M P; Jan 1993; 6 pp.; In English

Report No.(s): AD-A461898; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461898

We have undertaken a program to search for fast gamma ray pulsars (P \h1 s) in OSSE observations of the galactic center, galactic plane, LMC, and selected sources. We have used search strategies optimized for both isolated and binary pulsars. Applied to OSSE observations, these techniques are sensitive to isolated Crab pulsars at the galactic center and binary Crab pulsars in the local spiral arms. To date we have searched for pulsations from (i) known fast pulsars PSR1613-509 in RCW 103 and PSR0540-693 in the LMC, (ii) the gamma ray transient GRO J0422+32 and SN87A in the LMC, (iii) isolated pulsars in the galactic center, LMC, and galactic plane fields in Cygnus and Carina, and (iv) binary pulsars in these same fields. No pulsations have been detected at frequencies between 1 Hz and 4 kHz, with pulse fraction limits as low as 0.1% of total received count rate.

DTIC

Galaxies; Gamma Ray Spectra; Gamma Rays; Pulsars

20070009001 Naval Research Lab., Washington, DC USA

Observation of the Starburst Galaxy NGC 253 with the OSSE Instrument

Bhattacharya, Dipen; Gehrels, Neil; Kurfess, J D; Johnson, W N; Kinzer, R L; Strickman, M S; The, Lih-Sin; Jung, G V; Grabelsky, D A; Purcell, W R; Jan 1993; 7 pp.; In English

Report No.(s): AD-A461900; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461900

Gamma-ray observations of the nearby starburst galaxy NGC 253 over the energy range 0.06 -10 MeV have been obtained with the OSSE spectrometer. The source was detected up to 200 keV with a total significance of 4.2sigma. When attributed to NGC 253 this corresponds to an estimated luminosity of 3 x 10(exp 40) ergs s(exp-1). The spectrum is fit by a power law of photon index ~ 2.5. A search for 56Ni-\g56Co-\g 56Fe supernova gamma-ray lines yielded no significant detection: the 3sigma upper limits at 0.158, 0.847 and 1.238 MeV are 4 x 10(exp-5), 8 x 10(exp-5) and 9 x 10(exp-5) ph /sq cm s(exp-1) , respectively. We find that inverse Compton scattering is insufficient to explain the observed continuum radiation. Bremsstrahlung and discrete sources may account for the flux. We also consider the possibility that the detected emission may result from low energy continuum from scattered gamma-ray lines produced by a very recent Type Ia or Ib supernova outburst in NGC 253.

DTIC

Compton Effect; Continuum Mechanics; Electron Scattering; Galaxies; Gamma Ray Spectra; Gamma Rays; Starburst Galaxies

20070009081 Naval Research Lab., Washington, DC USA

Stellar Kinematics of Merging Galaxies: Clues to the Origins of Elliptical Galaxies

Shier, L M; Fischer, J; Apr 10, 1998; 6 pp.; In English

Report No.(s): AD-A461858; No Copyright; Avail.: CASI: A02, Hardcopy

There is significant evidence suggesting that mergers of galaxies produce elliptical galaxies. To determine whether the known kinematic properties of elliptical galaxies are consistent with those of their suggested progenitors, we have examined the stellar velocity dispersion in 11 nuclear regions within starbursting infrared-luminous galaxies. All of these galaxies are in some stage of merging. The new data are presented and statistically analyzed in combination with data from the literature. We find that the kinematic and photometric properties of these galaxies suggest that they are the progenitors of low- luminosity (L \h L*) elliptical galaxies. Dissipative collapse of gas followed by star formation is apparently not producing a core of high-density high-velocity dispersion stars like those found in very bright elliptical galaxies. We suggest that only the ultraluminous infrared galaxies can possibly produce L* ellipticals. We further present the results of population synthesis models that show that intermediate-age stellar populations should contribute significantly to the light of merger remnants even after the morphological signs of merging have vanished.

DTIC

Ellipses; Elliptical Galaxies; Galaxies; Infrared Radiation; Stars; Stellar Evolution

20070009097 Naval Research Lab., Washington, DC USA
Compton Observatory Observations of AGN
Kurfess, J D; Jan 1994; 11 pp.; In English
Report No.(s): AD-A461925; No Copyright; Avail.: CASI: A03, Hardcopy

The principal results on active galactic nuclei from the Phase 1 observations by the COMPTON Gamma Ray Observatory are presented. These include the detection of a new class of high-energy gamma ray sources by the EGRET instrument and extensive observations of Seyfert galaxies in low-energy gamma rays by OSSE. The identified EGRET sources are associated with core-dominated radio loud objects, OVV's and BL Lacs. EGRET has not detected any Seyfert galaxies. OSSE observes a thermal-like spectrum from NGC 4151, and the low-energy gamma ray spectra of other Seyferts are significantly softer than the spectra below 50 keV, suggesting that a thermal emission mechanism is characteristic of these objects. OSSE has not detected any positron annihilation radiation from any Seyfert, and neither OSSE nor COMPTEL have detected an MeV excess from these sources.
DTIC
Galaxies; Observatories

20070009099 Naval Research Lab., Washington, DC USA
OSSE Observations of Active Galaxies and Quasars
Cameron, R A; Grove, J E; Johnson, W N; Kurfess, J D; Jan 1993; 6 pp.; In English
Report No.(s): AD-A461936; No Copyright; Avail.: CASI: A02, Hardcopy

We present a summary of OSSE observations of galaxies and quasars that have been carried out during the Phase 1 all-sky survey by the Compton Observatory. The OSSE instrument has detected continuum emission from several Seyfert galaxies and quasars. Seyfert 1 galaxies make up the majority of the detections, typically at energies below 300 keV, with the measured spectra generally compatible with power-law continuum models with photon spectral indices around -2, or with thermal emission models with temperatures around 50 keV. The quasars generally have harder spectral indices than the Seyfert galaxies. With the exception of Centaurus A and NGC 4151, there is little evidence of signicant flux variability in the OSSE data sets for most of the Seyfert galaxies observed. In some cases, the OSSE detections are at flux levels significantly below those reported for previous observations. While the analysis of the complete set of Phase 1 OSSE observations of active galaxies is still in progress, the OSSE data will clearly provide a major new database for the examination and testing of models of high-energy emission from active galactic nuclei.
DTIC
Active Galaxies; Galaxies; Photons; Quasars; Scintillation

20070009101 Naval Research Lab., Washington, DC USA
OSSE Spectral Analysis Techniques
Purcell, W R; Browny, K M; Grabelsky, D A; Johnsonz, W N; Jungx, G V; Kinzerz, R L; Kroegerz, R A; Kurfessz, J D; Matz, S M; Strickmanz, M S; Ulmer, M P; Jan 1991; 14 pp.; In English
Report No.(s): AD-A461942; No Copyright; Avail.: CASI: A03, Hardcopy

Analysis of spectra from the Oriented Scintillation Spectrometer Experiment (OSSE) is complicated because of the typically low signal-to-noise (0.1%) and the large background variability. The OSSE instrument was designed to address these di culties by periodically o set-pointing the detectors from the source to perform background measurements. These background measurements are used to estimate the background during each of the source observations. The resulting background-subtracted spectra can then be accumulated and tted for spectral lines and/or continua. Data selection based on various environmental parameters can be performed at several stages during the analysis procedure. In order to achieve the instrument's statistical sensitivity, however, it will be necessary for investigators to develop a detailed understanding of the instrument operation, data collection, and the background spectrum and its variability. A brief description of the major steps in the OSSE spectral analysis process will be described, including a discussion of the OSSE background spectrum and examples of several observation strategies.
DTIC
Gamma Ray Spectra; Scintillation; Signal to Noise Ratios; Spectrometers; Spectrum Analysis

20070009154 Air Force Research Lab., Hanscom AFB, MA USA

A Post-AGB Star in the Small Magellanic Cloud Observed with the Spitzer Infrared Spectrograph

Kraemer, Kathleen E; Sloan, G C; Bernard-Salas, J; Price, Stephan D; Egan, Michael P; Wood, P R; Oct 23, 2006; 5 pp.; In English

Contract(s)/Grant(s): Proj-1010

Report No.(s): AD-A462009; AFRL-VS-HA-TR-2007-1002; No Copyright; Avail.: CASI: A01, Hardcopy

We have observed an evolved star with a rare combination of spectral features, MSX SMC 029, in the Small Magellanic Cloud (SMC) using the low-resolution modules of the Infrared Spectrograph on the Spitzer Space Telescope. A cool dust continuum dominates the spectrum of MSX SMC 029. The spectrum also shows both emission from polycyclic aromatic hydrocarbons (PAHs) and absorption at 13.7 micrometers from C2H2, a juxtaposition seen in only two other sources, AFGL 2688 and IRAS 13416-6243, both post-asymptotic giant branch (AGB) objects. As in these sources, the PAH spectrum has the unusual trait that the peak emission in the 7-9 micrometer complex lies beyond 8.0 micrometers. In addition, the 8.6 micrometer feature has an intensity as strong as the C-C modes that normally peak between 7.7 and 7.9 micrometers. The relative flux of the feature at 11.3 micrometers to that at 8 micrometers suggests that the PAHs in MSX SMC 029 either have a low-ionization fraction or are largely unprocessed. the 13-16 micrometer wavelength region shows strong absorption features similar to those observed in the post-AGB objects AFGL 618 and SMP LMC 11. This broad absorption may arise from the same molecules that have been identified in those sources: C2H2, C4H2, HC, N, and C6H6. The similarities between MSX SMC 029, AFGL 2688, and AFGL 618 lead us to conclude that MSX SMC 029 has evolved off the AGB in only the past few hundred years, making it the third post-AGB object identified in the SMC.

