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Space Administration
Langley Research Center

Scientific and Technical
Information Program Office

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WHAT'S INSIDE

NASA STI Program ... in Profile

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STAR includes citations to R&D results reported in:

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- NASA-owned patents and patent applications
- Other U.S. Government agency and foreign patents and patent applications
- Domestic and foreign dissertations and theses

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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 Divisions/Categories

Document citations are grouped by division and then by category, according to the *NASA Scope and Subject Category Guide.*

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Mathematical and Computer Sciences

Physics

Social and Information Sciences

Space Sciences

Indexes

Two indexes are available. You may use the find command under the tools menu while viewing the PDF file for direct match searching on any text string. You may also select either of the two indexes provided for linking to the corresponding document citation from *NASA Thesaurus* terms and personal author names.

Subject Term Index

Personal Author Index

SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

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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.

20080019647 NASA Langley Research Center, Hampton, VA, USA

Effective Simulation of Delamination in Aeronautical Structures Using Shells and Cohesive Elements

Davila, Carlos G.; Camanho, Pedro P.; Turon, Albert; January 2007; 27 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 732759.07.09; Copyright; Avail.: Other Sources

A cohesive element for shell analysis is presented. The element can be used to simulate the initiation and growth of delaminations between stacked, non-coincident layers of shell elements. The procedure to construct the element accounts for the thickness offset by applying the kinematic relations of shell deformation to transform the stiffness and internal force of a zero-thickness cohesive element such that interfacial continuity between the layers is enforced. The procedure is demonstrated by simulating the response and failure of the Mixed Mode Bending test and a skin-stiffener debond specimen. In addition, it is shown that stacks of shell elements can be used to create effective models to predict the inplane and delamination failure modes of thick components. The results indicate that simple shell models can retain many of the necessary predictive attributes of much more complex 3D models while providing the computational efficiency that is necessary for design.

Author

Cohesion; Delaminating; Simulation; Aeronautical Engineering; Shells (Structural Forms)

20080020536 NASA Glenn Research Center, Cleveland, OH, USA

CFD Analyses and Jet-Noise Predictions of Chevron Nozzles with Vortex Stabilization

Dippold, Vance; March 2008; 31 pp.; In English; 46th AIAA Aerospace Sciences Meeting and Exhibit, 7-10 Jan. 2008, Reno, NV, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 561581.02.08.03.03.02

Report No.(s): NASA/TM-2008-215150; AIAA Paper-2008-0037; E-16329; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080020536

The wind computational fluid dynamics code was used to perform a series of analyses on a single-flow plug nozzle with chevrons. Air was injected from tubes tangent to the nozzle outer surface at three different points along the chevron at the nozzle exit: near the chevron notch, at the chevron mid-point, and near the chevron tip. Three injection pressures were used for each injection tube location--10, 30, and 50 psig-giving injection mass flow rates of 0.1, 0.2, and 0.3 percent of the nozzle mass flow. The results showed subtle changes in the jet plume s turbulence and vorticity structure in the region immediately downstream of the nozzle exit. Distinctive patterns in the plume structure emerged from each injection location, and these became more pronounced as the injection pressure was increased. However, no significant changes in centerline velocity decay or turbulent kinetic energy were observed in the jet plume as a result of flow injection. Furthermore, computational acoustics calculations performed with the JeNo code showed no real reduction in jet noise relative to the baseline chevron nozzle.

Author

Computational Fluid Dynamics; Mass Flow Rate; Nozzle Flow; Jet Aircraft Noise; Vortices; Acoustics; Noise Prediction; Injection; Plug Nozzles

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.

20080019646 NASA Langley Research Center, Hampton, VA, USA
Investigations for Supersonic Transports at Transonic and Supersonic Conditions
Rivers, S. Melissa B.; Owens, Lewis R.; Wahls, Richard A.; January 2007; 30 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): WBS 561581.02.08.07.20.03; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080019646

Several computational studies were conducted as part of NASA s High Speed Research Program. Results of turbulence model comparisons from two studies on supersonic transport configurations performed during the NASA High-Speed Research program are given. The effects of grid topology and the representation of the actual wind tunnel model geometry are also investigated. Results are presented for both transonic conditions at Mach 0.90 and supersonic conditions at Mach 2.48. A feature of these two studies was the availability of higher Reynolds number wind tunnel data with which to compare the computational results. The transonic wind tunnel data was obtained in the National Transonic Facility at NASA Langley, and the supersonic data was obtained in the Boeing Polysonic Wind Tunnel. The computational data was acquired using a state of the art Navier-Stokes flow solver with a wide range of turbulence models implemented. The results show that the computed forces compare reasonably well with the experimental data, with the Baldwin-Lomax with Degani-Schiff modifications and the Baldwin-Barth models showing the best agreement for the transonic conditions and the Spalart-Allmaras model showing the best agreement for the supersonic conditions. The transonic results were more sensitive to the choice of turbulence model than were the supersonic results.
Author
Supersonic Transports; Transonic Wind Tunnels; Wind Tunnel Tests; Computational Grids; Navier-Stokes Equation; Turbulence Models; Mach Number; Reynolds Number

20080020055 Naval Postgraduate School, Monterey, CA USA
Real-Time Optimal Slew Maneuver Design and Control
Fleming, Andrew; Dec 2004; 179 pp.; In English; Original contains color illustrations
Report No.(s): AD-A477384; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This thesis considers the problem of time-optimal spacecraft slew maneuvers. Since the work of Bilimoria and Wie it has been known that the time-optimal reorientation of a symmetric rigid body was not the eigenaxis maneuver once thought to be correct. Here, this concept is extended to axisymmetric and asymmetric rigid body reorientations with idealized independent torque generating devices. The premise that the time-optimal maneuver is not, in general, an eigenaxis maneuver, is shown to hold for all spacecraft configurations. The methodology is then extended to include spacecraft control systems employing magnetic torque rods, a combination of pitch bias wheel with magnetic torque rods, and finally to control systems employing single gimbal control moment gyros. The resulting control solutions, designed within the limitations of the actuators, eliminate the requirement to avoid actuator singularities. Finally, by employing sampled-state feedback the viability of real-time optimal closed loop control is demonstrated.
DTIC
Eigenvectors; Maneuvers; Real Time Operation; Slewing

20080020320 Army Aviation and Missile Research Develoment Engineering Center, Redstone, AL USA
Guidelines for Gridding Simple Flows - The Flat Plate in Laminar Flow
Vaughn, Jr, Milton E; Jan 2008; 25 pp.; In English; Original contains color illustrations
Report No.(s): AD-A476652; TR-AMR-SS-08-09; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476652

In order to facilitate the application of Computational Fluid Dynamics (CFD) tools by aerodynamic designers, several guidelines are developed to quantify grid generation parameters for incompressible, laminar flat plate flows. These guidelines address several factors including: (1) domain size, (2) grid point distribution functions, (3) the error to be expected from a given initial point spacing, and (4) the number of grid points (or cells) in each coordinate direction. The guidelines are discerned by comparison of computed results with the classical Blasius solution. Then they are tested and verified for a case

outside the bounds of cases from which they were developed. The result is a set of rules of thumb that greatly simplify the grid generation process for non-specialists.
DTIC
Aerodynamics; Flat Plates; Laminar Flow

20080020517 ATK Space, Hampton, VA, USA
Forebody and Inlet Design for the HIFiRE 2 Flight Test
Ferlemann, Paul G.; May 12, 2008; 19 pp.; In English; JANNAF Airbreathing Propulsion Subcommittee Meeting, 12-16 May 2008, Boston, MA, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNL07AA00B; WBS 599489.02.07.07.03.01.02; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080020517

A forebody and inlet have been designed for the HIFiRE 2 scramjet flight test. The test will explore the operating, performance, and stability characteristics of a simple hydrocarbon-fueled scramjet combustor as it transitions from dual-mode to scramjet-mode operation and during supersonic combustion at Mach 8+ flight conditions. Requirements for the compression system were derived from inlet starting and combustor inflow requirements as well as physical size constraints. The design process is described. A planar, fixed geometry, mixed compression concept was used to produce laterally uniform flow at the inlet entrance and a conservative amount of internal contraction with respect to inlet starting. A grid sensitivity study was performed so that important flow physics caused by three-dimensional shock boundary layer interactions could be captured with confidence. Results from low Mach number operability studies, nominal trajectory cases, and high dynamic pressure heat load cases are discussed. The forebody and inlet solutions provide information for on-going combustor calculations, mass capture across the trajectory for fuel system design, and surface heating rates for thermal/structural analysis. The design has a one freestream Mach number margin for inlet starting, exceeds the high Mach number combustor entrance pressure requirement, produces high quality flow at the inlet exit for all Mach numbers and vehicle attitudes in the design space, and fits inside the booster shroud.
Author
Forebodies; Design Analysis; Uniform Flow; Flight Tests; Free Flow; Stability; Three Dimensional Boundary Layer; Supersonic Combustion Ramjet Engines; Structural Analysis

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.

20080019792 Civil Aeromedical Inst., Oklahoma City, OK USA
Development of an Aeromedical Scientific Information System for Aviation Safety
Peterman, Connie L; Rogers, Paul B; Veronneau, Stephen J; Whinnery, James E; Jan 2008; 24 pp.; In English
Report No.(s): AD-A477153; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477153

Introduction. The Bioinformatics Research Team at the Civil Aerospace Medical Institute (CAMI) uses data analysis techniques to study issues associated with medical certification decisions and their effects on the U.S. pilot population to ensure safety of flight. We developed a Scientific Information System to assist in research efforts associated with statistical and epidemiological studies of the U.S. civil pilot population. Significant data challenges exist relative to the integration and analysis of very large datasets associated with civil aviation. Methods. The CAMI aviation safety/medical certification data warehouse was created with data from varying time periods. Data includes NTSB mishap data from 1983 to 2005, FAA Accident Incident data from 1971 to 2005, airmen registry data (combined with medical certification data) from 1962 to 2005, toxicology data from 1990 to 2005, and autopsy data from 1980 to 2005. The research methodology, developed using records from the CAMI warehouse, was used to create the Aerospace Medical Research Scientific Information System that contains new metrics for comparing groups of aviators. This was done by developing a methodology that combined the various data sources into a single integrated database while transforming the data into a format conducive to epidemiological studies. Discussion. We will discuss the methodologies developed to create new metrics--Active Airmen, Months Contributed, and Effective Class--which show promise in comparing groups of aviators with various pathologic conditions. The distributions

and evolution of pathologic conditions can be observed in the resulting Scientific Information System pilot population for the time period of interest. The Scientific Information System overcomes the data incongruities between the source databases and makes analysis possible with statistical programs. Conclusion. CAMI was successful in creating a Scientific Information System.
DTIC
Aerospace Medicine; Aircraft Safety; Data Mining; Decision Support Systems; Epidemiology; Flight Safety; Information Systems; Pilots; Safety Factors; Systems Engineering

20080020092 Air Force Research Lab., Rome, NY USA
Coalition Airspace Management and Deconfliction
Griffith, David; Wilson-Smith, Geoffrey K; Ohmer, Mark; Seifert, Michael; DiLego, Jr , Francis; Hitchings, John; Sterling, Josh; Simmons, Henry; Jan 2008; 20 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-558S
Report No.(s): AD-A477492; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The risk of fratricide is a constant problem in all military engagements, a problem that is exacerbated in coalition operations where military forces from many allied nations operate in close proximity. Despite considerable efforts to mitigate this risk friendly fire engagements between air and ground units resulted in 13 deaths during Operation Iraqi Freedom. These incidents resulted, in part, from poor situation awareness and failures in the air command and control process. The movement of ground forces was swift and in many cases exceeded the ability of airspace management capabilities to keep up with the evolving situation. Lessons learned indicate that collaborative airspace planning dynamic replanning operational deconfliction and information sharing all needed to be significantly improved. The emergence of unmanned aerial systems stand-off weapons loitering munitions and sensors platforms necessitate their incorporation into disciplined airspace management while the coordination of operations in both combat and civil airspace further exacerbates the planning process. As a result AFRL is developing the Joint Airspace Management and Deconfliction (JASMAD) automated planning systems.
DTIC
Airspace; Military Operations; Planning

20080020358 Department of Homeland Security, Washington, DC, USA
Effects on Privacy and Civil Liberties. DHS Privacy Office Report Assessing the Impact of the Automatic Selectee and No Fly Lists on Privacy and Civil Liberties as Required under Section 4012(b) of the Intelligence Reform and Terrorism Prevention Act of 2004
Apr. 2006; 29 pp.; In English
Report No.(s): PB2007-112019; No Copyright; Avail.: CASI: A03, Hardcopy

This report responds to Section 4012(b)(2) of the Intelligence Reform and Terrorism Prevention Act (IRTPA) of 2004, P.L. 108-458, which requires the Security Privacy Officer of the Department of Homeland Security (DHS) to submit to Congress a report assessing the impact of the Automatic Selectee and No-fly (Selectee and No-fly) lists on privacy and civil liberties. In particular, the Privacy Office was asked to make recommendations for practices, procedures, regulations, or legislation necessary 'to minimize adverse effects of (these lists) on privacy, discrimination, due process, and other civil liberties'; to discuss the implications of 'applying those lists to other modes of transportation'; and to discuss the effect that the implementation of recommendations would have on 'the effectiveness of the use of such lists to protect the USA against terrorist attacks'. The No-fly list is a list of individuals who are prohibited from boarding an aircraft. The Automatic Selectee list is a list of individuals who must undergo additional security screening before being permitted to board an aircraft. Originally created and maintained by the Transportation Security Administration (TSA), No-fly and Selectee lists are now derived from the consolidated terrorist watch list maintained by the Terrorist Screening Center (TSC). Two agencies of the Department of Homeland Security, TSA and Bureau of Customs and Border Protection (CBP), use the No-fly and Selectee lists for screening airline passengers. TSA is responsible for screening domestic airline passengers; CBP screens international passengers. CBP also uses these lists to screen cruise line passengers.
NTIS
Intelligence; Law (Jurisprudence); Prevention; Privacy; Terrorism

20080020519 George Washington Univ., Hampton, VA, USA

Supersonic Combusting Jet Experiments for Code Development and Validation

Cutler, Andrew D.; Magnotti, G.; May 12, 2008; 16 pp.; In English; 55th JANNAF Propulsion Meeting/42nd Combustion/30th Airbreathing Propulsion/30th Exhaust Plume Technology/24th Propulsion Systems Hazards/12th SPIRITS User Group Joint Subcommittee Meeting, 12-16 May 2008, Newton, MA, USA; Original contains color illustrations

Contract(s)/Grant(s): FA9101-04-C-0013; NNX07AC32A; WBS 599489.02.07.07.03.01.01; Copyright; Avail.: CASI: A03, Hardcopy

Computational fluid dynamics (CFD) methods based on the Reynolds averaged Navier-Stokes (RANS) equations are extensively employed in the design of hypersonic airbreathing engines. A fundamental weakness in these methods is the accurate mathematical modeling of turbulence and turbulence-combustion interactions. This paper is one of a companion pair of papers which describe the use of the combined dual pump CARS and newly developed interferometric Rayleigh scattering optical system to acquire time-accurate turbulence and mixing data with which to aid calibration and verification of the current turbulence models. This test program consisted of a pilot laboratory-scale experiment used to develop the optical system and data acquisition techniques, and a significantly larger experiment to acquire the necessary turbulence data. The flow is an axially-symmetric, supersonic, combusting, free jet that provides good optical access, consisting of a central jet of hot 'vitiated air' and a coflow jet of hydrogen or ethylene fuel. In this paper the development of both experiments is described. Facility and flow visualization data are presented for various types of flames, including the flames selected for detailed study with the CARS/Rayleigh optical techniques.

Author

Computational Fluid Dynamics; Axisymmetric Flow; Supersonic Jet Flow; Reynolds Averaging; Turbulence Models; Hydrogen Fuels; Flow Visualization; Navier-Stokes Equation; Air Breathing Engines

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.

20080018943 Air Force Research Lab., Wright-Patterson AFB, OH USA

U.S. Air Force Efforts in Understanding and Mitigating the Effects of 'NDI Misses' (Preprint)

Butkus, Lawrence M; Gallagher, Joseph P; Berens, Alan P; Malas, James C; Babish, IV, Charles A; May 2007; 20 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F33615-03-D-5204; Proj-4349

Report No.(s): AD-A476857; AFRL-RX-WP-TP-2008-4045; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA476857

Recent events within the U.S. Air Force (USAF) have highlighted the reality that cracks large enough to be readily detected by non-destructive inspection (NDI) can be missed during in-service NDI actions. These so-called 'missed crack' or 'NDI miss' events may pose serious risks to the safety and integrity of aircraft structures. This paper will review USAF actions: 1) to understand the severity and ramifications of the NDI miss problem, 2) to minimize the probability that cracks will be missed, and 3) to mitigate the effects of undetected cracks. In this paper, the probability of detection (POD) concept will be described from the standpoint of the variables that govern the detectable crack size associated with a given POD. Examples will be presented that illustrate the ramifications missed cracks have on aircraft structural safety. A technique for estimating the probability distribution of missed cracks based on NDI findings (i.e., 'found cracks') and on the knowledge of a specific NDI technique's POD capability will be described. In addition, a brief review of recent advances in NDI technologies and techniques designed to minimize NDI misses will be presented.

DTIC

Cracks; Inspection; Maintenance

20080018945 Air Force Research Lab., Wright-Patterson AFB, OH USA

Advanced YBCO-Coated Conductors for Use on Air Platforms (Postprint)

Barnes, Paul N; Jun 2007; 10 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-3145

Report No.(s): AD-A476886; AFRL-RZ-WP-TP-2008-2016; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA476886

With progress of the YBCO-coated conductor to longer lengths, application of the conductor is nearing. An overview of a couple of current U.S. Air Force application programs is presented. A discussion is then made of where research and development of the YBCO-coated conductor should progress and examples in the U.S. Air Force program. These areas include magnetic flux pinning in YBCO thin films, reduction of the ac losses experienced in the YBCO conductor, and stability and quench issues when implementing the YBCO-coated conductor.

DTIC

Coatings; Conductors; Electric Generators; High Temperature Superconductors; Superconductivity; YBCO Superconductors

20080018948 Dayton Univ. Research Inst., OH USA

Deep Defect Detection within Thick Multilayer Aircraft Structures Containing Steel Fasteners Using a Giant-Magneto Resistive (GMR) Sensor (Preprint)

Ko, Ray T; Steffes, Gary J; Oct 2007; 10 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F33615-03-C-5219; Proj-4349

Report No.(s): AD-A476897; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA476897

Defect detection within thick multilayer structures containing steel fasteners is a challenging task in eddy current testing due to the magnetic permeability of the fasteners and overall thickness of the structure. To address these issues, a magnet is applied to the fasteners during the inspection to reduce the noise caused by the permeability. Using a GMR sensor coupled with a lock-in amplifier to increase eddy current sensitivity, data is obtained and at low frequencies. After developing a basic signal processing algorithm, the experimental results show this system can detect second layer defects occurring 10-mm below the surface of an aluminum structure with steel fasteners.

DTIC

Aircraft; Defects; Detection; Fasteners; Laminates; Magnetoresistivity; Steels

20080019719 Air Univ., Maxwell AFB, AL USA

The Need for a Permanent Gun System On the F-35 Joint Strike Fighter

Moore, Charles; Apr 2007; 47 pp.; In English

Report No.(s): AD-A476815; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA476815

Historically, the USA Air Force (USAF) concentrates on advanced or future weaponry when it develops advanced/next generation aircraft like the Joint Strike Fighter (JSF). However, some legacy weapons, such as an internal gun system, continue to prove they are still viable and are absolutely necessary if we want our future aircraft to have the flexibility necessary for the wide range of missions we expect them to perform. This point of view is far from being unchallenged. There are many individuals and organizations within the Department of Defense (DoD) and the within the aerospace industry that think the time for a gun on fighter aircraft is long over. These organizations/individuals primarily point to the advancements in modern weaponry to support their point of view. For example, the advancements in precision weapons have provided the USAF with the ability to target virtually any target, in any weather, at any time Additionally, the requirement to design, install and maintain a gun system on an aircraft does not come without additional expense Space and weight are always significant details when designing a new aircraft. These issues are magnified when designing a stealthy aircraft whose signature is negatively affected by any moving part and any opening on the aircraft's precisely designed fuselage.

DTIC

Fighter Aircraft; Guns (Ordnance); Warfare

20080019758 Air Univ., Maxwell AFB, AL USA

Logging the JSF: Acquisition Logistics and Fleet Management for Modern Fighters

Hawkins, Stacey T; Jun 2005; 99 pp.; In English

Report No.(s): AD-A477097; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA477097

Within the US Air Force, acquisition, operations, and logistics communities collectively face a perplexing question: What is the best way to plan the acquisition and life-cycle sustainment of a fighter aircraft fleet? To find the answer to this question the following thesis attempts to derive lessons learned from case study analysis to develop a new methodology for future use. Aircraft fleet size, in an acquisition program, is determined by assessing the capabilities necessary to meet current and future operational readiness demands. Aircraft sustainment, although equally important, is typically not considered during early procurement planning due to the difficulty in forecasting the sustainment infrastructure necessary to mitigate effects caused by aging and changing operational requirements. At best a nebulous endeavor, sustainment forecasting is affected by the myriad of dynamic organizational, technological, and budgetary influences caused by rigid DoD acquisition processes and inflexible Congressional appropriations cycles. Risk trade-offs between aircraft performance and costs variables directly influence the operational employment and sustainability of a weapon system over its service life. Quantitative modeling, through sensitivity analysis, provides a method to assess the unforeseen effects of these influences, such as peacetime/wartime attrition, fiscal year budget shortfalls, operational employment variations, and procedural shifts, on a weapon system s service-life viability. By measuring the extent that operations and logistics factors have on sortie capacity through sensitivity modeling, acquisitions planners can better validate initial service-life projections, determine fleet size requirements, and avert mid-life-cycle sustainability crises.

DTIC

Fighter Aircraft; Jet Aircraft; Logistics Management

20080019782 Miami Univ., Oxford, OH USA

Integrated Reconfigurable Aperture, Digital Beam Forming, and Software GPS Receiver for UAV Navigation

Morton, Y T; Dec 11, 2007; 20 pp.; In English

Contract(s)/Grant(s): FA9550-05-1-0035

Report No.(s): AD-A477139; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA477139

This report describes progress to date on establishing an integrated aperture, digital beam forming, and software receiver for UAV navigation in interference and jamming environment. Current progress has been made in the following areas: (1) implemented both carrier and code phase tracking loop for performance evaluation of a minimum power beam forming algorithm and null steering algorithm (2) Developed a criterion for interference bandwidth classification (3) implemented a multipath mitigation technique using joint space and polarization diversity.

DTIC

Apertures; Beamforming; Drone Vehicles; Global Positioning System; Navigation; Radio Receivers; Receivers

20080019796 Federal Aviation Administration, Washington, DC USA

Field Evaluation of Whole Airliner Decontamination Technologies for Narrow-Body Aircraft

Gale, William F; Gale, Hyacinth S; Watson, Jean; Jan 2008; 16 pp.; In English

Report No.(s): AD-A477159; DOT-FAA-AM-08-2; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA477159

The outcome of a field evaluation of AeroClave's thermal decontamination system is discussed. This exercise evaluated the system both as a stand-alone technology and as a means of delivering STERIS vaporized hydrogen peroxide (VHP)*. The report is submitted in the context of a decontamination technology selection exercise and work conducted on the efficacy of thermal decontamination. The field evaluation, performed on a McDonnell Douglas DC-9 aircraft, determined that the stand-alone thermal decontamination system exhibited reasonable temperature and relative humidity control capabilities. Indeed, the system reproduced the environmental conditions needed to be efficacious as an antiviral process, based on an earlier study. The thermal decontamination system also provided an effective means of providing environmental preconditioning for the use of VHP and for aeration after VHP exposure. The field evaluation did leave a number of unanswered issues which are discussed in the report. Overall, the field evaluation of both the stand-alone thermal decontamination system and the VHP add-in can be described as successful. *VHP is a registered trademark of the STERIS Corporation, Mentor, OH.

DTIC

Aircraft; Decontamination; Drugs; Hydrogen Peroxide; Spores; Transport Aircraft; Vaporizing; Viruses

20080019806 Humansystems, Inc., Guelph, Ontario Canada
Developing Human-Machine Interfaces to Support Monitoring of UAV Automation
Jamieson, Greg A; Mar 31, 2006; 45 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W7711-057975/001/TOR
Report No.(s): AD-A477178; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477178

Unmanned Aerial Vehicles (UAVs) are rapidly becoming an integral part of contemporary military operations. In light of developments in UAV flight and payload technologies, the role of UAV operators is evolving into that of supervisory controller of complex automated system. However, it is well established that human operators perform poorly in this role. A growing body of literature points to the crucial role that trust in automation plays in determining the efficacy of human monitoring of automated systems. A recent compilation of research on trust in automation suggest that providing operators with information related to automation process and context-specific automation reliability is essential in promoting appropriate trust in automation. This report presents a research plan to create innovative design concepts for cognitive artifacts that communicate these two types of information to UAV operators for the purpose of engendering appropriate trust in automated systems. It includes a categorization of the emerging automation technologies in UAV systems, an analysis of the changing tasks of UAV crews, and a selective review of relevant human-automation research. The report then introduces two human-machine interface concepts for selected types of UAV automation and proposes a research plan for testing and evaluating these design concepts.
DTIC
Aircraft; Man Machine Systems

20080019810 Library of Congress, Washington, DC USA
Border Security and Unmanned Aerial Vehicles
Blazakie, Jason; Jan 2, 2004; 7 pp.; In English
Report No.(s): AD-A477186; CRS-RS21698; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477186

The use of Unmanned Aerial Vehicles (UAVs) to improve border security is a technique that has garnered congressional attention. This report examines the strengths and limitations of deploying UAVs along the borders and related issues for Congress. This report is not intended to provide in-depth information regarding technical or military capabilities of UAVs, but to discuss their application at the border. This report will be updated as events warrant.
DTIC
Drone Vehicles; Pilotless Aircraft; Security

20080020221 Army Aviation and Missile Research Develoment Engineering Center, Redstone, AL USA
The Aerodynamic Influence of a Helicopter on a Jettisoned Missile
Vaughn, Jr, Milton E; Jan 2008; 26 pp.; In English; Original contains color illustrations
Report No.(s): AD-A476627; TR-AMR-SS-08-10; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476627

The effect of the presence of a helicopter fuselage on the aerodynamic behavior of an unthrusted, jettisoned missile with forward strakes and tail control surfaces is explored. The investigative tool used for this purpose is a production-oriented, Euler, Computational Fluid Dynamics (CFD) methodology Titled Euler Tunnel Analysis (ETA). Initially, comparison of CFD computations with wind tunnel measurements for the isolated missile are used to anchor the computations in reality and provide an evaluation benchmark. The ensuing study is assumed to be sufficiently fast so as to convect rotor downwash effects downstream of the region of interest. Further, the calculations are performed in steady-state mode for each scenario. As expected, it is found that even without downwash the presence of the fuselage significantly modifies the aerodynamic properties of the missile. In addition, the vorticity confinement method (which conserves field and surface vorticity) is shown to preserve the vorticity created by the forward strakes as it convects downstream to the tail controls.
DTIC
Aerodynamic Characteristics; Fuselages; Helicopters; Jettisoning; Missiles

20080020265 Air Force Packaging Technology and Engineering Facility, Wright-Patterson AFB, OH USA

Development of the MQ-9 Reaper Propeller Container

Sullivan, Joel A; Evans, Susan J; Feb 21, 2008; 42 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-06-P-105

Report No.(s): AD-A477347; AFPTEF-08-R-02; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Air Force Packaging Technology Engineering Facility (AFPTEF) was tasked with the design of a new shipping and storage container for the MQ-9 Reaper Propeller in March of 2006. The new container is designed to replace the fiberglass container currently used. The current container provides minimal shock protection and being fiberglass is susceptible to deformation, delamination, and extreme temperatures. Additionally, the fiberglass container can not house the propeller and spinner when the spinner is disassembled, the preferred shipping configuration. AFPTEF used proven design techniques to meet these design requirements. The CNU-690/E, designed to SAE ARP1967A, is an aluminum, long-life, controlled breathing, reusable shipping and storage container. The new container protects the Propeller mechanically and environmentally. The container passed all qualification tests per ASTM D4169. The CNU-690/E container not only meets user requirements but also provides an economic saving for the Air Force. The savings will be thousands of dollars per Propeller over the twenty-year life span of the container.

DTIC

Propellers; Performance Tests; Packaging

20080020266 Air Univ., Maxwell AFB, AL USA

Current Operations: Changing Equipment to Meet a Changing Threat

Read, Robyn S; Searle, Thomas R; Jan 2004; 3 pp.; In English

Report No.(s): AD-A477388; CADRE-QUICK-LOOK-04-8; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In general, current USAF aircraft and weapons were designed for major combat against a major military force and a coherent government. These systems performed brilliantly against conventional military forces in Afghanistan and Iraq and helped rapidly dismantle the Taliban regime and Saddam Hussein s government. However, having defeated the enemy conventional forces and dismantled coherent national governments, U.S. forces now face a variety of insurgents, terrorists, and criminals that our aircraft and weapons were not designed to defeat. Could different equipment help us do the job better? The enemy air threat has been reduced to MANPADS and small arms. This means that aircraft can operate at slower speeds, lower altitudes, and for a longer time than they could against robust IADs. The enemy is now operating in small, dispersed, hard-to-find elements that tax our ISR assets. The enemy is also trying to prolong the conflict rather than engage in decisive combat and prefers to operate in populated areas where our current weapons may cause excessive collateral damage.

DTIC

Warfare; Military Aircraft

20080020277 NASA Dryden Flight Research Center, Edwards, CA, USA

X-48B System Flight Test

Cosentino, Gary B.; November 13, 2007; 1 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080020277

Provides an overview of the X-48B prototype system flight test including vehicle characteristics and configuration. There are two X-48B Vehicles: the first, Vehicle 1, is the wind tunnel and flight test model. The second, Vehicle 2, provides the primary flight test. In mid-May 2006 the research team successfully completed 250 hours of wind tunnel tests on the X-48B Vehicle 1 at NASA's Langley Air Force Base. The prototype was then shipped to NASA's Dryden Flight Research Center at Edwards Air Force Base to serve as a backup to Vehicle 2, which is used for planned remotely piloted flight tests at Dryden.

CASI

Flight Tests; Prototypes; Research Aircraft

06
AVIONICS AND AIRCRAFT INSTRUMENTATION

Includes all avionics systems, cockpit and cabin display devices, and flight instruments intended for use in aircraft. For related information see also 04 Aircraft Communications and Navigation; 08 Aircraft Stability and Control; 19 Spacecraft Instrumentation and Astrionics; and 35 Instrumentation and Photography.

20080018959 NASA Marshall Space Flight Center, Huntsville, AL, USA
Reconfigurable Computing Concepts for Space Missions: Universal Modular Spares
Patrick, M. Clinton; October 22, 2007; 8 pp.; In English; 2008 IEEE Aerospace Conference, 1-8 Mar. 2008, Big Sky, MT, USA; Original contains color illustrations
Report No.(s): MFS-32654-1; IEEEAC 1503; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080018959

Computing hardware for control, data collection, and other purposes will prove many times over crucial resources in NASA's upcoming space missions. Ability to provide these resources within mission payload requirements, with the hardiness to operate for extended periods under potentially harsh conditions in off-World environments, is daunting enough without considering the possibility of doing so with conventional electronics. This paper examines some ideas and options, and proposes some initial approaches, for logical design of reconfigurable computing resources offering true modularity, universal compatibility, and unprecedented flexibility to service all forms and needs of mission infrastructure.
Author
Modularity; Space Missions; Reconfigurable Hardware; Autonomy; Avionics

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.

20080020317 NASA, Washington, DC USA
Low-noise fan exit guide vanes
Jones, Michael G., Inventor; Parrott, Tony L., Inventor; Heidelberg, Laurence J., Inventor; Envia, Edmane, Inventor; February 26, 2008; 7 pp.; In English
Patent Info.: Filed December 6, 2004; US-Patent-7,334,998; US-Patent-Appl-SN-11/005,624; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080020317

Low-noise fan exit guide vanes are disclosed. According to the present invention a fan exit guide vane has an outer shell substantially shaped as an airfoil and defining an interior cavity. A porous portion of the outer shell allows communication between the fluctuations in the air passing over the guide vane and the interior cavity. At least one acoustically resonant chamber is located within the interior cavity. The resonant chamber is in communication with the porous portion of the outer perimeter. The resonant chamber is configured to reduce the noise generated at a predetermined frequency. In various preferred embodiments, there is a plurality of acoustically resonant chambers located within the interior cavity. The resonant chambers can be separated by one or more partitions within the interior cavity. In these embodiments, the resonant chambers can be configured to reduce the noise generated over a range of predetermined frequencies.
Official Gazette of the U.S. Patent and Trademark Office
Guide Vanes; Low Noise; Noise Reduction

20080020363 General Electric Corp. and Development, Niskayuna, NY, USA
Model-Based Control Systems and Methods for Gas Turbine Engines
Brunell, B. J., Inventor; Kuman, A., Inventor; 2 Mar 04; 13 pp.; In English
Contract(s)/Grant(s): DOD-F33615-98-C-2901
Patent Info.: Filed Filed 2 Mar 04; US-Patent-Appl-SN-10-791-597
Report No.(s): PB2007-111937; No Copyright; Avail.: CASI: A03, Hardcopy

A method and system of controlling a gas turbine engine is disclosed. The engine has sensors to detect one or more parameters and actuators adapted to respond to commands. The method includes receiving data from the sensors of the engine

for one or more measured or sensed parameters, estimating a state of the engine by estimating one or more unmeasured or unsensed parameters using the data from the sensors and a predictive model of the engine, generating commands for the actuators based on the state using an optimization algorithm; and transmitting the commands to the engine. The system includes a state estimator adapted to estimate a state of the engine by estimating one or more unmeasured or unsensed parameters using data from the sensors of the engine for one or more measured or sensed parameters. The estimator includes a model of the engine. The system also includes a control module adapted to generate commands for the actuators based on the state. The control module includes an optimization algorithm for determining the commands.
NTIS
Gas Turbine Engines; Gas Turbines; Model Reference Adaptive Control; Patent Applications; Control

20080020516 NASA Dryden Flight Research Center, Edwards, CA, USA
NASA C-17 Usage Overview
Miller, Christopher R.; April 29, 2008; 3 pp.; In English; Original contains color illustrations; No Copyright; Avail.:
CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080020516

The usage and integrated vehicle health management of the NASA C-17. Propulsion health management flight objectives for the aircraft include mapping of the High Pressure Compressor in order to calibrate a Pratt and Whitney engine model and the fusion of data collected from existing sensors and signals to develop models, analysis methods and information fusion algorithms. An additional health manage flight objective is to demonstrate that the Commercial Modular Aero-Propulsion Systems Simulation engine model can successfully execute in real time onboard the C-17 T-1 aircraft using engine and aircraft flight data as inputs. Future work will address aircraft durability and aging, airframe health management, and propulsion health management research in the areas of gas path and engine vibration.
CASI
C-17 Aircraft; Systems Health Monitoring; Propulsion; Aircraft Engines

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*.

20080019721 Naval Postgraduate School, Monterey, CA USA
Structural Design of a NPS CubeSat Launcher
RoBberg, Felix; Jan 2008; 85 pp.; In English
Report No.(s): AD-A476837; NPS-SP-08-001; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476837

To encourage student interest in space and education Stanford University and CalPoly developed the CubeSat. These picosatellites weigh about one kg and can be developed and built by students. NPS is designing CubeSats and a structure to deploy them in orbit as part of its emphasis on hands-on education This technical report deals with the development of a CubeSat Launcher (NPSCuL). NPSCuL will carry up to ten P-PODs built and flight qualified by CalPoly. It will be launched into orbit and deploy multiple CubeSats. Several designs have been developed including finite element models each with a variable number of elements and shell wall thicknesses and tested to loads of 15 g. The simulation results show that the aluminum structures need to have a minimum shell thickness of 15 mm to handle the maximum expected stress. Different bolt patterns for the connection between the structure and the base plate were analyzed. A circular bolt pattern is preferred because the stress is distributed more evenly over the bolts but the shell thickness was modified based on the results from the frequency analysis.
DTIC
Launchers; Structural Design

20080019727 Air War Coll., Maxwell AFB, AL USA
Space Threat Warning: Foundation for Space Superiority, Avoiding a Space Pearl Harbor
Burke, Alan W; Apr 17, 2006; 30 pp.; In English
Report No.(s): AD-A476999; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476999

Space Superiority is a core task for the USAF, critically enabling US combat operations. As the US becomes more reliant on space-based resources to ensure military and economic success, the need to protect them will increase. A robust space threat warning capability--the ability to detect, assess and respond to hostile actions against space assets--is the foundation for this protection Senior leaders in the US government have stated the US must avoid a space Pearl Harbor. This concern is due to the idea that a decrease in the perceived threat to space assets after the demise of the Soviet Union coupled with a competition for space resources has resulted in a corresponding erosion of US space threat warning and attack assessment capabilities. This paper describes the development and gradual erosion of US space threat warning capabilities, emerging threats, and discusses the implications to national security should the US fail to field a robust space threat warning and attack verification capability. The paper concludes with recommendation to establish a focal point for space defense, institute end-to-end testing of the threat warning process, and to update space threat warning guidance to ensure space is not location of the next 'Pearl Harbor.' DTIC

Aerospace Systems; Harbors

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*.

20080018962 NASA Marshall Space Flight Center, Huntsville, AL, USA
The Next Giant Leap: NASA's Ares Launch Vehicles Overview
Cook, Stephen A.; Vanhooser, Teresa; November 30, 2007; 9 pp.; In English; 2008 IEEE Aerospace Conference, 1-8 Mar. 2008, Big Sky, MT, USA; Original contains black and white illustrations
Report No.(s): IEEEAC Paper 1555, Version 4; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080018962

The National Aeronautics and Space Administration (NASA)'s Constellation Program is developing new launch vehicles (Ares) and spacecraft (Orion) to send astronauts to the Moon, Mars, and beyond. This paper presents plans, projections, and progress toward fielding the Ares I and Ares V vehicles, and the Ares I-X test flight in 2009. NASA is building on both new research and aeronautical capabilities, as well as lessons learned from almost 50 years of aerospace experience. The Ares Projects Office (APO) completed the Ares I System Requirements Review (SRR) in 2006 and the System Definition Review in autumn 2007; and will focus on the Preliminary Design Review in 2008. Ares I is currently being refined to meet safety, operability, reliability, and affordability goals. The Ares team is simultaneously testing Ares I elements and building hardware for Ares I-X, while the Ares V is in the early design stage, with the team validating requirements and ensuring commonality with Ares I. Ares I and V are key to opening the space frontier for peaceful endeavors.
Author

Ares 1 Launch Vehicle; Ares 5 Cargo Launch Vehicle; NASA Space Programs; Flight Tests; Avionics; General Overviews

20080018963 NASA Marshall Space Flight Center, Huntsville, AL, USA
Ares Launch Vehicles Lean Practices Case Study
Doreswamy, Rajiv; Self, Timothy A.; November 30, 2007; 7 pp.; In English; 2008 IEEE Aerospace Conference, 1-8 Mar. 2008, Big Sky, MT; Original contains black and white illustrations
Report No.(s): IEEEAC Paper 1589; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080018963

The Ares launch vehicles team, managed by the Ares Projects Office (APO) at NASA Marshall Space Flight Center, has completed the Ares I Crew Launch Vehicle System Requirements Review and System Definition Review and early design work for the Ares V Cargo Launch Vehicle. This paper provides examples of how Lean Manufacturing, Kaizen events, and Six Sigma practices are helping APO deliver a new space transportation capability on time and within budget, while still meeting stringent technical requirements. For example, Lean philosophies have been applied to numerous process definition efforts and existing process improvement activities, including the Ares I-X test flight Certificate of Flight Readiness (CoFR)

process, risk management process, and review board organization and processes. Ares executives learned Lean practices firsthand, making the team 'smart buyers' during proposal reviews and instilling the team with a sense of what is meant by 'value-added' activities. Since the goal of the APO is to field launch vehicles at a reasonable cost and on an ambitious schedule, adopting Lean philosophies and practices will be crucial to the Ares Project's long-term SUCCESS.
Author
Ares 1 Launch Vehicle; Ares 5 Cargo Launch Vehicle; Systems Analysis; Launch Vehicles; Risk Management

20080019765 Naval Postgraduate School, Monterey, CA USA
Strategic Change and the Joint Terrorism Task Force: Ideas and Recommendations
Carlson, Andrew F; Jun 2006; 85 pp.; In English; Original contains color illustrations
Report No.(s): AD-A477107; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477107

Electrodynamic tethers can be employed to effect spacecraft orbital maneuvering outside of Keplerian motion without incurring the mass penalty of traditional propulsion systems. Recently, several studies have been conducted to establish a framework for guidance and control of such orbit maneuvers, including the optimization of a particular maneuver, the orbit transfer. This thesis provides an overview of the concept of electrodynamic tether employment, summarizes research in the field, and catalogues recent proposals. Two minimum-time orbit transfer problems are considered - an orbit raising and a deorbit problem. Both formulations use an identical set of initial conditions for the spacecraft. In the case of the orbit raising problem formulation, the terminal manifold requires an increase in semimajor axis and return to initial eccentricity and inclination values. Other orbital elements are unconstrained. For the deorbit case, optimal control is developed for a minimum time decrease in semimajor axis; the remaining orbital elements are unconstrained. The totality of optimality conditions for both cases of using electrodynamic tethers to maneuver from an initial orbit is examined. Observations and recommendations for future work are presented in the conclusions.
DTIC
Electrodynamics; Electromagnetic Fields; Maneuvers; Propulsion System Configurations; Propulsion System Performance; Terrorism; Tethering; Tetherlines

20080020024 Naval Postgraduate School, Monterey, CA USA
Control System of a Three DOF Spacecraft Simulator by Vectorable Thrusters and Control Moment Gyros
Price, William D; Dec 2006; 99 pp.; In English; Original contains color illustrations
Report No.(s): AD-A477316; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This thesis presents the continued design and system integration of a prototype three Degrees-Of-Freedom (DOF) Spacecraft Simulator used in the Proximity Operations Simulator Facility, as part of the Naval Postgraduate School's Spacecraft Robotics Laboratory, to simulate autonomous guidance, navigation and control (GNC) for spacecraft proximity operations and assembly as part of the Autonomous Multi-Agent Physically Interacting Spacecraft project. Several key enhancements of the spacecraft simulator were made including the integration of onboard sensors, improved electrical distribution system, improved command and data handling system, and the design and integration of vectorable thrusters. A pair of independently controlled 360 degree vectorable thrusters is now included in the spacecraft simulator. A control system and thruster mapping algorithm were developed to incorporate the translational and rotational control authority that the vectorable thrusters provide with the rotational control authority of the previously developed Miniature Single-Gimbaled Control-Moment-Gyroscope (MSGCMG). Simulation and experimental results are presented to demonstrate the functionality of the prototype AMPHIS vehicle. The work done in developing the prototype vehicle will enable rapid fabrication of additional vehicles to provide essential hardware-in-the-loop experimentation capabilities for evolving control algorithms, sensors and mating mechanisms to be used for autonomous spacecraft assembly.
DTIC
Control; Control Moment Gyroscopes; Simulators

20080020025 Naval Observatory, Washington, DC USA
Consistency and Quality of USNO Analysis Center Products
Hackman, Christine; Barrett, Paul; Kammeyer, Peter; Slabinski, Victor; Tracey, Jeffrey; Wooden, William; Jan 2007; 4 pp.; In English
Report No.(s): AD-A477317; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The USA Naval Observatory (USNO) has participated in the International Global Navigation Satellite System (GNSS)

Service (IGS) as an analysis center since 1997. This report summarizes the quality and consistency of USNO rapid and ultra-rapid submissions. The consistency of USNO's submissions has steadily improved over the years to where in 2007, they submitted 98% of the expected rapid and ultra-rapid products. The quality has improved as well, with current values reported as follows. After subtraction of a seven-parameter coordinate transformation, the median value of the weighted root-mean-square residuals of the USNO orbits with respect to (wrt) the IGS combined rapid orbits are 24 mm (USNO rapid) and 58 mm (USNO ultra-rapid). Polar motion: root-mean-square (RMS) residuals wrt the IGS final products are approx. 65 micro-arc seconds (rapid), 190 micro-arc seconds (ultra, past 24-h), and approx. 360 micro-arc seconds (ultra, 24-h predict). Polar motion rates (wrt IGS final products): approx. 180 micro-arc seconds/d (rapid), approx. 200 micro-arc seconds/d (ultra, past 24-h), and approx. 390 micro-arc seconds/d (ultra, 24-h predict). Planned improvements to accuracy include implementation of absolute antenna phase-center corrections and addition of more stations to processing.
DTIC

Consistency; Data Processing; Global Positioning System; Navigation Satellites; Observatories; Quality; Satellite Communication; United States

20080020026 Naval Postgraduate School, Monterey, CA USA

Guidance and Navigation Software Architecture Design for the Autonomous Multi-Agent Physically Interacting Spacecraft (AMPHIS) Test Bed

Eikenberry, Blake D; Dec 2006; 147 pp.; In English; Original contains color illustrations

Report No.(s): AD-A477319; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Autonomous Multi-Agent Physically Interacting Spacecraft (AMPHIS) test bed examines the problem of multiple spacecraft interacting at close proximity. This thesis contributes to this on-going research by addressing the development of the software architecture for the AMPHIS spacecraft simulator robots and the implementation of a Light Detection and Ranging (LIDAR) unit to be used for state estimation and navigation of the prototype robot. The software modules developed include: user input for simple user tasking; user output for data analysis and animation; external data links for sensors and actuators; and guidance, navigation and control (GNC). The software was developed in the SIMULINK/MATLAB environment as a consistent library to serve as stand alone simulator, actual hardware control on the robot prototype, and any combination of the two. In particular, the software enables hardware-in-the-loop testing to be conducted for any portion of the system with reliable simulation of all other portions of the system. The modularity of this solution facilitates fast proof-of-concept validation for the GNC algorithms. Two sample guidance and control algorithms were developed and are demonstrated here: a Direct Calculus of Variation method, and an artificial potential function guidance method. State estimation methods are discussed, including state estimation from hardware sensors, pose estimation strategies from various vision sensors, and the implementation of a LIDAR unit for state estimation. Finally, the relative motion of the AMPHIS test bed is compared to the relative motion on orbit, including how to simulate the on orbit behavior using Hill's equations.
DTIC

Autonomy; Computer Programming; Detectors; Navigation; Robots; Software Engineering; Test Stands

20080020116 Naval Surface Warfare Center, Dahlgren, VA USA

Expected Improvement in NIMA Precise Orbit and Clock Estimates Due to Adding Crosslink Ranging Data

Merrigan, Michael J; Swift, Everett R; Aug 1999; 44 pp.; In English

Report No.(s): AD-A477548; NSWCDD/TR-99/98; No Copyright; Avail.: Defense Technical Information Center (DTIC)

With the deployment of GPS Block HR and IIF satellites, crosslink data will be collected and used on-board for navigation. This motivated an effort to investigate the expected orbit and clock accuracy if crosslink data are available for post-processing on the ground. This study addresses the expected improvement in the National Imagery and Mapping Agency (NIMA) precise orbit and clock estimates with the inclusion of crosslink ranging data with the station tracking data. Simulated station data were created to reflect orbit and clock accuracy associated with NIMA production. Station tracking data were simulated for both 12- and 18-station networks covering 5 days to allow for three overlapping 3-day fit spans, with the middle day of each fit span used for analysis. Simulated crosslink ranging data, including pseudorange data, derived distance data, and derived clock data, were generated for the same 5 days and merged with the station data. Initially, a study was conducted to determine what satellite-related clock and crosslink bias parameters can be estimated with crosslink data types by themselves or in combination with station tracking data. Experiments were then conducted to investigate the characteristics and relative information content of the crosslink data types, including appropriate treatment and statistical assumptions for the crosslink biases. The sensitivity of precise orbit and clock estimates to various processing scenarios was also evaluated. Finally, the overall achievable orbit and clock accuracy through incorporating the crosslink data with station data was quantified. Analysis revealed that the inclusion of crosslink data with station data is equivalent to the inclusion of additional

stations. In particular, the low noise levels associated with the derived clock observations will improve the quality of the precise clock estimates.
DTIC
Clocks; Crosslinking; Estimates; Global Positioning System; Rangefinding; Satellite Communication; Satellite Networks

20080020268 Air Force Fellows Program, Maxwell AFB, AL USA
The Third Battle: Is the U.S. Ready to Wage the Next Conflict in Space
Henderson, Scott A; Mar 2004; 89 pp.; In English
Report No.(s): AD-A476998; AU/SCHOOL/NNN/2004-04; AFFP-CADRE/PC-2005-020; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476998

The USA is now entering the third battle in space - a battle to go beyond space as simply a force enhancer to a position of space supremacy. National grand strategy has shifted from strategic engagement to primacy, where the U.S. must preserve supremacy by outdistancing any global challenger. Military doctrine is emerging to support that ideal in space. Is the USA really ready to embark on such a grand vision? The USA is the world leader in space because it won the first two 'battles' in space. The first battle was won with the launch of the first photo reconnaissance systems and the deployment of a robust Intercontinental Ballistic Missile (ICBM) capability. The second battle was waged during the Cold War and saw the USA win the fight to integrate space into joint warfighting systems and doctrine. Today, there are serious questions about whether the U.S. can field a space force sufficiently powerful enough to dominate space. To pursue such an aggressive goal could actually erode the command of the space commons we maintain today. This paper analyzes the political and organizational issues the U.S. faces in space. The politics of U.S. grand strategy and national space doctrine are driving a discordant national security space doctrine. Existing space organizations are not equipped to lead the shift toward new and dynamic space missions. Political and organizational issues are forcing the U.S. to make difficult decisions in national security space that will affect the drive to win the 'third battle'
DTIC
Warfare; Intercontinental Ballistic Missiles; Deployment; Space Missions

20080020271 NASA Marshall Space Flight Center, Huntsville, AL, USA
The Next Giant Leap: NASA's Ares Launch Vehicles Overview
Cook, Stephen A.; Vanhooser, Teresa; March 2008; 22 pp.; In English; AIAA IEEE Aerospace Conference, 1-8 Mar. 2008, Big Sky, MT, USA; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080020271

The next chapter in NASA's history also promises to write the next chapter in America's history, as the Agency makes measurable strides toward developing new space transportation capabilities that wi!! put astronauts on course to explore the Moon as the next giant leap toward the first human footprint on Mars. This paper will present top-level plans and progress being made toward fielding the Ares I crew launch vehicle in the 2013 timeframe and the Ares V cargo launch vehicle in the 2018 timeframe. It also gives insight into the objectives for the first test flight, known as the Ares I-X, which is scheduled for April 2009. The U.S. strategy to scientifically explore space will fuel innovations such as solar power and water recycling, as well as yield new knowledge that directly benefits life on Earth. For the Ares launch vehicles, NASA is building on heritage hardware and unique capabilities; as well as almost 50 years of lessons learned from the Apollo Saturn, Space Shuttle, and commercial launch vehicle programs. In the Ares I Project's inaugural year, extensive trade studies and evaluations were conducted to improve upon the designs initially recommended by the Exploration Systems Architecture Study, resulting in significant reduction of near-term and long-range technical and programmatic risks; conceptual designs were analyzed for fitness against requirements; and the contractual framework was assembled to enable a development effort unparalleled in American space flight since the Space Shuttle. The Exploration Launch Projects team completed the Ares I System Requirements Review (SRR) at the end of 2006--the first such engineering milestone for a human-rated space transportation system in over 30 years.
Author
Ares 1 Launch Vehicle; Space Transportation System; Ares 5 Cargo Launch Vehicle; Space Shuttles; Space Commercialization; Saturn Launch Vehicles

16
SPACE TRANSPORTATION AND SAFETY

Includes passenger and cargo space transportation, e.g., shuttle operations; and space rescue techniques. For related information see also *03 Air Transportation and Safety; 15 Launch Vehicles and Launch Operations*; and *18 Spacecraft Design, Testing and Performance*. For space suits see *54 Man/System Technology and Life Support*.