DTIC

Asymptotic Giant Branch Stars; Infrared Instruments; Infrared Radiation; Magellanic Clouds; Spectrographs

20070009180 University of Central Florida, Orlando, FL USA

Deep-Space Calibration of the WindSat Radiometer

Jones, W L; Park, Jun D; Soisuvarn, Seubson; Hong, Liang; Gaiser, Peter W; St Germain, Karen M; Mar 2006; 21 pp.; In English

Report No.(s): AD-A462042; No Copyright; Avail.: CASI: A03, Hardcopy

The WindSat microwave polarimetric radiometer consists of 22 channels of polarized brightness temperatures operating at five frequencies: 6.8, 10.7, 18.7, 23.8, and 37.0 GHz. The 10.7-, 18.7-, and 37.0-GHz channels are fully polarimetric (vertical/horizontal, +or- 45 degrees and left-hand and right-hand circularly polarized) to measure the four Stokes radiometric parameters. The principal objective of this Naval Research Laboratory experiment, which flys on the USAF Coriolis satellite, is to provide the proof of concept of the first passive measurement of ocean surface wind vector from space. This paper presents details of the on-orbit absolute radiometric calibration procedure, which was performed during a series of satellite pitch maneuvers. During these special tests, the satellite pitch was slowly ramped to +45 degrees (and -45 degrees), which caused the WindSat conical spinning antenna to view deep space during the forward (or aft portion) of the azimuth scan. When viewing the homogeneous and isotropic brightness of space (2.73 K) through both the main reflector and the cold-load calibration reflector, it is possible to determine the absolute calibration of the individual channels and the relative calibration bias between polarimetric channels. Results demonstrate consistent and stable channel calibrations (with very small brightness biases) that exceed the mission radiometric calibration requirements.

DTIC

Calibrating; Deep Space; Military Spacecraft; Radiometers

90
ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

20070006747 NASA Johnson Space Center, Houston, TX, USA

Characterization of Three Carbon- and Nitrogen-Rich Particles from Comet 81P/WILD

Gallien, J.-P.; Khodja, H.; Herzog, G. F.; Taylor, S.; Koepsell, E.; Daghlian, C. P.; Flynn, G. J.; Sitnitsky, I.; Lanzirotti, A.; Sutton, S. R.; Keller, L. P.; [2007]; 2 pp.; In English; Lunar and Planetary Science Conference, 12-16 Mar. 2007, Houston, TX, USA; Copyright; Avail.: CASI: A01, Hardcopy

Comets may sample the early solar system s complement of volatile-forming elements - including C and N - more fully and reliably than do the terrestrial planets or asteroids. Until recently, all elemental analyses of unambiguously cometary

material were carried out remotely. The return of the Stardust mission makes it possible to analyze documented material from P81/Wild 2 in the laboratory Wild 2 particles fragmented when they stopped in the aerogel collectors. We have studied three fragments thought to be rich in C and N by using several techniques: FTIR to characterize organic matter; synchrotron-induced x-ray fluorescence (SXRF) to determine Fe and certain element/Fe ratios; SEM to image sample morphology and to detect semiquantitatively Mg, Al, Si, Ca, and Fe; and nuclear reaction analysis (NRA) to measure C, N, O, and Si.
Author
Carbon; Nitrogen; Comets; Wild 2 Comet; Asteroids; Terrestrial Planets; Aerogels

20070006749 NASA Johnson Space Center, Houston, TX, USA
Irradiation Effects in Fosterrite and the Nature of Interstellar Grains: A Coordinated Spectroscopy and Electron Microscopy Study
Keller, Lindsay P.; Christoffersen, R.; [2007]; 2 pp.; In English; Lunar and Planetary Science Conference, 12-16 Mar. 2007, Houston, TX, USA; Copyright; Avail.: CASI: A01, Hardcopy

Crystalline and amorphous silicates condense in the outflows of low mass evolved stars and massive red supergiant stars and are injected into the interstellar medium (ISM) where they are rendered almost completely amorphous by a multitude of destructive processes (e.g. shock, grain-grain collisions, and irradiation). Irradiation effects in particular may have played an important role in the genesis and modification of primitive grains in cometary dust, but unraveling those effects requires controlled experiments under appropriate conditions and with an emphasis on materials relevant to the ISM. Here we report our infrared (IR) microspectroscopy and trans-mission electron microscope (TEM) measurements on forsterite that was amorphized through irradiation by high energy heavy ions.
Author
Infrared Radiation; Irradiation; Amorphous Materials; Crystallinity; Silicates; Interstellar Matter; Supergiant Stars; Stellar Mass

20070006755 NASA Johnson Space Center, Houston, TX, USA, NASA Johnson Space Center, Houston, TX, USA
The Abundance and Distribution of Presolar Materials in Cluster IDPS
Messenger, Scott; Keller, Lindsay; Nakamura-Messenger, Keiko; Ito, Motoo; [2007]; 2 pp.; In English; Lunar and Planetary Science Conference, 12-16 Mar. 2007, Houston, TX, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070006755

Presolar grains and remnants of interstellar organic compounds occur in a wide range of primitive solar system materials, including meteorites, interplanetary dust particles (IDPs), and comet Wild-2 samples. Among the most abundant presolar phases are silicate stardust grains and molecular cloud material. However, these materials have also been susceptible to destruction and alteration during parent body and nebular processing. In addition to their importance as direct samples of remote and ancient astrophysical environments, presolar materials thus provide a measure of how well different primitive bodies have preserved the original solar system starting materials. The matrix normalized abundances of presolar silicate grains in meteorites range from 20 ppm in Semarkona and Bishunpur to 170 ppm for Acfer 094. The lower abundances of presolar silicates in Bishunpur and Semarkona has been ascribed to the destruction of presolar silicates during aqueous processes. Presolar silicates appear to be significantly more abundant in anhydrous IDPs, possibly because these materials did not experience parent body hydrothermal alteration. Among IDPs the estimated abundances of presolar silicates vary by more than an order of magnitude, from 480 to 5500 ppm. The wide disparity in the abundances of presolar silicates of IDPs may be a consequence of the relatively small total area analyzed in those studies and the fine grain sizes of the IDPs. Alternatively, there may be a wide range in presolar silicate abundances between different IDPs. This view is supported by the observation that 15N-rich IDPs have higher presolar silicate abundances than those with isotopically normal N.
Author
Interplanetary Dust; Organic Compounds; Chondrites; Meteoritic Composition; Meteorites; Astrophysics; Silicates

20070006756 NASA Johnson Space Center, Houston, TX, USA
Probing the Depths of Space Weathering: A Cross-sectional View of Lunar Rock 76015
Noble, Sarah K.; Keller, L. P.; FROM; [2007]; 2 pp.; In English; Lunar and Planetary Science Conference, 12-16 Mar. 2007, Houston, TX, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070006756

The term ‘space weathering’ refers to the cumulative effects of several processes operating at the surface of any solar

system body not protected by a thick atmosphere. These processes include cosmic and solar ray irradiation, solar wind implantation and sputtering, as well as melting and vaporization due to micrometeorite bombardment. Space weathering discussions have generally centered around soils but exposed rocks will also incur the effects of weathering. Rocks have much longer surface lifetimes than an individual soil grain and thus record a longer history of exposure. By studying the weathering products which have built up on a rock surface, we can gain a deeper perspective on the weathering process and better assess the relative importance of various weathering components. The weathered coating, or patina, of the lunar rock 76015 has been previously studied using SEM and TEM. It is a noritic breccia with both 'glazed' (smooth glassy) and 'classic' (microcratered and pancake-bearing) patina coatings. Previous TEM work on 76015 relied on ultramicrotomy to prepare cross sections of the patina coating, but these sections were limited by the 'chatter' and loss of material in these brittle samples. Here we have used a focused ion beam (FIB) instrument to prepare cross sections in which the delicate stratigraphy of the patina coating is beautifully preserved.
Author
Space Weathering; Lunar Rocks; Cosmic Rays; Solar Wind; Irradiation; Ion Beams; Micrometeorites; Breccia

20070006844 NASA Johnson Space Center, Houston, TX, USA
Carbonates Found in Stardust Aerogel Tracks
Wirick, S.; Leroux, H.; Tomeoka, K.; Zolensky, M.; Flynn, T.; Tyliszczak, T.; Butterworth, A.; Tomioka, N.; Ohnishi, I.; Messenger, K. Nakamura; Sandford, S.; Keller, L.; Jacobsen, C.; [2007]; 2 pp.; In English; Lunar and Planetary Science Conference, 12-16 Mar. 2007, Houston, TX, USA; Original contains black and white illustrations; Copyright; Avail.:
CASI: A01, Hardcopy

Preliminary examination of particles collected from Comet Wild 2 suggest that this comet is chondritic and formed under multiple processes. The lack of any hydrated minerals strongly suggests that most, if not all of these processes were anhydrous [1,2,3]. However, carbonates were found in particles extracted from 4 different tracks in the aerogel. It is our belief that these carbonates have a terrestrial origin and are a contaminant in these samples.
Author
Aerogels; Chondrites; Carbonates; Wild 2 Comet

20070007272 Brown Univ., Providence, RI, USA
Particle Detection in Superfluid Helium: R & D for Low Energy Solar Neutrinos. Final Report
Lanou, R. E.; Seidel, G. M.; Maris, H. J.; Mar. 31, 2006; 12 pp.; In English
Report No.(s): DE2006-878465; No Copyright; Avail.: Department of Energy Information Bridge

This report presents a summary of the results from R&D conducted as a feasibility study in the Department of Physics of Brown University for detection of low energy solar neutrinos utilizing a superfluid helium target. The report outlines the results in several areas: (1) development of experimental facilities, (2) energy deposition by electrons and alphas in superfluid helium, (3) development of wafer and metallic magnetic calorimeters, (4) background studies, (5) coded apertures and conceptual design, (6) Detection of single electrons and (7) a simulation of expected performance of a full scale device. Recommendations for possible future work are also presented. A bibliography of published papers and unpublished doctoral theses is included.
NTIS
Counters; Detection; Liquid Helium; Liquid Helium 2; Solar Neutrinos; Superfluidity; Targets

20070007605 Air Force Research Lab., Hanscom AFB, MA USA
Mid-Infrared Spectroscopy of Carbon Stars in the Small Magellanic Cloud
Sloan, G C; Kraemer, K E; Matsuura, M; Wood, P R; Price, S D; Egan, M P; Jul 10, 2006; 14 pp.; In English
Contract(s)/Grant(s): Proj-1010
Report No.(s): AD-A460806; AFRL-VS-HA-TR-2007-1001; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA460806

We have observed a sample of 36 objects in the Small Magellanic Cloud (SMC) with the Infrared Spectrometer on the Spitzer Space Telescope. Of these sources, 19 are carbon stars. An examination of the near- and mid-infrared photometry shows that the carbon-rich and oxygen-rich dust sources follow two easily separated sequences. A comparison of the spectra of the 19 carbon stars in the SMC to spectra from the Infrared Space Observatory (ISO) of carbon stars in the Galaxy reveals significant differences. The absorption bands at 715 and 13.7 microns due to C2H2 are stronger in the SMC sample, and the SiC dust emission feature at 11.3 microns is weaker. Our measurements of the MgS dust emission feature at 26-30 microns

are less conclusive, but this feature appears to be weaker in the SMC sample as well. All these results are consistent with the lower metallicity in the SMC. The lower abundance of SiC grains in the SMC may result in less efficient carbon-rich dust production, which could explain the excess C2H2 gas seen in the spectra. The sources in the SMC with the strongest SiC dust emission tend to have redder infrared colors than the other sources in the sample, which implies more amorphous carbon, and they also tend to show more MgS dust emission. The weakest SiC emission features tend to be shifted to the blue; these spectra may arise from low-density shells with large SiC grains.
DTIC
Carbon Stars; Dust; Emission; Magellanic Clouds; Spectroscopy

20070008409 Stanford Linear Accelerator Center, CA, USA, Wellesley Coll., MA, USA
Host Galaxies of X-shaped Radio Sources
Springmann, A.; Aug. 25, 2006; 19 pp.; In English
Report No.(s): DE2006-892607; SLAC-TN-06-021; No Copyright; Avail.: National Technical Information Service (NTIS)

The majority of radiation from galaxies containing active galactic nuclei (AGNs) is emitted not by the stars composing the galaxy, but from an active source at the galactic center, most likely a supermassive black hole. Of particular interest are radio galaxies, the active galaxies emitting much of their radiation at radio wavelengths. Within each radio galaxy, an AGN powers a pair of collimated jets of relativistic particles, forming a pair of giant lobes at the end of the jets and thus giving a characteristic double-lobed appearance. A particular class of radio galaxies have an 'X'-shaped morphology: in these, two pairs of lobes appear to originate from the galactic center, producing a distinctive X-shape. Two main mechanisms have been proposed to explain the X-shape morphology: one being through the merger of a binary supermassive black hole system and the second being that the radio jets are expanding into an asymmetric medium. By analyzing radio host galaxy shapes, we probe the distribution of the stellar mass to compare the differing model expectations regarding the distribution of the surrounding gas and stellar material about the AGN.
NTIS
Galaxies; Radio Galaxies

20070008415 Fermi National Accelerator Lab., Batavia, IL, USA
Dark Energy Survey Instrument Design
Flaugher, B.; January 2006; 10 pp.; In English
Report No.(s): DE2006-892262; FERMILAB-CONF-06-126-A-E; No Copyright; Avail.: National Technical Information Service (NTIS)

We describe a new project, the Dark Energy Survey (DES), aimed at measuring the dark energy equation of state parameter, w, to a statistical precision of approximately 5%, with four complementary techniques. The survey will use a new 3 sq. deg. mosaic camera (DECam) mounted at the prime focus of the Blanco 4m telescope at the Cerro-Tololo International Observatory (CTIO). DECam includes a large mosaic camera, a five element optical corrector, four filters (g,r,i,z), and the associated infrastructure for operation in the prime focus cage. The focal plane consists of 62 2K x 4K CCD modules (0.27 inch/pixel) arranged in a hexagon inscribed within the 2.2 deg. diameter field of view. We plan to use the 250 micron thick fully-depleted CCDs that have been developed at the Lawrence Berkeley National Laboratory (LBNL). At Fermilab, we will establish a packaging factory to produce four-side buttable modules for the LBNL devices, as well as to test and grade the CCDs. R&D is underway and delivery of DECam to CTIO is scheduled for 2009.
NTIS
Dark Energy; Surveys; Measuring Instruments

20070008772 Naval Research Lab., Washington, DC USA
Hard X-Ray and Gamma-Ray Imaging Systems Utilizing Germanium Strip Detectors
Johnson, W N; Kroeger, R A; Kinzer, R L; Kurfess, J D; Inderhees, S; Phlips, B; Graham, B; Jan 1995; 5 pp.; In English
Report No.(s): AD-A461532; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461532

We investigate the characteristics of imaging systems in the 20 keV-10 MeV energy band which incorporate the high spatial and spectral resolution of planar germanium strip detectors. A Compton scatter telescope provides sensitivity above approximately 250 keV; a coded aperture positioned above the top germanium detector plane of the Compton telescope forms a coded-aperture telescope with sensitivity in the 20-250 keV band. The high spectral resolution and spatial resolution of germanium strip detectors provides a Compton telescope with dramatically improved energy resolution, angular resolution,

and sensitivity compared with previous Compton instruments. Such a system has excellent angular response for point source identification and spectroscopy and also provides response to high energy diffuse emissions such as the Galactic 511 keV line emission and Al26 emission. Monte Carlo simulations of the concept and estimates of the sensitivity shall be presented.
DTIC
Detectors; Gamma Rays; Germanium; Imaging Techniques; X Ray Imagery; X Rays

20070008773 Institut Rudjer Boskovic, Zagreb, Macedonia
Brijuni Conference (10th), Imaging in Space and Time. Held in Brijuni, Croatia on 28 August-1 September 2006
Bosanac, Slobodan D; Sep 1, 2006; 60 pp.; In English
Contract(s)/Grant(s): FA8655-06-1-5052
Report No.(s): AD-A461533; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461533

The Final Abstracts for the Conference, Imaging in Space and Time, 28 August 2006 - 1 September 2006. The conference included: A) Acquiring and analyzing data from space. Much of information on distant objects in space is obtained from images in various frequency domains of electromagnetic radiation. Acquiring and analysis of images was reviewed. B) Nanotechnology for manipulation of light: Future advances in fundamental and applied research are envisaged in manipulation of molecules and their conglomerates with electromagnetic radiation. Results in femto and ato second research were reviewed. There were also talks on the possible implementation on quantum computing, for the fast processing of data. C) Images of the basic structure of matter: Elementary particles are the basic elements of matter, and their structure is still somewhat of a mystery. To infer on it one has to extract information data from experiments, which is known as the inversion problem. The status of the field was reviewed.
DTIC
Abstracts; Conferences; Croatia; Images; Imaging Techniques; Time

20070008792 Air Force Research Lab., Edwards AFB, CA USA
Comparisons of Polyhedral Oligomeric Silsesquioxane (POSS) Polyimides as Space-Survivable Materials (Postprint)
Tomczak, Sandra J; Vij, Vandana; Minton, Timothy K; Brunsvold, Amy L; Marchant, Darrell; Wright, Michael E; Petteys, Brian J; Guenthner, Andrew J; Mabry, Joseph M; Nov 15, 2006; 14 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0276; F49620-01-100335; Proj-DARP
Report No.(s): AD-A461558; AFRL-PR-ED-TP-2006-437; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/100.2/ADA461558

Kapton(registered name) is used extensively in spacecraft thermal blankets, solar arrays, and space inflatable structures. Atomic oxygen (AO) in low Earth orbit (LEO) causes severe degradation of Kapton. SiO2 coatings impart remarkable oxidation resistance to Kapton, yet imperfections in the SiO2 application process and micrometeoroid / debris impact in orbit damage the SiO2 coating leading to Kapton erosion. Polyhedral oligomeric silsesquioxane (POSS) is a silicon and oxygen cage-like structure surrounded by organic groups which can be polymerizable. POSS-diamine was polymerized with the Kapton monomers, pyromellitic dianhydride and 4.4'-oxydianiline. The resulting POSS-Kapton polyimide (PI) is self-passivating by the formation of a silica layer upon exposure to AO. Evidence of a SiO2 passivation layer has been shown by X-Ray Photoelectron Spectroscopy studies on AO exposed samples, and erosion yields of 3.5, 7.0, and 8.75 weight % Si8O11 MC-POSS-PI samples which were 3.7, 0.98, and 0.3 percent, respectively, of the erosion yield for Kapton H at a fluence of 8.5 x 10 to the 20th power oxygen atoms per square cm. The self-passivation of POSS-Kapton-PIs has also been demonstrated by monitoring a 1 micron deep scratch in MC-POSS-PI after exposure to AO. Kapton H(trade mark), SiO2 coated Kapton HN(trade mark) and 8.75 wt % Si8O11 MC-POSS-PI samples were exposed to AO, scratched, and re-exposed to AO. Upon the first exposure, these samples eroded 5.0 micron, 0 micron, and 200 nm respectively. Upon the second exposure the samples eroded, respectively, an additional 5.0 micron within and outside of the scratch, and 7.0 micron and 200 nm within the scratch only. Physical property characterization of POSS-PIs exposed to AO, and samples flown in LEO on the Materials International Space Station Experiment (MISSE), evidence that POSS-PIs are a viable Kapton replacement material.
DTIC
Aerospace Environments; Polyimides; Polymers; Spacecraft Construction Materials

20070008965 Naval Research Lab., Washington, DC USA

Advanced Telescope for High Energy Nuclear Astrophysics (ATHENA)

Johnson, W N; Dermer, C; Kroeger, R A; Kurfess, J D; Gehrels, N; Grindlay, J; Leising, M D; Prince, T; Purcell, W; Ryan, J; Tumer, T; Jan 1995; 12 pp.; In English

Report No.(s): AD-A461818; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461818

We present a space mission concept for a low energy gamma-ray telescope, ATHENA, which is under investigation as the next major advance in gamma-ray spectroscopy following the current COMPTON Gamma Ray Observatory and the planned INTEGRAL missions. The instrument covers the nuclear line emission energy domain with dramatically improved sensitivity and spectral resolution. The baseline configuration combines a high resolution Compton telescope constructed from Ge planar strip detectors for the 0.3-10 MeV energy region with a coded-aperture system for the 10 - 200 keV domain. The Ge Compton telescope provides a broad field of view with exceptional spectral and imaging resolution. The requirements, capabilities and simulations of ATHENA are discussed.

DTIC

Astrophysics; Nuclear Astrophysics; Telescopes

20070008979 Northwestern Univ., Evanston, IL USA

Gamma-Ray and Radio Observations of PSR B1509-58

Ulmer, M P; Matz, S M; Wilson, R B; Finger, M J; Hagedon, K S; Grabelsky, D A; Grove, J E; Johnson, W N; Kinzer, R L; Kurfess, J D; Purcell, W R; Strickman, M S; Kaspi, V M; Johnston, S; Manchester, R N; Lyne, A G; D'Amico, N; May 6, 1993; 17 pp.; In English

Report No.(s): AD-A461851; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/100.2/ADA461851

We report concurrent radio and gamma-ray observations of PSR B1509-58 carried out by the Parkes Radio Telescope and by the Burst and Transient Source Experiment (BATSE) and the Oriented Scintillation Spectrometer Experiment (OSSE) on the Compton Gamma Ray Observatory (CGRO-Gamma-ray light curves fitted at several energies between ~ 20-500 keV yield a phase offset with respect to the radio pulse that is independent of energy, with an average value 0.32 plus or minus 0.02. Although this value is larger by 0.07 than that reported by Kawai et al., the difference is not statistically significant (only~2 sigma) when account is taken of the uncertainty associated with their result. We briefly discuss the possibility that the energy-independence of the gamma-ray pulse phase is a signature of non-thermal radiation in the X-ray/gamma-ray range and the suggestion of a dependence of pulsar radio-gamma-ray phase offset on pulse period.