20080018966 NASA Marshall Space Flight Center, Huntsville, AL, USA
Integrating Safety and Mission Assurance in Design
Cianciola, Chris; Crane, Kenneth; March 03, 2008; 24 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080018966

This presentation describes how the Ares Projects are learning from the successes and failures of previous launch systems in order to maximize safety and reliability while maintaining fiscal responsibility. The Ares Projects are integrating Safety and Mission Assurance into design activities and embracing independent assessments by Quality experts in thorough reviews of designs and processes. Incorporating Lean thinking into the design process, Ares is also streamlining existing processes and future manufacturing flows which will yield savings during production. Understanding the value of early involvement of Quality experts, the Ares Projects are leading launch vehicle development into the 21st century.
Author
Mission Planning; Reliability; Low Earth Orbits; Launch Vehicles; Safety; Advanced Reconn Electric Spacecraft

17
SPACE COMMUNICATIONS, SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes space systems telemetry; space communications networks; astronavigation and guidance; and spacecraft radio blackout. For related information see also *04 Aircraft Communications and Navigation*; and *32 Communications and Radar*.

20080019644 NASA Marshall Space Flight Center, Huntsville, AL, USA
'Built-In' Action/Issues Tracking and Post-Ops Analysis Tool for Real-time Console Operations
Scott, David W.; December 17, 2007; 10 pp.; In English; 2008 IEEE Aerospace Conference, 1-8 Mar. 2008, Big Sky, MT, USA; Original contains color and black and white illustrations
Report No.(s): IEEEAC Paper 1265; No Copyright; Avail.: Other Sources

At Marshall Space Flight Center's (MSFC) Payload Operations Integration Center (POIC) for the International Space Station (ISS), the Payload Communications Manager (PAYCOM) team, whose members speak directly with the ISS onboard crew with respect to NASA payload operations, has found a creative way to reformat a mandatory Daily Report to organize action items, standing reminders, significant events, and other comments. While the report keeps others apprised of PAYCOM's current activities and issues, very brief summaries of the items are put into a 'Roll Off Matrix', including start and stop dates, resolution, and possible applicability to future ops. The matrix provides accountability for all action items, gives direct insight into issues regarding payloads, control center operations, and methods, yields indirect information on PAYCOM priorities and processes, and provides a roadmap for locating extensive details if needed. This paper describes how the Daily Report and Roll Off Matrix are organized, used, and inter-related to each other and the PAYCOM operations log. While the application is for a manned vehicle, the concepts could apply in a wide spectrum of operational settings.
Author
International Space Station; Payload Integration; Real Time Operation; Flight Operations; Spacecraft Communication; Consoles

20080020376 NASA Langley Research Center, Hampton, VA, USA
Entry, Descent, and Landing Operations Analysis for the Genesis Entry Capsule
Desai, Prasun N.; Lyons, Daniel T.; January 2007; 16 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 439654.02.07.01.01; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080020376

On September 8, 2004, the Genesis spacecraft returned to Earth after spending 29 months about the sun-Earth libration point (L1) collecting solar wind particles. Four hours prior to Earth arrival, the sample return capsule containing the samples was released for entry and subsequent landing at the Utah Test and Training Range. This paper provides an overview of the entry, descent, and landing trajectory analysis that was performed during the mission operations phase leading up to final

approach to Earth. The final orbit determination solution produced an inertial entry flight-path angle of -8.002 deg (which was the desired nominal value) with a 3-sigma error of +/-0.0274 deg (a third of the requirement). The operations effort accurately delivered the entry capsule to the desired landing site. The final landing location was 8.3 km from the target, and was well within the allowable landing area. Overall, the Earth approach operation procedures worked well and there were no issues (logistically or performance based) that arose. As a result, the process of targeting a capsule from deep space and accurately landing it on Earth was successfully demonstrated.
Author
Genesis Mission; Descent Trajectories; Trajectory Analysis; Sample Return Missions; Orbit Determination; Landing Sites; Flight Paths

20080020389 NASA, Washington, DC, USA
Read You Loud and Clear! The Story of NASA's Spaceflight Tracking and Data Network
Tsiao, Sunny; January 2008; 527 pp.; In English; Original contains black and white illustrations
Report No.(s): NASA/SP-2007-4232; NASA/SP-2008-4233; No Copyright; Avail.: CASI: EA5, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080020389

A historical account is provided of NASA's Spaceflight Tracking and Data Network (STDN), starting with its formation in the late 1950s to what it is today in the first decade of the 21st century. It traces the roots of the tracking network from its beginnings at the White Sands Missile Range in New Mexico to the Tracking and Data Relay Satellite System space-based constellation of today. The story spans the early days of satellite tracking using the Minitrack Network, through the expansion of the Satellite Tracking and Data Acquisition Network and the Manned Space Flight Network, and finally, to the Space and Ground networks of today. These accounts tell how international goodwill and foreign cooperation were crucial to the operation of the network and why the space agency chose to build the STDN as it did.
Author
STDN (Network); Satellite Tracking; Spacecraft Tracking; Space Communication; Communication Networks

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 Safety*.

20080018957 NASA Marshall Space Flight Center, Huntsville, AL, USA
Multi-Sensor Testing for Automated Rendezvous and Docking Sensor Testing at the Flight Robotics Lab
Brewster, Linda L.; Howard, Richard T.; Johnston, A. S.; Carrington, Connie; Mitchell, Jennifer D.; Cryan, Scott P.; March 2008; 6 pp.; In English; 2008 IEEE Aerospace Conference, 1-8 Mar. 2008, Big Sky, MT, USA
Report No.(s): IEEEAC Paper 1284, Version 3; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1109/AERO.2008.4526510

The Exploration Systems Architecture defines missions that require rendezvous, proximity operations, and docking (RPOD) of two spacecraft both in Low Earth Orbit (LEO) and in Low Lunar Orbit (LLO). Uncrewed spacecraft must perform automated and/or autonomous rendezvous, proximity operations and docking operations (commonly known as AR&D). The crewed missions may also perform rendezvous and docking operations and may require different levels of automation and/or autonomy, and must provide the crew with relative navigation information for manual piloting. The capabilities of the RPOD sensors are critical to the success ofthe Exploration Program. NASA has the responsibility to determine whether the Crew Exploration Vehicle (CEV) contractor-proposed relative navigation sensor suite will meet the requirements. The relatively low technology readiness level of AR&D relative navigation sensors has been carried as one of the CEV Project's top risks. The AR&D Sensor Technology Project seeks to reduce the risk by the testing and analysis of selected relative navigation sensor technologies through hardware-in-the-Ioop testing and simulation. These activities will provide the CEV Project information to assess the relative navigation sensors maturity as well as demonstrate test methods and capabilities. The first year of this project focused on a series of 'pathfinder' testing tasks to develop the test plans, test facility requirements, trajectories, math model architecture, simulation platform, and processes that will be used to evaluate the Contractor-proposed sensors. Four candidate sensors were used in the first phase of the testing. The second phase of testing used four sensors simultaneously: two Marshall Space Flight Center (MSFC) Advanced Video Guidance Sensors (AVGS), a laser-based video sensor that uses

retroreflectors attached to the target vehicle, and two commercial laser range finders. The multi-sensor testing was conducted at MSFC's Flight Robotics Laboratory (FRL) using the FRL's 6-DOF gantry system, called the Dynamic Overhead Target System (DOTS). The target vehicle for 'docking' in the laboratory was a mockup that was representative of the proposed CEV docking system, with added retroreflectors for the AVGS.' The multi-sensor test configuration used 35 open-loop test trajectories covering three major objectives: (l) sensor characterization trajectories designed to test a wide range of performance parameters; (2) CEV-specific trajectories designed to test performance during CEV-like approach and departure profiles; and (3) sensor characterization tests designed for evaluating sensor performance under more extreme conditions as might be induced during a spacecraft failure or during contingency situations. This paper describes the test development, test facility, test preparations, test execution, and test results of the multisensor series oftrajectories
Author
Flight Tests; Guidance Sensors; Mathematical Models; Multisensor Applications; Robotics; Autonomous Docking; Rendezvous Spacecraft

20080018958 NASA Marshall Space Flight Center, Huntsville, AL, USA
Space Vehicle Pose Estimation via Optical Correlation and Nonlinear Estimation
Rakoczy, John M.; Herren, Kenneth A.; March 16, 2008; 12 pp.; In English; SPIE Defense and Security Symposium 2008, 16-20 Mar. 2008, Orlando, FL, USA; Original contains black and white illustrations
Report No.(s): Paper 6977-13; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080018958

A technique for 6-degree-of-freedom (6DOF) pose estimation of space vehicles is being developed. This technique draws upon recent developments in implementing optical correlation measurements in a nonlinear estimator, which relates the optical correlation measurements to the pose states (orientation and position). For the optical correlator, the use of both conjugate filters and binary, phase-only filters in the design of synthetic discriminant function (SDF) filters is explored. A static neural network is trained a priori and used as the nonlinear estimator. New commercial animation and image rendering software is exploited to design the SDF filters and to generate a large filter set with which to train the neural network. The technique is applied to pose estimation for rendezvous and docking of free-flying spacecraft and to terrestrial surface mobility systems for NASA's Vision for Space Exploration. Quantitative pose estimation performance will be reported. Advantages and disadvantages of the implementation of this technique are discussed.
Author
Orbital Rendezvous; Spacecraft Docking; Degrees of Freedom; Discriminant Analysis (Statistics); Optical Correlators; Optical Measurement

20080018960 NASA Marshall Space Flight Center, Huntsville, AL, USA
The Manufacturing Process for the NASA Composite Crew Module Demonstration Structure
Pelham, Larry; Higgins, John E.; March 03, 2008; 2 pp.; In English; and Space Conference 2008: 11th International Conference on Engineering, Science, Construction, and Operations in Challenging Environments, 3-5 Mar. 2008, Long Beach, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

This paper will describe the approaches and methods selected in fabrication of a carbon composite demonstration structure for the Composite Crew Module (CCM) Program. The program is managed by the NASA Safety and Engineering Center with participants from ten NASA Centers and AFRL. Multiple aerospace contractors are participating in the design development, tooling and fabrication effort as well. The goal of the program is to develop an agency wide design team for composite habitable spacecraft. The specific goals for this development project are: a).To gain hands on experience in design, building and testing a composite crew module. b) To validate key assumptions by resolving composite spacecraft design details through fabrication and testing of hardware. This abstract is based on Preliminary Design data..The final design will continue to evolve through the fall of 2007 with fabrication mostly completed by conference date. From a structures perspective, the.CCM can be viewed as a pressure module with variable pressure time histories and a series of both impact and quasi-static, high intensity point, line, and area distributed loads. The portion of the overall space vehicle being designed and. fabricated by the CCM team is just the pressure module and primary loading points. The heaviest point loads are applied and distributed to the pressure module at.an aluminum Service Module/Alternate Launch Abort System (SM/ALAS) fittings and at Main and Drogue Chute fittings. Significant line loads with metal to metal impact is applied at.the Lids ring. These major external point and line loads as well as pressure impact loads (blast and water landing) are applied to the lobed floor

though the reentry shield and crushable materials. The pressure module is divided into upper and lower. shells that mate together with a bonded belly band splice joint to create the completed structural assembly. The benefits of a split CCM far outweigh the risks of a joint. These benefits include lower tooling cost and less manufacturing risk. Assembly of the top and bottom halves of the pressure shell will allow access to the interior of the shell throughout remaining fabrication sequence and can also potentially permit extensive installation of equipment and .crew facilities prior to final assembly of the two shell halves. A Pi pre-form is a woven carbon composite material which is provided in pre-impregnated form and frozen for long term storage. The cross-section shape allows the top of the pi to be bonded to a flat or curved surface with a second flat plate composite section bonded between two upstanding legs of the Pi. One of the regions relying on the merits of the Pi pre-form is the backbone. All connections among plates of the backbone structure, including the upper flanges, and to the lobe base of the pressure shell are currently joined by Pi pre-forms. The intersection of backbone composite plates is formed by application of two Pi pre-forms, top flanges and lobed surfaces are bonded with one Pi pre-form. The process of applying the pre-impregnated pi-preform will be demonstrated to include important steps like surface preparation, forming, application of pressure dams, vacuum bagging for consolidation, and curing techniques. Chopped carbon fiber tooling was selected over other traditional metallic and carbon fiber tooling. The requirement of schedule and cost economy for a moderate reuse cure tool warranted composite tooling options. Composite tooling schedule duration of 18 weeks compared favorably against other metallic tooling including invar tooling. Composite tooling also shows significant cost savings over low CTE metallic options. The composite tooling options were divided into two groups and the final decision was based on the cost, schedule, tolerance, temperature, and reuse requirements.
Author
Composite Structures; Composite Materials; Preforms; Service Modules; Spacecraft Design; Spacecraft Modules; Spacecrews; Woven Composites; Pressure Distribution; Reentry Shielding

20080019635 NASA Langley Research Center, Hampton, VA, USA
Design Development Test and Evaluation (DDT and E) Considerations for Safe and Reliable Human Rated Spacecraft Systems
Miller, James; Leggett, Jay; Kramer-White, Julie; April 2008; 138 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 510505.01.07.01.06
Report No.(s): NASA/TM-2008-215126/Vol I; NESC-RP-06-108/05-173-E; L-19450; No Copyright; Avail.: CASI: A07, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080019635
A team directed by the NASA Engineering and Safety Center (NESC) collected methodologies for how best to develop safe and reliable human rated systems and how to identify the drivers that provide the basis for assessing safety and reliability. The team also identified techniques, methodologies, and best practices to assure that NASA can develop safe and reliable human rated systems. The results are drawn from a wide variety of resources, from experts involved with the space program since its inception to the best-practices espoused in contemporary engineering doctrine. This report focuses on safety and reliability considerations and does not duplicate or update any existing references. Neither does it intend to replace existing standards and policy.
Author
Space Programs; System Effectiveness; Evaluation; Safety

20080019636 NASA Langley Research Center, Hampton, VA, USA
Design Development Test and Evaluation (DDT and E) Considerations for Safe and Reliable Human Rated Spacecraft Systems
Miller, James; Leggett, Jay; Kramer-White, Julie; April 2008; 702 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 510505.01.07.01.06
Report No.(s): NASA/TM-2008-215126/Vol II; NESC-RP-06-108/05-173-E/Part 2; L-19470; No Copyright; Avail.: CASI: A99, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080019636
A team directed by the NASA Engineering and Safety Center (NESC) collected methodologies for how best to develop safe and reliable human rated systems and how to identify the drivers that provide the basis for assessing safety and reliability.

The team also identified techniques, methodologies, and best practices to assure that NASA can develop safe and reliable human rated systems. The results are drawn from a wide variety of resources, from experts involved with the space program since its inception to the best-practices espoused in contemporary engineering doctrine. This report focuses on safety and reliability considerations and does not duplicate or update any existing references. Neither does it intend to replace existing standards and policy.
Author
Space Programs; System Effectiveness; Safety; Evaluation; Reliability

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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*.

20080018956 NASA Marshall Space Flight Center, Huntsville, AL, USA
Multi-Sensor Testing for Automated Rendezvous and Docking Sensor Testing at the Flight Robotics Laboratory
Brewster, L.; Johnston, A.; Howard, R.; Mitchell, J.; Cryan, S.; June 29, 2007; 1 pp.; In English; 2008 IEEE Aerospace Conference, 1-8 Mar. 2008, Big Sky, MT, USA; No Copyright; Avail.: Other Sources; Abstract Only

The Exploration Systems Architecture defines missions that require rendezvous, proximity operations, and docking (RPOD) of two spacecraft both in Low Earth Orbit (LEO) and in Low Lunar Orbit (LLO). Uncrewed spacecraft must perform automated and/or autonomous rendezvous, proximity operations and docking operations (commonly known as AR&D). The crewed missions may also perform rendezvous and docking operations and may require different levels of automation and/or autonomy, and must provide the crew with relative navigation information for manual piloting. The capabilities of the RPOD sensors are critical to the success of the Exploration Program. NASA has the responsibility to determine whether the Crew Exploration Vehicle (CEV) contractor proposed relative navigation sensor suite will meet the requirements. The relatively low technology readiness level of AR&D relative navigation sensors has been carried as one of the CEV Project's top risks. The AR&D Sensor Technology Project seeks to reduce the risk by the testing and analysis of selected relative navigation sensor technologies through hardware-in-the-loop testing and simulation. These activities will provide the CEV Project information to assess the relative navigation sensors maturity as well as demonstrate test methods and capabilities. The first year of this project focused on a series of'pathfinder' testing tasks to develop the test plans, test facility requirements, trajectories, math model architecture, simulation platform, and processes that will be used to evaluate the Contractor-proposed sensors. Four candidate sensors were used in the first phase of the testing. The second phase of testing used four sensors simultaneously: two Marshall Space Flight Center (MSFC) Advanced Video Guidance Sensors (AVGS), a laser-based video sensor that uses retroreflectors attached to the target vehicle, and two commercial laser range finders. The multi-sensor testing was conducted at MSFC's Flight Robotics Laboratory (FRL) using the FRL's 6-DOF gantry system, called the Dynamic Overhead Target System (DOTS). The target vehicle for 'docking' in the laboratory was a mockup that was representative of the proposed CEV docking system, with added retroreflectors for the AVGS. The multi-sensor test configuration used 35 open-loop test trajectories covering three major objectives: (1) sensor characterization trajectories designed to test a wide range of performance parameters; (2) CEV-specific trajectories designed to test performance during CEV-like approach and departure profiles; and (3) sensor characterization tests designed for evaluating sensor performance under more extreme conditions as might be induced during a spacecraft failure or during contingency situations. This paper describes the test development, test facility, test preparations, test execution, and test results of the multi-sensor series of trajectories.
Author
Guidance Sensors; Mathematical Models; Multisensor Applications; Orbital Rendezvous; Spacecraft Docking; Autonomous Docking; Robotics; Test Facilities

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*.

20080020206 California Inst. of Tech., Pasadena, CA USA
Chemical sensor system
Darrach, Murray R., Inventor; Chutjian, Ara, Inventor; February 19, 2008; 15 pp.; In English
Patent Info.: Filed November 12, 2002; US-Patent-7,332,345; US-Patent-Appl-SN-10/293,966; No Copyright; Avail.:
CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080020206

A chemical sensing apparatus and method for the detection of sub parts-per-trillion concentrations of molecules in a sample by optimizing electron utilization in the formation of negative ions is provided. A variety of media may be sampled including air, seawater, dry sediment, or undersea sediment. An electrostatic mirror is used to reduce the kinetic energy of an electron beam to zero or near-zero kinetic energy.
Official Gazette of the U.S. Patent and Trademark Office
Chemical Composition; Detection; Negative Ions; Electrostatics; Chemical Analysis; Molecules; Kinetic Energy

20080020220 Kyungpook National Univ., Daegu, South Korea
Electro-Responsive Behaviour Multi-Wall Nanotubes/Gelatin Composites and Cross-Linked Gelatin Electrospun Mats
Park, Soo-Young; Feb 11, 2008; 26 pp.; In English
Contract(s)/Grant(s): FA4869-07-1-4029
Report No.(s): AD-A476609; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476609

Swelling, states of water, morphology, stability in the aqueous solution, and electro-mechano- chemical bending behaviors of the gelatin/chitosan blend system were studied in order to clarify the potential use of this blend system as an actuator. The gelatin/chitosan blend system was prepared in order to avoid dissolution of the pure chitosan film system in an aqueous medium and the rigidity and easy degradation of the pure gelatin system in the swollen state. The blend systems showed improved material properties: the vacuum-dried blend sample at the G75/C25 (w/w, gelatin/chitosan) ratio showed approx. 4 times swelling (in distilled water, at neutral pH and room temperature), approx. 5 times stability (in distillated water), and approx. 6 times bending (at 6V/53mm and in 0.02 M NaCl aqueous solution) as compared to pure gelatin. These enhanced properties could be explained by the introduction of free -OH, -NH2, and -NHOCOCH3 groups of the amorphous chitosan in the blend and the network structure through the electrostatic interactions between the ammonium (-NH3+) ions of the chitosan and the carboxylate (-COO-) ions of the gelatin. The scanning electron microscopy (SEM) micrographs of the surfaces of the blend films showed homogeneous and smooth surfaces due to the good miscibility between gelatin and chitosan. However, a different morphology from the fractured surface was found for the pure gelatin and blend systems which showed condensed and foliaceous morphologies, respectively. The leafy morphology indicates a large and homogenous pore structure, which would cause increased ion diffusion into the gel and might lead to increased bending.
DTIC
Actuators; Crosslinking; Gelatins; Mixtures; Morphology; Nanotubes; Walls

20080020232 Christensen, OConnor, Johnson, Kindness, PLLC, Seattle, WA, USA
Methods for Photopatterning Hydrogels
Bryant, S. J., Inventor; Hauch, K. D., Inventor; Ratner, B. D., Inventor; 24 Feb 05; 17 pp.; In English
Contract(s)/Grant(s): R24HL64387; F32HL74619
Patent Info.: Filed Filed 24 Feb 05; US-Patent-Appl-SN-11 067 480
Report No.(s): PB2007-110140; No Copyright; Avail.: CASI: A03, Hardcopy

In one aspect, the invention provides methods for forming a photopatterned hydrogel. In some embodiments, the methods comprise the step of exposing a solution comprising a monomer, a crosslinking agent, and a photoinitiator to a pattern of light comprising a first and a second light intensity for a period of time and under suitable conditions for the first light intensity to induce essentially complete conversion of polymerizable groups on the monomer and the crosslinking agent to form a

patterned hydrogel, and for the second light intensity to induce partial conversion of the polymerizable groups on the monomer and the crosslinking agent to form partially polymerized polymers that remain soluble. In some embodiments, the first light intensity is lower than the second light intensity. In another aspect, the invention provides methods for forming porous, photopatterned hydrogels.
NTIS
Gels; Patent Applications; Polymers

20080020278 Hoag (Foley), LLP, Boston, MA, USA
Fluorescent, Semi-Conductive Polymers, and Devices Comprising Them
Swagner, T. M., Inventor; Kim, Y., Inventor; 6 Dec 04; 51 pp.; In English
Contract(s)/Grant(s): DAAD-19-02-D-0002
Patent Info.: Filed Filed 6 Dec 04; US-Patent-Appl-SN-11 005 634
Report No.(s): PB2007-110059; No Copyright; Avail.: CASI: A04, Hardcopy

The present invention relates to fluorescent, semiconductive polymers comprising electron withdrawing groups bonded to the polymer. The invention also relates to a method of detecting analytes comprising contacting the analyte with the fluorescent, semiconductive polymers of the present invention. The invention also relates to light emitting devices, photovoltaic devices, and sensors comprising the fluorescent, semiconductive polymers of the present invention.
NTIS
Fluorescence; Patent Applications; Polymers

20080020294 Greenlee Winner and Sullivan, P.C., Boulder, CA, USA
Preparation and Use of Photopolymerized Microparticles
Randolph, T., Inventor; Anseth, K., Inventor; Owens, J. L., Inventor; Lengsfeld, C., Inventor; 2 Mar 05; 31 pp.; In English
Contract(s)/Grant(s): NIH-5-R01-HL59400
Patent Info.: Filed Filed 2 Mar 05; US-Patent-Appl-SN-11-070 506
Report No.(s): PB2007-111927; No Copyright; Avail.: CASI: A03, Hardcopy

Methods of forming crosslinked polymer particles in situ from polymer precursors such as monomers or oligomers, comprising exposing a composition comprising at least one polymer precursor, a solvent or solvent mixture, and an antisolvent or antisolvent mixture to photoradiation under conditions whereby particles are formed are provided. The polymer precursor may be photosensitive, or a separate polymerization initiator may be used. In a preferred embodiment, the polymer precursor is insoluble in the antisolvent or antisolvent mixture and the solvent or solvent mixture is soluble in the antisolvent or antisolvent mixture at the concentrations used. Crosslinked polymer particles and crosslinked polymer particles comprising a polymer and a bioactive material are also provided. The polymer may be erodable, and the polymer particles formed may be used in a variety of applications, including controlled release of bioactive materials such as drugs. Polymer particles formed using the methods of the invention have low residual solvent levels and high additive encapsulation efficiencies. The processes of the invention allow control of particle size and morphology, use low operating temperatures and are useful for efficient bulk production.
NTIS
Microparticles; Patent Applications; Polymerization

20080020378 National Inst. of Aerospace, Hampton, VA, USA
Novel Low-Temperature Poss-Containing Siloxane Elastomers
Belcher, Marcus A.; Hinkley, Jeffrey A.; Kiri, Neha N.; Lillehei, Peter T.; May 18, 2008; 11 pp.; In English; SAMPE '08 Material and Process Innovations: Changing our World, 18-22 May 2008, Long Beach, CA, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 698259.02.07.07.04; Copyright; Avail.: CASI: A03, Hardcopy

One route to increased aircraft performance is through the use of flexible, shape-changeable aerodynamics effectors. However, state of the art materials are not flexible or durable enough over the required broad temperature range. Mixed siloxanes were crosslinked by polyhedral oligomeric silsesquioxanes (POSS) producing novel materials that remained flexible and elastic from -55 to 94 C. POSS molecules were chemically modified to generate homogeneous distributions within the siloxane matrix. High resolution scanning electron microscope (HRSEM) images indicated homogenous POSS distribution up to 0.8 wt %. Above the solubility limit, POSS aggregates could be seen both macroscopically and via SEM (approx.60-120 nm). Tensile tests were performed to determine Young s modulus, tensile strength, and elongation at break over the range of

temperatures associated with transonic aircraft use (-55 to 94 C; -65 to 200 F). The siloxane materials developed here maintained flexibility at -55 C, where previous candidate materials failed. At room temperature, films could be elongated up to 250 % before rupturing. At -55 and 94 C, however, films could be elongated up to 400 % and 125 %, respectively.
Author
Siloxanes; Flexibility; Control Equipment; Elastomers; Modulus of Elasticity; Tensile Tests; Aerodynamics; Elongation

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COMPOSITE MATERIALS

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

20080018961 Alabama Univ., Huntsville, AL, USA; NASA Marshall Space Flight Center, Huntsville, AL, USA
Mechanical Properties and Durability of 'Waterless Concrete'
Toutanji, Houssam; Grugel, Richard N.; March 03, 2008; 1 pp.; In English; Earth and Space Conference 2008: 11th International Conference on Engineering, Science, Construction, and Operations in Challenging Environments, 3-5 Mar. 2008, Long Beach, CA, USA; Copyright; Avail.: Other Sources; Abstract Only

Waterless concrete consists of molten elementary sulfur and aggregate. The aggregates in lunar environment will be lunar rocks and soil. Sulfur is present on the Moon in Troilite soil (FeS) and by oxidation soil iron and sulfur can be produced. Iron can be used to reinforce the sulfur concrete. Sulfur concrete specimens were cycled between liquid nitrogen (approximately 191 C) and room temperature (approximately 21 C) to simulate exposure to a lunar environment. Cycled and control specimens were subsequently tested in compression at room temperatures (approximately 21 C) and approximately 101 C. Test results showed that due to temperature cycling, compressive strength of cycled specimens was 20% of those non-cycled. Microscopic examination of the fracture surfaces from the cycled samples showed clear de-bonding of the sulfur from the aggregate material whereas it was seen well bonded in those non-cycled. This reduction in strength can be attributed to the large differences in thermal coefficients of expansion of the materials constituting the concrete which promoted cracking. Similar sulfur concrete mixtures were strengthened with short and long glass fibers. The glass fibers from lunar regolith simulant was melted in a 25 cc Pt-Rh crucible in a Sybron Thermoline high temperature MoSi2 furnace at melting temperatures of 1450 to 1600 C for times of 30 min to 1 hour. Glass fibers were cast from the melt into graphite crucibles and were annealed for a couple of hours at 600 C. Glass fibers and small rods were pulled from the melt. The glass melt wets the ceramic rod and long continuous glass fibers were easily hand drawn. The glass fibers were immediately coated with a protective polymer to maintain the mechanical strength. The glass fibers were used to reinforce sulfur concrete plated to improve the flexural strength of the sulfur concrete. Prisms beams strengthened with glass fibers were tested in 4-point bending test. Beams strengthened with glass fiber showed to exhibit an increase in the flexura strength by as much as 45%.
Author
Concretes; Durability; Mechanical Properties; Sulfur; Lunar Rocks; Lunar Soil

20080018965 Georgia Inst. of Tech., Atlanta, GA, USA; NASA Marshall Space Flight Center, Huntsville, AL, USA
Assessment of Crack Path Prediction in Non-Proportional Mixed-Mode Fatigue
Highsmith, Shelby, Jr.; Johnson, Steve; Swanson, Gregory; Sayyah, Tarek; Pettit, Richard; March 20, 2008; 27 pp.; In English; P-SAR, Third Annual Propulsion-Safety and Affordable Readiness (P-SAR) Conference, 18-20 Mar. 2008, Myrtle Beach, SC, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): SAA8-061059; Copyright; Avail.: CASI: A03, Hardcopy

Non-proportional mixed-mode loading is present in many systems and a growing crack can experience any manner of mixed-mode loading. Prediction of the resulting crack path is important when assessing potential failure modes or when performing a failure investigation. Current crack path selection criteria are presented along with data for Inconel 718 under non-proportional mixed-mode loading. Mixed-mode crack growth can transition between path deflection mechanisms with very different orientations. Non-proportional fatigue loadings lack a single parameter for input to current crack path criteria. Crack growth transitions were observed in proportional and non-proportional FCG tests. Different paths displayed distinct fracture surface morphologies. New crack path drivers & transition criteria must be developed.
Author
Crack Geometry; Failure Modes; Fatigue (Materials); Mathematical Models; Mechanical Properties; Alloys

20080019606 NASA Marshall Space Flight Center, Huntsville, AL, USA

Strain Measurement during Stress Rupture of Composite Over-Wrapped Pressure Vessel with Fiber Bragg Gratings Sensors

Banks, Curtis E.; Grant, Joseph; Russell, Sam; Arnett, Shawn; March 09, 2008; 10 pp.; In English; SPIE Smart Structures and Materials and Nondestructive Evaluation and Health Monitoring (NDE), 9-13 Mar. 2008, San Diego, CA, USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy

Fiber optic Bragg gratings were used to measure strain fields during Stress Rupture (SSM) test of Kevlar Composite Over-Wrapped Pressure Vessels (COPV). The sensors were embedded under the over-wrapped attached to the liner released from the Kevlar and attached to the Kevlar released from the liner. Additional sensors (foil gages and fiber bragg gratings) were surface mounted on the COPY liner.

Author

Strain Measurement; Bragg Gratings; Pressure Vessels; Measuring Instruments; Fiber Optics

20080019634 NASA Marshall Space Flight Center, Huntsville, AL, USA

Local Strain Measurement of Kevlar Strand with Fiber Optic Bragg Grating

Banks, Curtis E.; Grant, Joseph; Russell, Sam; Arnett, Shawn; March 09, 2008; 7 pp.; In English; SPIE Smart Structures and Materials and Nondestructive Evaluation and Health Monitoring (NDE), 9-13 Mar. 2008, San Diego, CA, USA; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy

1987 DuPont manufactured 4560 denier Kevlar/Epoxy Strands were instrumented with nine and three sensors each. Stress tests were performed at 30,45,60,70 and 80% of ultimate strength with dwell times of 10,000 seconds. FBG showed uneven stress levels which is contrary to conventional observation.

Author

Fiber Optics; Strain Measurement; Stress Measurement; Bragg Gratings; Kevlar (Trademark); Epoxy Resins

20080019729 Ocean State Technology Corp., Providence, RI USA

Research in Advanced Surface Effect Ships

Leonard, Douglas C; Feb 12, 2008; 26 pp.; In English

Contract(s)/Grant(s): N00014-05-2-0012

Report No.(s): AD-A477007; FTR-1; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA477007

Research is conducted toward development of high payload-fraction surface craft capable of efficient high-speed (50+ knots) coastal/short sea transport of passengers and cargo; other desired characteristics included shallow draft, steadiness, ease of reconfiguration, shock resistance and survivability in high threat areas. An experimental 42 ft lwl (50 ft oa) air-cushioned, composites constructed, catamaran is designed, built and tested to serve as a demonstrator and test bed for proprietary technology that could deliver the desired capabilities. The research vessel exhibits 25% to 50% lower hull resistance than comparable conventional fast craft, and moderate scaleups of the research vessel are estimated to be capable of full load speeds in excess of 50 kts. The craft handles and maneuvers well and exhibits very limited vertical accelerations in tested conditions up to sea state 4. Impressive fuel economy and payload capacity are projected for various scaleups (up to 125 ft length oa) of the test vessel, including very long range patrol/rescue/fireboat and 250 and 500 nm freighters, lighters and transports. Scaleups are favorably compared to Stiletto and LCAC.

DTIC

Acceleration (Physics); Fuels; Payloads; Surface Effect Ships

20080020382 NASA Langley Research Center, Hampton, VA, USA

Superposition of Cohesive Elements to Account for R-Curve Toughening in the Fracture of Composites

Davila, Carlos G.; Rose, Cheryl A.; Song, Kyongchan; May 19, 2008; 15 pp.; In English; 2008 ABAQUS User's Conference, 19-22 May 2008, Newport, RI, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 698259.02.07.07.03.03; Copyright; Avail.: CASI: A03, Hardcopy

The relationships between a resistance curve (R-curve), the corresponding fracture process zone length, the shape of the traction/displacement softening law, and the propagation of fracture are examined in the context of the through-the-thickness fracture of composite laminates. A procedure that accounts for R-curve toughening mechanisms by superposing bilinear

cohesive elements is proposed. Simple equations are developed for determining the separation of the critical energy release rates and the strengths that define the independent contributions of each bilinear softening law in the superposition. It is shown that the R-curve measured with a Compact Tension specimen test can be reproduced by superposing two bilinear softening laws. It is also shown that an accurate representation of the R-curve is essential for predicting the initiation and propagation of fracture in composite laminates.
Author
Composite Materials; Fractures (Materials); Laminates; Cohesion; Crack Propagation; Fracturing

20080020385 Swales Aerospace, Hampton, VA, USA
Guidelines and Parameter Selection for the Simulation of Progressive Delamination
Song, Kyongchan; Davila, Carlos G.; Rose, Cheryl A.; May 19, 2008; 15 pp.; In English; 2008 ABAQUS User's Conference, 19-22 May 2008, Newport, RI, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 698259.02.07.07.03.03; Copyright; Avail.: CASI: A03, Hardcopy

Turon s methodology for determining optimal analysis parameters for the simulation of progressive delamination is reviewed. Recommended procedures for determining analysis parameters for efficient delamination growth predictions using the Abaqus/Standard cohesive element and relatively coarse meshes are provided for single and mixed-mode loading. The Abaqus cohesive element, COH3D8, and a user-defined cohesive element are used to develop finite element models of the double cantilever beam specimen, the end-notched flexure specimen, and the mixed-mode bending specimen to simulate progressive delamination growth in Mode I, Mode II, and mixed-mode fracture, respectively. The predicted responses are compared with their analytical solutions. The results show that for single-mode fracture, the predicted responses obtained with the Abaqus cohesive element correlate well with the analytical solutions. For mixed-mode fracture, it was found that the response predicted using COH3D8 elements depends on the damage evolution criterion that is used. The energy-based criterion overpredicts the peak loads and load-deflection response. The results predicted using a tabulated form of the BK criterion correlate well with the analytical solution and with the results predicted with the user-written element.
Author
Delaminating; Composite Materials; Fracturing; Cohesion; Cantilever Beams; Loads (Forces); Simulation; Damage

20080020534 Akron Univ., Akron, OH, USA
A Modeling Technique and Representation of Failure in the Analysis of Triaxial Braided Carbon Fiber Composites
Littell, Justin D.; Binienda, Wieslaw K.; Goldberg, Robert K.; Roberts, Gary D.; April 20, 2008; 17 pp.; In English; FAA/DoD/NASA Aging Aircraft Conference, 20-24 Apr. 2008, Phoenix, AZ, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNX07AK57H; WBS 877868.02.07.03.05.03; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080020534

Quasi-static tests have been performed on triaxially braided carbon fiber composite materials with large unit cell sizes. The effects of different fibers and matrix materials on the failure mode were investigated. Simulations of the tests have been performed using the transient dynamic finite element code, LS-DYNA. However, the wide range of failure modes observed for the triaxial braided carbon fiber composites during tests could not be simulated using composite material models currently available within LS-DYNA. A macroscopic approach has been developed that provides better simulation of the material response in these materials. This approach uses full-field optical measurement techniques to measure local failures during quasi-static testing. Information from these experiments is then used along with the current material models available in LS-DYNA to simulate the influence of the braided architecture on the failure process. This method uses two-dimensional shell elements with integration points through the thickness of the elements to represent the different layers of braid along with a new analytical method for the import of material stiffness and failure data directly. The present method is being used to examine the effect of material properties on the failure process. The experimental approaches used to obtain the required data will be described, and preliminary results of the numerical analysis will be presented.
Author
Carbon Fibers; Composite Materials; Mechanical Properties; Matrix Materials; Fiber Composites; Failure Analysis; Static Tests; Stiffness; Braided Composites; Finite Element Method

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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 Astrophysics*.