DTIC

Gamma Rays; Radio Observation

20070009123 Naval Research Lab., Washington, DC USA

The Radio Spectral Index of the Crab Nebula

Bietenholz, M F; Kassim, N; Frail, D A; Perley, R A; Erickson, W C; Hajian, A R; Nov 20, 1997; 12 pp.; In English

Report No.(s): AD-A461969; No Copyright; Avail.: CASI: A03, Hardcopy

We present the results of a new, comprehensive investigation of the radio spectral index of the Crab Nebula supernova remnant. New data at 74 MHz are combined with data at 327 MHz, 1.5 GHz, and 5 GHz. In contrast to previous claims, little spatial variation in the spectral index is seen. In particular, between 327 MHz and 5 GHz we see no evidence of spectral steepening near the edge of the Nebula, the 'jet' or the ionized filaments. The rms limits on any spectral index variations in these regions amount to no more than 0.01. We believe that earlier reports of large steepening were the result of correlator bias and image registration problems. An elongated feature was detected 1' northwest of the pulsar, which may be a continuation of the well-known wisplike structures seen closer to the center of the Nebula. At 74 MHz, we see for the first time evidence of free-free absorption by the thermal material in the Crab Nebula's filaments. Apart from some possible renewed acceleration occurring in the wisps, the dominant accelerator of relativistic electrons in the Crab Nebula is the pulsar itself.

DTIC

Crab Nebula; Nebulae; Radio Astronomy; Spectra

20070009307 Naval Research Lab., Washington, DC USA

Hot H2O Emission and Evidence for Turbulence in the Disk of a Young Star

Carr, John S; Tokunaga, Alan T; Narta, Joan; Mar 1, 2004; 9 pp.; In English

Report No.(s): AD-A462250; No Copyright; Avail.: CASI: A02, Hardcopy

We report on the detection and analysis of hot rovibrational H2O emission from SVS 13, a young stellar object previously known to have strong CO overtone band head emission. Modeling of the high-resolution infrared spectrum shows that the H2O emission is characterized by temperatures of 1500 K, significantly lower than the temperatures that characterize the CO band head emission. The widths of the H2O lines are also found to be smaller than those of the CO lines. We construct a disk model of the emission that reproduces the CO and H2O spectrum. In this model, the H2O lines originate at somewhat larger disk radii (0.3 AU) than the CO overtone lines (0.1 AU). We find that the H2O abundance is about a factor of 10 lower than the calculated chemical equilibrium abundance. Large, approximately transonic, local line broadening is required to fit the profile of the CO band head. If this velocity dispersion is identified with turbulence, it is of significant interest regarding the transport of angular momentum in disks. Large local broadening is also required in modeling CO overtone emission from other young stellar objects, suggesting that large turbulent velocities may be characteristic of the upper atmospheres of the inner disks of young stars.

DTIC

A Stars; Infrared Spectra; Stellar Atmospheres; Turbulence; Water

91
LUNAR AND PLANETARY SCIENCE AND EXPLORATION

Includes planetology; selenology; meteorites; comets; and manned and unmanned planetary and lunar flights. For spacecraft design or space stations see *18 Spacecraft Design, Testing and Performance*.

20070006613 NASA Johnson Space Center, Houston, TX, USA

Sample Curation at a Lunar Outpost

Allen, Carlton C.; Lofgren, Gary E.; Treiman, A. H.; Lindstrom, Marilyn L.; [2007]; 2 pp.; In English; Workshop/Science Associated with Lunar Exploration Architecture, 27 Feb. - 2 Mar. 2007, Tempe, AZ, USA; Copyright; Avail.: CASI: A01, Hardcopy

The six Apollo surface missions returned 2,196 individual rock and soil samples, with a total mass of 381.6 kg. Samples were collected based on visual examination by the astronauts and consultation with geologists in the science back room in Houston. The samples were photographed during collection, packaged in uniquely-identified containers, and transported to the Lunar Module. All samples collected on the Moon were returned to Earth. NASA's upcoming return to the Moon will be different. Astronauts will have extended stays at an out-post and will collect more samples than they will return. They will need curation and analysis facilities on the Moon in order to carefully select samples for return to Earth.

Derived from text

Lunar Bases; Soil Sampling; Apollo Project; Curing; Moon; Lunar Surface

20070006616 NASA Johnson Space Center, Houston, TX, USA

Organics in APOLLO Lunar Samples

Allen, C. C.; Allton, J. H.; [2007]; 3 pp.; In English; Workshop/Science Associated Lunar Explosion and Architecture, 27 Feb. - 2 Mar. 2007, Tempe, AZ, USA; No Copyright; Avail.: CASI: A01, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070006616

One of many unknowns prior to the Apollo landings concerned the possibility of life, its remains, or its organic precursors on the surface of the Moon. While the existence of lunar organisms was considered highly unlikely, a program of biological quarantine and testing for the astronauts, the Apollo Command Modules, and the lunar rock and soil samples, was instituted in the Lunar Receiving Laboratory (LRL). No conclusive evidence of lunar organisms, was detected and the quarantine program was ended after Apollo 14. Analyses for organic compounds were also con-ducted. Considerable effort was expended, during lunar surface operations and in the LRL, to minimize and quantify organic contamination. Post-Apollo curatorial operations and cleaning minimize contamination from particulates, oxygen, and water but no longer specifically address organic contamination. The organic compounds measured in Apollo samples are generally consistent with known sources of contamination.

Author

Organic Compounds; Lunar Soil; Lunar Rocks; Lunar Surface; Lunar Geology; Soil Sampling; Contamination

20070006720 NASA Johnson Space Center, Houston, TX, USA

Water Recovery Systems for Exploration Missions

Pickering, Karen D.; [2007]; 1 pp.; In English; Space Technology and Applications International, 12-15 Feb. 2007, Albuquerque, NM, USA

Contract(s)/Grant(s): 516572.04.04.02; No Copyright; Avail.: Other Sources; Abstract Only

As NASA prepares for the Vision for Space Exploration, advances in technology for water recovery systems are necessary to enable future missions. This paper examines the proposed water recovery systems for the initial Constellation exploration missions as well as the capability gaps that exist in the current technology portfolio. We discuss how these gaps will be addressed with future technology development. In addition, the paper reviews how the water recovery system matures throughout the sequence of planned exploration missions, to ultimately support a 180-day lunar mission.

Author

Space Exploration; Water Reclamation; Constellations

20070006835 NASA Johnson Space Center, Houston, TX, USA

Initial Results from the MRO Crism Hyperspectral Imaging Spectrometer for the Columbia Hills in Gusev Crater on Mars

Morris, R. V.; Arvidson, R. E.; Murchie, S.; Bell, J. F., III; Humm, D.; Lichtenberg, K.; Seelos, F., IV; Wolff, M.; [2007]; 2 pp.; In English; Lunar and Planetary Science Conference, 12-16 Mar. 2007, Houston, TX, USA; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy

Initial results from the Mars Reconnaissance Orbiter (MRO) Compact Reconnaissance Imaging Spectrometer for Mars (CRISM) instrument are reported for the Columbia Hills region in Gusev Crater, Mars. The imaged region (data product FRT00003192_07) includes the surface traversed by the Mars Exploration Rover (MER) Spirit. CRISM hyperspectral data (approx. 0.4 to 2.6 micrometers) are compared with multispectral data (approx. 0.4 to 1.0 micrometers) obtained by Spirit's Panoramic Camera (Pancam) instrument.

Derived from text

Imaging Spectrometers; Mars Craters; Mars Exploration; Mars Landing Sites; Mars Reconnaissance Orbiter

20070006836 NASA Johnson Space Center, Houston, TX, USA

Identification of Iron-Bearing Phases on the Martian Surface and in Martian Meteorites and Analogue Samples by Moessbauer Spectroscopy

Klingelhoefer, G.; Agresti, D. G.; Schroeder, C.; Rodionov, D.; Yen, A.; Ming, Doug; Morris, Richard V.; [2007]; 2 pp.; In English; Lunar and Planetary Science Conference, 12-16 Mar. 2007, Houston, TX, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070006836

The Moessbauer spectrometers on the Mars Exploration Rovers (MER) Spirit (Gusev Crater) and Opportunity (Meridiani Planum) have each analyzed more than 100 targets during their ongoing missions (\g1050 sols). Here we summarize the Fe-bearing phases identified to date and compare the results to Moessbauer analyses of martian meteorites and lunar samples. We use lunar samples as martian analogues because some, particularly the low-Ti Apollo 15 mare basalts, have bulk chemical compositions that are comparable to basaltic martian meteorites [1,2]. The lunar samples also provide a way to study pigeonite-rich samples. Pigeonite is a pyroxene that is not common in terrestrial basalts, but does often occur on the Moon and is present in basaltic martian meteorites

Author

Chemical Composition; Mars Surface; Roving Vehicles; Mars Craters; Basalt; Lunar Geology; Mars Exploration; SNC Meteorites

20070007301 NASA Johnson Space Center, Houston, TX, USA

Oxidation State of Nakhlites as inferred from Fe-Ti oxide Equilibria and Augite/Melt Europium Partitioning

Makishima, J.; McKay, G.; Le, L.; Miyamoto, M.; Mikouchi, T.; [2007]; 2 pp.; In English; Lunar and Planetary Science Conference, 12-16 Mar. 2007, Houston, TX, USA; Copyright; Avail.: CASI: A01, Hardcopy

Recent studies have shown that Martian magmas had wide range of oxygen fugacities (fO2) and that this variation is correlated with the variation of La/Yb ratio and isotopic characteristics of the Martian basalts, shergottite meteorites. The origin of this correlation must have important information about mantle sources and Martian evolution. In order to understand this correlation, it is necessary to know accurate value of oxidation state of other Martian meteorite groups. Nakhlites,

cumulate clinopyroxenites, are another major group of Martian meteorites and have distinctly different trace element and isotopic characteristics from shergottites. Thus, estimates of oxidation state of nakhlites will give us important insight into the mantle source in general. Several workers have estimated oxidation state of nakhlites by using Fe-Ti oxide equilibrium. However, Fe-Ti oxides may not record the oxidation state of the parent melt of the nakhlite because it is a late-stage mineral. Furthermore, there is no comprehensive study which analyzed all nakhlite samples at the same time. Therefore, in this study (1) we reduced the uncertainty of the estimate using the same electron microprobe and the same standards under the same condition for Fe-Ti oxide in 6 nakhlites and (2) we also performed crystallization experiments to measure partition coefficients of Eu into pyroxene in the nakhlite system in order to estimate fO2 when the pyroxene core formed (i.e. Eu oxybarometer [e.g. 2,6]).
Derived from text
Europium; Nakhlites; Oxidation; Iron Oxides; Titanium Oxides; Equilibrium; Melts (Crystal Growth)

20070007323 NASA Johnson Space Center, Houston, TX, USA
An Overview of the Distributed Space Exploration Simulation (DSES) Project
Crues, Edwin Z.; Chung, Victoria I.; Blum, Michael G.; Bowman, James D.; [2007]; 10 pp.; In English; 2007 Spring SIW, 25-30 Mar. 2007, FL, USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy

This paper describes the Distributed Space Exploration Simulation (DSES) Project, a research and development collaboration between NASA centers which investigates technologies, and processes related to integrated, distributed simulation of complex space systems in support of NASA's Exploration Initiative. In particular, it describes the three major components of DSES: network infrastructure, software infrastructure and simulation development. With regard to network infrastructure, DSES is developing a Distributed Simulation Network for use by all NASA centers. With regard to software, DSES is developing software models, tools and procedures that streamline distributed simulation development and provide an interoperable infrastructure for agency-wide integrated simulation. Finally, with regard to simulation development, DSES is developing an integrated end-to-end simulation capability to support NASA development of new exploration spacecraft and missions. This paper presents the current status and plans for these three areas, including examples of specific simulations. Author
Software Engineering; Computerized Simulation; Aerospace Systems; Complex Systems; Computer Programs

20070008092 NASA Johnson Space Center, Houston, TX, USA
The Challenges of Developing a Food System for a Mars Mission
Perchonok, Michele; [2007]; 30 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070008092

A viewgraph describing the food system that NASA is developing for Manned Mars Missions is shown. The topics include: 1) The President's Vision for U.S. Space Exploration -January 14, 2004; 2) Introducing Orion (and Ares); 3) Mercury (1961-1963); 4) Gemini (1965-1966); 5) Apollo (1968-1972); 6) Skylab (1973-1974); 7) Shuttle/Mir (1995-1998); 8) Shuttle (1981-present) International Space Station (2000-present); 9) NASA Stored Food System; 10) Advanced Food Technology; 11) Orion Missions; 12) Orion Challenges; 13) Food Packaging; 14) Mars Mission Assumptions; 15) Planetary Food System Selected Crops; 16) Food Processing Equipment Constraints; 17) Crew Involvement Constraints; 18) Advanced Food Technology Integration; 19) Research Highlights Internal; and 20) Research Highlights External.
CASI
Food Processing; Manned Mars Missions; Space Shuttles; Dehydrated Food; NASA Space Programs

20070008106 NASA Johnson Space Center, Houston, TX, USA
Extraterrestrial Samples at JSC
Allen, Carlton C.; [2007]; 33 pp.; In English; Alumni College Weekend at Rice University, 24 Feb. 2007, Houston, TX, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070008106

A viewgraph presentation on the curation of extraterrestrial samples at NASA Johnson Space Center is shown. The topics include: 1) Apollo lunar samples; 2) Meteorites from Antarctica; 3) Cosmic dust from the stratosphere; 4) Genesis solar wind

ions; 5) Stardust comet and interstellar grains; and 5) Space-Exposed Hardware.
CASI
Extraterrestrial Matter; Lunar Geology; Sample Return Missions; NASA Space Programs

20070008107 NASA Johnson Space Center, Houston, TX, USA
Does Comet WILD-2 contain Gems?
Chi, M.; Ishii, H.; Dai, Z. R.; Toppani, A.; Joswiak, D. J.; Leroux, H.; Zolensky, M.; Keller, L. P.; Browning, N. D.; [2007]; 2 pp.; In English; Lunar and Planetary Science Conference, 12-16 Mar. 2007, Houston, TX, USA
Contract(s)/Grant(s): NNH06AD67I; W-7405-eng-48; Copyright; Avail.: CASI: A01, Hardcopy

It is expected that Comet Wild-2 dust should resemble anhydrous carbon-rich, chondritic porous (CP) interplanetary dust particles (IDPs) collected in the stratosphere because some CP IDPs are suspected to be from comets. The rarity of carbonaceous grains and presolar silicates, as well as the presence of high-temperature inner solar nebula minerals in the Wild-2 sample (e.g. osbornite and melilite), appear incompatible with most CP IDPs. However, it is premature to draw firm conclusions about the mineralogy of comet Wild-2 because only approx. 1% of the sample has been examined. The most abundant silicates in CP IDPs are GEMS (glass with embedded metal and sulfides). Nonsolar O isotopic compositions confirm that at least some GEMS in IDPs are presolar amorphous silicates. The presence or absence of GEMS in the Wild-2 sample is important because it addresses, (a) the relationship between CP IDPs and comets, and (b) the hypothesis that other GEMS in IDPs formed in the solar nebula. Here we show that most of the GEMSlike materials so far identified in Stardust aerogel were likely impact generated during collection. At the nanometer scale, they are compositionally and crystallographically distinct from GEMS in IDPs.
Derived from text
Glass; Mineralogy; Wild 2 Comet; Metals; Sulfides

20070008108 NASA Johnson Space Center, Houston, TX, USA
Human Research Program Science Management: Overview of Research and Development Activities
Charles, John B.; [2007]; 40 pp.; In English; Human Research Program Investigators' Workshop, 12-14 Feb. 2007, League City, TX, USA; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070008108

An overview of research and development activities of NASA's Human Research Science Management Program is presented. The topics include: 1) Human Research Program Goals; 2) Elements and Projects within HRP; 3) Development and Maintenance of Priorities; 4) Acquisition and Evaluation of Research and Technology Proposals; and 5) Annual Reviews
CASI
Research and Development; General Overviews; NASA Programs; Manned Space Flight

20070008110 NASA Johnson Space Center, Houston, TX, USA
Valence State Partitioning of Cr and V Between Pyroxene - Melt: Estimates of Oxygen Fugacity for Martian Basalt QUE 94201
Karner, J. M.; Papike, J. J.; Shearer, C. K.; McKay, G.; Le, L.; Burger, P.; [2007]; 2 pp.; In English; Lunar and Planetary Science Conference, 12-16 Mar. 2007, Houston, TX, USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy

Several studies, using different oxybarometers, have suggested that the variation of fO2 in martian basalts spans about 3 log units from approx. IW-1 to IW+2. The relatively oxidized basalts (e.g., pyroxene-phyric Shergotty) are enriched in incompatible elements, while the relatively reduced basalts (e.g., olivine-phyric Y980459) are depleted in incompatible elements. A popular interpretation of the above observations is that the martian mantle contains two reservoirs; 1) oxidized and enriched, and 2) reduced and depleted. The basalts are thus thought to represent mixing between these two reservoirs. Recently, Shearer et al. determined the fO2 of primitive olivine-phyric basalt Y980459 to be IW+0.9 using the partitioning of V between olivine and melt. In applying this technique to other basalts, Shearer et al. concluded that the martian mantle shergottite source was depleted and varied only slightly in fO2 (IW to IW+1). Thus the more oxidized, enriched basalts had assimilated a crustal component on their path to the martian surface. In this study we attempt to address the above debate on martian mantle fO2 using the partitioning of Cr and V into pyroxene in pyroxene-phyric basalt QUE 94201.
Derived from text
Basalt; Mars Surface; Oxygen; Pyroxenes; Valence; Chromium; Vanadium; Melts (Crystal Growth)

20070008111 NASA Johnson Space Center, Houston, TX, USA

Early Impacts on the Moon: Crystallization Ages of Apollo 16 Melt Breccias

Norman, M. D.; Shih, C.-Y.; Nyquist, L. E.; Bogard, D. D.; Taylor, L. A.; [2007]; 2 pp.; In English; Lunar and Planetary Science Conference, 12-16 Mar. 2007, Houston, TX, USA; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy

A better understanding of the early impact history of the terrestrial planets has been identified one of the highest priority science goals for solar system exploration. Crystallization ages of impact melt breccias from the Apollo 16 site in the central nearside lunar highlands show a pronounced clustering of ages from 3.75-3.95 Ga, with several impact events being recognized by the association of textural groups and distinct ages. Here we present new geochemical and petrologic data for Apollo 16 crystalline breccia 67955 that document a much older impact event with an age of 4.2 Ga.

Author

Breccia; Crystallinity; Geochemistry; Impact Melts; Space Exploration

20070008112 NASA Johnson Space Center, Houston, TX, USA

Desert Research and Technology Studies (RATS) Local and Remote Test Sites

Janoiko, Barbara; Kosmo, Joseph; Eppler, Dean; [2007]; 1 pp.; In English; Space Technology and Applications International, 11-15 Feb. 2007, Albuquerque, NM, USA; No Copyright; Avail.: Other Sources; Abstract Only

Desert RATS (Research and Technology Studies) is a combined group of inter-NASA center scientists and engineers, collaborating with representatives of industry and academia, for the purpose of conducting remote field exercises. These exercises provide the capability to validate experimental hardware and software, to evaluate and develop mission operational techniques, and to identify and establish technical requirements applicable for future planetary exploration. D-RATS completed its ninth year of field testing in September 2006. Dry run test activities prior to testing at designated remote field site locations are initially conducted at the Johnson Space Center (JSC) Remote Field Demonstration Test Site. This is a multi-acre external test site located at JSC and has detailed representative terrain features simulating both Lunar and Mars surface characteristics. The majority of the remote field tests have been subsequently conducted in various high desert areas adjacent to Flagstaff, Arizona. Both the local JSC and remote field test sites have terrain conditions that are representative of both the Moon and Mars, such as strewn rock and volcanic ash fields, meteorite crater ejecta blankets, rolling plains, hills, gullies, slopes, and outcrops. Flagstaff is the preferred remote test site location for many reasons. First, there are nine potential test sites with representative terrain features within a 75-mile radius. Second, Flagstaff is the location of the USA Geologic Survey (USGS)/Astrogeology Branch, which historically supported Apollo astronaut geologic training and currently supports and provides host accommodations to the D-RATS team. Finally, in considering the importance of logistics in regard to providing the necessary level of support capabilities, the Flagstaff area provides substantial logistics support and lodging accommodations to take care of team members during long hours of field operations.