20080019760 Wisconsin Univ., Madison, WI USA
Photonic Crystals in Silicon via Growth and Preferential Oxidation
Lagally, M G; Jan 2, 2007; 10 pp.; In English
Contract(s)/Grant(s): F49620-03-1-0316; Proj-2305/DX
Report No.(s): AD-A477102; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477102

Si, SiGe, and Ge nanomembrances offer a much more powerful paradigm for the development of silicon optoelectronics overall, not just PCs. Hence explore SiNM fabrication process as a more versatele apporach to Ge-based PCs. Develop membrance processingl release/transfer this is a major topic, as there are many parameters that can be modified. Develop membrane stacking procedures again, these depend on the release and transfer protocols, optimize ways to do this. Characterize Bragg mirrors and simple Si-based PC work with SiNMs. Develop processing ideas for 3D Si-based PCs. Develop contract technology. Develop a theoretical understanding of the relationship of complex index of refraction and charge in SiNMs. Investigate local (from atomic to <lOOnm) atomic transport, relaxation kinetics, and defect generation at the oxide-Si interface in SOl.
DTIC
Crystals; Electro-Optics; Oxidation; Refraction; Semiconductors (Materials); Silicon

20080019808 Defence Research and Development Canada, Toronto, Ontario Canada
Characterization of Atmospheric Emission Produced by Live Gun Firing: Test on the M777 155 mm Howitzer
Quemerais, Bernadette; Diaz, Emmanuela; Poulin, Isabelle; Marois, Andre; Oct 2007; 52 pp.; In English; Original contains color illustrations
Report No.(s): AD-A477180; DRDC-T-TR-2007-102; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477180

Atmospheric emissions produced by live gun firing of the 155 mm howitzer were characterized during a live firing training exercise in Canadian Forces Base (CFB) Valcartier in January 2007. Sampling was performed continuously for three hours during the exercise during which particles and chemicals accumulated on sampling media. Sixty-nine rounds were fired, each round using four bags of propellant, and an additional 3 rounds were fired, each round using 5 bags of propellant. Established occupational health methods were used to collect and analyze samples for particulate matter, hydrogen cyanide, polycyclic aromatic hydrocarbons (PAHs), dinitrotoluene compounds, benzene, toluene, ethylbenzene and xylene, metals, aldehydes, nitric acid (HNO3), nitric oxide (NO), nitrogen dioxide (NO2), hydrogen sulphide (H2S) and sulphur dioxide (SO2). Two sets of samples were collected, one at approximately 8 m at the left of the gun, and the second one at approximately 22 m in front of the gun muzzle, in the line of fire. Most of the chemicals were not detected during the trial. For both sets of samples, particles were found at concentrations much higher than the recommended environmental standards. The size distribution showed that at least 60% of the particles were below 10 micrometers. These findings suggest that there is a potential risk to health associated with exposure to particles for artillery soldiers. Formaldehyde was also detected at concentrations of 7.1 and 3.6 micrograms/cu m for the left and the front locations, respectively. These findings suggest that there is a need to conduct personal sampling to assess the health risk, if any, to artillery soldiers. For all substances, it is recommended that further investigations of air concentrations be made to properly assess personal exposure. It is also recommended to use more sensitive environmental methods to collect and analyse the samples.
DTIC
Airglow; Artillery Fire; Emission; Health; Howitzers

20080019995 California Univ., Santa Barbara, CA USA
Catalysis by Nanostructures: Methane, Ethylene Oxide, and Propylene Oxide Synthesis on Ag, Cu or Au Nanoclusters
Metiu, Horia; Feb 7, 2008; 10 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0459
Report No.(s): AD-A477251; 444012/448765-25382; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The principal investigators have developed new and innovative methods for the preparation of catalytic systems

consisting of very small metal clusters supported on an oxide and for the preparation of nano-structured oxides for supporting catalysts or for performing catalysis. Theory was used to analyze many of the observations or to propose new catalytic systems.
DTIC
Catalysis; Copper; Ethylene Oxide; Gold; Methane; Nanoclusters; Nanostructures (Devices); Oxides; Propylene Oxide; Silver

20080020032 Georgia Inst. of Tech., Atlanta, GA USA
Experimental Evaluation and Mathematical Modeling of Microbially Enhanced Tetrachloroethene (PCE) Dissolution
Amos, Benjamin K; Crhist, John A; Abriola, Linda M; Pennell, Kurt D; Loeffler, Frank E; Nov 2006; 9 pp.; In English
Contract(s)/Grant(s): ER-1293; W912HQ-04-C-0006
Report No.(s): AD-A477331; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Experiments to assess metabolic reductive dechlorination (chlororespiration) at high concentration levels consistent with the presence of free-phase tetrachloroethene (PCE) were performed using three PCE-to- cis-1,2- dichloroethene (cis-DCE) dechlorinating pure cultures (Sulfurospirillum multivorans, Desulfuromonas michiganensis strain BB1, and Geobacter lovleyi strain SZ) and Desulfitobacterium sp. strain Viet1, a PCE-to-trichloroethene (TCE) dechlorinating isolate. Despite recent evidence suggesting bacterial PCE-to- cis-DCE dechlorination occurs at or near PCE saturation (0.9-1.2 mM), all cultures tested ceased dechlorinating at 0.54 mM PCE. In the presence of PCE dense nonaqueous phase liquid (DNAPL), strains BB1 and SZ initially dechlorinated, but TCE and cis-DCE production ceased when aqueous PCE concentrations reached inhibitory levels. For S. multivorans, dechlorination proceeded at a rate sufficient to maintain PCE concentrations below inhibitory levels, resulting in continuous cis-DCE production and complete dissolution of the PCE DNAPL. A novel mathematical model, which accounts for loss of dechlorinating activity at inhibitory PCE concentrations, was developed to simultaneously describe PCE-DNAPL dissolution and reductive dechlorination kinetics. The model predicted that conditions corresponding to a bioavailability number (Bn) less than 1.25 10-2 will lead to dissolution enhancement with the tested cultures, while conditions corresponding to a Bngreater than this threshold value can result in accumulation of PCE to inhibitory dissolved-phase levels, limiting PCE transformation and dissolution enhancement. These results suggest that microorganisms incapable of dechlorinating at high PCE concentrations can enhance the dissolution and transformation of PCE from free-phase DNAPL.
DTIC
Chlorination; Dissolving; Mathematical Models

20080020119 Maryland Univ., College Park, MD USA
Low-loss YBa2Cu3Oy Films on Flexible, Polycrystalline-Yttria-Stabilized Zirconia Tapes for Cryoelectronic Applications
Harshavardhan, K S; Cristen, H M; Sillman, S D; Talanov, V V; Anlage, S M; Rajeswari, M; Claassen, J; Mar 26, 2001; 4 pp.; In English
Contract(s)/Grant(s): N00014-98-M-0016
Report No.(s): AD-A477555; No Copyright; Avail.: Defense Technical Information Center (DTIC)

High-temperature superconducting films of flexible, low-thermal conductivity, low-loss substrates offer a unique base for the development of cryoelectronic digital interconnects. Using an ion-beam-assisted pulsed-laser- deposition technique, we developed biaxially textured YBa(2)Cu(3)O(7) (YBCO) films on flexible polycrystalline-yttria-stabilized zirconia (YSZ) sybstrates with the following materials properties: (i) in-plane x-ray phi-scan full width at half maximum of approx. 7 deg.; (ii) transition temperatures (T(c)) in the range of 88-89 K with transition widths (DELTA T(c)) of approx. 0.5 K; (iii) critical current densities (J(c)) in the range 1.5 - 2 x 10(6) A/cm(2) at 77 K, zero field; (iv) magnetic penetration depth (lambda) of 284 nm at 77 K; and (v) surface resistance (R(s)) of 700 muOMEGA at 77 K, 10 GHz. The low-microwave loss, biaxilly textured YBCO films combined with the low-thermal conductivity YSZ substrate could facilitate a variety of RF cryoelectronic applications.
DTIC
Polycrystals; YBCO Superconductors; Yttrium; Yttrium Oxides; Zirconium; Zirconium Oxides

20080020217 Max-Planck-Gesellschaft zuer Foerderung der Wissenschaft e.V., Berlin, Germany
Ab Initio Atomistic Thermodynamics for Surfaces: A Primer
Rogal, Jutta; Reuter, Karsten; Feb 2006; 19 pp.; In English; Original contains color illustrations
Report No.(s): AD-A476575; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476575
No abstract available
Atomic Structure; Chemical Reactions; Surface Reactions; Thermodynamics

20080020293 North Carolina Agricultural and Technical State Univ., Greensboro, NC, USA
Heat of Dissolution Measurements for CO(sub2) in Mixed Alkanolamine Solvents. (Semi-Annual Technical Report, October 1, 2006-March 31, 2007)
Kabadi, V. N.; May 29, 2007; 12 pp.; In English
Contract(s)/Grant(s): DE-FG26-03NT41912
Report No.(s): DE2007-908916; No Copyright; Avail.: National Technical Information Service (NTIS)
The main objective of this project is to measure heat of dissolution of CO2 in carefully selected mixed alkanolamine solvent systems, and provide such directly measured data that might be used for efficient design of CO2 capture processes, or for better understanding of thermodynamics of CO2- alkanolamine systems. Carbon dioxide is one of the major greenhouse gases, and the need for stabilization of its composition in earths atmosphere is vital for the future of mankind. Although technologies are available for capture and storage of CO2, these technologies are far too expensive for economical commercialization. Reduction of cost would require research for refinement of the technology. For more economical CO2 capture and regeneration, there is a need for development of more efficient solvent systems. In this project we will extend the thermodynamic database by measuring heat of solution data of CO2 in mixed solvents made of MEA (monoethanolamine), MDEA (methyldiethanolamine), piperazine, and water. Mixed solvents of different compositions will be selected and in each case data will be measured at temperatures 40 and 80C and various partial pressures of CO2. At the end of the project, observations, conclusions, and recommendations will be derived for the choice of mixed solvents for efficient CO2 capture with potential for commercialization.
NTIS
Carbon Dioxide; Dissolving; Solvents

20080020299 Microfabrica Inc., Van Nuys, CA, USA; University of Southern California, Los Angeles, CA USA
Electrochemical Fabrication Methods Incorporating Dielectric Materials and/or using Dielectric Substrates
Cohen, A. L., Inventor; Zhang, G., Inventor; Tseng, F. G., Inventor; 3 Jan 05; 33 pp.; In English
Contract(s)/Grant(s): DARPA-DABT63-97-C-0051; DARPA-DABT63-97-C-0042
Patent Info.: Filed Filed 3 Jan 05; US-Patent-Appl-SN-11-029 181
Report No.(s): PB2007-112190; No Copyright; Avail.: CASI: A03, Hardcopy
Various embodiments are directed to the electrochemical fabrication of multilayer mesoscale or microscale structures which are formed using at least one conductive structural material, at least one conductive sacrificial material, and at least one dielectric material. In some embodiments the dielectric material is a UV-curable photopolymer. In other embodiments, electrochemically fabricated structures are formed on dielectric substrates.
NTIS
Dielectric Properties; Dielectrics; Electrochemistry; Fabrication; Substrates

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METALS AND METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals and metallic materials; and metallurgy.

20080018964 Mississippi State Univ., Mississippi State, MS, USA
Micro-Structural Response of DP 600 to High Strain Rate Deformation
Hamburg, Brian; Schneider, Judy; Jones, Stanley E.; March 09, 2008; 1 pp.; In English; 2008: 137th Annual Meeting and Exhibition, 9-13 Mar. 2008, New Orleans, LA, USA; Copyright; Avail.: Other Sources; Abstract Only
The object of this study was to investigate the micro-structural response of DP 600 subjected to high strain rate, ballistic impact tests. The ballistic tests were conducted using normal impact of a hardened steel penetrator into a 2 mm thick sheet of DP 600. The average strain rates produced from this test method are on the order of 10(exp 5)/s. Electron microscopy was

used to investigate the microstructure before and after high strain rate deformation. A variation in material response was observed between tests conducted at 0.8 x 105 and 25 x 10(exp 5)/s.
Author
Deformation; Mechanical Properties; Microstructure; Steels; Strain Rate

20080019794 Naval Postgraduate School, Monterey, CA USA
Investigation of Superplastic Behavior in FSP 5083 Aluminum Alloy
Bland, Marc T; Jun 2007; 65 pp.; In English; Original contains color illustrations
Report No.(s): AD-A477156; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477156

Continuously-cast AA5083 in the form of as-cast billets 15 mm in thickness condition was subjected to friction stir processing (FSP) by five overlapping passes. The FSP utilized a tool having a pin approximately 5 mm in length, so that the process zone had a depth that was approximately one-third of the billet thickness. The solidification microstructure of the as-cast material included grains that were approximately 60 m in size as well as non-equilibrium distributions of the Al8Mg5 and Al6Mn phases. Within the process zone the grains were reduced to approximately 1.0 m in size and the distribution of second-phase particles had become homogeneous. Microhardness traverses through the process zone into base material revealed that the hardness was increased from 80 to 120 kg mm-2 for the AA5083 material while the hardness was increased from 80 to ~180 kg mm-2 for AA5083 + 0.5 wt. pct. Cu. The elevated temperature tensile properties were evaluated by tension testing of coupons that had been sectioned from the process zones of the billets. For the AA5083 material superplastic ductility of 1245% elongation to failure was obtained at a nominal strain rate of 10-1 s-1 and superplastic response was observed in tension tests conducted at strain rates of 10-2 s-1 and 3 10-1 s-1. The stress - strain curves exhibited hardening, and the test coupons appeared to deform with minimal cavitation and failure took place by flow localization. Lower ductility of 143% elongation to failure was observed in the AA5083 + Cu material tested 10-2 s-1. Failure occurred by cavitation growth and linkage with minimal flow localization in the material with a Cu addition.
DTIC
Aluminum Alloys; Superplasticity

20080019970 Pennsylvania State Univ., University Park, PA USA
Laser-GMA Hybrid Pipe Welding System
Reutzel, Edward W; Kern, Ludwig; Sullivan, Michael J; Tressler, Jay F; Avalos, Juan; Nov 2007; 246 pp.; In English
Contract(s)/Grant(s): N00014-03-C-0413; Proj-S2060
Report No.(s): AD-A477194; PSU/ARL-TR-07-007; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The combination of laser welding with conventional gas metal arc welding technology offers substantial increases in production rate of joining pipe through single-pass joining compared to multi-pass techniques that are commonly used. The hybrid process has been examined and developed for this application, and the process has been qualified through the American Bureau of Shipping for a wide range of pipe schedules. A system to realize this application has been specified, designed, built, and implemented in General Dynamics NASSCO Shipyard, and been subjected to a seven month evaluation on the production floor. Lessons learned have been documented to benefit future efforts. Fifteen actual production pipe spools were manufactured using the system.
DTIC
Arc Welding; Laser Welding; Lasers; Pipes (Tubes); Welding

20080020284 Thorpe North and Western, Sandy, UT, USA
Titanium Boride Coatings on Titanium Surfaces and Associated Methods
Chandran, K. S. R., Inventor; Aich, S. A., Inventor; 3 May 05; 14 pp.; In English
Contract(s)/Grant(s): DAAL-19-99-1-0281
Patent Info.: Filed Filed 3 May 05; US-Patent-Appl-SN-11 122 119
Report No.(s): PB2007-105216; No Copyright; Avail.: CASI: A03, Hardcopy

A borided titanium article can include a titanium mass having titanium monoboride whiskers infiltrating inward from a surface of the titanium mass to form an integral surface hardened region. The titanium mass can be almost any titanium based metal or alloy such as high purity titanium, commercial grade titanium, alpha-titanium alloy, alpha+beta titanium alloy, beta-titanium alloy, titanium composite, and combinations thereof. Borided titanium articles can be formed by methods which include providing a titanium mass, contacting a surface of the titanium mass with a boron source medium, and heating the

titanium mass and boron source medium to a temperature from about 700 degrees C to about 1600 degrees C. The boron source medium can include a boron source and an activator selected to provide growth of titanium monoboride whiskers. The boron source medium can be provided as a solid particulate mixture, liquid mixture, or as a gaseous mixture. During heating, boron from the boron source infiltrates into the titanium mass and forms titanium monoboride whiskers which improve the surface hardness, wear resistance, oxidation resistance, and corrosion resistance of the treated surface. The titanium monoboride whiskers can be controlled to have the desired dimensions, depending on the application requirements. Boriding titanium surfaces using these methods, provides a relatively inexpensive and effective process for improving the surface properties of titanium which are then useful in a wide variety of applications.
NTIS
Metal Surfaces; Patent Applications; Protective Coatings; Titanium; Titanium Borides

20080020285 Harness Dickey and Pierce, PLC, Bloomfield Hills, MI, USA
Hinge Apparatus with Two-Way Controllable Shape Memory Alloy (SMA) Hinge Pin Actuator and Methods of Making Two-Way SMA Parts
Mabe, J. H., Inventor; 9 Mar 04; 14 pp.; In English
Contract(s)/Grant(s): N00421-99-D-1191 DO 00005
Patent Info.: Filed Filed 9 Mar 04; US-Patent-Appl-SN-10 796 806
Report No.(s): PB2007-110152; No Copyright; Avail.: CASI: A03, Hardcopy

A hinge apparatus generally includes a hinge pin formed of a two-way shape memory alloy (SMA) adapted to transition, without an externally applied load, between a first trained shape and a second trained shape upon switching the two-way SMA between a first state and a second state. The hinge pin can apply two-way reversible actuation forces to a device coupled to the hinge apparatus. The hinge pin can be produced by thermal cycling a material under a sufficient load for a sufficient number of thermal cycles between about the material's austenite and martensite temperatures to complete training of the material. The thermal cycling conditions the material to transition, without an externally applied load, between an austenitic shape and a martensitic shape to perform useful work when the material is thermally cycled between the austenite and martensite temperatures.
NTIS
Actuators; Hinges; Patent Applications; Pins; Shape Memory Alloys; Shapes

20080020339 Savannah River National Lab., Aiken, SC, USA
Tensile Testing of Carbon Steel in High Pressure Hydrogen
Duncan, A.; Lam, P. S.; Adams, T.; Jul. 22, 2007; 8 pp.; In English
Report No.(s): DE2007-908641; WSRC-STI-2007-00211; PVP2007-26736; No Copyright; Avail.: Department of Energy Information Bridge

An infrastructure of new and existing pipelines and systems will be required to carry and to deliver hydrogen as an alternative energy source under the hydrogen economy. Carbon and low alloy steels of moderate strength are currently used in hydrogen delivery systems as well as in the existing natural gas systems. It is critical to understand the material response of these standard pipeline materials when they are subjected to pressurized hydrogen environments. The methods and results from a testing program to quantify hydrogen effects on mechanical properties of carbon steel pipeline and pipeline weld materials are provided. Tensile properties of one type of steel (A106 Grade B) in base metal, welded and heat affected zone conditions were tested at room temperature in air and high pressure (10.34 MPa or 1500 psig) hydrogen. A general reduction in the materials ability to plastically deform was noted in this material when specimens were tested in hydrogen. Furthermore, the primary mode of fracture was changed from ductile rupture in air to cleavage with secondary tearing in hydrogen. The mechanical test results will be applied in future analyses to evaluate service life of the pipelines. The results are also envisioned to be part of the bases for construction codes and structural integrity demonstrations for hydrogen service pipeline and vessels.
NTIS
Carbon Steels; High Pressure; Hydrogen; Hydrogen Fuels; Pipelines; Tensile Tests

20080020381 Lawrence Livermore National Lab., Livermore, CA USA
Melting of Transition Metals at High Pressure and the Influence of Liquid Frustration. I. The Late Metals Cu, Ni and Fe
Ross, M.; Boehler, R.; Errandonea, D.; Mar. 23, 2007; 29 pp.; In English
Report No.(s): DE2007-908119; UCRL-TR-229360; No Copyright; Avail.: National Technical Information Service (NTIS)

This report focuses on the role that frustration, or preferred liquid local ordering, plays in the melting of transition metals.

Specifically, Cu, Ni and Fe. It is proposed that for liquids of metals with partially filled d-bands (Ni and Fe) frustration caused by Peierls/Jahn-Teller distortion and pressure-induced s-d electron promotion provides a mechanism for creating and enhancing the stability of local structures. At the most elementary level, liquid structures are essentially impurities that lower the freezing point. In the case of transition metals with partially filled d-bands, the application of pressure induces s-d electron promotion increases the concentration of local structures. This leads to melting slopes for Ni and Fe that are considerably lower than measured for Cu, and lower than for theoretical predictions employing models in which liquid structures are neglected.
NTIS
Frustration; High Pressure; Liquid Metals; Melting; Metals; Transition Metals

20080020384 Lawrence Livermore National Lab., Livermore, CA USA
Synthesis and Performance of Fe-based Amorphous Alloys for Nuclear Waste Applications
Kaufman, L.; Perepezko, J. H.; Hildal, K.; Feb. 06, 2007; 13 pp.; In English
Report No.(s): DE2007-908118; UCRL-CONF-227808; No Copyright; Avail.: Department of Energy Information Bridge

Recent developments in multicomponent Fe-based amorphous alloys have shown that these novel materials exhibit outstanding corrosion resistance compared to typical crystalline alloys such as high-performance stainless steels and Ni-based C-22 alloy. During the past decade, amorphous alloy synthesis has advanced to allow for the casting of bulk metallic glasses. In several Fe-based alloy systems it is possible to produce glasses with cooling rates as low as 100 K/s. At such low cooling rates, there is an opportunity to produce amorphous solids through industrial processes such as thermal spray-formed coatings. Moreover, since cooling rates in typical thermal spray processing exceed 1000 K/s, novel alloy compositions can be synthesized to maximize corrosion resistance (i.e. adding Cr and Mo) and to improve radiation compatibility (adding B) and still maintain glass forming ability. The applicability of Fe-based amorphous coatings in typical environments where corrosion resistance and thermal stability are critical issues has been examined in terms of amorphous phase stability and glass-forming ability through a coordinated computational analysis and experimental validation. For example, a wedge casting technique has been applied to examine bulk glass forming alloys by combining multiple thermal probes with a measurement based kinetics analysis and a computational thermodynamics evaluation to elucidate the phase selection competition and critical cooling rate conditions. Based upon direct measurements and kinetics modeling it is evident that a critical cooling rate range should be considered to account for nucleation behavior and that the relative heat flow characteristics as well as nucleation kinetics are important in judging ease of glass formation. Similarly, a novel computational thermodynamics approach has been developed to explore the compositional sensitivity of glass-forming ability and thermal stability. Also, the synthesis and characterization of alloys with increased cross-section for thermal neutron capture will be outlined to demonstrate that through careful design of alloy composition it is possible to tailor the material properties of the thermally spray-formed amorphous coating to accommodate the challenges anticipated in typical nuclear waste storage applications over tens of thousands of years in a variety of corrosive environments.
NTIS
Alloys; Amorphous Materials; Corrosion Resistance; Iron Alloys; Radioactive Wastes

20080020430 NASA, Washington, DC USA
Silicon germanium semiconductive alloy and method of fabricating same
Park, Yeonjoon, Inventor; Choi, Sang H., Inventor; King, Glen C., Inventor; March 11, 2008; 6 pp.; In English
Patent Info.: Filed September 27, 2005; US-Patent-7,341,883; US-Patent-Appl-SN-11/242,415; No Copyright; Avail.:
CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080020430

A silicon germanium (SiGe) semiconductive alloy is grown on a substrate of single crystalline Al.sub.2O.sub.3. A {111} crystal plane of a cubic diamond structure SiGe is grown on the substrate's {0001} C-plane such that a <110> orientation of the cubic diamond structure SiGe is aligned with a <1,0,-1,0> orientation of the {0001} C-plane. A lattice match between the substrate and the SiGe is achieved by using a SiGe composition that is 0.7223 atomic percent silicon and 0.2777 atomic percent germanium.
Official Gazette of the U.S. Patent and Trademark Office
Silicon Alloys; Germanium Alloys; Single Crystals; Substrates

27
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*.

20080019802 Naval Postgraduate School, Monterey, CA USA
Effects of Laboratory Rolling Conditions on Continuously Cast AA5083
Thompson, Matthew F; Jun 2007; 59 pp.; In English; Original contains color illustrations
Report No.(s): AD-A477173; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477173

Quick Plastic Forming (QPF) is a recent adaptation of Superplastic Forming (SPE) that allows economical fabrication of complex components using superplastic material. QPF requires refined, equiaxed grains and high-angle grain boundaries in the microstructure to enhance sheet deformation by GBS at the high strain rates involved. This study evaluates the effects of laboratory rolling conditions on continuously cast AA5083 in the hot-band condition in anticipation of QPF.
DTIC
Deformation; Fabrication; Superplasticity

20080020037 North Carolina State Univ., Raleigh, NC USA
A Brief Review of Some Approaches to Hysteresis in Viscoelastic Polymers
Banks, H T; Jan 27, 2008; 15 pp.; In English
Contract(s)/Grant(s): AFOSR-FA9550-04-1-0220
Report No.(s): AD-A477337; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We give a brief review of hysteresis in viscoelastic polymers. The efforts surveyed range from phenomenological to molecular modelling with applications involving recent efforts on elastomers to biotissue.
DTIC
Hysteresis; Polymers; Viscoelasticity

20080020280 DeWitt Ross and Stevens, S.C., Madison, WI, USA
Blocks for Absorption of Collision Energy
Vijay, P. V., Inventor; Gangarao, H. V. S., Inventor; Basto, J. R., Inventor; 7 Jan 05; 20 pp.; In English
Contract(s)/Grant(s): DE-FC26-00FT40598
Patent Info.: Filed Filed 7 Jan 05; US-Patent-Appl-SN-11 031 772
Report No.(s): PB2007-110047; No Copyright; Avail.: CASI: A03, Hardcopy

An energy-absorbing block is described for use as (or in conjunction with) bumpers and similar objects used to receive and dissipate large amounts of impact energy. The block includes an inner core at least partially formed of elastomeric materials, such as rubber from discarded vehicle tires, with the core being at least substantially surrounded by an outer shell which is preferably at least partially formed of a rigid thermoplastic material. The block may also contain a reinforcing layer of material, such as glass fiber or fabric, positioned between the core and the shell or interspersed within the shell. The block may be mounted to a bumper such as a guardrail, and/or to a mounting structure such as a guardrail post or loading dock, via a fastener inserted through a mounting bore in the block.
NTIS
Collisions; Elastomers; Patent Applications; Absorption

20080020521 NASA Langley Research Center, Hampton, VA, USA
Oxygen Plasma Modification of Poss-Coated Kapton(Registered TradeMark) HN Films
Wohl, C. J.; Belcher, M. A.; Ghose, S.; Connell, J. W.; May 18, 2008; 14 pp.; In English; SAMPE '08 Material and Process Innovations: Changing our World, 18-22 May 2008, Long Beach, CA, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 09283704020104; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080020521

The surface energy of a material depends on both surface composition and topographic features. In an effort to modify the surface topography of Kapton(Registered TradeMark) HN film, organic solutions of a polyhedral oligomeric silsesquioxane, octakis(dimethylsilyloxy)silsesquioxane (POSS), were spray-coated onto the Kapton(Registered TradeMark)

HN surface. Prior to POSS application, the Kapton(Registered TradeMark) HN film was activated by exposure to radio frequency (RF)-generated oxygen plasma. After POSS deposition and solvent evaporation, the films were exposed to various durations of RF-generated oxygen plasma to create a topographically rich surface. The modified films were characterized using optical microscopy, attenuated total reflection infrared (ATR-IR) spectroscopy, and high-resolution scanning electron microscopy (HRSEM). The physical properties of the modified films will be presented.
Author
Oxygen Plasma; Surface Energy; Topography; Kapton (Trademark); Siloxanes; Lunar Dust

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*.

20080019779 North Carolina State Univ., Raleigh, NC USA
Multi-Scale Computational Analyses of JP-8 Fuel Droplets and Vapors in Human Respiratory Airway Models
Kleinstreuer, Clement; Oct 31, 2007; 35 pp.; In English
Contract(s)/Grant(s): FA9550-04-1-0422
Report No.(s): AD-A477133; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477133

Using representative human nasal, oral and tracheobronchial airway models, transient 3- D as well as equivalent steady-state solutions have been obtained for the transport and deposition of spherical particles and droplets as well as vapors. It should be noted that equivalence to transient airflow and particle deposition results was achieved by employing matching Reynolds and Stokes numbers for steady-state simulations. Inhalation inlet conditions and aerosol characteristics resembled JP-8 fuel exposure scenarios in most case studies. Specifically, the following major tasks have been accomplished: (i)Airflow and transport/deposition of micron- and nano-size aerosols in representative human nasal airways; (ii) multi-component and/or impure droplet evaporation or hygroscopity; (iii) deposition differences between fuel aerosols (i.e., droplets) vs. vapors; (iv) studies of JP-8 fuel vapor transport and deposition by considering airway wall absorption; and (v) optimal drug- aerosol targeting. The 3-year-project results are documented in 17 peer-reviewed journal articles (14 published and 3 accepted or submitted) and 9 conference papers/presentations. The often quoted articles have a significant impact on toxic/therapeutic aerosol research worldwide.
DTIC
Air Flow; Analysis (Mathematics); Deposition; Drops (Liquids); Jet Engine Fuels; JP-8 Jet Fuel; Respiratory System; Toxicity; Vapors

20080020388 NASA Langley Research Center, Hampton, VA, USA
Gaseous Surrogate Hydrocarbons for a Hifire Scramjet that Mimic Opposed Jet Extinction Limits for Cracked JP Fuels
Pellett, Gerald L.; Vaden, Sarah N.; Wilson, Lloyd G.; May 12, 2008; 38 pp.; In English; 55th JANNAF Propulsion Meeting, 12-16 May 2008, Boston, MA, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 526282.01.07.04.06; Copyright; Avail.: CASI: A03, Hardcopy

This paper describes, first, the top-down methodology used to define simple gaseous surrogate hydrocarbon (HC) fuel mixtures for a hypersonic scramjet combustion subtask of the HiFIRE program. It then presents new and updated Opposed Jet Burner (OJB) extinction-limit Flame Strength (FS) data obtained from laminar non-premixed HC vs. air counterflow diffusion flames at 1-atm, which follow from earlier investigations. FS represents a strain-induced extinction limit based on cross-section-average air jet velocity, U(sub air), that sustains combustion of a counter jet of gaseous fuel just before extinction. FS uniquely characterizes a kinetically limited fuel combustion rate. More generally, Applied Stress Rates (ASRs) at extinction (U(sub air) normalized by nozzle or tube diameter, D(sub n or t) can directly be compared with extinction limits determined numerically using either a 1-D or (preferably) a 2-D Navier Stokes simulation with detailed transport and finite rate chemistry. The FS results help to characterize and define three candidate surrogate HC fuel mixtures that exhibit a common FS 70% greater than for vaporized JP-7 fuel. These include a binary fuel mixture of 64% ethylene + 36% methane, which is our primary recommendation. It is intended to mimic the critical flameholding limit of a thermally- or catalytically-cracked JP-7 like fuel in HiFIRE scramjet combustion tests. Our supporting experimental results include: (1) An

idealized kinetically-limited ASR reactivity scale, which represents maximum strength non-premixed flames for several gaseous and vaporized liquid HCs; (2) FS characterizations of Colket and Spadaccini s suggested ternary surrogate, of 60% ethylene + 30% methane + 10% n-heptane, which matches the ignition delay of a typical cracked JP fuel; (3) Data showing how our recommended binary surrogate, of 64% ethylene + 36% methane, has an identical FS; (4) Data that characterize an alternate surrogate of 44% ethylene + 56% ethane with identical FS and nearly equal molecular weights; this could be useful when systematically varying the fuel composition. However, the mixture liquefies at much lower pressure, which limits on-board storage of gaseous fuel; (5) Dynamic Flame Weakening results that show how oscillations in OJB input flow (and composition) can weaken (extinguish) surrogate flames up to 200 Hz, but the weakening is 2.5x smaller compared to pure methane; and finally, (6) FS limits at 1-atm that compare with three published 1-D numerical OJB extinction results using four chemical kinetic models. The methane kinetics generally agree closely at 1-atm, whereas, the various ethylene models predict extinction limits that average ~ 45% high, which represents a significant problem for numerical simulation of surrogate-based flameholding in a scramjet cavity. Finally, we continue advocating the FS approach as more direct and fundamental for assessing idealized scramjet flameholding potentials than measurements of 'unstrained' premixed laminar burning velocity or blowout in a Perfectly Stirred Reactor.

Author

Hydrocarbon Fuels; Supersonic Combustion Ramjet Engines; Jet Engine Fuels; Extinction; Combustion Chemistry; Fuel Combustion; Hypersonic Combustion; Gaseous Fuels; Binary Mixtures; Diffusion Flames

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*.

20080019740 Naval Surface Warfare Center, Dahlgren, VA USA

Fort Laurdale Branch, Naval Surface Warfare Center

Jan 31, 1998; 31 pp.; In English

Report No.(s): AD-A477054; NSWC-MP-89-244; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA477054

The Fort Lauderdale Branch of the Naval Surface Warfare Center operates the only land-based, deep-water test and evaluation (T&E) facility located on the Eastern Seaboard. Here, NSWC and other research and development activities conduct full-scale trials of air, surface, and underwater weapon systems under a variety of oceanographic conditions. The Fort Lauderdale Branch conducts field trials of air, surface, and underwater ordnance systems in the Atlantic Ocean; recovers test hardware to depths of 200 feet; develops, installs, maintains and operates ship tracking and offshore positioning equipment; installs and maintains a deep-water cable monitoring system; provides weapon assembly and storage areas, technical and support personnel, security, shore tracking and monitoring stations, boats and utility craft to support field trials and provides liaison and coordinates for test-related aircraft and Navy ships visiting Port Everglades.

DTIC

Navy; Ordnance; Warfare; Weapon Systems

20080019741 Naval Surface Warfare Center, Dahlgren, VA USA

1990 Report to the Community

Mar 26, 1990; 34 pp.; In English

Report No.(s): AD-A477056; NSWC-MP-90-105; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA477056

NSWC draws on 70 years of R&D experience to help meet tough surface warfare requirements. From basic research, to fleet support, to advanced system upgrade, we devise innovative concepts to link the offensive and defensive capabilities of ships, submarines, aircraft, and other systems that make up the battle force. While vigorously supporting today's modern surface fleet, NSWC is developing the weapon systems of the 21st century. This Center brings together resources designed to encourage creative teamwork. We exploit the great potential offered by advanced scientific and engineering concepts that were virtually unknown a few short years ago. We are dedicated to providing better weapons for our sailors at sea and to keeping our Navy ahead of the rest. In 1974, the Navy established the Naval Surface Weapons Center as a result of the merger of the Naval Weapons Laboratory at Dahlgren, Virginia and the Naval Ordnance Laboratory at White Oak, Maryland. With that merger came added responsibilities and a greatly expanded mission. From Dahlgren's early work on naval gun systems

and White Oak's underwater mine developments, we evolved into one of the Navy's largest research development, test, and evaluation (RDT&E) centers with a full-spectrum mission in support of the surface Navy. As the Space and Naval Warfare Systems Command's only R&D center with a surface ship warfare mission, NSWC brings experience, dedication, and a tradition of excellence to its work for the surface Navy. In 1987, we changed our name to the Naval Surface Warfare Center Dahlgren, the Center's headquarters, has a land area of 4300 acres that includes Potomac shoreline and a 25-mile downriver range for projectile testing. White Oak encompasses 730 acres. The two sites offer unique test facilities; e.g., anechoic chamber, hydroballistics tank, magnetic ships facility, etc. NSWC also operates major field activities.
DTIC
Ordnance; Weapon Systems

20080019775 Wave Technologies, Inc., Chantilly, VA USA
Custom Ontologies for Expanded Network Analysis
Vanderbilt, Amy K; Strauss, George; Dec 1, 2006; 27 pp.; In English; Original contains color illustrations
Report No.(s): AD-A477129; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477129
No abstract available
Network Analysis

20080019969 Naval Surface Warfare Center, Dahlgren, VA USA
Fort Monroe Test Facility
Jan 1991; 8 pp.; In English
Report No.(s): AD-A477124; NAVSWC-DD-MP-90-164; No Copyright; Avail.: Defense Technical Information Center (DTIC)
This brochure describes the mission and accomplishments of the Monroe Test Facility in Dahlgren, Virginia. The Naval Surface Warfare Center's Fort Monroe Test Facility conducts test and evaluation of a number of weapon systems, subsystems, and components. Located at Fort Monroe, Virginia, adjacent to the Hampton Roads ship channel and the Norfolk Harbor entrance, the Test Facility offers a sheltered, shallow-water harbor range suitable for testing a variety of devices. Originally established to support the Naval Surface Warfare Center's underwater mine development program, the Fort Monroe Test Facility also is available for use by the Department of Defense, other government agencies, and their contractors. The Naval Surface Warfare Center is the Navy's principal research, development, test and evaluation center for surface ship combat systems, ordnance, mines, and strategic systems support. As Center programs reflect increasingly complex modern technology, the Fort Monroe Facility has broadened the scope of its test and evaluation capabilities to include surface target sensors, in-water weapons for special forces, and devices associated with antisubmarine warfare, marine research, and oceanographic research. Today, the Fort Monroe Facility keeps pace with the technology employed in surface warfare systems and actively develops modern techniques for test and evaluation. The facility continues to operate a unique range in which bottom mines, mine sensor systems, and other devices may be tested in their intended environment. For test programs requiring an open-ocean environment, the facility conducts operations at its nearby Fort Story range on the Atlantic Ocean.
DTIC
Evaluation; Navy; System Effectiveness; Test Facilities; Warfare; Weapon Systems

20080019987 Naval Research Lab., Washington, DC USA
Characterization of the Optical Throughput Performance of Navy Prototype Optical Interferometer (NPOI)
Zhang, Xiaolei; Armstrong, J T; Clark, III, James A; Gilbreath, G C; Lucke, Robert; Restaino, Sergio; Mozurkewich, David; Benson, James A; Hutter, Donald J; White, Nat; May 2006; 13 pp.; In English
Report No.(s): AD-A477240; NRL 06-1226-1786; No Copyright; Avail.: Defense Technical Information Center (DTIC)
We have developed an approach for systematically investigating the optical throughput performance of the different segments of a Michelson stellar interferometer, and applied it to the characterization of the Navy Prototype Optical Interferometer (NPOI). We report the results of the first phase of throughput measurements on NPOI, as well as some of the lessons learned. Since the current generation of ground-based optical interferometers all suffers from varying degree of throughput degradation while the dominant causes for throughput loss are expected to vary for each individual instrument, the

methodologies and approaches developed here could be of general use for the quantitative characterization of the throughput performance of the different optical interferometers, a prerequisite for its ultimate improvement.
DTIC
Interferometers; Navy; Optical Measurement; Optical Measuring Instruments; Project Management; Prototypes; Tests

20080020019 Naval Observatory, Washington, DC USA
Rubidium-Fountain Characterization Using the USNO Clock Ensemble
Peil, Steven; Crane, Scott; Swanson, Thomas B; Ekstrom, Christopher R; May 2007; 5 pp.; In English
Report No.(s): AD-A477304; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We have carried out stability comparisons between our rubidium fountain, built as a prototype for a continuously operating clock, and the USNO Maser Mean timescale. Long, continuous runs of the prototype system allow us to demonstrate fractional frequency-stability comparisons to the Maser Mean that integrate as white frequency noise, with a stability of 5 10(exp -16) at one day. We have measured the frequency sensitivity of the rubidium fountain to various experimental parameters in order to establish the regulation required to reach a long-term stability of order 1 10(exp -16).
DTIC
Characterization; Clocks; Frequencies; Rubidium; Stability

20080020020 Naval Observatory, Washington, DC USA
A Practical Guide to Isolation Amplifier Selection
Walls, Warren F; Walls, Fred L; May 2007; 7 pp.; In English
Report No.(s): AD-A477305; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Whether distributing a house standard, adding a distribution module in a larger circuit design, or just working with a measurement system on the bench, one must be aware of how a number of distribution amplifier parameters can make or break an entire system's performance. This paper looks at a high performance quartz oscillator, a hydrogen maser, and a rubidium fountain's performance both in the short-term and long-term to develop a model of the signals that one may want to measure or distribute. Two different classes of distribution amplifiers are then reviewed to see how they compare to the sources presented earlier. The front-to-back isolation and phase noise of a distribution amplifier are not the only important parameters that need to be considered. Other important terms such as the return loss, stability over temperature, port-to-port isolation, differential delay over temperature, construction techniques, and design practices must be taken into account. Most of these parameters can be rigorously related in an equation to deliver an expected level of performance from the system. Typical manufacturing and design practices that are necessary to ensure a reliable device are presented. The goal of the paper being to better equip the reader with the skills to evaluate distribution amplifiers to find the one that best fits the needs and expectations in both reliability and overall system performance.
DTIC
Amplifiers; Isolation

20080020027 Colorado Univ., Boulder, CO USA
An Assessment of Relativistic Effects for Low Earth Orbiters: The GRACE Satellites
Larson, Kristine M; Ashby, Neil; Hackman, Christine; Bertiger, Willy; Jan 2007; 8 pp.; In English
Report No.(s): AD-A477321; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The GRACE mission consists of two identical satellites orbiting the Earth at an altitude of <500 km. Dual-frequency carrier-phase Global Positioning System (GPS) receivers are flying on both satellites. They are used for precise orbit determination and to time-tag the K-band ranging system used to measure changes in the distances between the two satellites. The satellites are also flying ultra-stable oscillators (USOs) to achieve the mission's need for short-term (<1 s) oscillator stability. Because of the high quality of both the GPS receivers and the oscillators, relativistic effects in the GRACE GPS data can be examined. An expression is developed for relativistic effects that explicitly includes the effects of the Earth's oblateness (J2). Use of this expression significantly reduces the twice per orbital period energy in the GRACE clock solutions, indicating that the effect of J2 can be significant and should be modeled for satellite clocks in low Earth orbit. After relativistic effects have been removed, both GRACE USOs show large (2 ns to 3 ns) once per orbital period signatures that correlate with voltage variations on the spacecraft.
DTIC
Clocks; Frequencies; Relativistic Effects; Scientific Satellites; Time; Variations

20080020029 Naval Surface Warfare Center, Dahlgren, VA USA

Career Growth Opportunities for Scientists and Engineers

Sep 1, 1990; 7 pp.; In English

Report No.(s): AD-A477327; NAVSWC-MP-90-156; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The single most critical determinant of the success of the Naval Surface Warfare Center (NSWC) is the appropriate selection, development, and retention of highly trained Scientists and Engineers. By acknowledging that people have individual interests, abilities, styles, and needs, the NSWC understands the importance of being responsive to the career aspirations of these key personnel. The purpose of this pamphlet is to provide an overview of the opportunities for career growth for Scientists and Engineers at the NSWC, Dahlgren, Virginia. Management is committed to providing employees with challenging and varied developmental assignments that will stimulate their intellectual and experiential growth. Through an aggressive educational and training program and with appropriate recognition and rewards for technical accomplishments, the NSWC will strive to motivate its Scientists and Engineers to advance as far as their capabilities and interests will take them. Whatever career option these employees choose, the opportunities are there for them to have a significant impact on the business and future direction of the NSWC and the Navy. Career focus is a concept that attempts to distinguish between areas of technical leadership. The Center provides opportunities for growth in three career focus areas: Science and Engineering, Project and Program Management, and Line Management.

DTIC

Engineers; Navy; Occupation; Personnel; Scientists

20080020030 Naval Surface Warfare Center, Dahlgren, VA USA

A Strategic Perspective on the Future of the Naval Surface Warfare Center: Today's Commitments, Tomorrow's Challenges

May 1988; 22 pp.; In English

Report No.(s): AD-A477329; NAVSWC-MP-88-129; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Naval Surface Warfare Center (NSWC), Dahlgren, Virginia, is at a crucial point in its history. We are striving to chart a course into the future that will build on our past strengths, develop new capabilities, assure our continued contribution to the Navy -- and to do all of this in a time of uncertainty about what the future holds. The complex environment in which we operate has changed -- and will continue to change, in ways that cannot be accurately predicted. But there is one aspect of our future that is both certain and timeless. We, along with the rest of the in-house Navy research and development community, will continue to have a grave responsibility: to serve as the 'technical conscience' of the Navy in acquiring the warfighting capabilities needed to protect our Nation's security. This is our continuing and overriding purpose. At the same time, we have near-term obligations and commitments to those we serve most directly -- the sponsors of our current programs -- and while these often take priority, we must never let them take precedence over our fundamental purpose. This is the most significant challenge facing management at all levels at the Center -- to recognize and understand the difference between what is good for the Navy in the short run and what is best for the Navy in the long run, and to act in accordance with the long-term view. This publication is divided into the following sections: NSWC's Purpose and Operating Philosophy; NSWC's Approach to Planning; the Future Character of the Center; the Future Posture of the Center; Future Directions in Sector Guidance and Department Guidance; the Center's Goals; Management Issues; Near-Term Objectives with Regard to Strategic Management, Internal Administration, and External Operations; Resource Boards; the Role of the Individual Employee; and A Retrospective Look at the Future.

DTIC

Evaluation; Management Planning; Navy; System Effectiveness; Warfare; Weapon Systems

20080020050 Naval Surface Warfare Center, Dahlgren, VA USA

Revolution at Sea Starts Here. A 1987 History of the Naval Surface Warfare Center

Humphrey, Sylvia G; Berlinski, Edward G; Miller, Cynthia; Mar 1, 1988; 130 pp.; In English; Original contains color illustrations

Report No.(s): AD-A477365; NSWC-AP-88-50; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This Command History records the major activities and achievements of the Naval Surface Warfare Center during the calendar year 1987, submitted in compliance with OPNAVINST 5750.12D of 17 Nov 1987. The report covers corporate issues and studies, highlights of major technical achievements, and presents assessments of their impact on the Navy. The History

discusses the state of the technology base followed by a list of awards and honors received by NSWC employees. Additional documentation - an integral part of this command history - is presented in the Appendices.
DTIC
Navy; Seas; Warfare

20080020051 Naval Surface Weapons Center, Dahlgren, VA USA
The Bennett Years: The Development of the Modern Naval Ordnance Laboratory
Bennett, Ralph D; Jun 19, 1987; 29 pp.; In English
Report No.(s): AD-A477366; NSWC-MP-87-150; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This publication is a reprinted version of a historical series that originally appeared in 'On the Surface,' the official periodical of the Naval Surface Weapons Center, during the period 9 September 1983 through 29 June 1984. Together, these articles describe the phenomenal growth of the modern Naval Ordnance Laboratory (NOL) from a small shop in the Washington Navy Yard to one of the Navy's premier research and development organizations. The Naval Ordnance Laboratory was one of the two major laboratories (the other being the Naval Weapons Laboratory, Dahlgren, Virginia) that were merged in 1974 to create the Naval Surface Weapons Center. Dr. Ralph D. Bennett came to NOL in 1940 and quickly became, in succession, Head of Mine Development, Director of Technical Development, and Technical Director by 1945. He was made civilian Technical Director in 1947, retiring in 1954 to be succeeded by Dr. Gregory K. Hartmann. Dr. Bennett was a man uniquely placed to bring about significant changes in the way the Navy handled its research and development in those early years. Having both a Captain's rank and a respected technical background, he played a major role in the development of the Military-civilian partnership at NOL, and saw its use accepted universally in the rest of the Navy's R&D management. The Navy-wide system of Commander/Technical Director management owes its origins to Dr. Bennett. This publication is issued on the occasion of the Naval Surface Weapons Center's third Technology Symposium, during which the White Oak auditorium is dedicated in recognition of Dr. Bennett's accomplishments, both technical and managerial.
DTIC
Antiship Warfare; Leadership; Navy; Ordnance; Warfare

20080020298 Naval Surface Warfare Center, Dahlgren, VA USA
1992 Report to the Community
Apr 20, 1992; 34 pp.; In English
Report No.(s): AD-A477060; NSWCDD/MP-92/179; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477060

The mission of the Naval Surface Warfare Agency, Dahlgren Division, Dahlgren, Virginia is to provide research, development, test and evaluation, engineering, and fleet support for surface warfare systems, surface ship combat systems, ordnance, mines, amphibious warfare systems, mine countermeasures, special warfare systems, and strategic systems.
DTIC
Ordnance; Navy; Oceanography

20080020441 Boeing Co., Chicago, IL USA
Integral resonator gyroscope
Shcheglov, Kirill V., Inventor; Challoner, A. Dorian, Inventor; Hayworth, Ken J., Inventor; Wiberg, Dean V., Inventor; Yee, Karl Y., Inventor; March 25, 2008; 47 pp.; In English
Patent Info.: Filed August 8, 2005; US-Patent-7,347,095; US-Patent-Appl-SN-11/199,004; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080020441

The present invention discloses an inertial sensor having an integral resonator. A typical sensor comprises a planar mechanical resonator for sensing motion of the inertial sensor and a case for housing the resonator. The resonator and a wall of the case are defined through an etching process. A typical method of producing the resonator includes etching a baseplate, bonding a wafer to the etched baseplate, through etching the wafer to form a planar mechanical resonator and the wall of the case and bonding an end cap wafer to the wall to complete the case.
Official Gazette of the U.S. Patent and Trademark Office
Resonators; Gyroscopes; Detection; Bonding; Etching

32
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*.