Author

Field Tests; Technology Utilization; Research and Development; Deserts; Test Facilities

20070008216 NASA Johnson Space Center, Houston, TX, USA

Applied Nanotechnology for Human Space Exploration

Yowell, Leonard L.; February 20, 2007; 28 pp.; In English; Environmental Nanotechnology Workshop, 19-22 Feb. 2007, Tokyo, Japan; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070008216

A viewgraph presentation describing nanotechnology for human space exploration is shown. The topics include: 1) NASA's Strategic Vision; 2) Exploration Architecture; 3) Future Exploration Mission Requirements Cannot be met with Conventional Materials; 4) Nanomaterials: Single Wall Carbon Nanotubes; 5) Applied Nanotechnology at JSC: Fundamentals to Applications; 6) Technology Readiness Levels (TRL); 7) Growth, Modeling, Diagnostics and Production; 8) Characterization: Purity, Dispersion and Consistency; 9) Processing; 10) Nanoelectronics: Enabling Technologies; 11) Applications for Human Space Exploration; 12) Exploration Life Support: Atmosphere Revitalization System; 13) Advanced and Exploration Life Support: Regenerable CO2 Removal; 14) Exploration Life Support: Water Recovery; 15) Advanced Life Support: Water Disinfection/Recovery; 16) Power and Energy: Supercapacitors and Fuel Cells; 17) Nanomaterials for EMI Shielding; 18) Active Radiation Dosimeter; 19) Advanced Thermal Protection System (TPS) Repair; 20) Thermal Radiation and Impact Protection (TRIPS); 21) Nanotechnology: Astronaut Health Management; 22) JSC Nanomaterials Group Collaborations.

CASI

Nanotechnology; Space Exploration; Manned Space Flight; NASA Space Programs

20070008222 NASA Johnson Space Center, Houston, TX, USA

The Lunar Atmosphere as a Cosmic-Ray Detector

Wilson, T. L.; [2007]; 2 pp.; In English; Lunar and Planetary Science Conference, 12-16 Mar. 2007, Houston, TX, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070008222

The recent discovery of a tenuous sodium (Na) atmosphere on the Moon and Mercury has renewed interest in studying the lunar atmosphere since the physics involved for the two bodies is thought to be of similar nature. Na came as a surprise because it had been missed by in situ UV measurements made during the Apollo program. The new lunar observations involve the visible D1 (5896) and D2 (5890) wavelengths which are highly efficient at scattering sunlight. Although its lunar source and morphology is still not completely understood, Na is present as a collisionless exosphere - apparently in the form of a cometary-type coma with a tail that can extend hundreds of lunar radii during Leonid showers. The global shape of the atmosphere, in particular for the shaded antisolar side, has been modelled by Smyth. Since planetary atmospheres can be used as cosmic-ray (CR) spectrometers by means of their fluorescence excited by CR-induced air shower particles, the subject of the Moon s atmosphere as a CR detector will be discussed here.

Author

Lunar Atmosphere; Cosmic Rays; Planetary Atmospheres; Mercury (Planet); Sodium; Cometary Atmospheres; Cosmic Ray Showers

20070008223 NASA Johnson Space Center, Houston, TX, USA

NASA Utilization of the International Space Station and the Vision for Space Exploration

Robinson, Julie A.; Thumm, Tracy L.; Thomas, Donald A.; [2007]; 10 pp.; In English; Original contains black and white illustrations

Report No.(s): IAC-06-B4.1.7; Copyright; Avail.: CASI: A02, Hardcopy

In response to the U.S. President s Vision for Space Exploration (January 14, 2004), NASA has revised its utilization plans for ISS to focus on (1) research on astronaut health and the development of countermeasures that will protect our crews from the space environment during long duration voyages, (2) ISS as a test bed for research and technology developments that will insure vehicle systems and operational practices are ready for future exploration missions, (3) developing and validating operational practices and procedures for long-duration space missions. In addition, NASA will continue a small amount of fundamental research in life and microgravity sciences. There have been significant research accomplishments that are important for achieving the Exploration Vision. Some of these have been formal research payloads, while others have come from research based on the operation of International Space Station (ISS). We will review a selection of these experiments and results, as well as outline some of ongoing and upcoming research. The ISS represents the only microgravity opportunity to perform on-orbit long-duration studies of human health and performance and technologies relevant for future long-duration missions planned during the next 25 years. Even as NASA focuses on developing the Orion spacecraft and return to the moon (2015-2020), research on and operation of the ISS is fundamental to the success of NASA s Exploration Vision.

Author

Space Exploration; International Space Station; Long Duration Space Flight; Microgravity; Payloads; Astronauts; Aerospace Environments

20070008224 NASA Johnson Space Center, Houston, TX, USA

The Mineralogy of Comet Wild-2 Nucleus Samples - What We Think We Know And What We Do Not Know

Zolensky, Michael E.; [2007]; 2 pp.; In English; Japan Geoscience Union Meeting, 19-24 May 2007, Tokyo, Japan; No Copyright; Avail.: Other Sources; Abstract Only

The sample return capsule of the Stardust spacecraft was successfully recovered in northern Utah on January 15, 2006, and its cargo of coma grains from Comet Wild-2 has now been the subject of intense investigation by approximately 200 scientists scattered across five continents. We can now perform mineralogical and petrographic analyses of particles derived directly from the Jupiter-family Comet Wild-2

Derived from text

Mineralogy; Petrography; Sample Return Missions; Wild 2 Comet

20070008268 NASA Ames Research Center, Moffett Field, CA, USA

NASA Ames Research Center Overview

Boyd, Jack; Proceedings of the Next Generation Exploration Conference; October 2006, pp. 48-58; In English; Next Generation Exploration Conference, 16-18 Aug. 2006, Moffett Field, CA, USA; See also 20070008265; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy

A general overview of the NASA Ames Research Center is presented. The topics include: 1) First Century of Flight, 1903-2003; 2) NACA Research Centers; 3) 65 Years of Innovation; 4) Ames Projects; 5) NASA Ames Research Center Today-founded; 6) Astrobiology; 7) SOFIA; 8) To Explore the Universe and Search for Life: Kepler: The Search for Habitable Planets; 9) Crew Exploration Vehicle/Crew Launch Vehicle; 10) Lunar Crater Observation and Sensing Satellite (LCROSS); 11) Thermal Protection Materials and Arc-Jet Facility; 12) Information Science & Technology; 13) Project Columbia Integration and Installation; 14) Air Traffic Management/Air Traffic Control; and 15) New Models-UARC.
CASI
NASA Programs; General Overviews; Space Exploration; Space Flight

20070008273 Arizona Univ., AZ, USA
Working Group Reports and Presentations: Asteroids
Lewis, John; Proceedings of the Next Generation Exploration Conference; October 2006, pp. 170-187; In English; Next Generation Exploration Conference, 16-18 Aug. 2006, Moffett Field, CA, USA; See also 20070008265; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

The study and utilization of asteroids will be an economical way to enable exploration of the solar system and extend human presence in space. There are thousands of near-earth objects (NEOs) that we will be able to reach. They offer resources, transportation, and exploration platforms, but also present a potential threat to civilization. Asteroids play a catastrophic role in the history of the Earth. Geological records indicate a regular history of massive impacts, which astronomical observations confirm is likely to continue with potentially devastating consequences. However, study and exploration of near earth asteroids can significantly increase advanced warning of an Earth impact, and potentially lead to the technology necessary to avert such a collision. Efforts to detect and prevent cataclysmic events would tend to foster and likely require international cooperation toward a unified goal of self-preservation. Exploration of asteroids will help us to understand our history and perhaps save our future. Besides the obvious and compelling scientific and security drivers for asteroid research and exploration, there are numerous engineering and industrial applications for near-term asteroid exploration. We have strong evidence that some asteroids are metal rich. Some are water and organic rich. They can be reached with a very low fuel cost compared to other solar system destinations. Once we reach them, there are efficient, simple extraction technologies available that would facilitate utilization. In addition, the costs of returning extracted resources from asteroids will be a fraction of the cost to return similar resources from the moon to Low Earth Orbit (LEO). These raw materials, extracted and shipped at relatively low cost, can be used to manufacture structures, fuel, and products which could be used to foster mankind s further exploration of the solar system. Asteroids also have the potential to offer transport to several destinations in the solar system. In addition to Mars and the Asteroid belt, it is possible to nudge the orbits of NEOs to provide convenient transport to other destinations. Resources to support life on these long voyages may be gathered from the host asteroid itself. As asteroids travel over a wide range of inclinations and ranges, they offer possible platforms to perform scientific investigations. These include unique vantage point observations of the sun and planets. These observations can help us to understand solar activity and space weather. They also afford us an opportunity to see how the earth looks from afar with different perspectives. When we look for planets outside of our solar system, these observations will help us to calibrate our data. Asteroids may also be used as platforms to support very long baseline interferometry with unprecedented angular resolutions.
Derived from text
Asteroids; Solar System; Space Exploration; Astrophysics; Astronomy

20070008280 Linden Labs., Inc., State College, PA, USA
Virtual Worlds, Virtual Exploration
LAmoreaux, Claudia; Proceedings of the Next Generation Exploration Conference; October 2006, pp. 143-168; In English; Next Generation Exploration Conference, 16-18 Aug. 2006, Moffett Field, CA, USA; See also 20070008265; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Space exploration shown in virtual reality if presented.
CASI
Space Exploration; Virtual Reality; Space Flight; Computerized Simulation

92
SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots. For related information see *93 Space Radiation*.

20070008094 NASA Goddard Space Flight Center, Greenbelt, MD, USA
A New Look at Some Solar Wind Turbulence Puzzles
Roberts, Aaron; [2006]; 1 pp.; In English; 2006 SHINE Workshop, 31 Jul. - 4 Aug. 2006, Midway, UT, USA; No Copyright; Avail.: Other Sources; Abstract Only