20080019809 Defence Research and Development Canada, Toronto, Ontario Canada

Application of Hierarchical Goal Analysis to the Halifax Class Frigate Operations Room: A Case Study

Chow, Renee; Crebolder, Jacquelyn M; Kobierski, Robert D; Coates, Curtis E; Nov 2007; 44 pp.; In English; Original contains color illustrations

Report No.(s): AD-A477182; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA477182

This paper reports on the first application of Hierarchical Goal Analysis (HGA) [1], a relatively new approach to requirements analysis for complex systems, to naval command and control. HGA, applied to 11 positions of the Canadian Forces Halifax Class Frigate operations room, decomposed three top-level goals to a full goal hierarchy of 563 goals. The hierarchy ranged from four to nine levels deep, with an operator assigned to each goal. The HGA process concluded with a stability analysis for identifying potential goal conflicts and an upward flow analysis for identifying requirements for feedback between operators. An examination of the stability analysis revealed that the current design of the operations room includes few sources of instability where multiple operators compete for control of the same variable. The upward flow analysis revealed that the requirement for feedback from operators assigned to lower-level goals to operators assigned to higher-level goals is relatively high, and the operations room could benefit from review and redesign. The goal hierarchy, operator assignments, stability and upward flow analyses, and proposed solutions were reviewed by subject matter experts. While used to model an existing system, the present application of HGA appears to be especially useful in providing a basis for evaluating a system design and developing design recommendations.

DTIC

Command and Control; Military Operations

20080020031 Naval Postgraduate School, Monterey, CA USA

Wireless Sensor Network: Channel Propagation Measurements and Comparison With Simulation

Alzaghal, Mohamad H; Jun 2006; 83 pp.; In English; Original contains color illustrations

Report No.(s): AD-A477330; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Wireless Sensor Networks (WSNs) is an important field of study as more and more applications are enhancing daily life. The technology trend is to achieve small-sized, cheap, and power efficient sensor nodes, which will make the system reliable and efficient. The Crossbow Technologies MICAz mote is an example used in this thesis. Measurements for its propagation characteristics in a realistic environment will help the deployment and installation of these motes to form a WSN. The CST Microwave Studio is used to build a simulation for the MICAz. The Rhino software is used to build Spanagel Hall, which is the location of the simulation. All of these elements are integrated in Urbana. Urbana is a simulation tool used to simulate the propagation decay around the mote and investigate the irregularity of the electromagnetic field for the indoor environment of the motes. The results and comparisons between empirical and simulated data are intended for assisting in the design and future studies and deployment of WSNs in the real world.

DTIC

Communication Networks; Computer Programs; Radiotelephones; Simulation

20080020264 Naval Observatory, Washington, DC USA

The Statistics of GPS

Matsakis, Demetrios; Jan 2007; 9 pp.; In English

Report No.(s): AD-A477268; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Global Positioning System (GPS) is an extremely effective satellite-based system that broadcasts sufficient information for a user to determine time and position from any location on or near the Earth. The fundamental GPS measurement is the corrected time of the satellite clock relative to the receiver clock. This paper uses publicly available information to present a statistical analysis of the underlying timescale and clock performance, which can be largely presented

without recourse to the many significant and interesting scientific corrections and parameterized models that could or must be applied to the data.
DTIC
Global Positioning System; Statistical Analysis; Position (Location); Broadcasting

20080020267 Andhra Univ., VISHAKHAPATNAM, India
Morphological Characteristics of L-Band Scintillations and Their Impact on GPS Signals - A Quantitative Study on the Precursors for the Occurrence of Scintillations
Rao, P V; Ram, S T; Krishua, S G; Niranjan, K; Prasad, D S; Jun 1, 2006; 80 pp.; In English; Original contains color illustrations
Report No.(s): AD-A476986; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476986
No abstract available
Global Positioning System; Ionospheric Propagation; Morphology; Scintillation; Ultrahigh Frequencies

20080020329 Tope-McKay and Associates, Malibu, CA, USA
Method and Apparatus for Increasing Fault Tolerance for Cross-Layer Communication in Networks
Ahmed, M., Inventor; Dao, S., Inventor; Feb. 3, 2004; 30 pp.; In English
Contract(s)/Grant(s): ONR-N00014-99-C-0322
Patent Info.: Filed Filed 3 Feb 04; US-Patent-Appl-SN-10-772 138
Report No.(s): PB2007-111934; No Copyright; Avail.: CASI: A03, Hardcopy
A method, apparatus, and computer program product are presented for providing a measure of fault tolerance and security in the operation of cross layer communication agents (CCA) in a hybrid network. Specifically, this method, apparatus and computer program provide the detection and control necessary to prevent network disruptions due to failures, attacks, or link unavailability.
NTIS
Communication Networks; Fault Tolerance; Patent Applications

20080020349 Department of Homeland Security, Washington, DC, USA
Safecom: 2006 National Interoperability Baseline Survey
Dec. 2006; 182 pp.; In English
Report No.(s): PB2007-112178; No Copyright; Avail.: National Technical Information Service (NTIS)
In May 2006, the Department of Homeland Security (DHS) announced plans to conduct a landmark study of public safety wireless communications interoperability in the Nation. Commissioned as part of the ongoing efforts of the SAFECOM program to improve public safety wireless communications, and building upon past work in this subject area, this study brings a new scope and breadth to the subject matter.
NTIS
Emergencies; Interoperability; Management Methods; Safety; Security; Surveys; Wireless Communication

20080020361 Department of Homeland Security, Washington, DC, USA
Tactical Interoperable Communications Scorecards Summary Report and Findings
Jan. 2007; 170 pp.; In English
Report No.(s): PB2007-112014; No Copyright; Avail.: National Technical Information Service (NTIS)
The tactical interoperable communications scorecard assesses the maturity of tactical interoperable communications capabilities in 75 urban/metropolitan areas. These scorecards were developed by subject matter expert panels that reviewed documentation on current communications plans, exercises, and a self-assessment to arrive at consensus findings and recommendations for each region on how to best improve that regions communications capabilities. These scorecards and the recommendations included are being distributed directly to each of the urban/metropolitan areas to focus their regional efforts to improve tactical interoperable communications. The Department of Homeland Security (DHS) is using these scorecards to focus technical assistance programs and target specific areas of improvement in communications interoperability. Overall, the scorecard results show that urban/metropolitan areas have come a long way in improving their tactical interoperable communications capabilities. As documented in the SAFECOM National Baseline Assessment, the technology exists to permit interoperable communications, but solutions are often not available regionally and are far from seamless in many areas.

Continued training on available technical solutions and procedures for their use is critical to operational success. Even in areas that have demonstrated success at the tactical, command level of communications interoperability, there is still work to be done. Multi-agency communications have been addressed within many of these jurisdictions, but regionalizing the existing communications strategies to identify longer term interoperability goals across multiple jurisdictions and levels of government still needs to be addressed.
NTIS
Security; Education; Panels

20080020427 Honeywell International, Inc., Morristown, NJ USA
Low power switching for antenna reconfiguration
Bauhahn, Paul E., Inventor; Becker, Robert C., Inventor; Meyers, David W., Inventor; Muldoon, Kelly P., Inventor; February 26, 2008; 12 pp.; In English
Patent Info.: Filed October 18, 2005; US-Patent-7,335,871; US-Patent-Appl-SN-11/253,188; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080020427

Methods and systems for low power switching are provided. In one embodiment, an optical switching system is provided. The system comprises at least one optically controlled switch adapted to maintain one of an open state and a closed state based on an associated light signal; and at least one light source adapted to output the associated light signal to the at least one switch, wherein the at least one light source cycles the light signal on and off, wherein the at least one light source is cycled on for a sufficient duration of time and with a sufficient periodicity to maintain the optically controlled switch in one of an open state and a closed state.
Official Gazette of the U.S. Patent and Trademark Office
Optical Switching; Antenna Design; Periodic Variations; Cycles

33
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*.

20080018944 Howard Univ., Washington, DC USA
Gesture Recognition Development for the Interactive Datawall
Vira, Naren; Jan 2008; 27 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8750-05-C-0257; Proj-NASA
Report No.(s): AD-A476884; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476884

Hand gestures provide a useful interface for humans to interact with not only other humans but also machines. Especially for a high degree-of-freedom manipulation tasks such as the operation of 3D objects in virtual scenes, the traditional interface composed of a keyboard and mouse is neither intuitive nor easy to operate. In collaborative environments using large screen displays for display of both 3D and 2D information, participants would benefit greatly from an interface that is unencumbered, natural, and effective for communication during discussions. The goal of this project was to investigate the feasibility of implementing an image triangulation technique to track the position of a passive device pointing towards a large screen display.
DTIC
Display Devices; Images; Triangulation

20080019967 Naval Undersea Warfare Center, Newport, RI USA
Auto-Catalytic Oscillators for Locomotion of Underwater Vehicles
Bandyopadhyay, Promode R, Inventor; Feb 5, 2008; 82 pp.; In English
Report No.(s): AD-D020323; No Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/100.2/ADD020323

A system is provided to control maneuvering flapping foils of an underwater vehicle. An oscillator generates periodic signals in which effects of external disturbances are minimized or amplified as required; the periodic signal can be either

sinusoidal or can depart significantly from a sinusoid; the amplitude and frequency are varied by changing the oscillator parameters and the phase between the signals are varied by changing the parameters. The oscillator restores the parameters after a disturbance. Since the oscillator functions without external sensors, the oscillator serves as an inner-loop controller with a centralized control. An open loop control architecture for the controller, results in a motion where the vehicle maneuvers execute as force and moment commands. The non-linear, auto-catalytic oscillator can be realized using a variety of second-order differential equations. An oscillator model is added to a conventional motor control, where the outputs of the oscillator control the foils in real-time.

DTIC

Control; Flapping; Locomotion; Nonlinear Systems; Oscillators; Patent Applications; Underwater Vehicles

20080019990 Washington State Univ., Pullman, WA USA

Characterization and Development of Advanced Materials: Role & Understanding of Interfacial Phenomena (Congressional)

Gupta, Yogendra M; Eilers, Hergen; Chaudhuri, Santanu; Exarhos, Gregory; Dec 2007; 18 pp.; In English

Contract(s)/Grant(s): N00014-03-1-0247; Proj-03PR04586-00

Report No.(s): AD-A477244; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The overall work focused on Nanophase Enhanced Optical Devices. Two projects Transparent Ceramics for Infrared Window and Laser Applications, and Broadband-Absorbing Polymer-Metal Nanocomposites for Photovoltaic Applications comprised this effort. The objectives for the first project were (i) to fabricate transparent yttria ceramics from commercially available nanopowder with a grain size significantly smaller than 100 micrometer and a transmittance in the infrared close to the theoretical maximum; and (ii) to fabricate polycrystalline Er,Yb:Y(2)O(3) ceramics, suitable as solid-state laser materials in the eye- safe wavelength range. The objective for the second project was to fabricate an organic photovoltaic device that absorbs solar radiation between 400 nm and 2500 nm and has a power conversion efficiency of 5% or better. A research laboratory was set up to synthesize, process, and characterize ceramic materials and polymer-metal nanocomposites. A transparent yttria ceramic with an average grain size of about 20 micrometer and good optical transparency was prepared and characterized. Yttria nanoparticles codoped with erbium and ytterbium were successfully prepared and characterized. Polymer-metal nanocomposites were successfully prepared and it was demonstrated that their absorption spectrum can be tailored to match the solar radiation.

DTIC

Light Emitting Diodes; Nanotechnology; Photovoltaic Effect; Solid Oxide Fuel Cells

20080019997 Advanced Ceramics Research, Inc., Tucson, AZ USA

High Strength Carbide-Based Fibrous Monolith Materials for Solid Rocket Nozzles

Blaine, Jeanette M; Patterson, Mark; Zhang, Xiaohong; Hilmas, Greg; Fehrenholtz, Bill; Feb 19, 2008; 67 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): HQ0006-05-C-7264

Report No.(s): AD-A477269; No Copyright; Avail.: Defense Technical Information Center (DTIC)

'Next generation' aluminized propellants have become more energetic in order to impart a higher specific impulse to the system, resulting in higher temperatures and pressures that need to be contained. Nozzles are exposed to temperatures of up to 6100 F (3371 C) during aluminized propellant burn. Additionally, these propellants produce very hostile, abrasive environments; existing materials for boost throat applications have been shown to erode at unacceptable rates, leading to a loss in performance due to throat widening. Implementation of these propellants for boost and thrust applications requires the development of a new family of materials providing structural integrity, thermal protection, and low- or near-zero ablation rates above 3000 C. Erosion resistant nozzles which can maintain dimensional stability during firing are required. Erosion in these systems can be attributed to the reactive environment, mechanical erosion, and spalling due to thermal shock. Appropriate material selection and architectural design can both be utilized to minimize erosion due to all three of these factors.

DTIC

Carbides; Fibers; High Strength; Rocket Nozzles

20080020080 State Univ. of New York, NY USA

Reliability of Next Generation Power Electronics Packaging Under Concurrent Vibration, Thermal and High Power Loads

Basaran, Cemal; Feb 2008; 273 pp.; In English

Contract(s)/Grant(s): N00014-04-1-0778; Proj-04PR13845-00

Report No.(s): AD-A477466; SUNY-001; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This final report presents a study on predicting reliability of next generation power electronics packaging, under high power loads. The study entails computational simulation modeling of power electronics packaging under high current density, high temperature gradient, high temperature and mechanical loads. Computer simulations are used for various scenarios to predict life time to failure and predictions are compared against actual experimental field data to validate the models.

DTIC

Component Reliability; Concurrent Engineering; Electronic Equipment; Loads (Forces); Packaging; Reliability; Turbogenerators; Vibration

20080020214

Shock Wave / Boundary Layer Interaction Experiment on Control Surface

Schlamp, Stefan; Prochazka, Lukas; Rosgen, Thomas; Jun 1, 2007; 23 pp.; In English; Original contains color illustrations

Report No.(s): AD-A476494; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA476494

No abstract available

Boundary Element Method; Boundary Layers; Control Surfaces; Shock Waves

20080020282 Haynes and Boone, LLP, Dallas, TX, USA

Compact Microcolumn for Automated Assembly

Sain, R., Inventor; Jandric, Z., Inventor; 12 Mar 04; 16 pp.; In English

Contract(s)/Grant(s): DAAH01-03-C-R217

Patent Info.: Filed Filed 12 Mar 04; US-Patent-Appl-SN-10 799 836

Report No.(s): PB2007-110044; No Copyright; Avail.: CASI: A03, Hardcopy

A microcolumn including an assembly substrate and a plurality of beam modification components. The assembly substrate includes a plurality of sockets, and the beam modification components each include a connector coupled to a corresponding one of the sockets. Assembly of the beam modification components to the assembly substrate may employ automation and/or automated calibration, including automated motion of robotic stages in a substantially automated manner.

NTIS

Electron Beams; Patent Applications

20080020306 California Univ., San Diego, La Jolla, CA USA

Left Handed Materials Research for Air Force Applications

Schultz, Sheldon; Jan 2, 2008; 4 pp.; In English

Contract(s)/Grant(s): FA9550-04-1-0146

Report No.(s): AD-A477158; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA477158

The words ‘Left Handed Materials’ in the Title were one early way of expressing what is now termed ‘Negative Index (of refraction) Metamaterials’ or NIMs In our proposal for this grant we focused on four general Goals: (1) Lowering the losses for the wire and SRR (split ring resonators) based unit cell construction designed to produce a desired negative permittivity (c) and negative permeability (micron) set of values. (2) Extend the theoretical concepts for making new types of NIMs, and then designing the new unit cells by the appropriate numerical simulations of Maxwell’s Equations. (3) Extend the range of NIM frequencies from THz to the Infrared and potentially the optical. (4) Find Applications of interest to the Air Force using improved negative permittivity and negative permeability unit cells. We summarize the examples of the progress made and discussed in the previous three Progress Reports in the Technical Final Performance Report attached herein.

DTIC

Resonators; Refractivity; Military Operations; Military Technology

20080020366 Hewlett-Packard Co., Fort Collins, CO, USA

Nanoscale Interconnection Interface

Kuekes, P. J., Inventor; Robinett, J. W., Inventor; Seroussi, G., Inventor; Williams, R. S., Inventor; 26 Apr 05; 105 pp.; In English

Contract(s)/Grant(s): DARPA-MDA972-01-3-005

Patent Info.: Filed Filed 26 Apr 05; US-Patent-Appl-SN-11-115 887

Report No.(s): PB2007-111935; No Copyright; Avail.: CASI: A06, Hardcopy

One embodiment of the present invention provides a demultiplexer implemented as a nanowire crossbar or a hybrid nanowire/microscale-signal--line crossbar with resistor-like nanowire junctions. The demultiplexer of one embodiment provides demultiplexing of signals input on k microscale address lines to 2(sup k) or fewer nanowires, employing supplemental, internal address lines to map 2(sup k) nanowire addresses to a larger, internal, n-bit address space, where n>k. A second demultiplexer embodiment of the present invention provides demultiplexing of signals input on n microscale address lines to 2(sup k) nanowires, with n>k, using 2(sup k), well-distributed, n-bit external addresses to access the 2(sup k) nanowires. Additional embodiments of the present invention include a method for evaluating different mappings of nanowire addresses to internal address-spaces of different sizes, or to evaluate mappings of nanowires to external address-spaces of different sizes, metrics for evaluating address mapping and demultiplexer designs, and demultiplexer design methods.

NTIS

Nanotechnology; Nanowires; Patent Applications

20080020434 NASA, Washington, DC USA

Schottky barrier diode and method thereof

Aslam, Shahid, Inventor; Franz, David, Inventor; March 11, 2008; 12 pp.; In English

Patent Info.: Filed September 30, 2005; US-Patent-7,341,932; US-Patent-Appl-SN-11/251,531; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080020434

Pt/n.sup.-GaN Schottky barrier diodes are disclosed that are particularly suited to serve as ultra-violet sensors operating at wavelengths below 200 nm. The Pt/n.sup.-GaN Schottky barrier diodes have very large active areas, up to 1 cm.sup.2, which exhibit extremely low leakage current at low reverse biases. Very large area Pt/n.sup.-GaN Schottky diodes of sizes 0.25 cm.sup.2 and 1 cm.sup.2 have been fabricated from n.sup.-/n.sup.+ GaN epitaxial layers grown by vapor phase epitaxy on single crystal c-plane sapphire, which showed leakage currents of 14 pA and 2.7 nA, respectively for the 0.25 cm.sup.2 and 1 cm.sup.2 diodes both configured at a 0.5V reverse bias.

Official Gazette of the U.S. Patent and Trademark Office

Schottky Diodes; Vapor Phase Epitaxy; Low Currents; Single Crystals

20080020435 California Inst. of Tech., Pasadena, CA USA

Cross-differential amplifier

Hajimiri, Seyed-Ali, Inventor; Kee, Scott D., Inventor; Aoki, Ichiro, Inventor; March 11, 2008; 14 pp.; In English

Patent Info.: Filed December 12, 2006; US-Patent-7,342,457; US-Patent-Appl-SN-11/638,639; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080020435

A cross-differential amplifier is provided. The cross-differential amplifier includes an inductor connected to a direct current power source at a first terminal. A first and second switch, such as transistors, are connected to the inductor at a second terminal. A first and second amplifier are connected at their supply terminals to the first and second switch. The first and second switches are operated to commutate the inductor between the amplifiers so as to provide an amplified signal while limiting the ripple voltage on the inductor and thus limiting the maximum voltage imposed across the amplifiers and switches.

Official Gazette of the U.S. Patent and Trademark Office

Differential Amplifiers; Voltage Amplifiers; Electric Potential; Transistors; Direct Current

20080020443 Illinois Univ., Urbana, IL USA
Sensor chip and apparatus for tactile and/or flow sensing
Liu, Chang, Inventor; Chen, Jack, Inventor; Engel, Jonathan, Inventor; April 15, 2008; 38 pp.; In English
Contract(s)/Grant(s): NAG5-8781
Patent Info.: Filed June 4, 2004; US-Patent-7,357,035; US-Patent-Appl-SN-10/861,096; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080020443

A sensor chip, comprising a flexible, polymer-based substrate, and at least one microfabricated sensor disposed on the substrate and including a conductive element. The at least one sensor comprises at least one of a tactile sensor and a flow sensor. Other embodiments of the present invention include sensors and/or multi-modal sensor nodes.
Official Gazette of the U.S. Patent and Trademark Office
Detection; Chips; Sensors; Substrates

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*.

20080018951 Army Missile Command, Redstone Arsenal, AL USA
Error Estimation for Three Turbulence Models: Incompressible Flow
Vaughn, Jr, Milton F; Jan 2008; 27 pp.; In English; Original contains color illustrations
Report No.(s): AD-A476651; TR-AMR-SS-08-12; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476651

In order to facilitate the application of Computational Fluid Dynamics (CFD) tools by aerodynamic designers, an assessment of error was made for the Menter Shear Stress Transport (SST), Spalart-Allmaras, and Nichols-Nelson Hybrid (RANS/LES) SST turbulence models. The assessment was made for incompressible flow over a smooth flat plate of unit length. Correlations of the error in drag coefficient with initial grid point spacing, expressed in terms of y+, were discovered for each model. It was found that the correlations were nonlinear and could be expressed in terms of the sine function.
DTIC
Error Analysis; Errors; Incompressible Flow; Turbulence

20080019738 West Virginia Univ., Morgantown, WV USA
Prediction of Turbulent Mixing at the Interface of Density Stratified, Shear Flows Using CFD
Umbel, Matthew R; Jan 1998; 201 pp.; In English
Report No.(s): AD-A477048; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477048

Density stratified, shear flows are a common flow phenomena that occur in many engineering applications. Using the commercial code CFX 4.1, several numerical simulations were performed involving various stratified shear flows that have been investigated experimentally. One set of experiments dealt with homogeneous shear, involving fresh water and brine, which are miscible fluids. The other set of experiments dealt with a developing shear layer, involving two immiscible fluids, namely fresh water and diesel fuel. Of primary interest in these simulations was the ability to predict trends for the interfacial thickness and local characteristic Richardson numbers. After these verification/validation studies, the re-fueling of a compensated fuel/ballast tank, which is partially characterized by a shear layer, was also simulated. Compensated fuel/ballast tanks (CFBT) are used in US navy ships and are located in the bottom of the ships. During re-fueling diesel fuel is pumped into a series of tanks through a vertical inlet pipe, forcing the compensating sea water out of the bottom of the tank through an exit pipe, and some of the fuel becomes entrained in the water exiting the tank. Of primary interest in this re-fueling process is the extent to which the fuel and water mix.
DTIC
Ballast (Mass); Computational Fluid Dynamics; Flow; Shear Flow; Shear Properties; Stratification; Tanks (Containers); Turbulent Flow; Turbulent Mixing

20080020046 West Virginia Univ., Morgantown, WV USA

The Development of a Droplet Formation and Entrainment Model for Simulations of Immiscible Liquid-Liquid Flows

Wilson, Wesley M; Jan 1999; 236 pp.; In English

Report No.(s): AD-A477360; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Droplet formation is a common phenomenon in turbulent mixing and has many practical applications. The ability to predict the relative sizes and distributions of fluid droplets formed from mixing events is a complex problem which is dependent on many different parameters including geometric considerations, the nature and physical properties of the fluids in question, turbulence parameters, buoyancy and body forces, and flow history. While there have been many researchers who have analyzed this problem for both liquid-liquid and gas-liquid systems, the present study will focus only on droplet formation in immiscible liquid-liquid systems. A review of the literature has shown that previous attempts at describing fluid droplet sizes essentially fall into two categories: (1) phenomenological models, and (2) statistical models. The use of phenomenological models usually involves semi-empirical analyses of a particular liquid-liquid or gas-liquid system, and typically employs a force balance to determine the conditions under which droplet formation or breakage occurs. Statistical models, on the other hand, utilize flow history and probability density functions to determine the size and number distribution of daughter droplets formed from the splitting of larger droplets or the coalescence of smaller ones. In the present study we will adopt many of the methods of the former set of models, resulting in expressions which determine the sizes of the dispersed phase droplets based on local flow parameters including turbulence quantities, appropriate characteristic length scales, and dimensionless parameters such as the gradient Richardson number. While much of the development of the droplet formation/entrainment (DFE) model comes from results from the literature concerning stratified shear flows, the model can be calibrated through the adjustment of certain constants to conform to a wide variety of flow scenarios.

DTIC

Drops (Liquids); Entrainment; Jet Flow; Multiphase Flow; Shear Flow; Simulation; Turbulent Mixing; Water

20080020088 Naval Postgraduate School, Monterey, CA USA

A CFD Analysis of The Performance of Pin-Fin Laminar Flow Micro/Meso Scale Heat Exchangers

Dimas, Sotirios; Sep 2005; 107 pp.; In English; Original contains color illustrations

Report No.(s): AD-A477485; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A full three dimensional computational study was carried out using a finite-volume based solver for analyzing the performance of pin-fin based micro/meso scale heat exchangers with air as the working fluid. A staggered arrangement of cylindrical pin fins in rectangular channel geometry was used. Various configurations were considered consistent with a parallel experimental study being conducted based on a micro-wind tunnel setup. The pin/channel height used was 0.4 mm, and the pin diameters varied from 0.17-0.50 mm to give hydraulic diameters in the range of 0.13-0.78 mm. This gave volumetric area densities for the heat exchangers in the range of 5-15 mm2/mm3. Various heat exchanger configurations were simulated to determine performance characteristics such as the Nusselt number, friction factor, specific fluid friction power and Mach number in the Reynolds number regime for laminar flows. In addition a detailed numerical diagnosis was carried out to determine local behavior on the pin surfaces, end walls, etc to identify specific characteristics such as regions of high and low heat transfer, locations for possible shock formation, etc. The range of results obtained would be useful for future design of micro heat exchangers for use in small footprint, high heat flux dissipation applications like turbine blade and microelectronic systems.

DTIC

Computational Fluid Dynamics; Fins; Heat Exchangers; Laminar Flow; Pins

20080020290 Pacific Northwest National Lab., Richland, WA, USA

Development of Millimeter-Wave Velocimetry and Acoustic Time-of-Flight Tomography for Measurements in Densely Loaded Gas-Solid Riser Flow

Fort, J. A.; Pfund, D. M.; Sheen, D. M.; Pappas, R. A.; Morgen, G. P.; Apr 2007; 55 pp.; In English

Contract(s)/Grant(s): DE-AC05-76RL01830

Report No.(s): DE2007-908956; No Copyright; Avail.: National Technical Information Service (NTIS)

The MFDRC was formed in 1998 to advance the state-of-the-art in simulating multiphase turbulent flows by developing advanced computational models for gas-solid flows that are experimentally validated over a wide range of industrially relevant conditions. The goal was to transfer the resulting validated models to interested US commercial CFD software vendors, who would then propagate the models as part of new code versions to their customers in the US chemical industry. Since the lack of detailed data sets at industrially relevant conditions is the major roadblock to developing and validating multiphase turbulence models, a significant component of the work involved flow measurements on an industrial-scale riser contributed

by Westinghouse, which was subsequently installed at SNL. Model comparisons were performed against these datasets by LANL. A parallel Office of Industrial Technology (OIT) project within the consortium made similar comparisons between riser measurements and models at NETL. Measured flow quantities of interest included volume fraction, velocity, and velocity-fluctuation profiles for both gas and solid phases at various locations in the riser. Some additional techniques were required for these measurements beyond what was currently available. PNNLs role on the project was to work with the SNL experimental team to develop and test two new measurement techniques, acoustic tomography and millimeter-wave velocimetry. Acoustic tomography is a promising technique for gas-solid flow measurements in risers and PNNL has substantial related experience in this area. PNNL is also active in developing millimeter wave imaging techniques, and this technology presents an additional approach to make desired measurements. PNNL supported the advanced diagnostics development part of this project by evaluating these techniques and then by adapting and developing the selected technology to bulk gas-solids flows and by implementing them for testing in the SNL riser testbed.
NTIS
Acoustic Measurement; Computational Fluid Dynamics; Millimeter Waves; Multiphase Flow; Risers; Solids Flow; Tomography; Two Phase Flow; Velocity Measurement

20080020315 Ohio State Univ., Columbus, OH USA
Localized arc filament plasma actuators for noise mitigation and mixing enhancement
Samimy, Mohammad, Inventor; Adamovich, Igor, Inventor; February 26, 2008; 17 pp.; In English
Contract(s)/Grant(s): NAS3-02116
Patent Info.: Filed September 1, 2004; US-Patent-7,334,394; US-Patent-Appl-SN-10/932,325; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080020315

A device for controlling fluid flow. The device includes an arc generator coupled to electrodes. The electrodes are placed adjacent a fluid flowpath such that upon being energized by the arc generator, an arc filament plasma adjacent the electrodes is formed. In turn, this plasma forms a localized high temperature, high pressure perturbation in the adjacent fluid flowpath. The perturbations can be arranged to produce vortices, such as streamwise vortices, in the flowing fluid to control mixing and noise in such flows. The electrodes can further be arranged within a conduit configured to contain the flowing fluid such that when energized in a particular frequency and sequence, can excite flow instabilities in the flowing fluid. The placement of the electrodes is such that they are unobtrusive relative to the fluid flowpath being controlled.
Official Gazette of the U.S. Patent and Trademark Office
Arc Generators; Electrodes; Fluid Flow; Plasmas (Physics); Noise Reduction

20080020459 ATK Space, Hampton, VA, USA
Analysis of the Effects of Vitiates on Surface Heat Flux in Ground Tests of Hypersonic Vehicles
Cuda, Vincent; Gaffney, Richard L; May 12, 2008; 13 pp.; In English; 55th JANNAF Propulsion Meeting/42nd Combustion/30th Airbreathing Propulsion/30th Exhaust Plume Technology/24th Propulsion Systems Hazards/12th SPIRITS User Group Joint Subcommittee Meeting, 12-16 May 2008, Newton, MA, USA
Contract(s)/Grant(s): NNL07AA00B; WBS 599489.02.07.07.03.01.01; Copyright; Avail.: CASI: A03, Hardcopy

To achieve the high enthalpy conditions associated with hypersonic flight, many ground test facilities burn fuel in the air upstream of the test chamber. Unfortunately, the products of combustion contaminate the test gas and alter gas properties and the heat fluxes associated with aerodynamic heating. The difference in the heating rates between clean air and a vitiated test medium needs to be understood so that the thermal management system for hypersonic vehicles can be properly designed. This is particularly important for advanced hypersonic vehicle concepts powered by air-breathing propulsion systems that couple cooling requirements, fuel flow rates, and combustor performance by flowing fuel through sub-surface cooling passages to cool engine components and preheat the fuel prior to combustion. An analytical investigation was performed comparing clean air to a gas vitiated with methane/oxygen combustion products to determine if variations in gas properties contributed to changes in predicted heat flux. This investigation started with simple relationships, evolved into writing an engineering-level code, and ended with running a series of CFD cases. It was noted that it is not possible to simultaneously match all of the gas properties between clean and vitiated test gases. A study was then conducted selecting various combinations of freestream properties for a vitiated test gas that matched clean air values to determine which combination of parameters affected the computed heat transfer the least. The best combination of properties to match was the free-stream total sensible enthalpy,

dynamic pressure, and either the velocity or Mach number. This combination yielded only a 2% difference in heating. Other combinations showed departures of up to 10% in the heat flux estimate.
Author
Hypersonic Vehicles; Aerodynamic Heating; Ground Tests; Temperature Effects; Propulsion System Configurations; Management Systems; Heat Flux; Fuel Combustion; Fuel Flow

20080020502 NASA Langley Research Center, Hampton, VA, USA
Discrete Roughness Transition for Hypersonic Flight Vehicles
Berry, Scott A.; Horvath, Thomas J.; January 2007; 17 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 732759.07.05
Report No.(s): AIAA Paper 2007-0307; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080020502

The importance of discrete roughness and the correlations developed to predict the onset of boundary layer transition on hypersonic flight vehicles are discussed. The paper is organized by hypersonic vehicle applications characterized in a general sense by the boundary layer: slender with hypersonic conditions at the edge of the boundary layer, moderately blunt with supersonic, and blunt with subsonic. This paper is intended to be a review of recent discrete roughness transition work completed at NASA Langley Research Center in support of agency flight test programs. First, a review is provided of discrete roughness wind tunnel data and the resulting correlations that were developed. Then, results obtained from flight vehicles, in particular the recently flown Hyper-X and Shuttle missions, are discussed and compared to the ground-based correlations.
Author
Boundary Layer Transition; Hypersonic Vehicles; Surface Roughness; Thermal Protection; Hypersonic Reentry; Thermodynamics

20080020503 NASA Langley Research Center, Hampton, VA, USA
Numerical Simulations of a Co-Axial Supersonic-Combusting Free-Jet Experiment
Gaffney, Richard L.; May 12, 2008; 21 pp.; In English; 55th JANNAF/42nd combustion/30th Airbreathing Propulsion/30th Exhaust Plume Technology/24th Propulsion Systems Hazards/12th SPIRITS User Group Joint Subcommittee Meeting, 12-16 May 2008, Newton, MA, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 599489.02.07.07.03.02.01; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080020503

CFD calculations using the Reynolds-averaged Navier-Stokes equations coupled with species continuity equations have been made for a supersonic coaxial-jet CFD-validation experiment to determine the sensitivity of the external flowfield to the main-nozzle exit profile. Four different nozzle exit profiles were used in the study: a uniform profile, one computed using only the nozzle geometry, one computed using the nozzle geometry and part of the upstream facility combustor, and one using the nozzle and the full facility combustor. Two cases were examined using the four profiles: a non-reacting case without coflow and a reacting case with hydrogen coflow. Results show that the nozzle exit profile has a significant effect on the external flowfield. The uniform profile produced the longest jet while the profile created with the full combustor produced the shortest jet. The nozzle-only and part-combustor profiles fell between the other two profiles. The reacting flow was found to be more sensitive to the nozzle exit profile since it affects the downstream mixing and combustion. These calculations indicate the importance of properly setting the nozzle-exit profile for this type of calculation.
Author
Computational Fluid Dynamics; Reacting Flow; Hydrogen; Supersonic Jet Flow; Reynolds Averaging; Free Jets; Combustion Chambers

20080020526 NASA Langley Research Center, Hampton, VA, USA
Simultaneous Temperature and Velocity Measurements in a Large-Scale, Supersonic, Heated Jet
Danehy, P. M.; Magnotti, G.; Bivolaru, D.; Tedder, S.; Cutler, A. D.; May 12, 2008; 13 pp.; In English; 55th JANNAF Propulsion Meeting/42nd Combustion/30th Airbreathing Propulsion/30th Exhaust Plume Technology/ 24th Propulsion Systems Hazards/12th SPIRITS User Group Joint Subcommittee Meeting, 12-16 May 2006, Newton, MA, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 599489.02.07.07.06.02; Copyright; Avail.: CASI: A03, Hardcopy

Two laser-based measurement techniques have been used to characterize an axisymmetric, combustion-heated supersonic

jet issuing into static room air. The dual-pump coherent anti-Stokes Raman spectroscopy (CARS) measurement technique measured temperature and concentration while the interferometric Rayleigh scattering (IRS) method simultaneously measured two components of velocity. This paper reports a preliminary analysis of CARS-IRS temperature and velocity measurements from selected measurement locations. The temperature measurements show that the temperature along the jet axis remains constant while dropping off radially. The velocity measurements show that the nozzle exit velocity fluctuations are about 3% of the maximum velocity in the flow.
Author
Supersonic Jet Flow; Velocity Measurement; Temperature Measurement; Lasers; Rayleigh Scattering; Combustion

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*.

20080018952 Missouri Univ., Rolla, MO USA
Millimeter Wave Holographical Inspection of Honeycomb Composites (Preprint)
Case, J T; Kharkovsky, S; Zoughi, R; Steffes, G; Hepburn, F L; Aug 2007; 9 pp.; In English
Contract(s)/Grant(s): FA8650-04-C-5704; Proj-2865
Report No.(s): AD-A476666; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476666

Multi-layered composite structures manufactured with honeycomb, foam, or balsa wood cores are finding increasing utility in a variety of aerospace, transportation, and infrastructure applications. Due to the low conductivity and inhomogeneity associated with these composites, standard nondestructive testing (NDT) methods are not always capable of inspecting their interior for various defects caused during the manufacturing process or as a result of in-service loading. On the contrary, microwave and millimeter wave NDT methods are well-suited for inspecting these structures since signals at these frequencies readily penetrate through these structures and reflect from different interior boundaries revealing the presence of a wide range of defects such as disbond, delamination, moisture and oil intrusion, impact damage, etc. Millimeter wave frequency spectrum spans 30 GHz - 300 GHz with corresponding wavelengths of 10 - 1 mm. Due to the inherent short wavelengths at these frequencies, one can produce high spatial resolution images of these composites either using real-antenna focused or synthetic-aperture focused methods. In addition, incorporation of swept-frequency in the latter method (i.e., holography) results in high-resolution three-dimensional images. This paper presents the basic steps behind producing such images at millimeter wave frequencies and the results of two honeycomb composite panels are demonstrated at Q-band (33-50 GHz). In addition, these results are compared to previous results using X-ray computed tomography.
DTIC
Composite Materials; Honeycomb Structures; Inspection; Millimeter Waves; Nondestructive Tests

20080019742 Massachusetts Inst. of Tech., Lexington, MA USA
Advanced Narrowband Electromagnetic Size and Shape Determination
Kusiak, S; Feb 15, 2008; 38 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8721-05-C-0002
Report No.(s): AD-A477065; TR-1116; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477065

This report discusses a fundamental radar imaging problem for narrowband electromagnetic waves that extends the recent results originally obtained in [1, 2] in the scalar, or acoustic, setting. In particular we demonstrate the ability to efficiently image three-dimensional convex conducting bodies by using the knowledge of the scattered electric field for one fixed monochromatic illumination of the target. In this problem our knowledge of the scattered electric wave is understood to be in the form of measurements of the amplitude and phase of the tangential components of the radiated electric field (generated by the radar target) on a finite two-dimensional array. We also provide a more general version of this streamlined result that describes imaging of multiply connected nonconvex objects with the same measurements.
DTIC
Electromagnetism; Narrowband; Radar Imagery; Shapes; Size Determination

20080019798 Defence Research and Development Canada, Toronto, Ontario Canada

Distance Estimation to Flashes in a Simulated Night Vision Environment

Morawiec, Garrett; Niall, Keith K; Scullion, Kathleen; Dec 2007; 130 pp.; In English; Original contains color illustrations

Report No.(s): AD-A477161; DRDC-TR-2007-143; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA477161

The Canadian Forces have recognized the importance of simulator training as a cost-effective alternative to real training; yet the effect of display simulation on visual perception is not fully understood. Fighteen subjects participated in an experiment to determine if training, in the form of immediate feedback, improved distance estimation to muzzle flashes in a simulated NVG environment. Testing was performed on a PC desktop computer using software that simulated a large open grassy field. Subjects were exposed to three flash types; five flashes, single flash, and a prolonged flash. Flashes were presented to the subjects both above and below the horizon. Significant improvement was shown in the experimental group's accuracy; this accuracy persisted over two weeks but with notable deterioration. Contrary to expectation the perception of a single flash resulted in significantly greater accuracy than the prolonged flash. This experiment reinforces the effectiveness of simulation as a tool in preparing soldiers. A bibliography of the topic is included.

DTIC

Night Vision; Simulators; Training Devices

20080020035 Washington Univ., Seattle, WA USA

Shipboard Survey Near the Philippines with a Coherent X-Band Radar

Plant, William J; Feb 26, 2008; 7 pp.; In English

Report No.(s): AD-A477335; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The goal of this research was to survey microwave signatures of oceanographic features near the Philippine Island. To do this a dual-polarized, X-band Doppler radar was mounted on a ship cruising near the Philippine Islands and was used to image the surface signatures of oceanographic features. At the same time other investigators collected surface and subsurface data to determine environmental conditions and the characteristics of these features. By analyzing these data set together, we could determine how properties of current gradients, wind, and surface waves affect the observed microwave signatures.

DTIC

Coherent Radar; Philippines; Superhigh Frequencies; Surveys

36
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*.

20080020097 Maryland Univ. Baltimore County, Catonsville, MD USA

Theoretical Study of an Actively Mode-Locked Fiber Laser Stabilized by an Intracavity Fabry-Perot Etalon: Linear Regime

Parkhomenko, Yurij; Horowitz, Moshe; Menyuk, Curtis R; Carruthers, Thomas F; Jul 2007; 11 pp.; In English

Report No.(s): AD-A477501; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We study theoretically the effect of an intracavity etalon on actively mode-locked fiber lasers by solving the master equation for the laser when nonlinearity in the laser is negligible. The first-order dispersion of the material inside the etalon can increase the pulse duration by a factor of 10. The minimum pulse duration is obtained when the relative frequency offset between the free spectral range of the etalon and the modulation frequency of the active mode locking is of the order of 10(exp -2). The group-velocity dispersion of the material inside the etalon as well as the finesse of the etalon affect the total cavity dispersion. The etalon helps to suppress both a simultaneous lasing in several supermodes and lasing in higher-order pulse modes of the master equation. The etalon also helps lock the central wavelength of the laser to the etalon comb.

DTIC

Etalons; Fiber Lasers; Laser Mode Locking; Lasers

20080020313 NASA, Washington, DC USA

Communication using VCSEL laser array

Goorjian, Peter M., Inventor; February 19, 2008; 16 pp.; In English

Patent Info.: Filed June 30, 2004; US-Patent-7,333,735; US-Patent-Appl-SN-10/885,533; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080020313

Ultrafast directional beam switching, using coupled vertical cavity surface emitting lasers (VCSELs) is combined with a light modulator to provide information transfer at bit rates of tens of GHz. This approach is demonstrated to achieve beam switching frequencies of 32-50 GHz in some embodiments and directional beam switching with angular differences of about eight degrees. This switching scheme is likely to be useful for ultrafast optical networks at frequencies much higher than achievable with other approaches. A Mach-Zehnder interferometer, a Fabry-Perot etalon, or a semiconductor-based electro-absorption transmission channel, among others, can be used as a light modulator.

Official Gazette of the U.S. Patent and Trademark Office

Laser Arrays; Laser Cavities; Surface Emitting Lasers

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*.

20080019643 Mississippi State Univ., Mississippi State, MS, USA

Effect of Weld Tool Geometry on Friction Stir Welded AA2219-T87 Properties

Querin, Joseph A.; Schneider, Judy A.; March 09, 2008; 1 pp.; In English; TMS 2008: 137th Annual Meeting and Exhibition, 9-13 Mar. 2008, New Orleans, LA, USA; Copyright; Avail.: Other Sources; Abstract Only

In this study, flat panels of AA2219-T87 were friction stir welded (FSWed) using weld tools with tapered pins The three pin geometries of the weld tools included: 0 (straight cylinder), 30 , and 60 angles on the frustum. For each weld tool geometry, the FSW process parameters were optimized to eliminate defects. A constant heat input was maintained while varying the process parameters of spindle rpm and travel speed. This provided a constant heat input for each FSW weld panel while altering the hot working conditions imparted to the workpiece. The resulting mechanical properties were evaluated from tensile test results of the FSW joint.

Author

Friction Stir Welding; Mechanical Properties; Tensile Tests; Hot Working

20080020303 Christian (Stephen R.), Idaho Falls, ID, USA

Systems for Delivering Liquified Gas to an Engine

Bingham, D. N., Inventor; Wilding, B. M., Inventor; O'Brien, J. E., Inventor; Slahpush, A. S., Inventor; Brown, K. B., Inventor; 13 Apr 05; 25 pp.; In English

Contract(s)/Grant(s): DE-AC07-94ID13223; DE-AC07-99ID12727

Patent Info.: Filed Filed 13 Apr 05; US-Patent-Appl-SN-11-105 767

Report No.(s): PB2007-112181; No Copyright; Avail.: CASI: A03, Hardcopy

A liquified gas delivery system for a motorized platform includes a holding tank configured to receive liquified gas. A first conduit extends from a vapor holding portion of the tank to a valve device. A second conduit extends from a liquid holding portion of the tank to the valve device. Fluid coupled to the valve device is a vaporizer which is in communication with an engine. The valve device selectively withdraws either liquified gas or liquified gas vapor from the tank depending on the pressure within the vapor holding portion of the tank. Various configurations of the delivery system can be utilized for pressurizing the tank during operation.

NTIS

Internal Combustion Engines; Liquefied Gases; Natural Gas; Patent Applications

20080020312 NASA, Washington, DC USA

Self-advancing step-tap tool

Pettit, Donald R., Inventor; Penner, Ronald K., Inventor; Franklin, Larry D., Inventor; Camarda, Charles J., Inventor; April 15, 2008; 13 pp.; In English

Patent Info.: Filed February 3, 2006; US-Patent-7,357,606; US-Patent-Appl-SN-11/357,461; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080020312

Methods and tool for simultaneously forming a bore in a work piece and forming a series of threads in said bore. In an embodiment, the tool has a predetermined axial length, a proximal end, and a distal end, said tool comprising: a shank located at said proximal end; a pilot drill portion located at said distal end; and a mill portion intermediately disposed between said shank and said pilot drill portion. The mill portion is comprised of at least two drill-tap sections of predetermined axial lengths and at least one transition section of predetermined axial length, wherein each of said at least one transition section is sandwiched between a distinct set of two of said at least two drill-tap sections. The at least two drill-tap sections are formed of one or more drill-tap cutting teeth spirally increasing along said at least two drill-tap sections, wherein said tool is self-advanced in said work piece along said formed threads, and wherein said tool simultaneously forms said bore and said series of threads along a substantially similar longitudinal axis.

Official Gazette of the U.S. Patent and Trademark Office

Cavities; Threads; Drills; Drill Bits

20080020350 Kansas State Univ., Manhattan, KS, USA

Report 18: Cost-Effective Reciprocating Engine Emissions Control and Monitoring for E and P Field and Gathering Engines (Technical Report, January 1, 2007-March 31, 2007)

Chapman, K. S.; Nuss-Warren, S. R.; Apr. 2007; 11 pp.; In English

Contract(s)/Grant(s): DE-FC26-02NT15464

Report No.(s): DE2007-908228; No Copyright; Avail.: National Technical Information Service (NTIS)

This report highlights work done on a project intended to lower the cost of environmental compliance and expedite project permitting for Exploration and Production (E&P) operators by identifying, developing, testing, and commercializing emissions control and monitoring technologies. Promising technologies have already been identified and developed. Current work focuses on testing these promising technologies. Specifically, several technologies are being tested in the laboratory for application to lean-burn engines or fully characterized on-site for use with rich-burn engines. Upon completion of these tests, the most cost-effective and robust technologies will be tested in the field and commercialization will ensue. During this quarter, progress in laboratory testing for lean-burn engines included testing an Eco-Jet pre-combustion chamber with a 0.20 orifice and varying fuel supply pressure. Unfortunately, these tests revealed that the engine continues to suffer from operational difficulties. Trends were found in the data collected, though results are not compared to previous data due to the operational difficulties. Work toward characterizing the effectiveness of NSCR systems occurred during this quarter, as well. Several participants have been identified for the NSCR characterization project, and the participants are poised to begin as soon as contractual details are completed. Other progress included work toward developing a data analysis program to automate analysis of the large amounts of data expected to be collected during the NSCR characterization. Additionally, approval for the changes to be made to test sites was received.