Some aspects of solar wind turbulence have defied explanation. While it seems likely that the evolution of Alfvenicity and power spectra are largely explained by the shearing of an initial population of solar-generated Alfvenic fluctuations, the evolution of the anisotropies of the turbulence does not fit into the model so far. A two-component model, consisting of slab waves and quasi-two-dimensional fluctuations, offers some ideas, but does not account for the turning of both wave-vector-space power anisotropies and minimum variance directions in the fluctuating vectors as the Parker spiral turns. We will show observations that indicate that the minimum variance evolution is likely not due to traditional turbulence mechanisms, and offer arguments that the idea of two-component turbulence is at best a local approximation that is of little help in explaining the evolution of the fluctuations. Finally, time-permitting, we will discuss some observations that suggest that the low Alfvenicity of many regions of the solar wind in the inner heliosphere is not due to turbulent evolution, but rather to the existence of convected structures, including mini-clouds and other twisted flux tubes, that were formed with low Alfvenicity. There is still a role for turbulence in the above picture, but it is highly modified from the traditional views.
Author
Solar Wind; Power Spectra; Turbulence; Shearing; Magnetic Flux; Vector Spaces; Magnetohydrodynamic Waves

20070008101 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Energetic Correlation Between Solar Flares and Coronal Mass Ejections
Dennis, Brian R.; Medlin, Drew A.; Haga, Leah; Schwartz, Richard a.; Tolbert, A. Kimberly; [2007]; 19 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

We find a strong correlation between the kinetic energies (KEs) of the coronal mass ejections (CMEs) and the radiated energies of the associated solar flares for the events that occurred during the period of intense solar activity between 18 October and 08 November 2003. CME start times, speeds, mass and KEs were taken from Gopalswamy et al. (2005), who used SOHO/LASCO observations. The GOES observations of the associated flares were analyzed to find the peak soft X-ray (SXR) flux, the radiated energy in SXRs (L(sub sxR)), and the radiated energy from the emitting plasma across all wavelengths (L(sub hot)). RHESSI observations were also used to find the energy in non-thermal electrons, ions, and the plasma thermal energy for some events. For two events, SORCE/TIM observations of the total solar irradiance during a flare were also available to give the total radiated flare energy (L(sub total)).W e find that the total flare energies of the larger events are of the same order of magnitude as the CME KE with a stronger correlation than has been found in the past for other time intervals.
Author
Solar Flares; Coronal Mass Ejection; Solar Activity; Thermal Energy; X Rays; Solar Radiation

20070008416 Johns Hopkins Univ., Laurel, MD, USA
Multi-Spacecraft Observations of Interplanetary Shock Accelerated Particle Events
Ho, G. C.; Lario, D.; Decker, R. B.; Desai, M. I.; Hu, Q.; Kasper, J.; Proceedings of the 2006 American Geophysical Union Fall Meeting; December 2006; 1 pp.; In English; 2006 American Geophysical Union Fall Meeting, 11-15 Dec. 2006, San Francisco, CA, USA
Contract(s)/Grant(s): NNG05GB44G
Report No.(s): SH43C-08; Copyright; Avail.: Other Sources; Abstract Only

We use simultaneous measurements from the Wind and ACE spacecraft to determine the spatial properties of both interplanetary (IP) shocks and the shock-associated energetic particle events. We combine plasma, magnetic field and energetic particle data from ACE and Wind for 124 energetic storm particle (ESP) events from 1998 to 2003 and examine the spatial and temporal variations of these events in the Earth's vicinity. We find that even though the two spacecraft were occasionally separated by more than 400 RE, the plasma, field, and energetic particle time-intensity profiles during the events were very similar. In addition, we find that the ion composition and energy spectra in individual IP shock events are identical at the two spacecraft locations. We also use the fitted shock velocity along the normal from ACE and estimate the shock transit time to

Wind location. In general, there is poor agreement between the estimated transit time and the actual measured transit time. Hence, our assumptions that a) the IP shock at 1 AU propagates radially, and/or b) the IP shock is spherically symmetric at 1 AU are not valid. In this paper, we will also study, for the first time, the anisotropy measurements of low-energy IP shock-associated ions at both ACE and Wind. We will then compare these new anisotropy analyses with locally measured shock parameters and identify possible signatures of different shock acceleration processes as predicted by the first-order Fermi and shock-drift models.
Author
Energetic Particles; Coronal Mass Ejection; Solar Storms; Solar Terrestrial Interactions; Solar Activity Effects

93
SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth radiation belts. For biological effects of radiation on plants and animals see *51 Life Sciences*; on human beings see 52 Aerospace Medicine. For theory see *73 Nuclear Physics*.

20070006730 NASA Johnson Space Center, Houston, TX, USA
The Use of Heavy Ion Radiation as an Analog for Space Radiation Environment and Its Effects on Drug Stability
Vaksman, Z.; Du, B.; Daniels, V.; Putcha, L.; [2007]; 1 pp.; In English; HRP Investigators Workshop, 12-14 Feb. 2007, League City, TX, USA; No Copyright; Avail.: Other Sources; Abstract Only

While it is common knowledge that electromagnetic radiation such as x-rays and gamma rays affect physical-chemical characteristics (PC) of compounds in addition to their toxic and mutagenic effects on biological systems, there are no reports on the effects of cosmic radiation encountered during space missions on stability of pharmaceuticals. Alterations in PC of drug formulations can adversely affect treatment with medications in space. Preliminary evaluation of stability and shelf-life of select pharmaceuticals (12) flown on space missions revealed that 37% and 40% of the formulations failed to meet USP requirements after shuttle and ISS flights, respectively. Based on these results, the current investigation is designed to examine the effect of proton (P) and heavy ion (Fe) radiation on 20 pharmaceutical preparations flown aboard the shuttle and ISS. The objectives of this project are: 1) Examine susceptibility of pharmaceuticals to short acute bouts of high intensity ionizing radiation species encountered during space flights; 2) Estimate extent of degradation of susceptible formulations as a function of intensity of each beam (P & Fe); and 3) compare and contrast the effects of single beam irradiation to that of a combined beam (P + Fe) that simulates space craft environment on drug stability. Irradiations were conducted at the Brookhaven National Laboratories (BNL) with beam strengths of 10 cGy, 10 or 50Gy of P and Fe beams separately. Preliminary evaluation of results revealed a reduction in the chemical content of label claim ranging 12-55 % for Augmentin, 7% for promethzine tablets and 9% for ciprofloxacin ointment. These results are in agreement, although less in magnitude than those observed during space flight and after gamma irradiation.
Author
Ionizing Radiation; Chemical Composition; Electromagnetic Radiation; Radiation Effects; Gamma Rays; Extraterrestrial Radiation; Cosmic Rays

99
GENERAL

Includes aeronautical, astronautical, and space science related histories, biographies, and pertinent reports too broad for categorization; histories or broad overviews of NASA programs such as Apollo, Gemini, and Mercury spacecraft, Earth Resources Technology Satellite (ERTS), and Skylab; NASA appropriations hearings.

20070008265 NASA Ames Research Center, Moffett Field, CA, USA
Proceedings of the Next Generation Exploration Conference
Schingler, Robbie, Editor; Lynch, Kennda; October 2006; 271 pp.; In English; Next Generation Exploration Conference, 16-18 Aug. 2006, Moffett Field, CA, USA; See also 20070008266 - 20070008280; Original contains color illustrations
Report No.(s): NASA/CP-2006-214551; Copyright; Avail.: CASI: A12, Hardcopy

The Next Generation Exploration Conference (NGEC) brought together the emerging next generation of space leaders over three intensive days of collaboration and planning. The participants extended the ongoing work of national space agencies to draft a common strategic framework for lunar exploration, to include other destinations in the solar system. NGEC is the first conference to bring together emerging leaders to comment on and contribute to these activities. The majority of the three-day conference looked beyond the moon and focused on the 'next destination': Asteroids, Cis-Lunar, Earth 3.0, Mars

Science and Exploration, Mars Settlement and Society, and Virtual Worlds and Virtual Exploration.
Author
Lunar Exploration; Mars Exploration; Moon; Asteroids; Earth Sciences

20070008266 Hawaii Univ., HI, USA
Comments about 'Earth 3.0'
Dator, Jim; Proceedings of the Next Generation Exploration Conference; October 2006, pp. 97-112; In English; Next Generation Exploration Conference, 16-18 Aug. 2006, Noffett Field, CA, USA; See also 20070008265; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Dr. Christopher P. McKay, Planetary Scientist with the Space Science Division of NASA Ames. Chris received his Ph.D. in AstroGeophysics from the University of Colorado in 1982 and has been a research scientist with the NASA Ames Research Center since that time. His current research focuses on the evolution of the solar system and the origin of life. He is also actively involved in planning for future Mars missions including human exploration. Chris been involved in research in Mars-like environments on Earth, traveling to the Antarctic dry valleys, Siberia, the Canadian Arctic, and the Atacama desert to study life in these Mars-like environments. His was a co-I on the Titan Huygen s probe in 2005, the Mars Phoenix lander mission for 2007, and the Mars Science Lander mission for 2009.
Derived from text
Solar System; Planetary Evolution; Astrophysics; Geophysics; Biological Evolution

20070008267 NASA Ames Research Center, Moffett Field, CA, USA
Life on Mars: Past, Present, and Future
McKay, Chris; Proceedings of the Next Generation Exploration Conference; October 2006, pp. 113-142; In English; See also 20070008265; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Mars has evidence for past liquid water, presence of an atmosphere with CO2 and N2, and potential for preservation of evidence of life. Composition of the Martian atmosphere is 95.3% Carbon dioxide, 2.7% Nitrogen, 1.6% Argon, 0.3-0.1% Water Vapor, 0.13% Oxygen, and 0.07% Carbon Monoxide. Current Mars missions include: Mars Global Surveyor, Mars Odyssey, Mars Exploration Rovers, Mars Express, and Mars Reconnaissance Orbiter,
Derived from text
Mars Exploration; Atmospheric Composition; Mars Global Surveyor; Mars Atmosphere; Nitrogen; Oxygen; Carbon Monoxide; Carbon Dioxide; Argon; Water Vapor

20070008269 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Working Group Reports and Presentations: Mars Science and Exploration
Beaty, David; Proceedings of the Next Generation Exploration Conference; October 2006, pp. 214-226; In English; Next Generation Exploration Conference, 16-18 Aug. 2006, Moffett Field, CA, USA; See also 20070008265; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

In Mars, the spirit of exploring an exciting and rewarding new frontier is alive. Mars not only offers a unique destination for exploration, but it is also a critical destination for the advancement of human society and preservation of humanity. The exploration of Mars will provide significant social and technological benefits to enhance life on Earth as well. International cooperation will not only be essential to the success of a human presence on Mars, but development of such interactions will jumpstart collaboration on global issues. The eventual commercialization of space holds tremendous opportunities for economic growth. Finally, there is an undeniable basic human need to explore and define our place in the universe. The overarching theme that ties together all of these reasons for exploration is to inspire and unite the global community to pursue a common cause that is much larger than disagreements over ethnic differences or national borders. Continuous inspiration of the public, the scientific community, and the community of Earth are required in order to explore Mars.
Derived from text
Mars Exploration; International Cooperation; Space Commercialization; Life Sciences; Economics