NTIS

Combustion Products; Cost Effectiveness; Exhaust Emission; Exhaust Gases; Internal Combustion Engines; Natural Gas; Piston Engines

20080020406 Lawrence Livermore National Lab., Livermore, CA USA

Modeling HCCI using CFD and Detailed Chemistry with Experimental Validation and a Focus on CO Emissions

Hessel, R.; Foster, D.; Aceves, S.; Flowers, D.; Pitz, B.; Apr. 24, 2007; 8 pp.; In English

Report No.(s): DE2007-908904; UCRL-CONF-230240; No Copyright; Avail.: Department of Energy Information Bridge

Multi-zone CFD simulations with detailed kinetics were used to model engine experiments performed on a diesel engine that was converted for single cylinder, HCCI operation, here using iso-octane as the fuel. The modeling goals were to validate the method (multi-zone combustion modeling) and the reaction mechanism (LLNL 857 species iso-octane), both of which performed very well. The purpose of this paper is to document the validation findings and to set the ground work for further analysis of the results by first looking at CO emissions characteristics with varying equivalence ratio.

NTIS

Computational Fluid Dynamics; Computerized Simulation; Diesel Engines; Energy Conversion; Ignition

20080020428

Supercharged two-cycle engines employing novel single element reciprocating shuttle inlet valve mechanisms and with a variable compression ratio

Wiesen, Bernard, Inventor; March 11, 2008; 24 pp.; In English

Contract(s)/Grant(s): NAS3-01035

Patent Info.: Filed July 14, 2006; US-Patent-7,341,040; US-Patent-Appl-SN-11/486,460; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080020428

This invention relates to novel reciprocating shuttle inlet valves, effective with every type of two-cycle engine, from small high-speed single cylinder model engines, to large low-speed multiple cylinder engines, employing spark or compression ignition. Also permitting the elimination of out-of-phase piston arrangements to control scavenging and supercharging of opposed-piston engines. The reciprocating shuttle inlet valve (32) and its operating mechanism (34) is constructed as a single and simple uncomplicated member, in combination with the lost-motion abutments, (46) and (48), formed in a piston skirt, obviating the need for any complex mechanisms or auxiliary drives, unaffected by heat, friction, wear or inertial forces. The reciprocating shuttle inlet valve retains the simplicity and advantages of two-cycle engines, while permitting an increase in volumetric efficiency and performance, thereby increasing the range of usefulness of two-cycle engines into many areas that are now dominated by the four-cycle engine.

Official Gazette of the U.S. Patent and Trademark Office

Internal Combustion Engines; Superchargers; Reciprocation; Volumetric Efficiency; Valves; Engine Design

20080020439 NASA, Washington, DC USA

System and method of analyzing vibrations and identifying failure signatures in the vibrations

Huang, Norden E., Inventor; Salvino, Liming W., Inventor; March 18, 2008; 30 pp.; In English

Patent Info.: Filed September 30, 2005; US-Patent-7,346,461; US-Patent-Appl-SN-11/251,004; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080020439

An apparatus, computer program product and method of analyzing structures. Intrinsic Mode Functions (IMFs) are extracted from the data and the most energetic IMF is selected. A spline is fit to the envelope for the selected IMF. The spline derivative is determined. A stability spectrum is developed by separating the positive and negative results into two different spectra representing stable (positive) and unstable (negative) damping factors. The stability spectrum and the non-linearity indicator are applied to the data to isolate unstable vibrations.

Official Gazette of the U.S. Patent and Trademark Office

Vibration; Identifying; Signatures; Damping; Computer Programs

20080020442 NASA, Washington, DC USA

Underwater vehicle propulsion and power generation

Jones, Jack A., Inventor; Chao, Yi, Inventor; April 8, 2008; 5 pp.; In English

Patent Info.: Filed July 10, 2006; US-Patent-7,353,768; US-Patent-Appl-SN-11/456,441; No Copyright; Avail.: CASI: A01, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080020442

An underwater vehicle includes a shaft with a propeller disposed thereon; a generator/motor having a stator and a rotor, the rotor being operable to rotate with the propeller; at least one energy storage device connected to the generator/motor; and a controller for setting the generator/motor in a charge mode, a propulsion mode and an idle mode.

Official Gazette of the U.S. Patent and Trademark Office

Underwater Vehicles; Propellers; Shafts (Machine Elements); Energy Storage; Controllers

38
QUALITY ASSURANCE AND RELIABILITY

Includes approaches to, and methods for reliability analysis and control, quality control, inspection, maintainability, and standardization.

20080020524 Commonwealth Scientific and Industrial Research Organization, Lindfield, Australia
Development and Evaluation of Sensor Concepts for Ageless Aerospace Vehicles: Report 3 - Design of the Concept Demonstrator
Abbott, David; Ables, Jon; Batten, Adam; Carpenter, David; Collings, Tony; Doyle, Briony; Dunlop, John; Edwards, Graeme; Farmer, Tony; Gaffney, Bruce; Hedley, Mark; Isaacs, Peter; Johnson, Mark; Joshi, Bhautik; Lewis, Chris; Poilton, Geoff; Price, Don; Prokopenko, Mikhail; Reda, Torsten; Rees, David; Scott, Andrew; Seneviratne, Sarath; Valencia, Philip; Wang, Peter; Whitnall, Denis; May 2008; 114 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): L-71346D; WBS 939904.05.07
Report No.(s): NASA/CR-2008-215307; Rept. TIPP 1628; No Copyright; Avail.: CASI: A06, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080020524

This report provides an outline of the essential features of a Structural Health Monitoring Concept Demonstrator (CD) that will be constructed during the next eight months. It is emphasized that the design cannot be considered to be complete, and that design work will continue in parallel with construction and testing. A major advantage of the modular design is that small modules of the system can be developed, tested and modified before a commitment is made to full system development. The CD is expected to develop and evolve for a number of years after its initial construction. This first stage will, of necessity, be relatively simple and have limited capabilities. Later developments will improve all aspects of the functionality of the system, including sensing, processing, communications, intelligence and response. The report indicates the directions this later development will take.
Author
Systems Engineering; Detection; Health; Modules; Intelligence

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*.

20080019645 NASA Langley Research Center, Hampton, VA, USA
NASA Langley's Approach to the Sandia's Structural Dynamics Challenge Problem
Horta, Lucas G.; Kenny, Sean P.; Crespo, Luis G.; Elliott, Kenny B.; January 2007; 29 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): WBS 561581.02.07; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080019645

The objective of this challenge is to develop a data-based probabilistic model of uncertainty to predict the behavior of subsystems (payloads) by themselves and while coupled to a primary (target) system. Although this type of analysis is routinely performed and representative of issues faced in real-world system design and integration, there are still several key technical challenges that must be addressed when analyzing uncertain interconnected systems. For example, one key technical challenge is related to the fact that there is limited data on target configurations. Moreover, it is typical to have multiple data sets from experiments conducted at the subsystem level, but often samples sizes are not sufficient to compute high confidence statistics. In this challenge problem additional constraints are placed as ground rules for the participants. One such rule is that mathematical models of the subsystem are limited to linear approximations of the nonlinear physics of the problem at hand. Also, participants are constrained to use these models and the multiple data sets to make predictions about the target system response under completely different input conditions. Our approach involved initially the screening of several different methods. Three of the ones considered are presented herein. The first one is based on the transformation of the modal data to an orthogonal space where the mean and covariance of the data are matched by the model. The other two approaches worked solutions in physical space where the uncertain parameter set is made of masses, stiffnesses and damping coefficients; one matches confidence intervals of low order moments of the statistics via optimization while the second one uses a Kernel density estimation approach. The paper will touch on all the approaches, lessons learned, validation 1 metrics and their

comparison, data quantity restriction, and assumptions/limitations of each approach. Keywords: Probabilistic modeling, model validation, uncertainty quantification, kernel density
Author
Dynamic Structural Analysis; Statistical Analysis; Systems Engineering; Uncertain Systems; Covariance; Mathematical Models; Kernel Functions

20080019650 NASA Langley Research Center, Hampton, VA, USA
Structural Optimization of Conceptual Aerospace Vehicles
Hrinda, Glenn Andrew; May 13, 2008; 10 pp.; In English; HPSM 2008: 4th International Conference on High Performance Structures and Materials, 13-15 May 2008, The Algarve, Portugal; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 510505.05.07.07.07; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080019650

Aerospace vehicle structures must be optimized for mass to maximize the mission payload. During the conceptual design phase, structures must be optimized to accurately predict the mass of the design. Analysis methods that are used in sizing members should allow for the selection of a variety of metallic and composite materials and user-defined geometry constraints. Rapid vehicle structural analysis is often necessary to improve the fidelity and the results that are obtained during the preliminary design. Recent experiences are highlighted that utilize the Collier Research Corporation's Hypersizer toolset to optimize structural concepts.
Author
Structural Analysis; Aerospace Vehicles; Composite Materials; Structural Design

20080020283 Akron Univ., Akron, OH, USA
Dynamic Pile Testing Technology Validation and Implementation
Liang, R.; Yang, L.; May 2007; 234 pp.; In English
Report No.(s): PB2007-109591; No Copyright; Avail.: CASI: A11, Hardcopy

Driven piles are widely used as foundation to support buildings, bridges, and other structures. In 2007, AASHTO has adopted LRFD method for foundation design. The probability based LRFD approach affords the mathematical framework from which significant improvements on the design and quality control of driven piles can be achieved. In this research, reliability-based quality control criteria for driven piles are developed based on the framework of acceptance-sampling analysis for both static and dynamic test methods with the lognormal distribution characteristics. As a result, an optimum approach is suggested for the number of load tests and the required measured capacities for quality control of driven piles. Furthermore, this research has compiled a large database of pile set-up, from which the reliability-based approach of FORM is employed to develop separate resistance factors for the measured reference (initial) capacity and predicted set-up capacity. This report also provides a Bayesian theory based approach to allow for combining the information from the static pile capacity calculation and dynamic pile testing data to improve pile design process. Specifically, the results from dynamic pile tests can be utilized to reduce the uncertainties associated with static analysis methods of pile capacity by updating the corresponding resistance factors. This research has also developed one-dimensional wave equation based algorithm to interpret the High Strain Testing (HST) data for the estimation of the shaft and toe resistance of driven piles. The closed form solution is obtained for determining the Smith damping factor and the static soil resistance. Finally, a set of new wireless dynamic testing equipment (both hardware and software) is developed for more efficient dynamic pile testing.
NTIS
Dynamic Tests; Pile Foundations; Reliability Engineering; Foundations

44
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*.

20080019723 Texas Univ., Austin, TX USA
Thermoplastic Applications for Pulse Power Alternators
Hearn, Clay S; Hahne, Jonathan J; Lui, Hsing-Pang; Werst, Michael D; Jan 2006; 9 pp.; In English
Report No.(s): AD-A476984; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476984

No abstract available

AC Generators; Thermoplasticity

20080019991 Naval Surface Warfare Center, Annapolis, MD USA
Development of Large Scale Advanced NI-CD Batteries Employing Roll-Bonded Electrodes
Ferreira, E; Charkey, A; Oct 17, 1994; 77 pp.; In English
Contract(s)/Grant(s): N60921-C-89-0123; N00024-79-C-4546
Report No.(s): AD-A477245; NSWCDD/TR-94/50; NAVSWC-DD-TR-94-050; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A 12-month, Phase II development effort was undertaken by Energy Research Corporation (ERC) for an effective transition of the ERC roll-bonded battery technology to the Navy. The current contract N60921-C-89-0123 as amended and extended has enabled both fabrication and cycle testing of prototype cells containing large (12-inch x 20-inch) size electrodes as well as accelerated corrosion testing of the electrode substrate material. It was established, through the accelerated corrosion study, that the estimated life of ERC's Ni-Cd cells exceeded eight years with cells still maintaining an output capacity of over 100 percent of rated capacity; extrapolated results indicated that at least a 10-year life is attainable. Six advanced 2000-Ah Ni-Cd cells demonstrated a cycle life of 600 cycles at the 1C rate while yielding an output capacity of 2100 Ah without cell failure. In addition, the cells demonstrated an energy density of 19 Wh/lb at the 1-hr rate. The Phase II ultimately demonstrated the capability of ERC's Ni-Cd cells to accumulate at lease 500 cycles over the potential 10-year life.
DTIC

Electric Batteries; Electrodes; Nickel Cadmium Batteries; Roll

20080020340 National Renewable Energy Lab., Golden, CO USA; Colorado State Univ., Fort Collins, CO, USA
Manufacturing Process Optimization to Improve Stability, Yield, and Efficiency of CdS/CdTe PV Devices. Phase II, Annual Technical Report, January-February 2007
Sampath, W. S.; Enzenroth, A.; Barth, K.; May 2007; 17 pp.; In English
Report No.(s): DE2007-908628; NREL/SR-520-41664; No Copyright; Avail.: National Technical Information Service (NTIS)

We designed, fabricated, installed, and tested a fixture for automated cooling of a substrate in vacuum for optimum processing of the back contact. Large-area devices have 10.9% efficiency.
NTIS

Cadmium Tellurides; Manufacturing; Photovoltaic Conversion; Solar Cells; Stability

45
ENVIRONMENT POLLUTION

Includes atmospheric, water, soil, noise, and thermal pollution.

20080020292 Washington Safety Management Solutions, LLC, Aiken, SC, USA
Modeling Atmospheric Releases of Tritium from Nuclear Installations
O'Kula, K. R.; Thoman, D. C.; January 2007; 10 pp.; In English
Report No.(s): DE2007-908927; WSRC-STI-2007-00027; No Copyright; Avail.: National Technical Information Service (NTIS)

Tritium source term analysis and the subsequent dispersion and consequence analyses supporting the safety

documentation of Department of Energy nuclear facilities are especially sensitive to the applied software analysis methodology, input data and user assumptions. Three sequential areas in tritium accident analysis are examined in this study to illustrate where the analyst should exercise caution. Included are: (1) the development of a tritium oxide source term; (2) use of a full tritium dispersion model based on site-specific information to determine an appropriate deposition scaling factor for use in more simplified, broader modeling, and (3) derivation of a special tritium compound (STC) dose conversion factor for consequence analysis, consistent with the nature of the originating source material. It is recommended that unless supporting, defensible evidence is available to the contrary, the tritium release analyses should assume tritium oxide as the species released (or chemically transformed under accidents environment). Important exceptions include STC situations and laboratory-scale releases of hydrogen gas. In the modeling of the environmental transport, a full phenomenology model suggests that a deposition velocity of 0.5 cm/s is an appropriate value for environmental features of the Savannah River Site. This value is bounding for certain situations but non-conservative compared to the full model in others. Care should be exercised in choosing other factors such as the exposure time and the resuspension factor.
NTIS
Atmospheric Models; Nuclear Power Plants; Tritium

20080020342 National Renewable Energy Lab., Golden, CO USA; Environmental Protection Agency, Washington, DC USA
Fuel Savings and Emission Reduction from Next-Generation Mobile Air Conditioning Technology in India
Chaney, L.; Thundiyil, K.; Chidambaram, Y.; Andersen, S.; May 2007; 15 pp.; In English
Report No.(s): DE2007-908255; NREL/CP-540-41154; No Copyright; Avail.: National Technical Information Service (NTIS)
This paper quantifies the mobile air-conditioning fuel consumption of the typical Indian vehicle, exploring potential fuel savings and emissions reductions these systems for the next generation of vehicles.
NTIS
Air Conditioning; Air Conditioning Equipment; Fuel Consumption; India

20080020343 USA Gypsum Co., Chicago, IL, USA; National Energy Technology Lab., Pittsburgh, PA USA
Fate of Mercury in Synthetic Gypsum Used for Wallboard Production. Topical Report, Task 5 Wallboard Plant Test Results
Sanderson, J.; Blythe, G. M.; Richardson, M.; June 2006; 36 pp.; In English
Contract(s)/Grant(s): DE-FC26-04NT42080
Report No.(s): DE2007-908234; No Copyright; Avail.: Department of Energy Information Bridge
This report presents and discusses results from Task 5 of the study Fate of Mercury in Synthetic Gypsum Used for Wallboard Production, performed at a full-scale commercial wallboard plant. Synthetic gypsum produced by wet flue gas desulfurization (FGD) systems on coal-fired power plants is commonly used in the manufacture of wallboard. The FGD process is used to control the sulfur dioxide emissions which would result in acid rain if not controlled. This practice has long benefited the environment by recycling the FGD gypsum byproduct, which is becoming available in increasing quantities, decreasing the need to landfill this material, and increasing the sustainable design of the wallboard product. However, new concerns have arisen as recent mercury control strategies developed for power plants involve the capture of mercury in FGD systems. The objective of this study is to determine whether any mercury is released into the atmosphere when the synthetic gypsum material is used as a feedstock for wallboard production. The project is being co-funded by the U.S. DOE National Energy Technology Laboratory (Cooperative Agreement DE-FC26-04NT42080), USG Corporation, and EPRI. USG Corporation is the prime contractor, and URS Group is a subcontractor. The project scope includes five discrete tasks, each conducted at various USG wallboard plants using synthetic gypsum from different FGD systems. The five tasks were to include (1) a baseline test, then variations representing differing power plant (2) emissions control configurations, (3) treatment of fine gypsum particles, (4) coal types, and (5) FGD reagent types. However, Task 5, which was to evaluate gypsum produced from an alternate FGD reagent, could not be conducted as planned. Instead, Task 5 was conducted at conditions similar to a previous task, Task 3, although with gypsum from an alternate FGD system. In this project, process stacks in the wallboard plant have been sampled using the Ontario Hydro method. The stack locations sampled for each task include a dryer for the wet gypsum as it enters the plant and a gypsum calciner. The stack of the dryer for the wet wallboard product was also tested as part of this task, and was tested as part of Tasks 1 and 4. Also at each site, in-stream process samples were collected and analyzed for mercury concentration before and after each significant step in wallboard production. The Ontario Hydro results,

process sample mercury concentration data, and process data were used to construct mercury mass balances across the wallboard plants.
NTIS
Desulfurizing; Gypsum

20080020345 Federal Railroad Administration, Washington, DC USA
Record of Decision: Use of Locomotive Horns Final Rule. Federal Railroad Administration
Jan. 2004; 9 pp.; In English
Report No.(s): PB2007-112363; No Copyright; Avail.: CASI: A02, Hardcopy

This Record of Decision (ROD) contains the reasoning employed by the Federal Railroad Administration (FRA) to reach a decision on issuance of the Final Rule on the Use of Locomotive Horns at Highway-Rail Grade Crossings. It is supported by the much more detailed analysis included in the preambles to the Interim Final Rule on the Use of Locomotive Horns at Highway-Rail Grade Crossings (Interim Final Rule) and Final Rule. On December 5, 2003, Federal Railroad Administrator Allan Rutter approved the Final Environmental Impact Statement (EIS) for the Interim Final Rule. The final EIS notice of availability was published in the Federal Register by the Environmental Protection Agency (EPA) on January 2, 2004.
NTIS
Crossings; Locomotives; Noise Pollution; Rail Transportation; Warning Systems

20080020356 Office of Air Quality Planning and Standards, Research Triangle Park, NC USA
Guidance for Using Supplemental Environmental Projects to Implement Wood Stove Changeout Programs
Apr. 2007; 24 pp.; In English
Report No.(s): PB2007-112022; No Copyright; Avail.: CASI: A03, Hardcopy

This document provides guidance to state government officials on how to utilize supplemental environmental projects to implement a wood stove changeout program. This document does not establish any policies or opinions on federal supplemental environmental projects, but does highlight official policies issued to date by the EPAs Office of Enforcement and Compliance Assurance that may be useful to state officials.
NTIS
Wood; Environmental Surveys; Environmental Tests

20080020357 Office of Air Quality Planning and Standards, Research Triangle Park, NC USA
Economic Impact Analysis of the Halogenated Solvent Cleaners Residual Risk Standard
Apr. 2007; 43 pp.; In English
Report No.(s): PB2007-112021; No Copyright; Avail.: CASI: A03, Hardcopy

This report provides the economic impacts associated with this standard. The impacts in this report are estimated based on comparisons of annualized compliance costs to the revenues for affected firms. We find that the impacts of these options are generally minimal to small businesses, and that large businesses should experience cost savings for the most part. No small business, or any business affected by this final rule, is expected to have annualized compliance costs of more than 0.7 percent of their revenues. We find that small firms represent approximately one-third of the businesses affected under the final rule, and that 40 percent of the affected small firms will experience either no costs or cost savings. There is no significant economic impact on a substantial number of small entities (or SISNOSE) associated with this final standard.
NTIS
Cleaners; Cleaning; Economic Impact; Risk; Solvents

20080020362 McNair Attorneys, Greenville, SC, USA
Portable Aerosol Contaminant Extractor
Carlson, D. C., Inventor; De Gange, J. J., Inventor; Cable-Dunlap, P., Inventor; 25 Feb 04; 12 pp.; In English
Contract(s)/Grant(s): DE-AC09-96SR18500
Patent Info.: Filed Filed 25 Feb 04; US-Patent-Appl-SN-10-786 625
Report No.(s): PB2007-111939; No Copyright; Avail.: CASI: A03, Hardcopy

A compact, portable, aerosol contaminant extractor having ionization and collection sections through which ambient air

may be drawn at a nominal rate so that aerosol particles ionized in the ionization section may be collected on charged plate in the collection section, the charged plate being readily removed for analyses of the particles collected thereon.
NTIS
Aerosols; Contaminants; Patent Applications

20080020377 Lawrence Livermore National Lab., Livermore, CA USA
Dynamic Data-Driven Event Reconstruction for Atmospheric Releases
Kosovic, B.; Belles, R.; Chow, F. K.; Monache, L. D.; Dyer, K.; Mar. 26, 2007; 235 pp.; In English
Report No.(s): DE2007-908126; UCRL-TR-229417; No Copyright; Avail.: National Technical Information Service (NTIS)

Accidental or terrorist releases of hazardous materials into the atmosphere can impact large populations and cause significant loss of life or property damage. Plume predictions have been shown to be extremely valuable in guiding an effective and timely response. The two greatest sources of uncertainty in the prediction of the consequences of hazardous atmospheric releases result from poorly characterized source terms and lack of knowledge about the state of the atmosphere as reflected in the available meteorological data. In this report, we discuss the development of a new event reconstruction methodology that provides probabilistic source term estimates from field measurement data for both accidental and clandestine releases. Accurate plume dispersion prediction requires the following questions to be answered: What was released. When was it released. How much material was released. Where was it released. We have developed a dynamic data-driven event reconstruction capability which couples data and predictive models through Bayesian inference to obtain a solution to this inverse problem. The solution consists of a probability distribution of unknown source term parameters. For consequence assessment, we then use this probability distribution to construct a composite forward plume prediction which accounts for the uncertainties in the source term. Since in most cases of practical significance it is impossible to find a closed form solution, Bayesian inference is accomplished by utilizing stochastic sampling methods. This approach takes into consideration both measurement and forward model errors and thus incorporates all the sources of uncertainty in the solution to the inverse problem. Stochastic sampling methods have the additional advantage of being suitable for problems characterized by a non-Gaussian distribution of source term parameters and for cases in which the underlying dynamical system is nonlinear. We initially developed a Markov Chain Monte Carlo (MCMC) stochastic methodology and demonstrated its effectiveness by reconstructing a wide range of release scenarios, using synthetic as well as real-world data.
NTIS
Hazardous Materials; Meteorological Parameters

20080020422 Hampton Univ., VA, USA
Development of a Novel Catalyst for No Decomposition (Semi-Annual Report, September 15, 2006-March 14, 2007)
Akyurtlu, A.; Akyurtlu, J. F.; Apr. 2007; 11 pp.; In English
Contract(s)/Grant(s): DE-FG26-03NT41911
Report No.(s): DE2007-908813; No Copyright; Avail.: National Technical Information Service (NTIS)

The main objective of the research that is being undertaken is the evaluation of the Pt/SnO2 catalysts for the decomposition of NO in simulated power plant stack gases with particular attention to the resistance to deactivation by O2, CO2, and elevated temperatures. Temperature programmed desorption (TPD) and temperature programmed reaction (TPRx) studies on Pt/SnO2 catalysts having different noble metal concentrations and pretreated under different conditions were done. It is also planned to perform NO decomposition tests in a laboratory-size packed-bed reactor to obtain long-term deactivation data.
NTIS
Air Pollution; Catalysts; Decomposition; Exhaust Gases; Pollution Control; Stacks

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*.

20080019724 Alaska Univ., Fairbanks, AK USA
Investigating the Auroral Thermosphere with N2+ Lidar
Collins, Richard L; Su, Liguo; Lummerzheim, Dirk; Doe, Richard A; Jun 1, 2006; 38 pp.; In English; Original contains color illustrations
Report No.(s): AD-A476985; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476985
No abstract available
Atmospheric Chemistry; Auroras; Incoherent Scatter Radar; Ions; Nitrogen; Optical Radar; Photometers; Thermosphere

20080019726 University Coll. of Wales, Aberystwyth, UK
Large-Scale Plasma Structure in the Polar and Auroral Ionosphere: Experimental Observations and Modelling
Pryse, S E; Middleton, H R; Dewis, K L; Wood, A G; Whittick, E L; Balthazor, R L; Jun 1, 2006; 11 pp.; In English; Original contains color illustrations
Report No.(s): AD-A476991; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476991
No abstract available
Atmospheric Models; Auroras; Earth Ionosphere; Electron Density (Concentration); Plasmas (Physics); Polar Regions

20080019747 Universidad de Concepcion, Chile
Morphology of Southern Hemisphere Riometer Auroral Absorption
Foppiano, A J; Jun 1, 2006; 51 pp.; In English; Original contains color illustrations
Report No.(s): AD-A477076; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477076
No abstract available
Absorption; Auroral Absorption; Auroras; Geomagnetism; Morphology; Riometers; Southern Hemisphere

20080019766 University of Western Ontario, London, Ontario Canada
High Latitude Ionospheric Structures
MacDougall, John; Jun 2006; 32 pp.; In English; Original contains color illustrations
Report No.(s): AD-A477111; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477111
No abstract available
Ionospheres; Polar Regions

20080019767 EISCAT Scientific Association, Ramfjordbotn, Norway
What Can We Learn About the Ionosphere Using the EISCAT Heating Facility?
Rietveld, Michael T; Jun 2006; 41 pp.; In English; Original contains color illustrations
Report No.(s): AD-A477112; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477112
No abstract available
EISCAT Radar System (Europe); Heating; High Frequencies; Ionospheres; Plasma Heating

20080019768 Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Neustrelitz, Germany
GPS Sounding of the Ionosphere Onboard CHAMP
Jakowski, N; Mayer, C; Wilken, V; Jun 2006; 53 pp.; In English; Original contains color illustrations
Report No.(s): AD-A477113; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477113
No abstract available
Global Positioning System; Ionospheres; Plasmasphere; Solar Activity

20080019778 North Carolina Univ., Charlotte, NC USA

Developing ′Superbeams' for Improved Propagation Through Turbulence

Gbur, Greg; Jan 31, 2008; 14 pp.; In English

Contract(s)/Grant(s): FA9550-05-1-0288

Report No.(s): AD-A477132; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA477132

Studies of the behavior of partially coherent beams and other special beam classes on propagation through atmospheric turbulence were undertaken. A pair of new tools were developed to study the behavior of special beam classes in turbulence: a generator of partially coherent field realizations and an angular spectrum technique for propagating partially coherent fields in turbulence analytically. These tools were used in preliminary investigations of partially coherent fields and non-diffracting fields in turbulence. The stability and information-carrying ability of vortex beams were studied using multiple phase screen simulations of atmospheric turbulence. The tools developed during this project will facilitate future studies of special beam classes, and the simulation results demonstrate that special beam classes have significant potential for improving optical communications systems.

DTIC

Atmospheric Turbulence; Laser Beams; Optical Communication; Turbulence

20080020094 Alaska Univ., Fairbanks, AK USA

Modeling of Ionospheric Refraction of UHF Radar Signals at High Latitudes

Watkins, Brenton; Maurits, Sergei; Kulchitsky, Anton; Jun 2006; 15 pp.; In English; Original contains color illustrations

Report No.(s): AD-A477496; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

Atmospheric Models; Atmospheric Refraction; Earth Ionosphere; Polar Regions; Refraction; Ultrahigh Frequencies

20080020515 NASA Marshall Space Flight Center, Huntsville, AL, USA

Lunar Dust Charging by Secondary Electron Emission and its Complex Role in the Lunar Environment

Abbas, M. M.; Tankosic, D.; Spann, J. F.; LeClair, A.; Dube, M. J.; March 10, 2008; 2 pp.; In English; 39th Lunar and Planetary Science Conference, 10-14 Mar. 2008, League City, TX, USA; Original contains black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy

The lunar surface is covered with a thick layer of micron/sub-micron size dust grains formed by billions of years of meteoritic impact. With virtually no atmosphere and exposed to the solar wind plasma and solar electromagnetic radiation, the lunar surface and the dust grains are electrostatically charged. The dominant charging processes include: photoelectric emissions (UV, X-rays), impact of solar wind electrons and ions, and secondary electron emissions (SEE) induced by energetic solar wind electrons. During the Apollo missions, the astronauts found the lunar dust to be extraordinarily high in its adhesive characteristics, sticking to the suits and the mechanical equipment. Electrostatically charged lunar dust is believed to be transported over long distances by the induced electric fields, as indicated by the observed dust streamers and the horizon glow [e.g., 1-3]. The hazardous effects of dust in the lunar environment are recognized to be one of the major issues that must be addressed in planning the forthcoming missions for robotic and human exploration of the Moon. Theoretical studies are being performed along with the development of analytical models and a variety of experimental investigations, to better understand the lunar dust phenomena. [e.g., 4-6]. The lunar dust is believed to be charged negatively on the lunar night-side by interaction With solar wind electrons. However, rigorous theoretical expressions for calculation of SEE yields and the sticking efficiencies of individual micron size dust grains are not yet available, and the information has to be obtained by experiment. On theoretical considerations, however, it is well recognized that SEE yields, similar to the photoelectric yields for small-size grains, would be totally different from the corresponding bulk values [e.g., 7-9]. Some theoretical models for charging of individual small spherical particles have been developed [e.g., 10], and some limited measurements on individual metallic dust grains at keV electron energies have been made [e.g., i 1]. In this paper, we present the first measurements of the secondary electron emission yields of individual micron/sub-micron size dust grains selected from sample returns of Apollo 11 and Apollo 17 missions.

Author

Lunar Dust; Lunar Environment; Electron Emission; Electrostatic Charge; X Rays; Hypervelocity Impact; Photoelectric Emission

20080020530 Defence Research and Development Canada, Ottawa, Ontario Canada
Mitigation of Ionospheric Effects on High Frequency Surface Wave Radar
Riddolls, Ryan J; Jun 1, 2006; 39 pp.; In English; Original contains color illustrations
Report No.(s): AD-A476969; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476969

No abstract available

Antenna Arrays; Clutter; Electromagnetic Radiation; High Frequencies; Ionospheres; Radar; Surface Waves

47
METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification.

20080019637 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Small-Scale Drop-Size Variability: Empirical Models for Drop-Size-Dependent Clustering in Clouds
Marshak, Alexander; Knyazikhin, Yuri; Larsen, Michael L.; Wiscombe, Warren J.; Journal of the Atmospheric Sciences; February 2005; Volume 62, Issue 2, pp. 551-558; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NNG04GF15G; DE-AI02-95ER61961; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1175/JAS-3371.1

By analyzing aircraft measurements of individual drop sizes in clouds, it has been shown in a companion paper that the probability of finding a drop of radius r at a linear scale l decreases as l(sup D(r)), where 0 less than or equals D(r) less than or equals 1. This paper shows striking examples of the spatial distribution of large cloud drops using models that simulate the observed power laws. In contrast to currently used models that assume homogeneity and a Poisson distribution of cloud drops, these models illustrate strong drop clustering, especially with larger drops. The degree of clustering is determined by the observed exponents D(r). The strong clustering of large drops arises naturally from the observed power-law statistics. This clustering has vital consequences for rain physics, including how fast rain can form. For radiative transfer theory, clustering of large drops enhances their impact on the cloud optical path. The clustering phenomenon also helps explain why remotely sensed cloud drop size is generally larger than that measured in situ.
Author

Drop Size; Clouds (Meteorology); Probability Theory; Rain; Remote Sensing; Radiative Transfer; Radii

20080019638 Boston Univ., Boston, MA, USA; NASA Goddard Space Flight Center, Greenbelt, MD, USA
Small-Scale Drop Size Variability: Impact on Estimation of Cloud Optical Properties
Knyazikhin, Y.; Myneni, R. B.; Marshak, A.; Wiscombe, W. J.; Larsen, M. L.; Martonchik, J. V.; Journal of Atmospheric Sciences; July 2005; Volume 62, Issue 7, pp. 2555-2567; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NNG04GF15G; DE-A105-90ER61069; ATM01-0106271; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1175/JAS3488.1

Most cloud radiation models and conventional data processing techniques assume that the mean number of drops of a given radius is proportional to volume. The analysis of microphysical data on liquid water drop sizes shows that, for sufficiently small volumes, this proportionality breaks down; the number of cloud drops of a given radius is instead proportional to the volume raised to a drop size-dependent nonunit power. The coefficient of proportionality, a generalized drop concentration, is a function of the drop size. For abundant small drops the power is unity as assumed in the conventional approach. However, for rarer large drops, it falls increasingly below unity. This empirical fact leads to drop clustering, with the larger drops exhibiting a greater degree of clustering. The generalized drop concentration shows the mean number of drops per cluster, while the power characterizes the occurrence frequency of clusters. With a fixed total number of drops in a cloud, a decrease in frequency of clusters is accompanied by a corresponding increase in the generalized concentration. This initiates a competing process missed in the conventional models: an increase in the number of drops per cluster enhances the impact of rarer large drops on cloud radiation while a decrease in the frequency suppresses it. Because of the nonlinear relationship between the number of clustered drops and the volume, these two opposite tendencies do not necessarily compensate each other. The data analysis suggests that clustered drops likely have a stronger radiative impact compared to their unclustered counterpart; ignoring it results in underestimation of the contribution from large drops to cloud horizontal optical path.
Author

Cloud Physics; Drop Size; Optical Properties; Radii; Drops (Liquids)

20080019744 Air Force Research Lab., Hanscom AFB, MA USA

Characterization of High Altitude Turbulence for Air Force Platforms

Ruggiero, Frank H; Werne, Joseph A; Mahalov, Alex; Nichols, Basil; Wroblewski, Donald E; Jun 2007; 7 pp.; In English

Contract(s)/Grant(s): Proj-2301

Report No.(s): AD-A477070; F19628-02-C-0037; FG9620-02-1-0026; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA477070

The Air Force has an urgent need to characterize and predict high-altitude (z > 10 km MSL) mechanical and optical turbulence. Mechanical turbulence will adversely impact both manned and unmanned reconnaissance and surveillance aircraft. Optical turbulence affects the propagation of light through the atmosphere and adversely affects the phase and power of a laser beam, thereby reducing the effectiveness of directed energy weapon and communication systems. At high altitudes both types of turbulence tend to occur in vertically thin layers (delta z < 1 km). Predicting high altitude turbulence (HAT) in near real-time is complicated by the fact that the numerical weather prediction (NWP) models that are currently run in real-time do not have the vertical fidelity to resolve these thin layers. The objective is to improve the understanding of the dynamical processes that occur in HAT and develop parameterizations of the process that can be employed with operational NWP models. In order to carry out the stated objective direct numerical and microscale simulations are carried out for HAT phenomena. Microscale simulations carried out for a case study have revealed details of the generation of mountain waves, their propagation and amplification into the stratosphere. The power of direct numerical simulations is revealed by the ability to match up aircraft observations with Kelvin-Helmholtz shear simulations and determine details about the phenomena that the aircraft is flying through that is not directly resolved from the observations themselves.

DTIC

Computerized Simulation; High Altitude; Simulation; Turbulence

20080020348 State Dept., Washington, DC, USA; Agency for International Development, Washington, DC, USA

USA Energy Needs, Clean Development and Climate Change

January 2007; 34 pp.; In English

Report No.(s): PB2007-112179; No Copyright; Avail.: CASI: A03, Hardcopy

President Bush is firmly committed to taking sensible action on climate change at home and abroad. Climate change is a serious, long-term challenge that requires an effective, sustainable policy and the USA is implementing a comprehensive strategy to address the challenges of global climate change. It is science-based, promotes innovative scientific and technological breakthroughs, harnesses the power of markets, and encourages global participation. Our approach emphasizes near-term policies and measures to slow the growth of greenhouse gas emissions, longer-term climate change science and technology development initiatives, and international collaboration. Our collaborative efforts include a wide array of action-oriented partnerships. Our partnerships rely on voluntary and practical measures to reduce greenhouse gas intensity, create new investments, build local capacity, and remove barriers to the introduction of cleaner technologies.

NTIS

Climate Change; Exhaust Emission; Exhaust Gases; Greenhouse Effect

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*.

20080019720 Boston Univ., Boston, MA USA

Alkylating Derivatives of Vitamin D Hormone for Prostate Cancer

Ray, Rahul; Oct 2007; 19 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0546

Report No.(s): AD-A476835; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA476835

The two most significant achievements in this reporting period are : launching of studies to evaluate the molecular mechanism/s of action of. I 25-dihydroxyvitamin D3-3-bromoacetate (I 25(OH)2D3-3-BE) and development of an androgen-

sensitive mouse model of human prostate cancer. In addition we have screened several cancer cell lines to determine potential efficacy of I 25(OH)2D3-3-BE in cancers in addition to prostate cancer.
DTIC
Alkylation; Calciferol; Cancer; Derivation; Hormones; Prostate Gland

20080019731 Wisconsin Univ., Madison, WI USA
Fluorescence and Diffuse Reflectance Spectroscopy for Breast Cancer Diagnosis During Core Needle Biopsy
Zhu, Changfang; Sep 2007; 56 pp.; In English
Contract(s)/Grant(s): W81XWH-05-1-0380
Report No.(s): AD-A477034; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477034

The goal of this project is to explore the potential of using tissue fluorescence and diffuse reflectance spectroscopy for breast cancer detection during a core needle breast biopsy. Both empirically based and model based approaches have been explored for the extraction of diagnostically useful information from the tissue spectra, as well as the diagnosis of breast cancer based on these extracted features. For the sample set investigated in our study, both intrinsic tissue properties extracted using model based approach and spectral features extracted using empirical spectral analysis could provide sensitivity and specificity of up to 89% for discriminating breast malignancy. These outcomes provided the foundation for using the optical sensor based on tissue fluorescence and diffuse reflectance spectroscopy as an adjunct diagnostic tool, which has the potential to provide guidance for core needle breast biopsy.
DTIC
Breast; Cancer; Cores; Diagnosis; Diffuse Radiation; Fluorescence; Mammary Glands; Needles; Reflection; Spectroscopy

20080019732 Baylor Coll. of Medicine, Houston, TX USA
Uncovering the Mechanism of ICI-Mediated Estrogen Receptor-Alpha Degradation
Casa, Angelo; Oct 2007; 11 pp.; In English
Contract(s)/Grant(s): W81XWH-06-1-0714
Report No.(s): AD-A477035; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477035

A cytoplasmic ER variant (lacking the NLS), expressed in MCF-7 cells, is resistant to ICI-mediated degradation up until 12hr. At 24hr, this protein may start to degrade, so temporal effects of ICI on cER degradation will have to be further explored. Interestingly, this cytoplasmic ER variant may actually be stabilized by ICI after 6hr of treatment. A rhodopsin-fused full-length ER-alpha (containing its NLS) that is sequestered at the plasma membrane might be degraded by increasing concentrations of ICI in MCF-7 cells. Furthermore, this RhER construct may be post-translationally modified by ICI but not by estradiol.
DTIC
Cytoplasm; Degradation; Estrogens; Hormones

20080019733 Baylor Coll. of Medicine, Houston, TX USA
A Proteomic Approach to Identify Phosphorylation-Dependent Targets of BRCT Domains
Songyang, Zhou; Mar 2007; 9 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-05-1-0233
Report No.(s): AD-A477036; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477036

BRCA1 C-terminal (BRCT) domains are novel phosphopeptide binding modules. Cancer-associated missense and deletion mutations have been found in the BRCT repeat regions of BRCA1, suggesting an essential role of BRCT domains in regulating BRCA1activity. In addition, BRCT domains are found in many proteins that regulate DNA damage repair, cell cycle, and genome stability, implying a more global role of BRCT domains in genome stability surveillance. These results suggest that the BRCT domain acts as a sensor to protein phosphorylation in response to DNA damage, recruits phosphorylated cellular targets, and mediates signaling complex formation. However, the identities of the in vivo BRCT domain targets are largely unknown. In order to understand the role of phosphorylation in protein-protein interactions, we developed several approaches utilizing peptide libraries and peptide arrays. We propose to use these methods to systematically identify phosphorproteins that can interact with BRCT domains. In addition to potential new regulators of genome stability, the approaches can identify phosphorylated sequences on proteins that are important for DNA damage responses and cell

cycle. Such information should prove valuable, especially for the development of new screening strategies, drug targets, and treatment for breast cancer.
DTIC
Breast; Cancer; Deoxyribonucleic Acid; Domains; Hormones; In Vivo Methods and Tests; Males; Mammary Glands; Peptides; Phosphorylation; Proteome; Targets

20080019734 Kentucky Univ., Lexington, KY USA
Treatment of Prostate Cancer with a DBP-MAF-Vitamin D Complex to Target Angiogenesis and Tumorigenesis
Fannon, Michael W; Feb 2007; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-04-1-0010
Report No.(s): AD-A477038; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477038

The purpose of this study has been to determine the efficacy of combined therapy using vitamin D binding protein-macrophage activating factor (DBP-maf) and vitamin D as therapy for prostate cancer using a mouse model of human prostate tumors. In this phase of the study we have tested the ability of vitamin D and DBP-maf to inhibit the formation of endothelial cells into tubes. Both molecules were effective on their own, however, the combination of vitamin D and DBP-maf showed synergistic behavior. Because of its high affinity for actin, the possibility that DBP-maf acted by inhibiting microtubule formation was investigated using an anti-phalloidin antibody. No differences in phalloidin strength or localization were observed. Using immunoassays we were able to identify a 75 kDa protein in tumor cells that is phosphorylated by DBP-maf and a synthetic maf peptide. We are investigating the identity of that protein since the mechanism by which DBP-maf works remains unknown.
DTIC
Calciferol; Cancer; Prostate Gland; Targets; Therapy

20080019735 Stevens Inst. of Tech., Hoboken, NJ USA
Test Bed Development for Detection and Diagnosis of Prostate Cancer Via Internet and Wireless Communication Networks
Yao, Yu-Dong; Man, Hong; Meng, Yan; Apr 2007; 15 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-05-1-0218
Report No.(s): AD-A477039; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477039

During the summer of 2006, seven HBCU undergraduates participated in our prostate cancer research and training program at Stevens Institute of Technology. In this HBCU Undergraduate Collaborative Summer Training program, we address detection and diagnosis of prostate cancer in two technology and application aspects, (a) remote detection and diagnosis through Internet and wireless networks and (b) computer-aided detection and diagnosis. With remote detection and diagnosis, we will provide prostate cancer screenings to men in rural regions and developing countries. With computer-aided detection and diagnosis, we will develop techniques to reduce the costs of telepathology for prostate cancer detection and diagnosis, both in terms of transmission costs and online reading costs
DTIC
Cancer; Communication Networks; Diagnosis; Internets; Medical Science; Prostate Gland; Test Stands; Wireless Communication

20080019736 Rochester Univ., NY USA
Targeting of Breast Cancer with Triptolide Nanoparticle
Yang, Shanmin; Aug 2006; 14 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-04-1-0766
Report No.(s): AD-A477044; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477044

We have demonstrated that the Triptolide (TPL) a diterpenoid tripoxides-like molecule (MW 360) purified from the herb Triptetygium wilfordii Hook F possesses a potent anti-tumor effect. To further enhance its targeting effect on tumor TPL was conjugated with human RGD and NGR that highly expressed on vessel and tumor cells and then further precessed in a liposome form as nanoparticle of RGD/NGR-PA-TPL-Liposome. The results of in vitro test RGD/NGR-PA-TPL-lipo showed a similar effect as TPL along. In the tumor bearing mice model the tail vein injection showed a good targeting effect on vessel

however after 6 injections of RGD/NGR-PA-TPL-Lipo all the treated mice died of allergy (fast breathing with a pattern of IgE type immune reaction) when 7 injection was carried out indicating that the RGD/NGR is a foreign antigen to mouse. Then we decided to conjugate TPL to hyaluronan (HA) the ligand to CD44 that is highly expressed on surface of breast cancer cells. The results of in vitro and in vivo tests showed that the new nanoparticle had a similar anti-tumor effect as TPL. Conclusion: 1) in technique RGD/NGR-PA-TPL-Lipo can be obtaines; 2) human RGD/NGR enhances the targeting effect on vessel; 3) RGD/NGR acts as a foreign antigen to mouse perhaps to human too therefdre it is not a good carrier to anti-tumor toxic agent; and 4) TPL itself is potent enough to kill cancer cells without further modification.
DTIC
Breast; Cancer; Mammary Glands; Molecules; Nanoparticles

20080019757 QinetiQ Ltd., Malvern, UK
Applications of Network Visualisation in Infectious Disease Management
Varga, Margaret; Jacobson, Zack; Dec 1, 2006; 21 pp.; In English; Original contains color illustrations
Report No.(s): AD-A477095; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477095
No abstract available
Diseases; Infectious Diseases; Multisensor Fusion; Public Health