20070008270 Los Alamos National Lab., NM, USA
Working Group Reports and Presentations: Cis-lunar
Laubscher, Bryan; Proceedings of the Next Generation Exploration Conference; October 2006, pp. 188-200; In English; Next Generation Exploration Conference, 16-18 Aug. 2006, Moffett Field, CA, USA; See also 20070008265; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Space agencies are committed to the 'safe, sustained, affordable human and robotic exploration of the Moon, Mars, and beyond.' However, we recommend that they explicitly define our ultimate goal and motivation in order to portray a sense of purpose to the public. Our goal is sustainable human settlement of the Moon and Mars and our motivation is to preserve the human race. All secondary exploration and science objectives flow from this main goal and are still imperative to our success. As an economic guiding principle, governments should be limited to those areas where only government can perform the activity and should recognize and coordinate with the larger private and military sectors. Also, space agencies must continue to fund the interdisciplinary science necessary to characterize environmental hazards associated with dust, radiation, surface charging, topology, and meteorites in order to make our first attempts at extraterrestrial living viable.
Derived from text
Space Exploration; Robotics; Economics; Meteorites; Moon

20070008271 NASA Ames Research Center, Moffett Field, CA, USA
Dawn of a New Space Age: Developing a Global Exploration Strategy.
Volosin, Jeff; Proceedings of the Next Generation Exploration Conference; October 2006, pp. 14-26; In English; Next Generation Exploration Conference, 16-18 Aug. 2006, Moffett Field, CA, USA; See also 20070008265; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Jeff Volosin is an aerospace engineer with over 20 years of experience in the design, development, and operations of both robotic and crewed spacecraft. Mr. Volosin is currently leading the NASA effort to develop and integrate a global exploration strategy which reflects the lunar exploration interests of international space agencies, academia and commercial stakeholders. Prior to joining NASA as a member of the Exploration Systems Mission Directorate in 2004, Jeff was an aerospace contractor, serving in a number of leadership positions including: Operations Manager for the NASA Communications Network and Flight Operations Manager for the Advanced Composition Explorer, Tropical Rainfall Measuring Mission, and the NOAA Polar and Geostationary satellite constellations. Earlier in his career, Jeff spent 4 years as a system engineer supporting the Space Exploration Initiative studies on human voyages to the Moon and Mars and also supported the Space Station program as an advanced life support engineer.
Derived from text
Space Exploration; Geosynchronous Orbits; Lunar Exploration; Life Support Systems; Space Stations; Satellite Constellations; Advanced Composition Explorer

20070008272 Hawaii Univ., HI, USA
Till the Ductile Anchor Hold: Towards Space Settlements in the 21st Century.
Dator, Jim; Proceedings of the Next Generation Exploration Conference; October 2006, pp. 35-47; In English; Next Generation Exploration Conference, 16-18 Aug. 2006, Moffett Field, CA, USA; See also 20070008265; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Humans are restless explorers. For 99% of humanity s time on Earth, we have been nomadic wanderers, not farmers, warriors, factory workers, developers, or NASA employees. Only recently--for only a few thousand years--have most humans been tied to the land as many are now. But as more and more of us live in information societies and some indeed in dream societies where our identity derives from the knowledge we share and the image we project, and not from the property we own or the manual work we do, the time may be coming when we should break free from the land, and roam once again. But beware: the reality of Man and Woman the Explorer has a very dark side as well. Many people where I live view the recent experience of Man on the Move as a history of theft, murder, racism, exploitation, and genocide. So we need to be very careful if we say that space exploration is only natural for humans, since the experience has not been very uplifting and noble for most recipients of the exploring of others. But such warnings are not new. Humans have been alerting each other to the dangers of change and novelty from the very beginning: Who and what is this?
Derived from text
Space Exploration; Ductility; Exploitation; Hazards

20070008274 Arizona Univ., AZ, USA
Asteroid Exploration and Exploitation
Lewis, John S.; Proceedings of the Next Generation Exploration Conference; October 2006, pp. 60-73; In English; Next Generation Exploration Conference, 16-18 Aug. 2006, Moffett Field, CA, USA; See also 20070008265; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

John S. Lewis is Professor of Planetary Sciences and Co-Director of the Space Engineering Research Center at the

University of Arizona. He was previously a Professor of Planetary Sciences at MIT and Visiting Professor at the California Institute of Technology. Most recently, he was a Visiting Professor at Tsinghua University in Beijing for the 2005-2006 academic year. His research interests are related to the application of chemistry to astronomical problems, including the origin of the Solar System, the evolution of planetary atmospheres, the origin of organic matter in planetary environments, the chemical structure and history of icy satellites, the hazards of comet and asteroid bombardment of Earth, and the extraction, processing, and use of the energy and material resources of nearby space. He has served as member or Chairman of a wide variety of NASA and NAS advisory committees and review panels. He has written 17 books, including undergraduate and graduate level texts and popular science books, and has authored over 150 scientific publications.
Derived from text
Asteroids; Planetary Atmospheres; Solar System Evolution; Planetary Evolution; Exploitation; Earth Resources; Astronomy

20070008275 Los Alamos National Lab., NM, USA
The Space Elevator and Its Promise for Next Generation Exploration
Laubscher, Bryan E.; Proceedings of the Next Generation Exploration Conference; October 2006, pp. 74-96; In English; Next Generation Exploration Conference, 16-18 Aug. 2006, Moffett Field, CA, USA; See also 20070008265; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Bryan E. Laubscher received his Ph.D. in physics in 1994 from the University of New Mexico with a concentration in astrophysics. He is currently on entrepreneurial leave from Los Alamos National Laboratory where he is a project leader and he has worked in various capacities for 16 years. His past projects include LANL's portion of the Sloan Digital Sky Survey, Magdalena Ridge Observatory and a project developing concepts and technologies for space situational awareness. Over the years Bryan has participated in research in astronomy, lidar, non-linear optics, space mission design, space-borne instrumentation design and construction, spacecraft design, novel electromagnetic detection concepts and technologies, detector/receiver system development, spectrometer development, interferometry and participated in many field experiments. Bryan led space elevator development at LANL until going on entrepreneurial leave in 2006. On entrepreneurial leave, Bryan is starting a company to build the strongest materials ever created. These materials are based upon carbon nanotubes, the strongest structures known in nature and the first material identified with sufficient strength-to-weight properties to build a space elevator.
Author
Space Elevators; Astrophysics; Space Missions; Spacecraft Design; Structural Design; Satellite-Borne Instruments; Optical Radar; Sky Surveys (Astronomy)

20070008276 Hawaii Univ., HI, USA
Working Group Reports and Presentations: Earth 3.0.
Dator, James; Proceedings of the Next Generation Exploration Conference; October 2006, pp. 201-213; In English; Next Generation Exploration Conference, 16-18 Aug. 2006, Moffett Field, CA, USA; See also 20070008265; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

We affirm the principle that a viable human space exploration program must be conducted hand-in-hand with a comprehensive scientific research program that incorporates both the physical and life sciences and that continues to protect and extend understanding of our home planet. Without advances in life science, we will be incapable of devising self-sustaining extraterrestrial habitats, and we will struggle to survive on the only living planet we know. Without advances in the physical sciences, we limit our ability to imagine new technologies for space travel and to understand the nature of the universe we explore. Scientific advances expand the boundaries of humanity s dreams.
Derived from text
Life Sciences; Space Exploration; Habitats; Physical Sciences

20070008277 Linden Labs., Inc., State College, PA, USA
Working Group Reports and Presentations: Virtual Worlds and Virtual Exploration
LAmoreaux, Claudia; Proceedings of the Next Generation Exploration Conference; October 2006, pp. 247-259; In English; Next Generation Exploration Conference, 16-18 Aug. 2006, Moffett Field, CA, USA; See also 20070008265; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Scientists and engineers are continually developing innovative methods to capitalize on recent developments in computational power. Virtual worlds and virtual exploration present a new toolset for project design, implementation, and resolution. Replication of the physical world in the virtual domain provides stimulating displays to augment current data

analysis techniques and to encourage public participation. In addition, the virtual domain provides stakeholders with a low cost, low risk design and test environment. The following document defines a virtual world and virtual exploration, categorizes the chief motivations for virtual exploration, elaborates upon specific objectives, identifies roadblocks and enablers for realizing the benefits, and highlights the more immediate areas of implementation (i.e. the action items). While the document attempts a comprehensive evaluation of virtual worlds and virtual exploration, the innovative nature of the opportunities presented precludes completeness. The authors strongly encourage readers to derive additional means of utilizing the virtual exploration toolset.
Derived from text
Virtual Reality; Engineers; Display Devices; Low Cost

20070008278 European Space Agency, France
Towards the Establishment of a Strategic Framework for a Global Exploration Strategy.
Messina, Piero; Proceedings of the Next Generation Exploration Conference; October 2006, pp. 27-34; In English; Next Generation Exploration Conference, 16-18 Aug. 2006, Moffett Field, CA, USA; See also 20070008265; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy

A viewgraph presentation on the development of space exploration through a framework of the European Space Policy is shown. The topics include: 1) Europe's Involvement in Space Exploration; 2) Different Programs-Similar Goals; 3) International Cooperation; and 4) Establishing an International Cooperation Framework.
CASI
Space Exploration; European Space Agency

20070008279 NASA Ames Research Center, Moffett Field, CA, USA
Working Group Reports and Presentations: Mars Settlement and Society
McKay, Chris; Proceedings of the Next Generation Exploration Conference; October 2006, pp. 227-246; In English; Next Generation Exploration Conference, 16-18 Aug. 2006, Moffett Field, CA, USA; See also 20070008265; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

The long-term implications of space exploration must be considered early in the process. With this in mind, the Mars Settlement and Society Group focused on five key areas: Philosophical Framework, Community Infrastructure and Government, Creating Stakeholders, Human Subsystems, and Habitat Design. The team proposes long and short term goals to support getting to and then staying long-term on Mars. All objectives shared the theme that they should engage, inspire, and educate the public with the intent of fostering stakeholders in the exploration of Mars. The objectives of long-term settlement on Mars should not neglect group dynamics, issues of reproduction, and a strong philosophical framework for the establishment of a society.
Derived from text
Space Exploration; Microgravity; Habitats; Group Dynamics; Psychology; Astronauts

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