20080019761 State Univ. of New York, Albany, NY USA
Functional Geonic Analysis of Breast Cancer Cell Tumorigenicity Using a Noval Gene Silencing Resource
Conklin, Douglas S; Apr 2007; 19 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-04-1-0474
Report No.(s): AD-A477103; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477103
We have identified approximately 30 genes that negatively impact the growth of Erb-B2 positive breast cancer cells. Year 2 of funding resulted in tests of the specificity of the shRNAs negative impact on the growth of Erb-B2 positive breast cancer cells. Effects of these shRNAs on normal cells and other breast cancer cell lines, identified approximately 20 shRNAs that specifically inhibit Erb-B2 positive breast cancer cells target genes. Several of these gene targets are known to be important to a variety of cancers. The PBP and NR1D1 genes are interesting because they give new insight into a pathway that can be exploited as a potential therapeutic target. Year 3 of funding resulted in finding that inhibition of PBP-PPAR?-NR1D1 does not affect ERBB2 signaling in breast cancer cells. That this pathway is overactive in her-2/neu breast cancer cells is likely due to the tight genetic linkage of Nr1D1 and her-2. We have also found that the PBP-PPAR?-NR1D1 pathway alters fat metabolism in breast cancer cells and have identified lipotoxicity as a likely mechanism for triggering apoptosis in the her-2/neu positive breast cancer cells.
DTIC
Breast; Cancer; Functional Analysis; Genes; Lipid Metabolism; Mammary Glands

20080019762 Minneapolis Medical Research Foundation, Inc., MN USA
Polymicrobial Chronic Infection Including Acinetobacter Baumannii in a Plated Segmental Defect in the Rat Femur
Tsukayama, Dean T; Jan 2008; 13 pp.; In English
Contract(s)/Grant(s): W81XWH-07-1-0195
Report No.(s): AD-A477104; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477104
The goal of this work was to develop a model of a realistic polymicrobial infection with bony involvement in an internally stabilized segmental defect in the rat femur. This model could then be used to assess the combined therapy of an osteogenic agent to stimulate bone formation while local and system antibiotic therapy was being applied to control the polymicrobial infection. A bone isolate of Acinetobacter baumanii exhibited very little osteolytic involvement when used alone in the model.
DTIC
Antibiotics; Bones; Cytogenesis; Defects; Femur; Infectious Diseases; Osteogenesis; Rats

20080019763 Toledo Univ., OH USA
Ultrasound Imaging of Breast Cancer
Erhardt, Paul W; Jul 2007; 6 pp.; In English
Contract(s)/Grant(s): W81XWH-06-1-0595
Report No.(s): AD-A477105; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477105

The synthesis of the fully-protected version of the target probe compound (i.e. its penultimate intermediate) has been accomplished on a scale that should be large enough to yield the desired amount of the final product. Attempts to develop an in vitro, cell culture assay for enhancement of ultrasound images have not yet been successful.
DTIC
Breast; Cancer; Hydrocarbons; Image Enhancement; Imaging Techniques; Mammary Glands; Ultrasonics

20080019774 Carnegie-Mellon Univ., Pittsburgh, PA USA
Understanding Public Responses to Domestic Threats
Bruine de Bruin, Wandi; Florig, H K; Fischhoff, Baruch; Downs, Julie S; Stone, Eric; Sep 2007; 102 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W7711-057947/001/TOR
Report No.(s): AD-A477127; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477127

The overall goal of this report is to improve understanding of public responses to domestic threats. Project 1 focuses on pandemic influenza and dirty bomb threats, aiming to understand the role of emotions in anticipated behavioral responses. Project 2 examines a situation in which people are evacuated from a community to avoid exposure to radioactive fallout from an upwind nuclear explosion. This project aims to understand the factors that affect people's decisions about how long to wait until returning to their homes, given the gradual decline in radiation levels resulting from radioactive decay. First, the authors present an overview of each problem using models that summarize scientific knowledge. The models use logic of influence diagrams with nodes that reflect relevant variables affecting risk, and mitigating it, and links showing how they are connected. The models differ from traditional risk models because they include emotional and behavioral components that affect how a risk event unfolds. The Project 1 models focus on the interplay between emotional and behavioral responses to domestic threats, particularly fear and anger. The model for Project 2 focuses on the health, social, and economic factors that may affect people's decision to return to a community with residual radiation levels that elevate cancer risk. Second, they report on surveys of Canadian and U.S. participants based on these models. For Project 1, they found that, independent of anger and trait emotions, fear was related to seeing more risk of morbidity and mortality, and predicting less resilience, more compliance with mitigation strategies, and higher likelihood of being absent from work in the case of pandemic influenza. For Project 2, they found that people's decision to return were affected by the cancer risk of radioactive fallout as well as the availability of free housing in the evacuation zone.
DTIC
Emotions; Fallout; Influenza; Nuclear Explosions

20080019776 Park Nicollet Inst, Saint Louis, MN USA
Predictors of Lymphedema Following Breast Cancer Surgery
Swenson, Karen K; Sep 2007; 25 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-1-0738
Report No.(s): AD-A477130; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477130

Surgery for breast cancer includes removal of the breast tumor along with axillarylymph nodes. Unfortunately, a relatively common side effect following axillary lymph node dissection (ALND) is upper-extremity lymphedema. The purpose of this study is to identify risk factors for lymphedema among women with breast cancer surgery. A case-control study was conducted with 94 cases with lymphedema and 94 controls that were frequency matched on type of axillary surgery and surgery date. On multivariate analysis, lymphedema cases were more likely to have active cancer status at their last follow-up, and to have received chemotherapy than controls. Greater Body Mass Index was associated with moderate or severe lymphedema. The severity of arm or hand swelling was significantly related to how much the lymphedema interfered with patients daily activities. Quality of life was affected by lymphedema with lymphedema patients reporting significantly lower scores on the physical component scale of the SF-36.
DTIC
Breast; Cancer; Lymphatic System; Mammary Glands; Predictions; Surgery

20080019780 Virginia Univ., Charlottesville, VA USA
The Transgenic TGF-Alpha or EGFR1 Overexpression Mouse Model for Symptom Complex Research
Rich, Tyvin; Oct 2007; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-06-1-0666
Report No.(s): AD-A477134; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477134

The TGF- transgenic over expression model has been used to study circadian running wheel activity (RWA) in C57Bl6 mice. The genotype of each transgenic animal is determined by PCR analysis of tissue and gel electorphoresis. Male and female transgenic and control animals have been assessed for RWA, phase, and total amount of activity in a light controlled environment using a 12:12 hour light/dark (LD) cycle and in constant darkness (DD). The results show an intact central clock in LD and DD condition in each gender when assessed for phase of the circadian period. The endogenous rhythm of both the transgenic and wild type animals is 23.45 and 23.55 hours for female and males animals, respectively. The measure of the relative duration of activity in the transgenic animals is significantly shorter compared to controls and is consistent with our hypothesis that overproduction of TGF- is associated with inhibition of activity. Our next phase of study will use this established model to test the effect of a tyrosine kinase inhibitor on activity.
DTIC
Circadian Rhythms; Estrogens; Mice; Signs and Symptoms; Wheels

20080019781 Rosalind Franklin Univ. of Medicine and Science, Chicago, IL USA
Improving Quality of Life in Ovarian Cancer Patients: A Brief Intervention for Patients and their Partners
Zakowski, Sandra G; Sep 2006; 8 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0722
Report No.(s): AD-A477137; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477137

The current study examines the effects of a psychological intervention that encourages emotional expression in ovarian cancer patients and their partners. Ovarian cancer patients (n=130) and their partners are randomly assigned to an intervention or a control group. Following Pennebaker's model, subjects in the intervention group are asked to write about their deepest thoughts and feelings regarding their cancer experience for 20 minutes each day for three consecutive days. The control group is asked to write about trivial non-emotional topics. Outcome variables including psychological distress, quality of life, and physical symptoms is assessed at baseline and over a period of nine months after the intervention (one week, three, six, and nine months). In accordance with our approved Statement of Work data collection is currently underway. To date 87 subjects have been enrolled and are at various stages of the data collection process. Data processing is continuing as planned, including data entry and verification, which has been completed for all subjects currently enrolled in the project. Preliminary data analyses are being conducted.
DTIC
Cancer; Ovaries; Patients

20080019784 Johns Hopkins Univ., Baltimore, MD USA
Polyamine Analogues as Novel Anti-HER Family Agents in Human Breast Cancer
Richards, Talmesha; Sep 2007; 13 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XH-06-1-0705
Report No.(s): AD-A477142; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477142

Elevated levels of all three naturally occurring polyamines, spermine, spermidine and putrescine, have been found in breast cancer tissues. Polyamine analogues have been shown to inhibit cell growth and in some cases induce apoptosis. My studies have demonstrated the ability of CGC-11144 and other oligoamines to inhibit cell growth in human breast cancer cell lines. These oligamines can also suppress epidermal growth factor receptor (EGFR), human epidermal growth factor receptor-2 (HER2) and estrogen receptor(ER)-alpha protein in multiple human breast cancer cell lines. This suppression is both time and dose dependent. A relationship between oligoamine structure, growth inhibition, and suppression of EGFR and HER2 protein expression seems to exist, with higher nitrogen compounds have the greatest effect. This project will demonstrate that oligoamines are novel anti-HER family agents and oligoamine-induced down regulation of HER family

members contributes to their cytotoxicity in human breast cancer cell lines. The completion of this project will also provide valuable information about the potential clinical application of oligoamines
DTIC
Analogs; Breast; Cancer; Mammary Glands; Polymers

20080019789 Alabama Univ., Birmingham, AL USA
Proteomic Analysis of Genistein Mammary Cancer Chemoprevention
Lamartiniere, Coral A; Jul 2007; 25 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0433
Report No.(s): AD-A477150; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477150

We have developed reproducible methodology for separation biochemical and statistical analysis and identification of mammary gland proteins. We have discovered that GTP-CHl expression is significantly increased shortly following exposure at day 21 by genistein. At day 50 there was significant up-regulation of tyrosine hydroxylase and VEGF-R2. This and previous work suggests that early postnatal (prepubertal) exposure to genistein enhances cell proliferation and cell differentiation and gland maturation. This unique developmental maturation leads to a new biochemical blue-pnnV whereby the cells have reduced EGF-signaling and VEGFR2 that render the mature mammary gland less proliferative and susceptible to chemically-induced mammary cancer initiation angiogenesis and for cancer progression. Our experiments in identifying protein biomarkers in interstitial fluid surrounding mammary glands in rats have been much more difficult and not successful to-date. We have recently developed our own probes that should allow us to collect a higher yield of proteins and hopefully allow success.
DTIC
Breast; Cancer; Chemotherapy; Mammary Glands; Proteome

20080019791 Jackson (Henry M.) Foundation, Rockville, MD USA
Improving Performance Efficiency in the Warfighter
Wu, T J; Dec 2007; 27 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): X81XWH-05-1-0344
Report No.(s): AD-A477152; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477152

The goal of this project is to design novel compounds that selectively bind estrogen receptor beta (ER(3) to alleviate fear and anxiety-related behaviors and enhance cognitive function ER(3 is a recently described member of the steroid/thyroid hormone receptor superfamily Although it was originally cloned and named based on homology to the classic estrogen receptor (a) ER(3 does not appear to be a critical component of reproductive physiology For example ER(3-knockout-mice have few reproductive deficits in contrast to ERa-knockout mice which are sterile Despite its name ER(3 is not exclusively a receptor for estrogen ER(3 can bind a number of other hormones and recent studies suggest that in males ER(3 is the functional receptor for 5a-androstane-3(3 17(3-diol (3(3-diol) an endogenous metabolite of the testicular androgen dihydrotestosterone ER(3 is also synthesized in brain with a distribution that gives clues to its function: ER(3 is found at high levels in areas that regulate stress responses and cognitive function Consistent with this ER(3 knockout mice show increased anxiety- related behaviors and reduced cognitive function Our preliminary findings described in the original application support this possibility Acute administration of the non-steroidal ER(3 selective agonist diarylpropionitrile (DPN) dramatically reduces anxiety related behaviors in female AND male rats when examined in behavioral tests such as the elevated plus maze and open field test DPN treatment also potently inhibits the hormonal responses to physical and psychological stressors.
DTIC
Psychological Tests; Warfare

20080019797 Baylor Coll. of Medicine, Houston, TX USA
Seladin-1: A Novel Tumor Suppressor Gene Involved in Breast Cancer?
Galaktionov, Konstantin I; Aug 1, 2007; 8 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-06-1-0650
Report No.(s): AD-A477160; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477160

Seladin-1 maps to the human chromosome region 1p31-1p32 that shows frequent loss of heterozygosity (LOH) in human

breast tumors. Publicly available data (Entrez, GEO) also show a significant variability between levels of Seladin-1 expression in breast cancer cell lines and normal breast epithelium. Is Seladin-1 a tumor suppressor on 1p31-1p32 that is involved in breast cancer? Our concept is that it is. In order to determine if Seladin-1 is a TSG involved in breast cancer we propose to: 1) Identify possible Seladin-1 mutations in primary breast tumors. 2) Investigate the alterations of Seladin-1 expression in breast cancer cells. 3) Perform functional assays on tumor-specific Seladin-1 mutants. Accordingly, we amplified Seladin-1 exons from 40-60 breast tumor genomic DNA samples (obtained from tissue banks or commercial sources), followed by the sequence analysis of the open reading frames. As a result, no missense or nonsense mutations were detected. We found that expression of Seladin-1 significantly varies between different breast cancer cell lines, and in one such line, MDAMB- 231, is significantly below expression in normal breast epithelium.
DTIC
Breast; Cancer; Genes; Mammary Glands; Tumor Suppressor Genes

20080019800 Ordway Research Inst., Albany, NY USA
Selective Oncolytic Therapy for Hypoxic Breast Cancer Cells
Fasullo, Michael T; Oct 1, 2007; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-06-1-0586
Report No.(s): AD-A477171; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477171

We tested the hypothesis that hypoxic breast cancer cells would be more permissive to herpes simplex (HSV-1)-derived plasmids. Since hypoxic cells are more resistant to traditional therapies this work could provide a new strategy for treating aggressive breast cancer. The general hypothesis was that ERK (extracellular receptor kinase) would be active in hypoxic cells rendering them susceptible to oncolytic viruses such as R3616. R3616 lacks the gamma-1 34.5 gene that normally blocks the host cells attempt to inhibit viral protein synthesis. We determined whether hypoxic MCF-7 MDA-MB-231 and MDA-MB-435 cells would be more permissive to R3616. We observed that hypoxic MDA-MB-231 cells were indeed more permissive to R3616; however MDA-MB-435 cells were not. This observation may lead to future experiments to identify novel treatment modalities for hypoxic cells. However considering that ERK1/2 activation is constitutive in MDA-MB-231 cells, it is possible that other hypoxic signaling pathways are important in rendering the MDA-MB-231 cells permissive to the oncolytic virus.
DTIC
Breast; Cancer; Hypoxia; Mammary Glands; Therapy; Viruses

20080019975 Roswell Park Memorial Inst., Buffalo, NY USA
Mechanism of Selenium Chemoprevention and Therapy in Prostate Cancer
Gao, Allen C; Nov 2007; 21 pp.; In English
Contract(s)/Grant(s): W81XWH-06-1-0006
Report No.(s): AD-A477208; No Copyright; Avail.: Defense Technical Information Center (DTIC)

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

20080019993 Primary Health Care and Public Health Directorate, Ottawa, Ontario Canada
Epidemiologic Considerations in Network Modeling of Theoretical Disease Events
Lem, Marcus; Dec 1, 2006; 37 pp.; In English; Original contains color illustrations
Report No.(s): AD-A477249; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available
Diseases; Epidemiology; Infectious Diseases

20080019994 Applied Research and Analysis Directorate [ARAD], Ottawa, Ontario Canada
Modeling Influenza Pandemic Response Effectiveness in Canada
Jacobson, Zack; Houston, Ben; Dec 1, 2006; 22 pp.; In English; Original contains color illustrations
Report No.(s): AD-A477250; No Copyright; Avail.: Defense Technical Information Center (DTIC)
No abstract available
Canada; Health; Influenza; Medical Services; Viruses

20080019999 Northeastern Univ., Boston, MA USA
Prostate Activated Prodrugs and Imaging Agents
Jones, Graham B; May 2006; 25 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0254
Report No.(s): AD-A477273; No Copyright; Avail.: Defense Technical Information Center (DTIC)
The goal of this project is to demonstrate that enzymatically active PSA in the prostatic microenvironment can be used to locally activate either prodrugs or imaging systems. The substrate chosen was a 3 component system composed of a peptide sequence with affinity for PSA, an imaging agent / cytotoxic drug, and a deactivating bridge-linker, which electronically incapacitates the imaging agent /cytotoxin. On PSA mediated release, the peptide sequence is designed to uncouple from the bridge, which then undergoes spontaneous decomposition, releasing imaging agent /free cytoxoxin. The linker selected was 4-amino benzyl alcohol and proof of principle studies were conducted with a tyrosine derivative to which was coupled a series of three image contrast agents. Enzymatic release of imaging agents was achieved on exposure to PSA, however the conjugates were also substrates for the enzyme -chymotrypsin, limiting their usefulness for screening prostate cancer cells. Specificity for PSA was eventually achieved by conversion to a hexapeptide derivative which underwent selective activation by PSA, releasing imaging agent on exposure to enzyme or prostate cancer tissue.
DTIC
Cancer; Imaging Techniques; Prostate Gland

20080020000 New York Hospital-Cornell Medical Center, New York, NY USA
Radioimmunotherapy (RIT) Dose-Escalation Studies in Prostate Cancer Using Anti-PSMA Antibody 177Lu-J591: RIT Alone and RIT in Combination with Docetaxel
Vallabhajosula, Shankar; Oct 2007; 7 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0884
Report No.(s): AD-A477274; No Copyright; Avail.: Defense Technical Information Center (DTIC)
Phase I dose escalation studies with 177Lu-DOTA-huJ591 using dose fractionation regimen will be performed in patients with PCa and who have recurrent and/or metastatic disease. The 177Lu dose (20-45 mCi/m2) will be escalated in 6 different dose levels (3-6 patients at each dose level). At each dose level, the patients would receive two doses of 177Lu-J591 Mab, 2 weeks apart. The dose of huJ591 MAb will remain fixed at a total dose of 20 mg/dose. After almost 2.5 years of discussions, the phase I protocol was finally approved in Aug 2007 by HSSRB at DOD. In January 2007, we prepared a new lot of DOTAJ591 under GMP conditions for clinical studies. After receiving the approval, we started clinical studies in August 2007. We already recruited the first 3 subjects in Group-1. We hope to complete the first trial by June 2008 and start the combination therapy protocol almost immediately. We plan to complete the study in march 2009. The revised SOW is attached.
DTIC
Antibodies; Cancer; Dosage; Prostate Gland

20080020001 Duke Univ., Durham, NC USA
Biological Basis for Chemoprevention of Ovarian Cancer. Addendum
Berchuck, Andrew; Oct 2007; 35 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0666
Report No.(s): AD-A477276; No Copyright; Avail.: Defense Technical Information Center (DTIC)
To better understanding the etiology of ovarian cancer, we have initiated a case-control study that considers genetic susceptibility, epidemiologic factors and somatic alterations. Subjects are interviewed in their homes and 1,100 cases and 1,000 controls have been accrued. Blood and cancer samples have been collected and molecular analyses of genetic polymorphisms have been performed. We have performed an Illumina array experiment with 1,536 haplotype tagging single nucleotide polymorphisms in about 150 candidate genes with an emphasis on DNA repair genes and found preliminary evidence of an association of this pathway with ovarian cancer risk. We also have played a leadership role in establishing an

international consortium of groups to validate initial associations. A chemoprevention trial with levoneorestrel in chickens demonstrated a protective effect and we have shown that progestin mediated apoptosis in the ovarian epithelium is mediated by transforming growth factor-beta. In vitro data has suggested that vitamin D analogues may also represent appealing chemopreventives. A chemoprevention trial in chickens that incorporates both progestins and vitamin D analogues has been performed. These studies have the potential to increase our ability to identify high-risk women and to lead to the development of chemoprevention strategies that might decrease mortality from this disease.
DTIC
Cancer; Chemotherapy; Ovaries

20080020002 Pennsylvania Univ., Philadelphia, PA USA
Sentinel Lymph Node Biopsy: Quantification of Lymphedema Risk Reduction
Cheville, Andrea L; Oct 2006; 44 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0649
Report No.(s): AD-A477277; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Lymphedema is a common complication of primary breast cancer therapy. It is a chronic, insidiously progressive, and potentially devastating condition. Radiation increases patients lymphedema risk as conventional fields encompass functioning lymphatics. Imaging technologies may identify these lymphatics and allow tailoring of radiation fields to minimize radiation exposure while preserving regional tumor control. This study uses SPECT scanning to localize lymphatics critical for arm drainage after surgical removal of axillary lymph nodes. The study has established the feasibility of fusing SPECT images with high resolution CT scans used in radiation simulation. Furthermore the study has demonstrate that fusing allows precise quantification of radiation dosimetry delivered to lymph nodes critical for arm drainage. The study will test the hypothesis that increased arm volume correlates with high levels of radiation dosimetry. The fact that higher doses of radiation and larger radiation ports are associated with an increased incidence of lymphedema (volume > 150ml.), particularly severe lymphedema (volume > 400ml.), supports this hypothesis. The proposed study realizes the BCRP goals by elucidating a novel means of refining breast cancer treatment to minimize patients' risk of developing the most prevalent and dreaded complication of conventional therapy, lymphedema.
DTIC
Breast; Cancer; Lymphatic System; Mammary Glands; Radiation Effects; Risk; Sentinel System; Thermal Radiation

20080020003 Creighton Univ., Omaha, NE USA
Ethnic and Environmental Influences on Vitamin D Requirement in Military Personnel
Heaney, Robert P; Sep 2007; 13 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0818
Report No.(s): AD-A477278; No Copyright; Avail.: Defense Technical Information Center (DTIC)

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 consist of 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.
DTIC
Calciferol; Ethnic Factors; Military Personnel

20080020004 Beth Israel Deaconess Medical Center, Boston, MA USA
Mapping Mammary Epithelial Cell Transformation in BRCA1 Mutant Mice
Wulf, Gerburg M; Jul 2006; 16 pp.; In English
Contract(s)/Grant(s): W81XWH-05-1-0453
Report No.(s): AD-A477279; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Recently developed culture models provide us with a window into the initial stages of breast cancer formation, when some molecular changes have already occurred but the typical malignant growth is not yet present. We have called these cells that have already taken one or more 'hits', but do not yet form cancer, tumor progenitor cells. It is our hypothesis that the breast tissue of BRCA1 carriers harbors a population of cancer progenitor cells that can be identified with suitable culture techniques. We used a BRCA1 mutant mouse model to address this question. The BRCA1 mutant mice were bred and their breast tissue cells systematically analyzed in an assay that allows for the growth of these cells in three dimensions, where their growth pattern most closely resembles the mammary gland environment. Culture conditions for the growth of these mammary

epithelial cells were established; i.e. growth in a 2% matrigel medium supplemented with EGF, Insulin and Hydrocortisone. Conditional BRCA1 mutant mice were bred together with the respective controls. Mammary glands were harvested at the ages of 6, 12 and 15 months. The differences in growth pattern of PMECs isolated from these mice did not differ significantly.
DTIC
Breast; Cancer; Epithelium; Genes; Mammary Glands; Mice

20080020006 Michigan Univ., Ann Arbor, MI USA
Nitric Oxide Generating Polymeric Coatings for Subcutaneous Glucose Sensors
Meyerhoff, Mark E; Oct 2007; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-05-1-0602
Report No.(s): AD-A477282; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Heretofore efforts to develop implantable sensors for real-time clinical monitoring of glucose subcutaneously (SQ) in diabetic patients have been hindered by the unreliable analytical results owing largely to biocompatibility problems induced by sensor implantation (e.g. inflammatory/foreign body response). The goal of this research program is to explore and optimize the chemistries required to fabricate implantable amperometric glucose sensors with outer polymeric coatings that slowly generate low levels of nitric oxide (NO). Release of NO has been shown to enhance the biocompatibility of the implanted sensors by decreasing the inflammatory response. The focus of this research has been to develop new polymeric coatings (biomedical hydrogels and polyurethanes) that possess immobilized copper ion sites or organoselenium and organotellurium species that will serve as catalytic sites for in situ conversion of endogenous nitrosothiol species (RSNO) to NO thereby providing a sustained local generation of NO species at the surface of the implanted sensors. Preliminary biocompatibility experiments suggest that RSNO levels within the SQ fluid of rats may be sufficient to generate enough local NO to reduce the inflammatory response at the implant site. New needle type sensors are being developed to determine the levels of RSNOs in the SQ region. Finally functional needle type SO glucose sensors have been prepared with both NO release and NO generation coatings. These sensors provide the basis of assessing if NO generationireleasing chemistries are compatible with glucose sensing chemistries.
DTIC
Angiogenesis; Glucose; Nitric Oxide; Plastic Coatings; Polymeric Films

20080020007 Stanford Univ., Stanford, CA USA
VEGF-Iron Oxide Conjugate for Dual MR and PET Imaging of Breast Cancer Angiogenesis
Chen, Xiaoyuan; Sep 2007; 18 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-06-1-0665
Report No.(s): AD-A477283; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The overall hypothesis of this concept award proposal is that a single probe that allows simultaneous acquisition of both positron emission tomography (PET) and molecular magnetic resonance imaging (mMRI) data will maximizes the topographical, anatomical, functional, and molecular information of breast cancer. In this proposal, we choose to image breast cancer tumor vasculature by visualization and quantification of Flt-1 and Flk-1/KDR. Objectives: Aim 1: To develop iron oxide (IO) nanoparticles functionalized with both VEGF121 and PET isotope 64Cu (t1/2 = 12.7 h) and test the dual probe in vitro. Aim 2: To test the PET and mMRI efficacy of the dual-functional nanoprobe in breast cancer in vivo. Major Findings: We have developed VEGF121 mutant that is VEGFR-2 specific. We have developed water soluble iron oxide nanoparticles conjugated with macrocyclic chelating agent DOTA for 64Cu-labeling and cyclic RGD peptide for integrin alpha(v)beta(3) recognition. We have also developed IO-VEGF conjugate and tested the nanoconstruct.
DTIC
Angiogenesis; Breast; Cancer; Conjugates; Imaging Techniques; Iron Oxides; Mammary Glands

20080020008 Roger Williams Medical Center, Providence, RI USA
Trials of Anti-PSMA Designer T Cells in Advanced Prostate Cancer (Phase 1). Revision
Junghans, Richard P; Jul 2007; 9 pp.; In English
Contract(s)/Grant(s): W81XWH-05-1-0408
Report No.(s): AD-A477284; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Anti-PSMA designer T cells Autologous T cells that are gene-modified to express chimeric immunoglobulin T cell receptors (TgTCR) that recognize the prostate specific membrane antigen. We will conduct Phase I dose-escalation trial with infusion of designer T cells into prostate cancer patients after non-myeloablative (NMA) conditioning. This procedure will

allow for the stable engraftment and persistence of the infused cells for improved therapeutic effect. The first year efforts have been in preparation of a clinical-grade vector producer cell (VPC) line, production and testing of clinical vector supernatants and in harmonizing IRB-recommended protocol modifications and completing administrative features in advance of the trial. In year 2 the vector was received from NGVL after production delay. Patients will commence enrollment in year 3 January 2008.
DTIC
Cancer; Lymphocytes; Prostate Gland

20080020009 Vanderbilt Univ., Nashville, TN USA
Stathmin: A Relay Protein in the Development of Prostate Cancer and a Potential Target for Anti-Cancer Therapy
Ghosh, Ritwik; Nov 2007; 34 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-06-1-0015
Report No.(s): AD-A477292; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The long term goal of this work is to determine whether stathmin can be targeted as an effective therapy in the clinic against prostate cancer (PCa). The purpose of this work is to i)correlate stathmin overexpression with progression of PCa ii) determine the signaling pathways activated through selective phosphorylation of stathmin and whether inactivation of these pathways promotes sensitization to treatment with Taxotere or Erbitux iii)examine the effects of stathmin expression on tumor development and the outcomes of Taxotere Erbitux on blocking tumorigenesis in tissue recombination and and transgenic mouse models. We have identified that stathmin modulates TGFbeta signaling in inducing epithelial-to-mesenchymal transformation of PCa cells. We have also established for the first time that p38MAPK acts downstream of stathmin in this pathway. Loss of stathmin results in the sequestering of phosphorylated Smad in the cellular cytoplasm. In its place the Smad-independent MAPKpathway is activated as seen by p38 phosphorylation and the appearance of spindle-shaped cells. Thus we have identified stathmin as a major regulator of epithelial cell homeostasis.
DTIC
Cancer; Prostate Gland; Proteins; Targets; Therapy

20080020010 North Shore-Long Island Jewish Research Inst., Manhasset, NY USA
Stimulation of Estrogen Receptor Signaling in Breast Cancer by a Novel Chaperone Synuclein Gamma
Shi, Y E; Jun 2007; 35 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0569
Report No.(s): AD-A477293; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The association between SNCG expression and the progression of steroid dependent cancers of breast and ovary promoted us to investigate the role of SNCG in regulation of ERalpha. SNCG strongly stimulated the ligand-dependent transcriptional activity of ERalpha in breast cancer cells. A notable finding relevant to this study is that SNCG acting as a chaperone for ER strongly stimulated the ligand-dependent transcriptional activity of ERalpha ligand-dependent cell growth and ligand-dependent mammary tumorigenesis. Augmentation of SNCG expression stimulated the transcriptional activity of ERalpha and ligand-dependent growth whereas compromising endogenous SNCG expression suppressed ERa signaling and ligand-dependent growth.
DTIC
Breast; Cancer; Estrogens; Mammary Glands; Stimulation

20080020018 Dana Farber Cancer Inst., Boston, MA USA
Targeting of CD151 in Breast Cancer and in Breast Cancer Stem Cells
Hemler, Martin E; Apr 2007; 34 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-06-1-0580
Report No.(s): AD-A477303; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A mouse model for spontaneous breast cancer has been set up to analyze the role of CD151 during breast cancer progression. Using this model, which involves amplification of the ErbB2 oncogene, preliminary data was then obtained indicating that the absence of CD151 causes a substantial delay in the appearance of mouse mammary tumors. To confirm these preliminary results, we next set up a larger scale experiment to evaluate the role of CD151 during mammary tumor progression. Results from this larger scale experiment are pending further growth of the mice. In another experiment, a subpopulation of human MCF7 cells was isolated that has 'stem-cell' like properties. Removal of CD151 from this 'stem cell'-like population dramatically diminished cell invasion and responsiveness to EGF. In addition, the CD151 gene was

successfully ablated from several different human mammary carcinoma cell lines, by using an siRNA strategy. As a consequence of CD151 removal, human mammary epithelial cells show diminished invasion, migration, signaling, adhesion, and EGFR collaboration. Together these results establish that CD151 plays a major role in the progression of breast cancer. DTIC

Breast; Cancer; Mammary Glands; Proteins; Stem Cells

20080020022 Arizona Univ., Tucson, AZ USA

Effects of Modification in the Laminin-10 Basal Lamina on Prostate Cancer Invasion

Pawar, Sangita C; Bair, Elisabeth L; Oct 2007; 14 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0611

Report No.(s): AD-A477311; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In order for prostate cancer to metastasize it must invade through a laminin-511 rich barrier. We have previously shown that the matrix metalloprotease MTI-MMP which is expressed in prostate cancer but not in normal prostate tissue cleaves the laminin alpha-5 chain into four distinct fragments. This cleavage allows for increased prostate cancer cell migration in vitro. Laminin-511 cleavage also occurs in vivo in human prostate tissue. Cleavage of laminin-511 and release of laminin-511 fragments leads to altered cell function leading to increased cell migration and invasion in in vitro assays. We have demonstrated that prostate cancer cells treated with laminin-511 that has been cleaved by MTI-MMP have increased EGFR phosphorylation compared with cells grown on tissue culture plastic or intact laminin-511 in a Western blot. We have purified a recombinant 45kDa laminin-511 N-terminal cleavage fragment which contains laminin EGF like domains. Treatment of prostate cancer cells with soluble recombinant fragment demonstrates that the cleaved laminin fragment acts as a trikine activating the EGFR on prostate cancer cells in a Western blot. This work demonstrates that increased MTI-MMP expression in prostate cancer not only cleaves the major laminin surrounding prostate cancer to clear a path for migration, but also releases active fragments from the laminin-511 that signal for increased migration.

DTIC

Cancer; Laminates; Prostate Gland

20080020023 Stanford Univ., Stanford, CA USA

Oral Contraceptives and Bone Health in Female Runners

Kelsey, Jennifer L; Aug 2007; 144 pp.; In English

Contract(s)/Grant(s): DAMD17-98-1-8518

Report No.(s): AD-A477313; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Highly trained female athletes may experience loss of menses because of their participation in intense physical activity. Previous cross-sectional research has shown that women with exercise-induced menstrual irregularities have a significantly higher frequency of stress fractures and low bone mass than normally menstruating controls. Longitudinal studies suggest that these women are losing bone mass over time. Low serum estrogen levels are believed to be a principal cause of the bone loss. If so, reestablishing normal estrogen levels in these women should prevent or retard bone loss and decrease the incidence of stress fracture. This was a 2-year randomized trial of the effects of oral contraceptives on bone mass and stress fracture incidence among 150 female competitive distance runners ages 18-26 years. The Coordinating Center was 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, New York. In addition to a publication from baseline data, two manuscripts from this study have been accepted for publication. One manuscript, '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 these data are inconclusive. 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. Another manuscript, 'The Effect of Oral Contraceptives on Body Weight and Body Composition in Young Female Runners,' will be submitted for publication shortly. Two other manuscripts are in preparation.

DTIC

Athletes; Bones; Estrogens; Females; Fractures (Materials); Health; Osteoporosis; Physiological Effects; Therapy

20080020033 Pennsylvania State Univ., University Park, PA USA

Closed-Loop Noninvasive Ultrasound Glucose Sensing and Insulin Delivery

Smith, Nadine; Pishko, Michael; Gabby, Robert; Werner, Jacob; Sep 2007; 70 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0617

Report No.(s): AD-A477332; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Numerous studies have shown that ultrasound can successfully be used for noninvasive blood glucose monitoring and transdermal insulin delivery. To facilitate the ability of a diabetic patient to avoid repeated needle sticks to monitor blood glucose level and painful daily injections of insulin, this basic research proposal will study the feasibility of safe and portable ultrasonic system to do both. Specifically using the low profile and light weight 'cymbal' transducer, a potentially portable ultrasound array of will be designed. Moreover the feasibility of a 'smart' diabetes management system will be developed to control both the glucose monitoring and insulin delivery system. The report herein describes the year one progress for this award and there are no deviations from the original research plan and this research is progressing on schedule.

DTIC

Blood; Chemical Composition; Detection; Feedback Control; Glucose; Insulin; Metabolic Diseases; Ultrasonics

20080020034 California Univ., Irvine, CA USA

The Role of Alternative Splicing in Breast Cancer Progression

Hertel, Klemens J; Sep 2007; 8 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0598

Report No.(s): AD-A477333; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Alternative pre-mRNA splicing generates thousands of different mRNA isoforms in metazoan organisms. It is unknown if breast-cancer associated alternative splicing is regulated like tissue-specific splicing, or whether it is caused by changes in the splicing accuracy. To test the hypothesis that the accuracy of the spliceosome is compromised in breast tumor cells, we have designed a quantitative real-time PCR assay to determine the number of incorrectly spliced mRNA products made from pre-mRNA transcripts that produce only a single mRNA product in all eukaryotic genomes. Analysis of all possible alternative exon exclusion patterns for these genes demonstrates that in some cases a splicing mistake is made only once in 25,000 intron removal events. These results demonstrate that the error rate of the spliceosome is extremely low. Using this assay we examined splicing error rates in breast cancer cell lines. Using matched cancer and normal cell lines we demonstrated that breast cancer cell lines exhibit an up to 3-fold decrease in the number of splicing errors. We conclude that perturbed pre-mRNA splicing in breast cancer is mediated in part through alterations of the intrinsic fidelity of the spliceosome.

DTIC

Breast; Cancer; Mammary Glands; Splicing

20080020036 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA

Assay for and Replication of Karshi (Mammalian Tick-Borne Flavivirus Group) Virus in Mice

Turell, Michael J; Whitehouse, Chris A; Butler, Ashley; Baldwin, Carson; Hottel, Hannah; Mores, Christopher N; Jan 2008; 5 pp.; In English

Report No.(s): AD-A477336; TR-07-049; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Little is known about the replication of Karshi virus, a member of the mammalian tick-borne flavivirus group, in its rodent hosts. Therefore, we developed a novel quantitative real-time RT-PCR assay and measured the amount of viral RNA in selected tissues of infected Swiss Webster mice. Two-day-old mice were highly susceptible, with 100% fatality between days 9 and 12 after infection, while 9-day-old mice were less susceptible with death occurring only rarely. In nearly all cases, mice inoculated when 2-days old contained similar numbers of viral genome equivalents from blood and liver samples from any given mouse, with titers declining after day 7. In contrast, the amount of viral RNA in the brain began to rise rapidly 4 days after exposure, peaked at about 6 days after virus exposure with a (titer of > 10 (exp to the 13) genome equivalents/g), and remained at that level until euthanasia or death. Viral profiles were similar in needle-inoculated or tick-exposed mice

DTIC

Animals; Assaying; Diseases; Encephalitis; Mammals; Mice; Viruses

20080020040 Air Force Academy, CO USA

Estimating Mass Discharge From Dense Nonaqueous Phase Liquid Source Zones Using Upscaled Mass Transfer Coefficients: An Evaluation Using Multiphase Numerical Simulations

Christ, John A; Ramsburg, C A; Pennell, Kurt D; Abriola, Linda M; Nov 28, 2006; 14 pp.; In English

Report No.(s): AD-A477342; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Difficulties associated with identifying the dense nonaqueous phase liquid (DNAPL) source zone architecture at the field scale, combined with the computational costs of field-scale DNAPL dissolution simulations, have motivated the development of a number of simplified models that rely upon upscaled (i.e., domain-averaged) mass transfer coefficients to approximate field-scale dissolution processes. While conceptually attractive, these upscaled models have yet to be fully evaluated for prediction of mass recovery from a range of nonuniform, three-dimensional DNAPL source zones. This study compares upscaled model predictions of flux-weighted downstream concentrations and source longevity to predictions derived from three-dimensional multiphase numerical simulation of tetrachloroethene (PCE)-NAPL dissolution for realizations of a statistically homogeneous, nonuniform aquifer. Although the functional forms of the upscaled models are generally shown to be mathematically equivalent, upscaled model flux-weighted concentration predictions varied by over one order of magnitude, with variations attributed to the dependence of the upscaled model parameters on the specific source zone scenario used for model calibration. Replacement of upscaled model calibration parameters with source zone parameters that can be obtained from site characterization information (specifically, the initial flux-weighted concentration and source zone ganglia-to-pool (GTP) mass ratio) reduced the root-mean-square error between upscaled and numerical model predictions by approximately 80%. Application of this modified model to a range of source zone scenarios ($0.4 < GTP < 1$) demonstrates the efficacy of the model for use as a screening tool to relate DNAPL mass removal and flux-weighted concentrations when mass removal is less than 80%.

DTIC

Estimating; Liquid Phases; Mass Transfer; Metabolism; Numerical Analysis

20080020052 Texas Univ., Houston, TX USA

The Role of Stat3 Activation During Prostate Cancer Progression

Blando, Jorge; DiGiovanni, John; Nov 2007; 34 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0045

Report No.(s): AD-A477370; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The purpose of this proposal is to detect the role of Stat3 activation during prostate cancer progression. Amultifaceted approach is being used to accomplish the proposed research goals. Significant progress was made insupport of Task I in that we were able to overexpress activated Stat3 (Stat3C) in tow human prostate cell lines. Both lines were characterized and at least on line (MDAPLa 2b) exhibits molecular alterations consistent with Stat3 activation. In support of Task 2 we have begun characterization of the Pb.Stat3C transgenic line and the preliminary histopathological findings indicate that expression of activated Stat 3 may confer a neoplastic phenotype. The proposed bigenic cross (Pb.Stat3C x BK5.IGF-I) has also been initiated as well as an alternate strategy due to the limited fertility of the BK5.IGF-1 transgenic line and the apparent compromise in viability of the bigenic offspring. Our results to date have been promising and should further our understanding of the role of Stat3activation in prostate cancer progression.

DTIC

Cancer; Prostate Gland

20080020053 Ohio State Univ., Columbus, OH USA

Genetic Alterations in Epithelial and Stromal Compartments of Prostate Adenocarcinomas

Eng, Charis; Jan 2006; 36 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0118

Report No.(s): AD-A477380; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Genetic analyses on prostate cancer has been occurring for over a decade. However such studies were uniformly performed on the entire tumor without regard to its components despite the fact that a few groups were quite aware of both epithelial and stromal components of tumors and the cell biology of the tumor 'microenvironment' has been described for the last 20 years. Thus until now when a genetic alterabon be it intragenic mutabon regional amplificabon or deletion manifested by loss of heterozygosity of markers (LOH) is attributed to a prostate cancer it is unclear if the alteration is actually occurring in the epithelial compartment the surrounding stromal compartment or both. Our own preliminary data on breast carcinomas demonstrate that LOH and even somatic mutations can occur in surrounding stromal fibroblasts. Therefdre this proposal proposes to search for genetic alterations in the stroma of prostate cancers and to determine if such alterations can influence

clinical outcome. In the first year we have accrued 55 distinct non-M1 sporadic adenocarcinomas of the prostate have subjected them to laser capture microdissection to separate compartments and are about to begin a total genome LOH scan. DTIC

Cancer; Compartments; Genetics; Neoplasms; Prostate Gland

20080020056 New York Hospital-Cornell Medical Center, New York, NY USA

Radioimmunotherapy (RIT) Dose-Escalation Studies in Prostate Cancer Using Anti-PSMA Antibody 177Lu-J591: RIT Alone and RIT in Combination With Docetaxel

Vallabhajosula, Shankar; Oct 2006; 7 pp.; In English

Contract(s)/Grant(s): W81XWH-04-1-0884

Report No.(s): AD-A477385; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Phase I dose escalation studies with 177Lu-DOTA-huJ591 using dose fractionation regimen will be performed in patients with PCa and who have recurrent and/or metastatic disease. The 177Lu dose (20-45 mCi/m2) will be escalated in 6 different dose levels (3-6 patients at each dose level). At each dose level the patients would receive two doses of 177Lu-J591 Mab, 2 weeks apart. The dose of huJ591 MAb will remain fixed at a total dose of 20 mg/dose. The phase I protocol was initially approved by lRB at New York Cornell Medical Center in Aug 2004. All the paperwork was submitted to HSSRB at DOD, for their approval of the protocol. Finally after 2.5 years of discussions, the protocol was finally approved in by FDA in January 2007 and DOD by June 2007. We hope to start recruiting patients very soon. Six months ago, we prepared a new lot of DOTA-J591 under GMP conditions for clinical studies. All the qc studies were performed to start the clinical trial. DTIC

Antibodies; Cancer; Dosage; Prostate Gland

20080020058 Colorado Univ., Boulder, CO USA

An Experimental System to Evaluate LOH in Prostate Cancer

Strauss, William M; Jul 2004; 12 pp.; In English

Contract(s)/Grant(s): DAMD17-99-1-9032

Report No.(s): AD-A477389; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The goal of this grant is to establish a new biological system for studying the progression of prostate cancer. We propose a technology we have previously developed to help define X-chromosome inactivation to increase our understanding of the molecular biology of prostate cancer. Using a mouse model, our goal is to induce functional Loss of Heterozygosity (LOH) on a particular chromosome at various specified time during development or life span. Specifically, we plan to induce LOH only in mouse prostatic tissue. DTIC

Cancer; Chromosomes; Heterogeneity; Molecular Biology; Prostate Gland

20080020059 Greater San Antonio Hospital Council, TX USA

Methods to Increase Access to Care for the Uninsured and the Indigent in the Greater San Antonio Hospital Systems: A Policy Analysis

Cleckley, Janiese A; Mar 22, 2007; 72 pp.; In English

Report No.(s): AD-A477392; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Health care coverage in the USA has decreased drastically over the past 10 years. This phenomenon is of tremendous concern as the number of uninsured persons in the USA has increased considerably from 33 million to over 46 million within a decade. Of all the states, Texas has the highest rates of uninsured and under-insured in the country. According to the Census Bureau, an estimated 24.6 percent of the total population or 5.4 million Texans Were uninsured in 2004. For the 44-46 age cohorts, classified as non-elderly, the statewide uninsured rate was 27.3 percent. Specific to San Antonio, one in every four persons is uninsured. As a result, this lack of access to health care coverage has resulted in poor health outcomes, higher mortality rates, shorter life spans, low income, educational inadequacies, and low socio-economic standing in the community. The purpose of this policy analysis is to identify the best policy alternative(s) that will increase access to care for the uninsured in San Antonio, Texas and at the same time improve the socio-economic standing of the community as a whole. DTIC

Hospitals; Insurance (Contracts); Medical Services; Policies

20080020060 Madigan Army Medical Center, Takoma, WA USA

Evaluating the Coding and Workload Accounting Improvement Initiative of Madigan Army Medical Center

Bewley, Lee W; Bender, Brian J; Apr 27, 2007; 59 pp.; In English

Report No.(s): AD-A477393; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The purpose of this study was to evaluate the Coding and Workload Accounting Improvement Initiative (CWAI) at Madigan Army Medical Center (MAMC). The CWAI aims to improve MAMC's outpatient clinical workflow and business processes, nurse and medical technician workload documentation, provider coding accuracy and education, and clinic electronic medical record (AHLTA) usage. The desired end state of the CWAI is improved medical documentation and coding accuracy at MAMC. Data were analyzed using descriptive statistics and Pearson's chi-square test to assess the CWAI before and after data. Results indicate statistically significant improvements in coding accuracy and compliance. An additional CWAI byproduct Was increased provider productivity and a statistically significant increase in clinic AHLTA usage. Results indicate the CWAI does indeed have a statistically significant positive impact on the MAMC outpatient coding program. The author recommends sustaining the current CWAI program, as well as adding additional educational programs to best facilitate accurate coding results.

DTIC

Coding; Medical Services; Productivity; Workloads (Psychophysiology)

20080020061 Ben Taub General Hospital, Houston, TX USA

Ben Taub General Hospital & LifeGift: Strengthening a Partnership to Save Lives and Improve Healthcare Delivery

Philpot, Douglas G; May 24, 2007; 38 pp.; In English

Report No.(s): AD-A477395; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Ben Taub General Hospital, working closely with LifeGift, consistently ranks at or near the top of the list of hospitals in the USA that receive informed consent for organ donation from patients' families. Presently, organs are procured from these patients only after they are transferred to nearby hospitals. If these organs were procured within Ben Taub General Hospital, the Harris County Hospital District would be able to capture much needed revenue and, more importantly, enhance patient care by increasing the conversion rate of organ donors and avoiding unnecessary transfers, easing an already difficult time for patients' families. The full implementation of an organ procurement program at Ben Taub General Hospital will involve support from almost every area of the hospital. Successful execution demands involvement from radiology, pharmacy, laboratory, emergency center, accounting, billing, operating room, and executive staff. In addition, extensive effort, in the form of policy and procedure creation and revision, and a reallocation and prioritization of resources is needed to ensure accomplishment of this task.

DTIC

Hospitals; Organs; Procurement

20080020064 Blanchfield Army Community Hospital, Fort Campbell, KY USA

Contributing Factors to Total Mission Time for Medical Evacuation Missions during Operation Iraqi Freedom II

Leech, III, Jack R; May 2007; 54 pp.; In English; Original contains color illustrations

Report No.(s): AD-A477404; AMEDDCS-12-07; No Copyright; Avail.: Defense Technical Information Center (DTIC)

During Operation Iraqi Freedom 11 from March to September of 2004, the patient evacuation team (PET) of the l% Marine Expeditionary Force recorded 1133 missions during the evacuation of2010 casualties. They recorded Total Mission Time and other key characteristics of the missions such as the evacuation category of the casualties and the amount of flight time it took to evacuate the casualty to the next echelon of care. The average mission involved 1.77 casualties. The average Urgent flight tookjust 39 minutes; however, the Total Mission Time was over one and one half hours. Several predictor (independent) variables were used in attempt to explain the total amount of time that it took to complete the mission. This model explained 46% (R2 = .459) of the Total Mission Time. The model produced a regression equation, F (10, 1122) = 95.38, (p <.001). The variable contributing the most was Urgent Casualty (t = -21.42, p <.001). Future planners should use all of these contributing factors to train their Marines and Soldiers on casualty assessment and proper evacuation request procedures.

DTIC

Evacuating (Transportation); Iraq; Medical Services; Military Operations

20080020066 Vanderbilt Univ., Nashville, TN USA

Recombinant Peptides as Biomarkers for Metastatic Breast Cancer Response

Diaz, Roberto; Oct 2007; 11 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0788

Report No.(s): AD-A477411; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The overall objective of this Proposal is to rapidly and non-invasively assess metastatic breast cancer susceptibility to tyrosine kinase inhibitors (TKIs) by use of recombinant peptides that bind within tumors. We will then identify the receptor to which the recombinant peptide binds. We propose that this receptor protein becomes unveiled following therapy. These recombinant peptides in turn can be labeled with internal emitters to provide a means of non-invasive monitoring of tumor responsiveness to therapy. We propose that the peptide will bind to receptors within the tumor microvasculature that are specifically induced in response to therapy and are not present in untreated endothelium. These aims will test the central hypothesis that non-invasive assessment of breast tumor susceptibility to therapy can be achieved by use of recombinant peptides selected from phage-displayed libraries.

DTIC

Biomarkers; Breast; Cancer; Mammary Glands; Metastasis; Peptides

20080020067 Harvard Medical School, Boston, MA USA

A New Concept for Androgen Receptor-Independent Growth of Prostate Cancer

Hu, Guo-fu; Kishikawa, Hiroko; Yoshioka, Norie; Nov 2007; 11 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0031

Report No.(s): AD-A477419; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Angiogenin is progressively upregulated in prostate cancer, in particular in androgen-independent diseases. The objective of this project is to explore the role angiogenin plays in the development of androgen-independent disease. In this reporting period, we have demonstrated that nuclear translocation of angiogenin is specific for prostate cancer cells and does not occur in normal prostate epithelial cells. Angiogenin is translocated to the nucleus of androgen-dependent cells (LNCaP) only when the cells are stimulated with androgen (DHT). But angiogenin is constitutively translocated to the nucleus of androgen-independent cells (PC-3, PC-3M, DU145). Angiogenin is required for DHT to stimulate rRNA transcription and cell proliferation of androgen-dependent cells. Overexpression of angiogenin enables androgen-independent growth of otherwise androgen-dependent prostate cancer cells in vitro and in vivo. Finally, we have shown that angiogenin binds to the promoter region of rDNA in vivo and stimulates rRNA transcription.

DTIC

Cancer; Hormones; Males; Prostate Gland; Proteins; Ribonucleic Acids

20080020068 Michigan Univ., Ann Arbor, MI USA

Molecular Modulation of Inhibitors of Apoptosis as a Novel Approach for Radiosensitization of Human Prostate Cancer

Xu, Liang; Nov 2007; 12 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0010

Report No.(s): AD-A477422; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The major goal of the project is to investigate the radiosensitizationactivity and mechanism of action of novel IAP-inhibitors in prostate cancer. In the second year of the project, we have investigated the in vivo radiosensitization activity of our lead IAPinhibitors, SH-130 and Embelin, in human prostate cancer cell xenograft model. IAP-inhibitorspotently enhanced radiationinduced tumor growth inhibition. In nude mouse xenograft models, IAP-inhibitors Embelin and SH-130 potently sensitized the DU-145 tumors to X-ray radiation. Bioluminescence imaging confirmed SH-130 plus radiation resulted in complete tumor regression in 6 out of 10 tumors, comparing 2/10 tumors with radiation alone, and 0/10 tumors with SH-130 alone. Mechanism studies show that NK-kB pathway activation was also inhibited in the combination therapy. Based on our exciting data obtained from this PCRP project, together with data from other collaborators, we are working with FDA for IND filing aiming for Phase I clinical trial with SH-130 as radiosensitizer for prostate cancer.

DTIC

Apoptosis; Cancer; Inhibitors; Modulation; Prostate Gland

20080020070 Darnall Army Hospital, Fort Hood, TX USA

An Analysis of Primary Care Provider Productivity in the Department of Family and Community Medicine at Carl R. Darnall Army Medical Center

Richter, Steven J; Jun 8, 2007; 69 pp.; In English

Report No.(s): AD-A477448; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Military Health System (MHS) uses relative value units per provider per day (RVU/PP/PD) to measure the productivity of its primary care providers. The purpose of this Graduate Management Project (GMP) is to look at productivity in the Department of Family and Community Medicine (DFCM) and determine whether a reason can be found as to why the RVU/PP/PD fell below the Army goal of 15.4 RVU/PP/PD for five months in fiscal year 2006. The data analyzed consists of 1252 primary care provider months from eight MEPRS in the DFCM. Logistics regression revealed that provider skill set pediatric and pediatric nurse practitioner lends to a 94% and 186%, respectively increase in the likelihood of meeting the RVU/PP/PD productivity goal and that provider type GS lends to an 82% increase in the likelihood of meeting the RVU/PP/PD productivity goal. Of the 1252 primary care provider months only 36% met the Army RVU/PP/PD goal. Two main factors found during the analysis that lend to a lower rate of meeting the goal are the electronic medical record (AHLTA) that was implemented at the beginning of fiscal year 2006, and the reliability and validity of UCAPERS data that is required to compute the RVU/PP/PD formula.

DTIC

Medical Services; Physicians; Productivity

20080020071 Northwestern Univ., Chicago, IL USA

Design and Development of Peptides from the Anti-Angiogenic Pigment Epithelial-Derived Factor for the Therapy of Prostate Cancer

Mirochnik, Yelena; Dec 2007; 13 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0103

Report No.(s): AD-A477451; No Copyright; Avail.: Defense Technical Information Center (DTIC)

To create PEDF based therapy for hormone-refractory CaP we have proposed to design short synthetic peptides corresponding to the 34- mer anti-angiogenic epitope of PEDF. The 3D structure of PEDF 34-mer peptide was analyzed using Protean software in terms of relative hydrophobicity, charge distribution, and antigenic index. Three synthetic peptides covering the 34-mer PEDF fragment were generated and tested for the ability to reproduce anti-angiogenic effect of PEDF. Although all peptides (14, 18 and 23-mer) inhibited FGF-induced endothelial cell migration only 18 and 23-mer induced apoptosis in endothelial cells. The 18-mer peptide also blocked neovascularization induced by FGF in vivo as demonstrated in corneal and matrigel assays. This peptide was further tested in vivo in mouse model for ability to inhibit prostate tumor growth. Subcutaneous PC3 tumor growth was inhibited in mice treated with 18-mer peptide. There was significant reduction in microvascular density in the 18-mer treated animals accompanied by increased apoptosis.

DTIC

Antigens; Cancer; Endothelium; Peptides; Pigments; Prostate Gland; Therapy

20080020072 Wake Forest Univ., Winston-Salem, NC USA

Simultaneous Analysis of Germline Crips and Snips in High Risk Prostate Cancer Families

Xu, Jianfeng; Oct 2007; 65 pp.; In English

Contract(s)/Grant(s): W81XWH-06-1-0281

Report No.(s): AD-A477452; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Prostate cancer is the leading cancer among men in the USA, and is a disease with strong genetic susceptibility. The genetic susceptibility is due to the inheritance of altered germline DNA sequences, either in the form of point mutations such as single nucleotide polymorphisms (SNPs), or deletions/gains of a string of nucleotides such as copy number polymorphisms (CNPs). Most current genetic studies focus only on the role of SNPs in genetic susceptibility. In contrast, few studies have explored the role of deletions/gains in cancer predisposition, due to limited methods. In fact, germline deletions/gains are common in the human genome and may have a significant impact on gene products because they can involve an entire gene or a significant portion of a gene. They may play a more important role in hereditary PCa, a type of PCa that is likely due to germline changes in major genes. With the grant support, we have made important progresses toward this new research area. To our knowledge, our study is the first of its kind. Results will likely contribute to our understanding of prostate cancer etiology, and provide novel targets for prostate cancer risk assessment, prevention, and therapy.

DTIC

Cancer; Deoxyribonucleic Acid; Nucleotides; Polymorphism; Prostate Gland; Risk

20080020073 Army Medical Dept. Center and School, Fort Sam Houston, TX USA

A Business Case Analysis: Establishment of a Sub-Acute Ward for Tripler Army Medical Center

Reichenberg, Colleen; Mar 31, 2007; 75 pp.; In English

Report No.(s): AD-A477453; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This business case examines the likely costs and benefits of establishing of a sub-acute ward which is designed to decrease the cost of treating long-stay patients. The recommendation is to establish a sub-acute ward on a current surgical ward by October 1, 2009. Three options were evaluated: (1) current ward space, (2) enhanced use lease (EUL) building, or (3) business as usual (BAU). The BAU option returned a net present value (NPV) of negative $41.8M with a return on investment (ROI) of negative 99.40 percent. The ward option returned a NPV of negative $23.4M with a ROl of negative 54.8 percent. The EUL option has a NPV of negative $23.8M with a ROI of negative 54.8 percent.

DTIC

Commerce; Cost Analysis; Cost Effectiveness; Health; Medical Services; Military Operations

20080020074 Naval Hospital, Jacksonville, FL USA

An Analysis of the Impact of AHLTA Implementation on Provider Productivity at Naval Hospital Jacksonville, FL

Esguerra, Diego; Aug 29, 2007; 43 pp.; In English

Report No.(s): AD-A477454; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Naval Hospital Jacksonville, FL, implemented the use of an electronic medical record (AHLTA) in November 2005. Following the installation of AHLTA, productivity decreased. This study measured productivity at the provider level during each period. The dependent variable for this study was productivity, defined as Relative Value Units (RVU) divided by encounters. Regression results indicated that the overall model significantly predicted provider productivity, albeit weakly: R2=.249, R2 adj=.237, F(12, 759)=20.63, p<.05. This model accounts for 23.7% of variance in provider productivity.

DTIC

Computer Programs; Computer Techniques; Hospitals; Medical Services; Military Operations; Productivity

20080020075 Walter Reed Army Medical Center, Washington, DC USA

Business Case Analysis of the Walter Reed Army Medical Center Medical/Surgical Prime Vendor Generation III Service Level Electron Program

Markot, Peter B; Oct 25, 2007; 96 pp.; In English

Report No.(s): AD-A477455; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The purpose of the business case analysis was to determine what combination of Full-Time Equivalent (FTE) staffing and medical/surgical services offered under the Prime Vendor (PV) Generation III contract would provide the best supply chain management solution for Walter Reed Army Medical Center (WRAMC). In support, three scenarios were developed with various combinations of FTE staffing and PV service options in order to determine a best value solution. Results of the analysis indicated that the addition of five floater FTEs fully cross-strained in all areas should be added to the current staffing model and no changes or additions to PV contract services should be made. This scenario improves the division's ability to respond to patient surges, National Security matters, and operational requirements. The additional FTEs can also provide logistics support branches the ability to respond to turnover, retirement, leave, and illness. Ultimately, failure to hire additional FTEs could place a greater burden on the logistics staff and force the command to assume greater risk based on the inability to respond to additional requirements.

DTIC

Commerce; Cost Reduction; Logistics Management; Medical Services; Military Operations

20080020076 Landstuhl Regional Medical Center, Landstuhl, Germany

A Proposed Conceptual Model of Military Medical Readiness

Van Hall, Brian M; May 2007; 127 pp.; In English

Report No.(s): AD-A477458; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No single accepted definition or uniform framework has ever been offered or suggested defining medical readiness within the Department of Defense. The purpose of this research is to consolidate existing literature on the latent variable of medical readiness, and to propose a composite theoretical model of medical readiness that may provide healthcare professionals a common operating picture for understanding and improving medical readiness. The basis for the proposed conceptual model builds on common and accepted latent variable and theoretical modeling techniques proposed by healthcare scholars,

organizational theorists, mathematical methodologists and military leaders. It is the intent of the author that this framework might act as a foundation in describing and presenting future discussion on military medical readiness.
DTIC
Maintainability; Medical Services; Military Operations; Models

20080020077 North Mississippi Medical Center, Tupelo, MS USA
A Strategic Management Plan to Adopt a New Methodology for Treating Total Joint Replacement Patients
Gann, Bradley D; Jun 28, 2007; 52 pp.; In English
Report No.(s): AD-A477459; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The strategic management issue researched is how to improve the NMMC's total joint replacement program. This procedure was initially recognized as an area of concern by the organization due to its high cost and predictions of a substantial national increase in volume over the next several years. The hospital intends to strategically position itself to increase quality outcomes, volume, and cost effectiveness relative to total joint replacements. The evaluation of the external environment, service area competitor analysis and internal environment demonstrates the need for the hospital to pursue both enhancement and penetration strategies. Service enhancement will be achieved through the adoption of a new methodology to improve its operations and services through increased quality and efficiency. This new approach is often referred to as the wellness approach and is a unique, innovative way of patient education and treatment. The concept places an increased focus on pre-surgical education, family involvement and group interactions than most traditional treatment approaches.
DTIC
Management Planning; Medical Services; Military Operations; Optimization; Orthopedics; Patients; Replacing

20080020078 Naval Medical Research Inst., San Diego, CA USA
Strategies to Make Immunization Status Visible During Patient Encounters at Naval Medical Center San Diego
Nevins, Robert P; Oct 29, 2007; 89 pp.; In English
Report No.(s): AD-A477461; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Despite the existence of office systems that can be used for automation, Naval Medical Center San Diego (NMCSD) continues to utilize paper based immunization records which do not always accurately report patient immunization status. The practice of using multiple forms to record immunization data has led to problems in determining individual immunization needs during outpatient visits. Providers often miss opportunities to vaccinate during primary care encounters due to scattered, inaccurate or missing immunization records. This strategic analysis proposes that NMCSD implement the adaptive strategy of enhancement. Under enhancement, NMCSD should implement a new process to check immunization using AHLTA during every patient visits. It is also proposed that the NMCSD form an alliance with NMCP and NNMC in order pool all the resources to ensure successful implementation of the enhancement strategy. Finally, this analysis also proposes that NMCSD adopt a strategic posture as a prospector in order to better respond to changes in the environment.
DTIC
Encounters; Immunology; Medical Services; Military Operations; Patients; Public Health; Vaccines

20080020079 Texas Univ., Dallas, TX USA
VatuximabTM: Optimizing Therapeutic Strategies for Prostate Cancer Based on Dynamic MR Tumor Oximetry
Mason, Ralph P; Dec 2007; 186 pp.; In English
Contract(s)/Grant(s): W81XWH-06-1-0149
Report No.(s): AD-A477464; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Targeting the vasculature of tumors promises a new effective therapy for prostate cancer. We propose a new approach targeting the blood vessels in the tumor. Specifically, a novel antibody 3G4, which targets phosphatidylserine (PS) expressed on tumor vasculature was developed by Thorpe et al. and is being developed by Peregrine Pharmaceuticals for clinical trials. Normally, PS exclusively resides on the cytosolic leaflet of the plasma membrane. However, in tumors PS becomes externalized and provides a viable target. The agent not only targets various tumors, but also induces vascular damage and tumor regression with minimal accompanying toxicity. In developing a new therapy, critical issues include scheduling, optimal combination with other interventions to achieve synergy and early assessment of efficacy. Magnetic resonance imaging allows us to follow the induction and development of tumor vascular damage providing new insight into spatial and temporal activity and facilitating effective combination with the hypoxic cell selective cytotoxin tirapazamine. Importantly, this therapy may be

effective at any stage of tumor development, and could be most effective for advanced disease. Success will confirm the potential of this new therapeutic approach to prostate cancer in man and lay the foundation for future clinical trials.
DTIC
Cancer; Oximetry; Prostate Gland; Therapy; Tumors

20080020081 Texas Univ., San Antonio, TX USA
Amplification of Type II Cadherins in Prostate Cancer
Johnson-Pais, Teresa L; Nov 2007; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-06-1-0090
Report No.(s): AD-A477469; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Genomic alterations of 18q have been observed in prostate cancer. This research focuses on analyzing the role of increased gene copy number at 18q22.1 in prostate cancer. We believe the key genes in this region are type II cadherins. We are studying the role of overexpression of cadherin 7 (CDH7) on the tumorigenic and invasive potential of prostate cancer cells. The increased copy number of CDH7 is specific to prostate cancer and results in increased levels of CDH7 mRNA in prostate tumors. We previously created and purified polyclonal antibodies against CDH7 peptides to use in immunohistochemistry experiments to determine if increased CDH7 copies increases the protein level, but these antibodies proved to be inadequate. We have since created polyclonal and monoclonal antibodies against full-length bacterially-expressed protein and are in the process of testing these antibodies. We have already performed knockdown experiments of the CDH7 mRNA in a prostate cancer cell line and will analyze the CDH7 protein levels in these cells with these new antibodies. We will subsequently evaluate these knockdown cells for invasive and tumorigenic potential.
DTIC
Amplification; Antibodies; Cancer; Prostate Gland

20080020082 University Health Network, Toronto, Ontario Canada
Integration of Diagnostic and Interventional MRI for the Study of Persistent Prostate Cancer After External Beam Radiotherapy
Menard, Cynthia; Oct 2007; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-05-1-0570
Report No.(s): AD-A477475; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This study involves the technical development and clinical testing of a novel technique for magnetic resonance imaging (MRI) guided prostate biopsy in a 1.5T horizontal bore scanner using a dedicated interventional table. We primarily hypothesize that the integration of diagnostic and interventional MRI enables needle biopsy targeting to foci of tumor recurrence after radiotherapy, and will enable a determination of the diagnostic accuracy of MRI in mapping sub-sites of tumor recurrence after radiotherapy. Major finding to date: This clinical study received ethics approval from USAMRCMC approval on October 13 2006. Funds were released after HSRRB approval, and received in September 2006. In the first year of research,14 patients have been accrued to stage 1 (phase 1) of the trial. We will proceed to Stage 2 as soon as we receive HSRRB approval of study amendment. Tasks 1a-1d are complete, as per the Statement of work.
DTIC
Cancer; Prostate Gland; Radiation Therapy

20080020083 Washington Univ., Saint Louis, MO USA
The Opposing Roles of Nucleophosmin and the ARF Tumor Suppressor in Breast Cancer
Apicelli, Anthony J; Apr 2007; 78 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-04-1-0394
Report No.(s): AD-A477476; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The ARF tumor suppressor protein plays an important role in the tumor surveillance of human cancer. In the search for novel ARF binding proteins, we uncovered NPM. Despite the important role ARF plays in the regulation of tumorigenesis, alterations selectively affecting its ability to negate NPM function have not been studied. In our proposed study, we aimed to determine the impact of ARF-NPM interactions in the pathogenesis of breast cancer. To this end, we have found that overexpression of NPM in the absence of ARF is a powerful transforming event. NPM promotes tumorigenesis without affecting genomic stability, implying that the subsequent tumors should remain diploid, a hallmark of ARF-null breast cancers. Indeed, when we analyzed sixty breast carcinomas, NPM was highly overexpressed in 50% of cases. We have begun further

analyses of how NPM promotes tumor formation and have discovered that it does so through ribosome dysregulation, opening up the door to new therapeutic targets in breast cancer: protein synthesis.
DTIC
Breast; Cancer; Mammary Glands; Neoplasms; Proteins; Suppressors; Tumors

20080020084 California Univ., San Francisco, CA USA
Temporal and Spatial Dynamics of Androgen Receptor Conformation and Interactions in Prostate Cancer Cells
Schaufele, Fred; Nov 2007; 27 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-05-1-0013
Report No.(s): AD-A477478; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Our long-term goal is to correlate the undesired escape from androgen deprivation therapy with specific molecular events in Androgen Receptor signaling in order to determine the best molecular targets for prostate cancer treatment. Studies supported by this grant indicate that the failure of tumors to respond to anti-androgen therapy corresponded best with an increased nuclear transport of AR. However, an intramolecular fold and AR dimerization, both activated abnormally by heterologous hormones (estrogen and progestin) and measured by fluorescence resonance energy transfer of CFP and YFP-tagged ARs), also was linked to four different AR mutants associated with treatment-refractory prostate proliferation. High throughput methods were developed to measure AR folding, dimerization and nuclear transport. These methods will facilitate the future identification of new drugs that block AR folding, dimerization and nuclear transport and that may prove useful in treatment-refractory therapy.
DTIC
Cancer; Hormones; Males; Prostate Gland

20080020087 Beth Israel Deaconess Medical Center, Boston, MA USA
AR-NCoR Interaction as a Therapeutic Target for Prostate Cancer Prevention and Treatment
Balk, Steven P; Oct 2007; 23 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0849
Report No.(s): AD-A477481; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Aim 1 is to determine the precise molecular basis for NCoR binding to the RU486 liganded AR. Since the previous report we have used chromatin immunoprecipitation to demonstrate that RU486 inhances AR NCoR recruitment to AR assembled on androgen regulated genes. We have also generated the additional AR and NCoR mutants to define the precise amino acids mediating the interaction. Aim 2 is to determine whether NCoR recruitment can suppress androgen independent expression of AR regulated genes and prostate cancer growth and identify molecular markers that predict whether RU486 (or related drugs) will be effective in particular prostate cancers in vivo. We have now used chromatin immunoprecipitation to examine the functional effects of RU486 mediated NCoR recruitment and find that NCoR is not mediating deacetylation and hence not suppressing gene expression. The reason for this is now under investigation. These results in conjunction with our previous data reflect further progress towards determining the structural basis for AR-NCoR interaction (Aim 1) and determining whether this interaction can be exploited to treat prostate cancer (Aim 2).
DTIC
Cancer; Hormones; Males; Prevention; Prostate Gland; Targets; Therapy

20080020090 Naval Health Research Center, San Diego, CA USA
The Navy Medical Technology Watch: Hemostatic Dressing Products for the Battlefield
Snow, Carl; Olson, Cheryl; Melcer, Ted; Sep 9, 2006; 27 pp.; In English; Original contains color illustrations
Report No.(s): AD-A477487; NHRC-TD-07-1A; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Uncontrolled hemorrhage is the major cause of death among warfighters. Hemostatic dressing products have been introduced to treat combat casualties in the field. The objectives of the present report are to provide an assessment of current and developing hemostatic dressing products or methods with military potential, and to provide a summary table of current research evidence on these products or methods. The Medical Modeling, Simulation and Mission Support program at Naval Health Research Center initiated a 'Tech Watch' project to investigate current and developing technologies for hemostatic dressings and to review current independently published research evaluating these products. A variety of hemostatic dressing products are currently available, and several have been used in the field with some success. A summary of each product is presented in the main text of this report. At present, no one product appears to offer a complete solution, and most remain under continual development to reduce cost or side effects, increase usability, and/or meet specific combat care niches such as for

major versus minor wounds. Recent developmental projects target noninvasive methods to control bleeding, such as ultrasound or medication.
DTIC
Biotechnology; Hemorrhages; Medical Equipment; Navy

20080020099 Naval Health Research Center, San Diego, CA USA
Navy Medicine Technology Watch: Concepts of Operations
Melcer, Ted; Snow, Carl; Hancock, Bill; Stigall, Mike; Hamilton, Bill; Nov 10, 2006; 45 pp.; In English; Original contains color illustrations
Report No.(s): AD-A477507; TD-07-7G; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The present study objectives were to (1) develop an informational tech watch website and/or service for Navy Medicine that tracks commercial-off-the-shelf (COTS)/government-off-the-shelf (GOTS) medical technologies, and (2) integrate the Tech Watch service with relevant Navy entities, such as the Fleet Forces Command (FFC) and Naval Warfare Development Command. A concepts of operations (CONOPS) included four components: (1) gathering information based on keyword inputs to an Internet search engine, (2) filtering the information for relevance and duplication, (3) reporting results to relevant users, and (4) extending the service to include new keywords and technologies based on user feedback. A prototype Internet search tool and database were developed. Additional work would develop a Web-based interface, user database, and use of artificial intelligence methods to permit semantic search and filtering capabilities. The combat development process for Navy medical requirements is still under development at FFC; therefore, integration of the NHRC Tech Watch service is pending. The utility of similar efforts, such as the Office of Naval Research Tech Solutions project, a Web-based solution for collecting and responding to nonmedical technology requests, suggests that a similar medical effort such as NHRC's Tech Watch project would add value to the development of military medical technology.
DTIC
Commercial Off-the-Shelf Products; Medical Services; Military Operations; Navy

20080020101 Naval Hospital, Camp Pendleton, CA USA
SMART (Sports Medicine and Rehabilitation Team) Centers: An Empirical Analysis
Schwartz, Michael D; Apr 2007; 72 pp.; In English
Report No.(s): AD-A477515; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In an era of finite health care resources, increased military operational tempo, and smaller expeditionary fighting forces, the US Navy has developed SMART (Sports Medicine and Rehabilitation Team) Center. SMART Centers address the multitude of muscular skeletal injuries encountered at Recruit Training Commands and Marine Corps Installations by offering an alternative to traditional Orthopedic Services. SMART Centers provide open access and one-stop shopping to multidisciplinary muscular skeletal services. This study attempts to use predictor (independent) variables such as access, surgical rates, and return to duty status to determine if there are differences between the SMART Center and the Orthopedic and Sports Medicine Clinics medical evaluation board reports (MEBRs). This study did not find the type of clinic to be a predictor of MEBRs, although this study discovered several significant subsequent findings associating the SMART Center with enhanced clinical outcomes over the Orthopedic and Sports Medicine Clinics.
DTIC
Health; Medical Services; Military Operations; Musculoskeletal System; Sports Medicine

20080020102 TRICARE Southwest, San Antonio, TX USA
A Policy Analysis of the Coast Guard's Existing Patient Satisfaction System and Recommendations for Improvement
Coughlin, Kelly A; Oct 3, 2007; 68 pp.; In English
Report No.(s): AD-A477521; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Patient satisfaction evaluation has been an impetus for quality improvements throughout the U.S. health care system. The USA Coast Guard (CG), an armed military service, operates 42 ambulatory clinics throughout the nation and abroad. The CG patient satisfaction system consists of 42 unique assessment approaches. The diversity of evaluation processes makes measurement challenging and limits improvement efforts. This paper evaluates CG organizational demands, describes CG practice landscape, presents standards, reviews initial clinic process analysis, and evaluates the cost and criteria of proposed

policy alternatives. The findings of this research, concludes that the CG should standardize the evaluation of patient satisfaction by implementing the American Medical Group Association's (AMGA) Survey program.
DTIC
Clinical Medicine; Coasts; Medical Services; Patients; Policies; Surveys

20080020104 Naval Health Research Center, San Diego, CA USA
Use of Recombinant Factor VIIa for Control of Combat-Related Hemorrhage: Findings From the U.S. Navy-Marine Corps Combat Trauma Registry
Woodruff, Susan I; Dye, Judy L; Mohrle, Charlene R; Galarneau, Michael R; Wade, Amber L; Mar 1, 2007; 15 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-M0095.005
Report No.(s): AD-A477527; NHRC-07-13; No Copyright; Avail.: Defense Technical Information Center (DTIC)

New methods of hemorrhage control are needed for use in remote surgical locations, such as the battlefield. Data from the Navy-Marine Corps Combat Trauma Registry (CTR) describe recombinant activated human coagulation factor VII (FVIIa), a site-specific, intravascular approach to promote clotting, which is being used as an adjunct to surgical control of bleeding in trauma patients in the battlefield environment. The present 20-month retrospective study identified 22 casualties from the CTR who were wounded in Iraq and received FVIIa. Primarily young Marines, these patients typically had penetrating injuries from improvised explosive devices and gunshot wounds. Injuries were often abdominal, supporting the utility of FVIIa for noncompressible injuries. The average dose used was similar to that reported elsewhere, although dosing varies widely in the existing experimental and anecdotal literature. Over two thirds (68%) of the FVIIa patients survived. Survival outcomes did not differ significantly between the FVIIa group and a matched control group. Results are discussed in terms of battlefield applications for FVIIa and methodological limitations of the study.
DTIC
Coagulation; Combat; Enzymes; Hemorrhages; Injuries; Navy; Peptides

20080020105 Army Medical Dept. Center and School, Fort Sam Houston, TX USA
What Resources are Required to Provide Full Service Obstetric and Gynecologic Care to DoD Employees and their Families on the Korean Peninsula?
Jones, Alan A; Jun 10, 2007; 56 pp.; In English
Report No.(s): AD-A477528; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Purpose of this Graduate Management Project is to identify the obstetric/gynecologic (OB/GYN) resource requirements to meet the needs of all Department of Defense (DoD) employees and their family members on the Korean Peninsula. The unique environment in Korea presents several challenges to the Military Health System for providing OB/GYN care. The study uses both quantitative and qualitative analysis. The quantitative analysis measured staffing, productivity, and access to care. Results of the quantitative analysis indicated the need for additional support staff. The qualitative study was used to verify and/or identify any additional requirements. Results of the qualitative analysis indicated that there was a need to increase the availability of prenatal care, increase the amount of appropriate support staff, and provide a more robust Storknest program.
DTIC
Defense Program; Gynecology; Health; Medical Services; Military Personnel; Peninsulas; Personnel; South Korea

20080020106 Michigan Univ., Ann Arbor, MI USA
Role of Human Polyomavirus Bkv in Prostate Cancer
Das, Dweepanita; Imperiale, Michael J; Dec 2007; 60 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-06-1-0132
Report No.(s): AD-A477536; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Prostate cancer has been predicted to cause nearly 10% of male cancer deaths in US in 2007. The frequency of mutations in the tumor suppressor genes (pRb and p53) is rare in prostate cancer. This has led to the possibility that a human virus like BK virus (BKV), which establishes a lifelong, subclinical persistent infection in the urinary tract and encodes oncoproteins (large T antigen, TAg; small T antigen, tAg), which interfere with these tumor suppressor pathways, may play a role in the early stages of the disease. Our initial analysis of cancerous prostate tissues shows the presence of BKV in normal and atrophic epithelium, which is a precursor lesion to prostate cancer and metastatic disease. TAg, which is a nuclear protein, is expressed in the atrophic cells, is cytoplasmic, and co-localizes with p53. We have extended our analysis to show that BKV is present

at a much lower frequency in non-cancerous prostate. Additionally, TAg expression in normal prostate is only observed in specimens that have proliferative inflammatory atrophy and prostatic intraepithelial neoplasia. Utilizing laser capture microdissection, we observe an inverse correlation between TAg expression in atrophic epithelium and mutations in the p53 gene in those cells. This supports our hypothesis that BKV inactivates p53 in the early stages of prostate cancer. Our data suggests there could be a potential link between BKV and prostate cancer.
DTIC
Cancer; Prostate Gland; Viruses

20080020107 Cancer Therapy and Research Foundation, San Antonio, TX USA
Identification and Characterization of Prostate Cancer Associated Protein Biomarkers Using High-Throughput Mass Spectrometry
Malik, Gunjan; Dec 2007; 56 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-06-1-0111
Report No.(s): AD-A477537; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Prostate cancer (PCa) remains to be the most common non-skin cancer in the US. Currently available screening tests for PCa including prostate specific antigen (PSA) test, digital rectal examination (DRE) and prostate biopsy, call for more accurate and non-invasive techniques to detect, diagnose, and stratify the disease based on molecular markers present in the body fluids. Using MALDI-TOF mass spectrometry protein fingerprint profiling, we generated decision tree algorithms to classify cancer from non-cancer. We have also devised strategies to isolate and identify protein biomarkers from the fingerprint profiles of PCa patients in the clinical gray-area where PSA fails to detect cancer. Identification of such cancer biomarkers will assist in development of better non-invasive diagnostic tools for prostate cancer and may also lead to better therapeutic targets.
DTIC
Biomarkers; Cancer; Mass Spectroscopy; Physical Examinations; Prostate Gland; Proteins

20080020108 Washington Univ., Seattle, WA USA
CD4+ Th1 HER2-Specific T Cells as a Novel Treatment for HER2-Overexpressing Breast Cancer
Lai, Vy P; Oct 2007; 14 pp.; In English
Contract(s)/Grant(s): W81XWH-06-1-0724
Report No.(s): AD-A477538; No Copyright; Avail.: Defense Technical Information Center (DTIC)

During the last research period, we have made significant progress in the development of our mouse neu-reactive T cell lines. First, we have confirmed the key CD4+ neu peptides (p101 and p373) most effective at priming T cell responses. Of the peptide-specific T cell lines tested, only p101- and p373- T cells induced both peptide- and protein-specific responses. In preliminary studies involving adjuvants, GMCSF was highly effective for use with our peptide vaccines. Second, we have thoroughly characterized the cytokine production by our ex vivo expanded T cells and observed high levels of secreted Th1 cytokines, primarily IFN and GM-CSF, but also, interestingly, Th2 cytokines, primarily IL-5 and IL-6. Furthermore, IL-17, a pro-inflammatory cytokine, was also found to be secreted by the cultured T cells during ex vivo expansion. Our studies have also demonstrated that the addition of IL-7 (among all the tested cytokines) to IL-2 in the T cell culture regimen is necessary for optimal ex vivo growth. Third, we have clearly demonstrated that our neu specific T cell lines were highly effective at inhibiting tumor growth, particularly MP (multiple peptide)-specific T cells. Three T cell infusions were more effective at inducing tumor regression than a single infusion. Most importantly, the antitumor inhibition was mediated by endogenous CD8+ T cells.
DTIC
Breast; Cancer; Lymphocytes; Mammary Glands

20080020109 Iowa Univ., Iowa City, IA USA
Coralville Reservoir Water Quality Project
Espinosa-Villegas, Claudia; Just, Craig; Nakato, Tatsuaki; Schnoor, Jerald; May 2006; 249 pp.; In English
Contract(s)/Grant(s): DACW25-03-P-0057
Report No.(s): AD-A477539; IIHR-TR-446; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Coralville flood control dam is located in Johnson County, Iowa, about three miles north of Iowa City. The lake, at the conservation pool, 680 feet mean sea level (msl), is 21.7 miles long with a surface area of 2,650 acres, and at spillway level (712 feet msl) is 45.1 miles long with a surface area of 25,040 acres. Prior to February 1992 the level of the pool was normally reduced to 675 feet msl in late winter to facilitate the use of the impoundment for flood control. At this level, the

reservoir has an area of 1,320 acres. More recent surveys indicated that at spillway level (712 feet msl) reservoir capacity was 420,960-acre feet, 17,720-acre feet at conservation pool level (680 feet msl), and 7,850-acre feet at 675 feet msl. In February 1992 the reservoir operational procedure was modified. Under the current operational plan, the reservoir conservation pool will be held at 683 feet msl from December 15 to February 15 and then reduced to 679 feet msl by March 20. Pool level will be held at 679 feet msl from March 20 to June 20 and then be allowed to increase to the summer conservation pool of 683 feet msl where it will remain through September 15. The fall pool will be variable with a maximum elevation of 686 feet msl. During periods of high river flow the lake level often rises above these elevations due to downstream flow constraints. The Coralville Reservoir Water Quality Project was initiated in 1964, and continued without interruption through October 1981. No sampling occurred from November 1981 through March 1982, but the project resumed on an abbreviated schedule in April 1982 and continued through January 1983 when it was again interrupted. Sampling was reinstituted in June of 1983 and continued through September 1985.
DTIC
Biochemical Oxygen Demand; Flood Control; Hydrology; Reservoirs; Water Flow; Water Quality

20080020110 California Univ., San Francisco, CA USA
MRI Study of Uninvolved Breast Tissue for Patients With Locally Advanced Breast Cancer Undergoing Pre-Operative Chemotherapy
Klifa, Catherine; Aug 2006; 37 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-05-1-0518
Report No.(s): AD-A477540; No Copyright; Avail.: Defense Technical Information Center (DTIC)
Purpose: To study possible associations between the MRI morphological patterns of the primary breast tumor and properties of the surrounding host tissue. Scope: Identification of such properties of host tissue may be useful in characterizing breast tissue for earlier stage breast cancers. Major findings: We have developed MRI algorithms necessary to measure signal enhancement ratios in non-tumor tissue using the existing database of patients who underwent neoadjuvant chemotherapy. Results: We found that change in uninvolved breast tissue volume with treatment was correlated with tumor phenotypes and was shown to be predictive of recurrence. Significance: Host tissue changes with treatment can potentially provide information about pre-cancerous tissue that may have applicability to risk assessment.
DTIC
Breast; Cancer; Chemotherapy; Imaging Techniques; Magnetic Resonance; Mammary Glands; Patients

20080020111 Duke Univ., Durham, NC USA
Temporal Subtraction of Digital Breast Tomosynthesis Images for Improved Mass Detection
Li, Christina M; Oct 2007; 22 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-06-1-0732
Report No.(s): AD-A477541; No Copyright; Avail.: Defense Technical Information Center (DTIC)
Digital breast tomosynthesis (DBT) strives to overcome the obstacles presented in conventional 2D mammography by taking multiple projections over a fixed angle and reconstructing volumetric data isolates overlying anatomy from in-plane structures and amplify the conspicuity of lesions. Temporal subtraction automates the process of comparative analysis by using two images taken sequentially and subtracting them in order to find temporal discrepancies. The purpose of this project is to determine the feasibility of using temporal subtraction on DBT phantom images to allow for easier and earlier detection of breast cancer than with either technique alone. The investigator acquired initial tomosynthesis images with the compressible and deformable breast phantom using materials to simulate the breast parenchyma. This was a first step to see if the physical breast phantom originally conceived in theory would work in practice. Unfortunately, the materials used for the breast tissues did not provide a realistic enough breast simulation. Further work must be done to find different materials to use for the physical breast phantom so that realistic images can be used for the observer study. The investigator found that a 3D computer simulated breast phantom needs to provide a realistic and accurate representation of the breast parenchyma in order to offer a compelling argument for the technique. This can be accomplished through either mathematical methods using geometrical primitives or voxelizations of real patient data. The investigator has decided to use an approach combining empirical breast CT data with subdivision surfaces (SD)and non-uniform rational b-splines (NURBS) in the future for the computer breast simulation.
DTIC
Breast; Cancer; Computerized Simulation; Detection; Digital Systems; Imaging Techniques; Mammary Glands; Mass

20080020112 Baltimore Research and Education Foundation, Inc., Baltimore, MD USA

Physical Characterization of a Highly Infectious Monodisperse Preparation of TSE Infectivity as a Substrate for Diagnostic Development

Rohwer, Robert G; Timmes, Andrew G; Gregori, Luisa L; Alexeeva, Irina; Sep 2007; 27 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-03-1-0749

Report No.(s): AD-A477542; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Purification and characterization of the infectious agent that causes transmissible spongiform encephalopathies would be a breakthrough in the development of diagnostic tests and treatments for the victims of these fatal neurological diseases. Using a preparation of highly dispersed, nanofiltered scrapie infected brain homogenate, we have developed an ultracentrifugation procedure for the purification of dispersed, small infectious particles. The design of this protocol was guided by our determinations of the buoyant density and sedimentation constant of scrapie infectivity and its only known marker, PrPres. We are actively pursuing scaled up pathways to achieve the original plan of this project, which is to use buoyant density, sedimentation rate, and other biochemical characteristics to concentrate, purify, and study the scrapie infectious agent.

DTIC

Infectious Diseases; Substrates

20080020114 Baltimore Research and Education Foundation, Inc., Baltimore, MD USA

Development of an Assay for the Detection of PrPres in Blood and Urine Based on PMCA Assay and ELISA Methods

Rohwer, Robert G; Gregori, Luisa L; Sep 2007; 13 pp.; In English

Contract(s)/Grant(s): DAMD17-03-1-0756

Report No.(s): AD-A477544; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The focus of this program is the development of a pre-clinical blood-based TSE diagnostic assay. The assay in the pilot form is developed with plasma from hamsters infected with the 263K strain of scrapie. The same assay can be adapted to human PrP test. In this funding period we completed the optimization of the conditions for proteinase K (PK) digestion of PrPres in scrapie infected hamster plasma. We have also started a large study to determine the PK concentration that preserves plasma infectivity while reducing the level of endogenous normal PrP to below the limit of detection of our PrP assay. The PK concentration that indicates no infectivity reduction will be used to digest infected plasma for detection of PrPres. We also found that urine excreted by infected hamsters harbors infectivity with infectivity titers similar to that of hamster plasma. More recently, we inoculated animals with urine from pre-clinical hamsters. This study is still on-going and will be completed by the end of the funding period. Urine could be a useful alternative to blood in a TSE diagnostic assay. We also completed the titration of bladder and kidneys with similar titers approximately 5 log10 ID50/g of tissue.

DTIC

Assaying; Blood; Infectious Diseases; Urine

20080020115 Emory Univ., Atlanta, GA USA

Molecular Imaging With Quantum Dots Probing EMT and Prostate Cancer Metastasis in Live Animals

Chung, Leland W K; Oct 2007; 57 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0916

Report No.(s): AD-A477546; No Copyright; Avail.: Defense Technical Information Center (DTIC)

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. Aim 1 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

20080020117 Naval Health Research Center, San Diego, CA USA
Air Force Operational Medicine: Using the Estimating Supplies Program to Develop Materiel Solutions for the Operational Clinical Requirements for the U.S. Air Force Otolaryngology Team (FFENT)
Hopkins, Curt; Nix, Ralph; Konoske, Paula; Pang, Gerry; Hill, Martin; Negus, Tracy; Onofrio, Kathleen; Oct 10, 2007; 90 pp.; In English; Original contains color illustrations
Report No.(s): AD-A477550; NHRC-TD-07-10J; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The U.S. Air Force Medical Support Agency, Surgeon General Support Logistics Office, requested that the Naval Health Research Center (NHRC) conduct a proof of concept study to assess the validity and feasibility of using NHRC's medical modeling tool for the development and management of Air force medical Allowance Standards as a baseline for standardization throughout the armed services. The primary objective of this study was to provide the Air Force with the ability to validate the clinical requirements of the Otolaryngology Augmentation Team. the Air Force Allowance Standard addresses the equipment, medicines, consumable, and durables required for a 7-day period.
DTIC
Estimating; Medical Personnel; Medical Services; Military Operations; Otolaryngology; Supplying; Surgery

20080020368 NASA Marshall Space Flight Center, Huntsville, AL, USA
Evaluation of a Pilot Surveillance System: Health and Environment Linked for Information Exchange in Atlanta (HELIX-Atlanta)
Meyer, P.; Shire, J.; Qualters, Judy; Daley, Randolph; Fiero, Leslie Todorov; Autry, Andy; Avchen, Rachel; Stock, Allison; Correa, Adolofo; Siffel, Csaba; Devine, Owen; Gotway, Carol; Crawford; Mitchell, Ken; Pollard, Solomon; Rao, Ravi; Kajumba, Ntale; Rickman, Doug; Quattrochi, Dale; Estes, Maury; Meyer, Paul; Crosson, Bill; Limaye, Ashutosh; Al-Hamdan, Mohammad; Khan, Maudood; August 23, 2007; 1 pp.; In English; Copyright; Avail.: Other Sources; Abstract Only

CDC and its partners established the Health and Environment Linked for Information Exchange, Atlanta (HELIX-Atlanta) demonstration project, to develop linking and analysis methods that could be used by the National Environmental Public Health Tracking (EPHT) Network. Initiated in October 2003, the Metropolitan Atlanta-based collaborative conducted four projects: asthma and particulate air pollution, birth defects and ozone and particulate air pollution, childhood leukemia and traffic emissions, and children's blood lead testing and neighborhood risk factors for lead poisoning. This report provides an overview of the HELIX-Atlanta projects' goals, methods and outcomes. We discuss priority attributes and common issues and challenges and offer recommendations for implementation of the nascent national environmental public health tracking network.
Author
Tracking Networks; Surveillance; Public Health; Air Pollution; Asthma; Lead Poisoning; Leukemias; Ozone; Particulates

20080020464 Institute of Space Medico-Engineering, Beijing, China
Effects of Heat Stress on Exercise Tolerance, Serum Testosterone and Cortisol Concentrations in Tail-Suspended Rats
YANG, Zhen-zhong; YU, Xue-jun; FEI, Jin-xue; GAO, Yu-chen; WANG, Hong-hui; Space Medicine and Medical Engineering, Volume 20, No. 6; December 2007, pp. 410-413; In Chinese; See also 20080020461; Copyright; Avail.: Other Sources

Proposed to investigate the effects of heat stress on exercise tolerance and functions of protein metabolism changes in tail-suspended rats. Forty-six male SD rats were randomly assigned to 4 groups: exercise control group (Con) , exercise after tail-suspension group (ES), exercise under high temperature group (EHT) and exercise under high temperature after tail-suspension group (EHTS). The rats underwent exercise of increasing intensity until exhaustion under normal or 38 C environment after 14 d of tail suspension or Con. The running time and the increased rectal temperature after exercise were measured at the end of exhaustion. Blood samples were collected immediately after exercise to detect serum testosterone and

cortisol concentrations. As compared with Con rats, the running time, serum testosterone concentrations and testosterone/cortisol ratio of ES rats, EHT and EHTS rats decreased significantly. As compared with Con rats, the serum cortisol concentrations showed no significant change in ES and EHT rats, and the concentrations increased significantly in EHTS rats. Running time, serum testosterone concentrations and testosterone/cortisol ratio of EHTS rats were significantly shorter or lower when compared with those of ES rats. The increases of rectal temperature and serum cortisol concentrations in EHTS rats were significantly higher than those in ES rats. Thermal stress(38 C) significantly decreases the exercise tolerance of tail-suspended rats, which might be related to the decrease of thermoregulation capability, intensification of catabolism and attenuation of anabolism.
Author
Temperature Effects; Physiological Responses; Stress (Physiology); Physical Exercise; Tolerances (Physiology); Hormones; Heat; High Temperature; Heat Tolerance; Thermoregulation

20080020466 Institute of Space Medico-Engineering, Beijing, China
Alteration of Fos Expression in Periaqueductal Gray of Rat after 2 Weeks Simulated Weightlessness
Zhu, Yong-jin; Fan, Xiao-li; Wu, Su-di; Song, Xin-ai; Xu, Lin-ping; Space Medicine and Medical Engineering, Volume 20, No. 6; December 2007, pp. 414-417; In Chinese; See also 20080020461; Copyright; Avail.: Other Sources

Proposed to investigate the effects of simulated weightlessness on expression of Fos in rat periaqueductal gray (PAG). The model of weightlessness was simulated by tail-suspended female rats, and all rats were randomly divided into 14 d tail-suspension (SW-14 d) group and control (Con) group. Each group was further divided into 3 subsets of 4 rats according to experimental intervention: electrical stimulation subset (ES), pretreatment with succinylcholine subset (PS) and succinylcholine injection subset (SI). The quantity and appearance of Fos-like immuno-positive (FLI) neurons in ventrolateral part of PAG were investigated by immunocytochemical staining method. FLI neurons in the ventrolateral part of PAG were observed in both groups. As compared with control group, FLI neurons in SW-14 d group were stained lightly, cellular integrity was impaired and cellular verge was unclear. Analysis of countings showed that the number of FLI neurons was the largest in PS, medium in ES and small in the SI subset. In the control group they are 71.06 +/- 8.96, 46.94 +/- 3.38 and 35.04 +/- 4.62 respectively and in 14 d simulated weightlessness group, they are 32.91 +/- 2.99, 27.77 +/- 3.27 and 11.75 +/- 1.00 respectively. As compared with control groups, the number of FLI neurons in all subsets of 14 d tail-suspension group decreased obviously. Nociceptive stimulus can induce expression of Fos in neurons of ventrolateral part in PAG, intravenous injection of succinylcholine (SCH) can result in increase of FLI neurons in ventrolateral part of PAG. The number of FLI neurons in the ventrolateral part of PAG decreased obviously after 2 weeks of simulated weightlessness.
Author
Proteins; Gene Expression; Brain; Weightlessness Simulation; Pain Sensitivity

20080020469 China Astronaut Research and Training Center, Beijing, China
Effects of Carbon Monoxide on Cerebella Gene Expression in Mice
LI, Shu-guang; LIANG, Hong; ZHANG, Heng-tai; HE, Xin-xing; Space Medicine and Medical Engineering, Volume 20, No. 6; December 2007, pp. 418-421; In Chinese; See also 20080020461; Copyright; Avail.: Other Sources

Proposed to investigate the effect of carbon monoxide (CO) on cerebella gene expression in mice. Suppression subtractive hybridization (SSH) technique was applied to screen differentially expressed gene in cerebella of mice that breathed 750 mg/m3 CO for 72 h. Twenty differentially expressed sequence tags found after exposure to 750 mg/m3 CO for 72 h were cloned and determined. CO toxicity may influence gene expression related to significant cell signs, transduction, metabolism, spermiogenesis, immunity and more.
Author
Carbon Monoxide; Cerebellum; Gene Expression; Genetics; Toxic Hazards

20080020474 Institute of Space Medico-Engineering, Beijing, China
Protective Effects of Cudrania Tricuspidata Polysaccharides and Lycium Barbarium Polysaccharides on the Immune Function of Tail-Suspended Mice
Song, Jin-ping; Zhang, Hong-yu; Qu, Li-na; Yang, Fen; Liu, Shao-fang; Wang, Hong-hui; Liu, Yue; Xiong, Jiang-hui; Space Medicine and Medical Engineering, Volume 20, No. 6; December 2007, pp. 402-405; In Chinese; See also 20080020461; Copyright; Avail.: Other Sources

Proposed to study the protective effects of Cudrania tricuspidata polysaccharides (CPS) and Lycium barbarium

polysaccharides (LBP) on the cellular immune function in tail-suspended mice. Two dosages of CPS and LBP were orally administered to tail-suspended mice, respectively. Splenic T lymphocyte proliferation was determined by MTS colorimetric assay and cytokines production in supernatants obtained from cultured spleen cells after stimulation with ConA were detected by ELISA assay. Splenic T lymphocyte proliferation and the levels of IL-2 and IFN-gamma decreased significantly in tail-suspended mice 7 d later, which could be enhanced by administration of CPS. CPS has protective effects on cellular immunity of tail-suspended mice in simulated microgravity.
Author
Polysaccharides; Immunity; Cells (Biology); Weightlessness Simulation; Microgravity

20080020476 Institute of Space Medico-Engineering, Beijing, China
Facial Skin Temperature Increase Induced by Local Cooling of Jugular Vessel and its Interpretation Using Systematic Bioheat Transfer Mechanism
LV, Yong-gang; LIU, Jing; Space Medicine and Medical Engineering, Volume 20, No. 6; December 2007, pp. 441-446; In English; See also 20080020461; Copyright; Avail.: Other Sources

Proposed to interpret the effect of local cooling on the thermal response of the human brain using the concept of system biology. The thermal response of a healthy human face was monitored using an infrared thermometer when the neck was subjected to strong local surface cooling. Further, a three-dimensional heat transfer process in the brain tissue subjected to local peripheral cooling was simulated via theoretical modeling. The fact that a strong enough local cooling (for example by 0 C ice and water mixture) on jugular vessel could possibly increase heart rate and raise facial temperature rather than reduce it, showed a complex systematic regulation mechanism of thermal physiology. However, no such thermoregulation phenomenon was observed when 55 C warm water was used to heat the jugular vessel. This study is expected to be a valuable reference for conducting an efficient thermal administration and temperature monitoring during clinical brain hypothermic resuscitation.
Author
Face (Anatomy); Skin Temperature (Biology); Blood Vessels; Cooling; Thermoregulation

20080020477 University of Science and Technology, Hefei Anhui, China
Identification of Model Parameters Basing on Matched Processing between Simulated and Recorded sEMG Signals
Li, Qiang; Yang, Ji-hai; Zhao, Zhang-yan; Chue, Xue-zhong; Chen, Xiang; Lou, Zhi; Space Medicine and Medical Engineering, Volume 20, No. 6; December 2007, pp. 391-397; In English; See also 20080020461; Copyright; Avail.: Other Sources

Proposed to identify the model parameters of surface Electromyography (sEMG) by comparison between simulated and recorded signals. A physiological model of sEMG signal was established basing on several logical hypothetical conditions, such as motor unit action potentials (MUAP), motor unit recruitment and firing behavior caused by excitation, architecture of volume conductor and other simulated factors. According to the matched shapes between the simulated and recorded sEMG signals, a group of model parameters was obtained; according to the similar power spectrum variations of real sEMG signals, decreased muscle fiber conduction velocity (MFCV) was applied to simulate the sEMG signals of the fatigued muscle. The experimental results showed that the simulated superimposed MUAP shapes could be matched with the recorded MUAPs satisfactorily by adjusting some proper physiological parameters of the model. When the MFCV of each fiber was assumed to decrease, the mean and median frequency (MNF, MDF) of the simulated sEMG signals declined, and this phenomenon was very similar to that of the recorded sEMG signals and could be used to interpret the muscle fatigue process. This model provides an effective approach to simulate real sEMG signals, and the simulated signals can also be used to help the analysis of recorded sEMG signals.
Author
Models; Parameter Identification; Electromyography; Signals; Biodynamics; Motion; Bioelectric Potential; Electrophysiology

52
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*.

20080019737 Army Research Inst. of Environmental Medicine, Natick, MA USA
Impact of a Protective Vest and Spacer Garment on Exercise-Heat Strain
Cheuvront, Samuel N; Goodman, Daniel A; Kenefick, Robert W; Montain, Scott J; Sawka, Michael N; Jan 2008; 8 pp.; In English
Report No.(s): AD-A477047; USARIEM/TMMD-M07-17; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477047

Protective vests worn by global security personnel, and weighted vests worn by athletes, may increase physiological strain due to added load, increased clothing insulation and vapor resistance. The impact of protective vest clothing properties on physiological strain, and the potential of a spacer garment to reduce physiological strain, was examined. Eleven men performed 3 trials of intermittent treadmill walking over 4 h in a hot, dry environment (35 C, 30% rh). Volunteers wore the US Army battle dress uniform (trial B), B + protective vest (trial P), and B + P + spacer garment (trial S). Biophysical clothing properties were determined and found similar to many law enforcement, industry, and sports ensembles. Physiological measurements included core (T sub c), mean skin (T sub sk) and chest (T sub chest) temperatures, heart rate (HR), and sweating rate (SR). The independent impact of clothing was determined by equating metabolic rate in all trials. In trial P, HR was +7 b/min higher after 1 h of exercise and +19 b/min by the fourth hour compared to B ($P<0.05$). T sub c (+0.30 C), T sub sk (+1.0 C) and Physiological Strain Index were all higher in P than B ($P<0.05$). S did not abate these effects except to reduce T sub sk ($P>S$) via a lower T sub chest (-0.40 C) ($P<0.05$). SR was higher ($P<0.05$) in P and S versus B, but the magnitude of differences was small. A protective vest increases physiological strain independent of added load, while a spacer garment does not alter this outcome.
DTIC
Armor; Garments; Physical Exercise; Spacers; Vests

20080020461 Institute of Space Medico-Engineering, Beijing, China
Space Medicine and Medical Engineering, Volume 20, No. 6
Wang, Yong-zhi, Editor; Grigoriev, A. I., Editor; White, Ronald J., Editor; Wang, Xi-ji, Editor; Yu, Meng-sun, Editor; QI Fa-ren, Editor; Wei, Jin-he, Editor; Chen, Shan-guang, Editor; Wang, Xian-min, Editor; Bai, Jing, Editor; Bai, Yan-qiang, Editor; Sun, Xi-qing, Editor; Hong, Feng, Editor; Su Hong-yu, Editor; Jiang, Shi-zhong, Editor; December 2007; ISSN 1002-0837; 100 pp.; In English; See also 20080020462 - 20080020478; Original contains black and white illustrations
Report No.(s): CN-11-2774/R; Copyright; Avail.: Other Sources

Topics covered include: Identification of Model Parameters Basing on Matched Processing between Simulated and Recorded sEMG Signals; Cardiovascular Responses to Lower Body Negative Pressure (LBNP) in Healthy Females of Different Physical Fitness; Protective Effects of Cudrania Tricuspidata Polysaccharides and Lycium Barbarium; Polysaccharides on the Immune Function of Tail-suspended Mice; Effects of Simulated Weightlessness on Cellular Morphology, Cell Multiplication and Cell Cycle of MG-63 Cell; Effects of Heat Stress on Exercise Tolerance, Serum Testosterone and Cortisol; Concentrations in Tail-Suspended Rats; Alteration of Fos Expression in Periaqueductal Gray of Rat after 2 Weeks Simulated Weightlessness; Effects of Carbon Monoxide on Cerebella Gene Expression in Mice; Design of a Head-up Tilt Experimental System for Measuring Head Blood Pressure and Its Dynamic Process; The Design and Experiment of Solid Polymer Electrolyte Water Electrolytic Cell; A Study of Metal Oxide CO2 Absorbents; A Study of Computer Detecting Methods for Animal Swimming Experiment; Facial Skin Temperature Increase Induced by Local Cooling of Jugular Vessel and Its Interpretation Using Systematic Bioheat Transfer Mechanism; EEG Study on Transcutaneous Electrical Acupoint Stimulation as a Fatigue Countermeasure; Estimation of Mean Trabecular Bone Spacing Using Cepstrum Method Based on Inverse Filter; Detrended Fluctuation Analysis of Pulse Rate Variability Signals of Coronary Disease Patients; Automatic Sleep Stage Classification Based on Hilbert-Huang Transform Method of EEG; and Progress in Fabrication of Neural Probe Microelectrodes and Its Application in Brain-Machine Interface.
Derived from text
Aerospace Medicine; Bone Mineral Content; Carbon Dioxide; Cardiovascular System; Countermeasures; Electroencephalography; Heart Diseases; Heart Function; Physiological Responses; Pressure Measurement; Physical Exercise

20080020462 Institute of Space Medico-Engineering, Beijing, China

Estimation of Mean Trabecular Bone Spacing Using Cepstrum Method Based on Inverse Filter

Huang, Kai; Ta, De-an; Wang, Wei-qi; Lawrence, HL; Space Medicine and Medical Engineering, Volume 20, No. 6; December 2007, pp. 451-454; In Chinese; See also 20080020461; Copyright; Avail.: Other Sources

Proposed to explore the feasibility of estimating mean trabecular bone spacing (MTBS) by the improved cepstrum method. The improved cepstrum method based on an inverse filter is proposed in this paper. In order to test its performance, simulations were performed and bovine tibia cancellous bone specimens in vitro were used in our experiments. It is indicated that the improved cepstrum method can minimize the influence of transducer impulse response and tissue scatterer properties. It also can be easily implemented with little computation. Compared with traditional cepstrum, the improved cepstrum method has a more accurate MTBS estimate because of its less sensitivity to the variety of MTBS, diffuse scattering and noise.
Author

Bones; Spine; Cepstral Analysis; Orthopedics; Bioastronautics; Gravitational Physiology

20080020463 Institute of Space Medico-Engineering, Beijing, China

EEG Study on Transcutaneous Electrical Acupoint Stimulation as a Fatigue Countermeasure

DONG, Jie; LI, Lu-ming; HAO, Hong-wei; CHEN, Zhao-yang; Space Medicine and Medical Engineering, Volume 20, No. 6; December 2007, pp. 447-450; In Chinese; See also 20080020461; Copyright; Avail.: Other Sources

Proposed to investigate the action of transcutaneous electrical acupoint stimulation to reduce fatigue, and to evaluate the countermeasure effect. Twelve-channel EEG signals (F3, F2, F4, C3, Cz, C4, P3, Pz, P4, O1, Oz, O21) were recorded in 9 young, healthy male volunteers under three conditions: normal, fatigue and after transcutaneous electrical acupoint stimulation. G values, the average power spectral densities, of delta, theta, alpha, beta EEG bands were calculated to analyze the EEG effect after transcutaneous electrical acupoint stimulation. G values of delta, theta, alpha, beta EEG bands and imbalance of G values of alpha EEG bands increased during fatigue, compared with those in the normal condition. G values of delta, theta, alpha, beta EEG bands and imbalance of G values of alpha EEG bands decreased after transcutaneous electrical acupoint stimulation. Transcutaneous electrical acupoint stimulation provides a positive countermeasure effect for fatigue as revealed by EEG.
Author

Electroencephalography; Skin (Anatomy); Touch; Fatigue (Biology); Countermeasures; Electrophysiology

20080020465 Institute of Space Medico-Engineering, Beijing, China

Effects of Simulated Weightlessness on Cellular Morphology, Cell Multiplication and Cell Cycle of MG-63 Cells

Wang, Pan; Zhang, Shu; Wang, Bing; Sun, Xi-qing; Geng, Jie; Gao, Yuan; Space Medicine and Medical Engineering, Volume 20, No. 6; December 2007, pp. 406-409; In Chinese; See also 20080020461; Copyright; Avail.: Other Sources

Proposed to investigate the effects of simulated weightlessness on cell area, cell multiplication and cell cycle of MG-63 cells. The rotating clinostat was used to simulate weightlessness. The change of cell area was measured with image processing and analysis soft (Image J). Cell growth curve was measured with cytometry. The change of cell cycle was examined with a flow cytometer. Compared with control group, the cell area of cell line MG-63 in 24 h,36 h and 48 h durations of rotating group decreased significantly ($P<0.05$). Compared with 12 h duration, the cell area in 24 h, 36 h and 48 h durations of rotating group decreased significantly ($P<0.05$). But in control group, cell area of all 4 experimental durations showed no significant difference among each other. Compared with control group, cell growth curve revealed that cell multiplication was inhibited in rotating group. Compared with control group, the cell cycles of cell line MG-63 in 12 h, 36 h, 48 h sections of rotating group did not change significantly, but the cell in 24 h duration of rotating group was decreased significantly ($P<0.05$) in G0 + G1 phase and increased significantly ($P<0.05$) in S phase. Simulated weightlessness in rotating clinostat may lead cell area of cell line MG-63 in 24 h, 36 h and 48 h durations to be decreased. Cell multiplication is inhibited in 12 h, 24 h, 36 h and 48 h durations. The conversion of cell from S phase to G2 phase is inhibited in 24 h duration.
Author

Cell Division; Cytology; Morphology; Weightlessness Simulation; Cells (Biology); Biodynamics; Cancer; Bones

20080020467 China Astronaut Research and Training Center, Beijing, China

A Study of Metal Oxide CO2 Absorbents

YU, Qing-ni; ZHAO, Cheng-jian; WEI, Wei; Space Medicine and Medical Engineering, Volume 20, No. 6; December 2007, pp. 432-435; In Chinese; See also 20080020461; Copyright; Avail.: Other Sources

Proposed to develop a regenerable metal oxide CO2 removal technology and to prepare a metal oxide absorbent for

absorbing CO2. Several formulations were selected to form metal oxide absorbent pellets, their performances of CO2 absorption and regeneration were then tested respectively. The results demonstrated that the metal oxide absorbent we prepared has good CO2 absorption and regeneration performances (up to 0.2 g/mL CO2 capacity per volume unit, crush strength of 4 kg and bulk density of 1.53 g/mL). The metal oxide absorbent we prepared has the potential for application in regenerable portable life support system.
Author
Absorbents; Carbon Dioxide Removal; Metal Oxides; Life Support Systems

20080020470 Institute of Space Medico-Engineering, Beijing, China
Automatic Sleep Stage Classification Based on Hilbert-Huang Transform Method of EEG
Li, Gu; Fan, Ying-le; Li, Yi; PANG, Quan; Space Medicine and Medical Engineering, Volume 20, No. 6; December 2007, pp. 458-463; In English; See also 20080020461; Copyright; Avail.: Other Sources

Proposed to present a new application of the Hilbert-Huang transform method for automatic sleep stage classification. Instantaneous frequencies of sleep EEG with physical meaning and energy-frequency distribution used as feature parameters for each stage were computed with the Hilbert-Huang transform. Finally, the pattern recognition method of nearest neighbors was applied to optimal classification. Five hundred and sixty samples were picked from sleep EEG, and classification was made. The mean rate of accuracy was as high as 81.7%. Automatic sleep stage classification can be made effectively from features of sleep EEG by the Hilbert-Huang transform.
Author
Electroencephalography; Hilbert Transformation; Sleep; Classifications

20080020473 Institute of Space Medico-Engineering, Beijing, China
Design of a Head-up Tilt Experimental System for Measuring Head Blood Pressure and Its Dynamic Process
LIU, Yan-yong; YU, Meng-sun; XIANG, Hai-yan; JI, Jun; Li, Yin-hua; QIN, Yu-fei; Space Medicine and Medical Engineering, Volume 20, No. 6; December 2007, pp. 422-426; In Chinese; See also 20080020461; Copyright; Avail.: Other Sources

Proposed to design a head-up tilt (HUT) experimental system which is capable of measuring head blood pressure and its dynamic process, to enhance the efficiency of a HUT experiment. The head blood pressure was calculated by the individual-calibrated pulse wave transit time (PWTT) measured from the B point of the impedance cardiography (ICG) to the beginning point of the superficial temporal artery pulse wave. Based on the improved tilt bed, the HUT experimental system was designed to detect the dynamic blood pressure, ECG, phonocardiogram (PCG), respiration and ICG continuously. Finally, the system performance was examined by HUT experiments of three volunteers. Head blood pressure was calibrated with individual precise PWTT. The system detected physiological signals continuously and stably during HUT experiments and our preliminary results presented the minimum value, dynamic regulating process and overall level of head blood pressure. The system can exactly describe continuous, dynamic and transient process of head blood pressure during HUT experiments, which will provide more information about the regulation function of the cardiovascular system. It is possible to study the instant responses of the pilot to + Gz stresses in high-perfomance aircraft.
Author
Head Up Tilt; Blood Pressure; Head (Anatomy); Biodynamics; Flight; Physiological Responses

20080020475 Institute of Space Medico-Engineering, Beijing, China
Detrended Fluctuation Analysis of Pulse Rate Variability Signals of Coronary Disease Patients
Zhao, Hai-yong; Qiu, Yi-hong; Hu, Si-jun; Zhu, Yi-sheng; Space Medicine and Medical Engineering, Volume 20, No. 6; December 2007, pp. 455-457; In Chinese; See also 20080020461; Copyright; Avail.: Other Sources

Nonlinear method was applied to the analysis of pulse rate variability (PRV) signal of healthy people and coronary disease patients to find the different features, which can be used to detect coronary disease invasively and monitor the process of the disease. Pulse waves of the healthy people and patients (18 subjects in each group) were sampled by photoplethysmographic (PPG) sensor. The detrended fluctuation analysis algorithm was applied to PRV series which extracted from PPG signals, and the scaling exponents of the two groups of signals were obtained. The average scaling exponents of the patients, i.e. short term alpha(exp 1) long term alpha(exp 2), and whole process alpha, were significantly lower than those of the healthy subjects. Detrended fluctuation analysis algorithm was applied to the PRV signal of the healthy subjects and coronary disease patients. It was found that the average scaling exponents of the patients, alpha(exp 1) , alpha(exp 2) and alpha, are significantly different

from those of the healthy people. These findings suggest that a nonlinear index could be used to detect and monitor coronary disease non-invasively.
Author
Nonlinear Equations; Pulse Rate; Variability; Coronary Artery Disease; Biometrics

20080020478 Institute of Space Medico-Engineering, Beijing, China
Cardiovascular Responses to Lower Body Negative Pressure (LBNP) in Healthy Females of Different Physical Fitness
Lu, Li-li; Wu, Bin; Huang, Wei-fen; Gu, Zhi-ming; Wang, Yan-lei; Liu, Xing-hua; Tang, Yun; Mo, Yan; Space Medicine and Medical Engineering, Volume 20, No. 6; December 2007, pp. 398-401; In Chinese; See also 20080020461; Copyright; Avail.: Other Sources

Proposed to compare responses of tolerance to lower body negative pressure (LBNP) in healthy women of different fitness levels. V02max was examined using a treadmill and a step-wise LBNP procedure to the maximum of -50 mmHg was applied. Twenty one healthy female volunteers were divided into group A, sitting employees (n=11, V02max 33.69 +/- 4.50 mL kg(exp -1) min(exp -1) and group B, pilots (n=10, V02max 39.61 +/- 3.84 mL kg(exp -1) min(exp -1). With the step-wise of LBNP, heart rate of all groups were gradually increased. Under -50 mmHg, heart rate (HR) increased significantly (P<0.01 to approximately 0.001), systolic blood pressure (SBP) of group B decreased significantly (P<0.01), diastolic blood pressure (DBP) of group A increased significantly (P<0.05) and mean blood pressure (MBP) of group B decreased significantly (P<0.05). It is indicated that those with better fitness have lower cardiovascular responses to LBNP.
Author
Cardiovascular System; Females; Lower Body Negative Pressure; Physical Fitness; Physiological Responses; Tolerances (Physiology); Heart Rate

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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*.

20080019730 Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD USA
Reassessment of Human Performance Parameter Estimates for Respiratory Protection Design and Development
Caretti, David M; Coyne, Karen M; Jan 2008; 48 pp.; In English
Report No.(s): AD-A477008; ECBC-TR-605; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477008

The key to ensuring that rational respirator technology solutions are possible and acceptable to the user community is the knowledge that each option has a sound scientific basis. Historical mask wear human performance research offers useful, albeit limited, insights on the relationships between design parameters and performance. The purposes of the current task were to review and revise the existing human performance capabilities and mask design parameters databases and to derive new algorithms to more accurately define human performance capabilities related to respirator wear. The results reaffirm that much of the basic psychophysiological data needed to enhance respirator design requirements remains elusive. The main data gaps across all performance capabilities include little or no knowledge concerning the relationships among respirator design components and performance and the impacts of design parameters on task performance across different work intensities. The impacts of mask design on subjective comfort and subsequent task performance is the capability area with the least amount of reliable information. In this regard, research needs to continue to advance the knowledge base to ensure that next generation respirator designs can be based on robust human factors data.
DTIC
Human Performance; Parameter Identification; Protection; Respirators

20080019804 Humansystems, Inc., Guelph, Ontario Canada
OPTICS (Operational Threat Integrated Corrective Spectacles) Production and Initial Human Factors Testing (Lunettes Optics (Lunettes Correctrices Integrees a L'equipment de protection Contre les Menaces Operationnelles) - Production et Essais Initiaux Relatifs Aux Facteurs Humains)
Angel, Harry; Jun 2006; 52 pp.; In English; Original contains color illustrations
Report No.(s): AD-A477175; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477175

This report details the design, development and preliminary testing of three different Operational Threat Integrated

Corrective Spectacles (OPTICS) concepts. The aim of the OPTICS project is to develop an integrated set of corrective eyewear inserts that will be compatible with ballistic protective eyewear and will be compatible for use inside the in-service C-4 respirator. Over the course of 13 months, three different OPTICS concepts were designed, developed and delivered to DCIEM. An iterative design approach with user feedback was utilized. Each concept employed a different approach for meeting the aims of the device; Concept 0 utilized a Commercial Off the Shelf sports style prescription insert as its starting point, Concept 1 used a previously developed NBC spectacle as its inspiration and finally Concept 2 used a unique carrier approach. The concept of fielding a system that could utilize a prescription insert with ballistic eyewear and with a C4 respirator was well received. The participants also identified the need to have a minimum of two sets of OPTICS inserts. Advantages and disadvantages with all of the concepts developed were noted. Overall the participants believed that Concept 0 and Concept 1 were the most promising for further development and testing. Proposed modifications to all concepts were noted. The participants believed that further development should only proceed after CTS has identified a winner in its ballistic eyewear program. Additional test requirements were also noted.
DTIC
Human Factors Engineering; Inserts; Protection; Protectors

20080019805 Toronto Univ., Ontario Canada
Developing Human-Machine Interfaces to Support Appropriate Trust and Reliance on Automated Combat Identification Systems
Jamieson, Greg A; Wang, Lu; Sep 17, 2007; 85 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W7711-068000/001/TOR
Report No.(s): AD-A477176; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477176

This research tested the effects of system reliability information and interface features on human trust and reliance on individual combat ID systems. Experiment I showed that participants had difficulty in estimating the reliability of the 'unknown' feedback from these systems. Providing the reliability information led to appropriate reliance on that feedback. Experiment II showed that participants' trust in the 'unknown' feedback was influenced by the system's activation mode and the 'unknown' feedback form, but their reliance on unknown feedback was not affected. In addition, a new method was proposed to measure reliance on automation. This measure was used effectively in both experiments, and demonstrated several advantages over previous methods. Finally, implications for the design of interfaces for individual combat ID systems and the training of infantry soldiers were drawn from the results of the studies.
DTIC
Automatic Control; Combat; Man Machine Systems

20080019807 CAE Professional Services, Ottawa, Ontario Canada
INCOMMANDS TDP: Development of Decision Aid Implementation Guidance for the INCOMMANDS Human Factors Design and Evaluation Guide (Elaboration des Directives Relatives a la Mise en Oeuvre de l'Aide a la Decision Pour le Guide de Conception et d'evaluation Tenant Compte des Facteurs Humains - INCOMMANDS)
Banbury, Simon; Gauthier, Michelle; May 2007; 84 pp.; In English
Contract(s)/Grant(s): W7701-04-3544/001/QCL
Report No.(s): AD-A477179; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477179

The INCOMMANDS TDP seeks to research, demonstrate and evaluate new command decision support concepts for the HALIFAX Class frigate's command and control (C2) system, with the objective of improving team battlespace awareness, and increasing decision speed and accuracy. The aim of this document is to support the design and development of Operator Machine Interface (OMI) concepts developed as part of the INCOMMANDS TDP by providing a structured and comprehensive set of design guidelines which address decision aiding concepts specifically. The guidance within this document will be integrated within a final document, the INCOMMANDS Human Factors Design and Evaluation Guide, which will cover both OMI and decision aid guidance.
DTIC
Decision Support Systems; Human Factors Engineering; Human-Computer Interface

20080019972 Queens Univ., Kingston, Ontario Canada

Clothe the Soldier Prototype K1 Load Carriage System Design Assessment using the APLCS Load Carriage Simulator

Stevenson, J M; Bryant, J T; Doan, J; Rigby, W A; Reid, S A; Mar 2006; 57 pp.; In English; Original contains color illustrations

Report No.(s): AD-A477203; DRDC-T-CR-2006-300; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The objective of this study was to conduct a standardized assessment of the Clothe the Soldier (CTS) Prototype K1 pack on a computerized Load Carriage (LC) Simulator to assess the load control and load transfer capability of the CTS K1 Pack. These aspects of pack design were comprised of displacement, force, moment and pressure variables that had been validated on previously tested systems where LC Simulator outputs were compared to assessments by experienced users during human trials. A trial consisted of measuring inertial properties and dimensions, loading the pack with a 25 kg payload, and mounting the pack and balancing the moments. Output variables were: three dimensional motions of the pack's center of gravity relative to the person's motion; forces and moments from a 6 degree of freedom load cell at the level of the hips; and average and peak skin pressures and skin forces over the anterior and posterior shoulders, and upper and lower back. To examine the resistance of the pack frame to torso motions in three planes, a pack LC stiffness compliance tester was developed. For load control, the CTS pack K1 ranked as superior in side to side, up and down and resultant (r) relative pack person motions. All other load control variables were not significantly different from other systems. For load transfer, the CTS K1 pack was inferior for dampening average forces in the vertical direction (z). The CTS Prototype Pack K1 showed typical stiffness characteristics in torsion and in lateral bending. It also demonstrated superior forward flexion stiffness which is correlated to good combined functional ratings where large movements are required, reduced posterior neck discomfort and reduced lower back discomfort.

DTIC

Carriages; Loads (Forces); Military Personnel; Prototypes; Simulators; Systems Engineering

20080020096 Naval Health Research Center, San Diego, CA USA

Augmenting Task-Centered Design with Operator State Assessment Technologies

Van Orden, Karl F; Viirre, Erik; Kobus, David A; May 14, 2007; 12 pp.; In English; Original contains color illustrations

Report No.(s): AD-A477499; NHRC-07-6F; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Task-Centered Design (TCD) of human-systems interfaces focuses on supporting the user throughout all phases of tasks from initiation to completion. TCD typically requires software that monitors aspects of system information to trigger tasks, develop user-friendly information sets, propose task solutions and actions, and confirm actions as directed and approved by the operator. The operator monitors tasks awaiting completion on a Task Manager display. We demonstrate that moment-to-moment operator workload monitoring is greatly facilitated by TCD. Workload estimates were obtained every 2-min over the course of a 35-min test session during an air defense command and control scenario. Workload was readily modeled by the task loading and the density of track icons on the display. A second study related the unitary workload estimates to NASA TLX workload subscales. Unpublished data from our laboratory indicated that eye activity measures (e.g. blink frequency and duration pupil diameter fixation frequency and dwell time) did not improve the estimation of workload. These findings indicate that at least for well-executed TCD systems eye tracking technologies may be best employed to monitor for fatigue and incongruities between the focus of attention and task requirements. Recent findings using EEG hold promise for the identification of specific brain signatures of confusion orientation and loss of situational awareness. Thus the critical element of human directed systems is good initial design. Understanding of the task will lead to system automation that can balance the workload of the operator who is functioning in a normal state. However physiological monitoring will be most useful if operators veer beyond their normal conditions and are confused over-loaded disoriented or have other impairments to their abilities. By detecting the operators loss of function early inappropriate operator inputs can potentially be avoided.

DTIC

Cognition; Human Factors Engineering; Human-Computer Interface

20080020263 Humansystems, Inc., Guelph, Ontario Canada

Soldier Integrated Headwear System: Conceptual Design Phase Summary Report

Tack, David W; Colbert, Heather J; Nov 22, 2005; 85 pp.; In English; In English; In French; Original contains color illustrations

Contract(s)/Grant(s): W7711-037880/001-TOR

Report No.(s): AD-A477252; DRDC-TORONTO-CR-2007-031; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The aim of the Soldier's Integrated Headwear System (SIHS) project is to empirically determine the most promising

headwear integration concept that significantly enhances the survivability and effectiveness of the future Canadian soldier/warfighter by developing, evaluating, and demonstrating novel concepts for integrating enhanced protection, sensing, information display, and communications technologies into a headwear system. The SIHS design cycle comprises four developmental phases: concept design, digital models, physical mock-ups, and a final functional prototype. This report describes the process and results of the concept development phase. Seven concept helmet designs were developed using conceptual foci based on helmet and operational functions, and helmet capabilities in relation to the five NATO capability areas: lethality, survivability, mobility, sustainability, and C4I. A downselection process was then undertaken to progress the most successful features and capabilities of the seven concepts into four new concepts for further development in the Digital Model Development phase. The traceability of all design ideas, from the initial seven concepts through to the four new downselected concepts, is detailed in this report.
DTIC
Helmets; Display Devices; Design Analysis

20080020318 Boeing Co., Chicago, IL USA
Composite shell spacecraft seat
Barackman, Victor J., Inventor; Pulley, John K., Inventor; Simon, Xavier D., Inventor; McKee, Sandra D., Inventor; February 26, 2008; 7 pp.; In English
Contract(s)/Grant(s): NAS8-01099
Patent Info.: Filed January 6, 2005; US-Patent-7,334,844; US-Patent-Appl-SN-10/905,483; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080020318

A two-part seat (10) providing full body support that is specific for each crew member (30) on an individual basis. The two-part construction for the seat (10) can accommodate many sizes and shapes for crewmembers (30) because it is reconfigurable and therefore reusable for subsequent flights. The first component of the two-part seat construction is a composite shell (12) that surrounds the crewmember's entire body and is generically fitted to their general size in height and weight. The second component of the two-part seat (10) is a cushion (20) that conforms exactly to the specific crewmember's entire body and gives total body support in more complex environment.
Official Gazette of the U.S. Patent and Trademark Office
Cushions; Seats; Shells (Structural Forms); Spacecraft Equipment

20080020341 National Renewable Energy Lab., Golden, CO USA
Overview of Vehicle Test and Analysis Results from NREL's A/C Fuel Use Reduction Research
Bharathan, D.; Chaney, L.; Farrington, R. B.; Lustbader, J.; Keyser, M.; June 2007; 17 pp.; In English
Report No.(s): DE2007-908616; NREL/CP-540-41155; No Copyright; Avail.: National Technical Information Service (NTIS)

This paper summarizes results of air-conditioning fuel use reduction technologies and techniques for light-duty vehicles evaluated over the last 10 years.
NTIS
Air Conditioning; Automobiles; Energy Conservation; Energy Consumption

20080020355 Public Health Inst., Berkeley , CA, USA; California Dept. of Health Services, Berkeley, CA, USA
Fatality Assessment and Control Evaluation (FACE) Report for California: Supervisor Dies When Caught Between an Adjusting Bar and the Frame of a Knitting Machine
Aug. 1997; 6 pp.; In English
Report No.(s): PB2007-112043; FACE-97-CA-002-01; No Copyright; Avail.: CASI: A02, Hardcopy

A 51-year old supervisor/mechanic (decedent) died when he was caught and pinned at the neck between an adjusting rod (take-up) and the leg of the frame of a knitting machine. The decedent was attempting to correct a problem with the lines of thread feeding into the knitter. With the protective gate (machine guard) open due to a defeated interlock, he pushed the machine's stop button. He then apparently squatted down to look at the knitted cloth as the machine was coming to a stop. Before the machine stopped, the decedent's neck became pinned.
NTIS
Accident Investigation; Bars; Frames; Health; Safety

20080020471 Institute of Space Medico-Engineering, Beijing, China

Progress in Fabrication of Neural Probe Microelectrodes and its Application in Brain-Machine Interface

Yao, Yuan; Li, Gang; Jin, Qing-hui; Zhao, Jian-long; Space Medicine and Medical Engineering, Volume 20, No. 6; December 2007, pp. 464-468; In English; See also 20080020461; Copyright; Avail.: Other Sources

Recently, implantable neural microelectrodes has been a new, exciting field in neural science and microelectronics. In this paper, the development and current status of techniques for fabricating the neural probe microelectrode and its applications in brain-machine interface were reviewed in detail, the characteristics and limitations of various methods for fabricating probe microelectrodes were discussed and progress and further investigations in this area were reviewed.

Author

Probes; Microelectronics; Microelectromechanical Systems; Man Machine Systems; Brain; Nanofabrication; Implanted Electrodes (Biology)

20080020472 Institute of Space Medico-Engineering, Beijing, China

The Design and Experiment of Solid Polymer Electrolyte Water Electrolytic Cell

Zhou, Kang-han; Yin, Yong-li; Wang, Fei; Space Medicine and Medical Engineering, Volume 20, No. 6; December 2007, pp. 427-431; In Chinese; See also 20080020461; Copyright; Avail.: Other Sources

Proposed to realize a solid polymer electrolyte (SPE) oxygen generation assembly (OGA) in order to supply oxygen for the stewards of a sealed cabin and to solve problems that may exist in the engineering process. The cell stack was a kind of anode feed water electrolyzer in a bipolar arrangement between two compression end plates. The metal racks and the end plates were designed to be lighter and they were assembled by a pressing filter. Three sets of the electrolyzers were constructed. In the experiment of three persons living in a sealed cabin for 62 d, the ORS operated stably and the purity of generated oxygen was higher than 99.5% with the pressure of 1 MPa and flow rate of 1 523 L/h. The electrolyzer specially designed is light and compact. The OGA constructed satisfies the requirements of providing oxygen in a sealed cabin for a long time with stable performance.

Author

Electrolytic Cells; Oxygen Production; Solid Electrolytes; Polymers; Electrochemistry; Water; Pressurized Cabins; Aerospace Engineering; Electrical Engineering

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*.

20080020281 Allen, Dyer, Doppelt, Milbrath and Gilchrist, PA, Orlando, FL, USA

Method and Apparatus for Data Encryption

Kurdziel, M. T., Inventor; 3 Mar 04; 16 pp.; In English

Contract(s)/Grant(s): MDA904-99-C-6511

Patent Info.: Filed Filed 3 Mar 04; US-Patent-Appl-SN-10 792 236

Report No.(s): PB2007-110045; No Copyright; Avail.: CASI: A03, Hardcopy

A block cipher device for a cryptographically secured digital communication system includes a pair of first stages connected in parallel for receiving an input data block and a control data block. Each first stage defines a respective first data path and includes a sum modulo-two unit for receiving the control data block and the input data block. Each first stage also includes a first nibble swap unit downstream from the sum modulo-two unit. A key scheduler generates a random key data block based upon a received key data block. A pair of second stages is connected in parallel downstream from the first stages and receives the random key data block, the control data block and output signals from the first stages for providing an output data block. Each second stage defines a respective second data path and includes a plurality of modulo units. The block cipher device further includes a bit diffuser connected in both of the first data paths for mixing data there between.

NTIS

Computer Information Security; Cryptography; Patent Applications; Scheduling

20080020291 Pacific Northwest National Lab., Richland, WA, USA
High Accuracy Method for Semi-Supervised Information Extraction
Tratz, S.; Sanfilippo, A.; Apr. 2007; 4 pp.; In English
Report No.(s): DE2007-908955; No Copyright; Avail.: Department of Energy Information Bridge

Customization to specific domains of dis-course and/or user requirements is one of the greatest challenges for todays Information Extraction (IE) systems. While demonstrably effective, both rule-based and supervised machine learning approaches to IE customization pose too high a burden on the user. Semi-supervised learning approaches may in principle offer a more resource effective solution but are still insufficiently accurate to grant realistic application. We demonstrate that this limitation can be overcome by integrating fully-supervised learning techniques within a semi-supervised IE approach, without increasing resource requirements.

NTIS
Extraction; Linguistics; Machine Learning; Natural Language Processing

20080020346 National Inst. of Justice, Washington, DC USA; Department of Energy, Washington, DC, USA
Forensic Examination of Digital Evidence: A Guide for Law Enforcement
Apr 2004; 91 pp.; In English
Report No.(s): PB2007-112362; NCJ-199408; No Copyright; Avail.: CASI: A05, Hardcopy

This guide is intended for use by law enforcement officers and other members of the law enforcement community who are responsible for the examination of digital evidence. This guide is not all-inclusive. Rather, it deals with common situations encountered during the examination of digital evidence. It is not a mandate for the law enforcement community; it is a guide agencies can use to help them develop their own policies and procedures. Technology is advancing at such a rapid rate that the suggestions in this guide are best examined in the context of current technology and practices. Each case is unique and the judgment of the examiner should be given deference in the implementation of the procedures suggested in this guide. Circumstances of individual cases and Federal, State, and local laws/rules may also require actions other than those described in this guide.

NTIS
Law (Jurisprudence); Laws

20080020352 Government Accountability Office, Washington, DC, USA
Cybercrime: Public and Private Entities Face Challenges in Addressing Cyber Threats
Jun. 2007; 59 pp.; In English
Report No.(s): PB2007-112056; GAO-07-705; No Copyright; Avail.: CASI: A04, Hardcopy

Computer interconnectivity has produced enormous benefits but has also enabled criminal activity that exploits this interconnectivity for financial gain and other malicious purposes, such as Internet fraud, child exploitation, identity theft, and terrorism. Efforts to address cybercrime include activities associated with protecting networks and information, detecting criminal activity, investigating crime, and prosecuting criminals. GAO's objectives were to (1) determine the impact of cybercrime on our nation's economy and security; (2) describe key federal entities, as well as nonfederal and private sector entities, responsible for addressing cybercrime; and (3) determine challenges being faced in addressing cybercrime. To accomplish these objectives, GAO analyzed multiple reports, studies, and surveys and held interviews with public and private officials. Cybercrime has significant economic impacts and threatens U.S. national security interests. Various studies and experts estimate the direct economic impact from cybercrime to be in the billions of dollars annually.

NTIS
Crime; Security; Internets

20080020354 Government Accountability Office, Washington, DC, USA
Veterans Affairs: Inadequate Controls Over IT Equipment at Selected VA Locations Pose Continuing Risk of Theft, Loss, and Misappropriation
Jul. 2007; 59 pp.; In English
Report No.(s): PB2007-112053; GAO-07-505; No Copyright; Avail.: CASI: A04, Hardcopy

In July 2004, GAO reported that the six Department of Veterans Affairs (VA) medical centers it audited lacked a reliable property control database and had problems with implementation of VA inventory policies and procedures. Fewer than half the items GAO selected for testing could be located. Most of the missing items were information technology (IT) equipment. Given recent thefts of laptops and data breaches, the requesters were concerned about the adequacy of physical inventory

controls over VA IT equipment. GAO was asked to determine (1) the risk of theft, loss, or misappropriation of IT equipment at selected locations; (2) whether selected locations have adequate procedures in place to assure accountability and physical security of IT equipment in the excess property disposal process; and (3) what actions VA management has taken to address identified IT inventory control weaknesses. GAO statistically tested inventory controls at four case study locations. A weak overall control environment for VA IT equipment at the four locations GAO audited poses a significant security vulnerability to the nation's veterans with regard to sensitive data maintained on this equipment.
NTIS
Information Systems; Losses; Position (Location); Risk

20080020359 Department of Homeland Security, Washington, DC, USA
Data Mining Report, 2007. DHS Privacy Office Response to House Report 109-699
Jul. 2007; 42 pp.; In English
Report No.(s): PB2007-112018; No Copyright; Avail.: CASI: A03, Hardcopy

The Department of Homeland Security (DHS) Privacy Office is pleased to provide to the Congress its 2007 Data Mining Report: DHS Privacy Office Response to House Report 109-699. This is the second report by the Privacy Office to Congress on data mining. This report describes data mining activities deployed or under development within the Department that meet the definition of data mining as mandated in House Report No. 109-699 Making Appropriations for the Department of Homeland Security for the Fiscal Year Ending September 30, 2007, and for Other Purposes. In addition, it provides an update on how the Privacy Office has begun implementation of the recommendations outlined in its first report on data mining entitled, Data Mining Report: DHS Privacy Office Response to House Report 108-774, issued July 6, 2006 (July 2006 Report). The Privacy Office recognizes the importance of these reports to Congress, since Congress mandated specifically data mining as one of the analytical tools that the Department should use in fulfilling its mission. In this report, the Privacy Office applied the new definition for data mining from House Report 109-699 in evaluating whether or not Departmental information processing activities were data mining activities. Additionally, this report examines various definitions describing data mining and the impact those definitions have on the technology and analysis.
NTIS
Data Mining; Information Dissemination; Privacy; Security; Data Processing

20080020360 Department of Homeland Security, Washington, DC, USA
Data Mining Report, 2006. DHS Privacy Office Response to House Report 108-774
Jul. 2006; 36 pp.; In English
Report No.(s): PB2007-112017; No Copyright; Avail.: CASI: A03, Hardcopy

This report is prepared pursuant to the requirements of House Report 108-774 Making Appropriations for the Department of Homeland Security for the Fiscal Year ending September 30, 2005, and for Other Purposes. This report provides information related to the status, issues, and programs related to DHS data mining activities.
NTIS
Data Mining; Information Dissemination; Privacy; Security

20080020380 Lawrence Livermore National Lab., Livermore, CA USA
Determining Application Runtimes Using Queueing Network Modeling
Elliott, M. L.; Mar. 22, 2006; 125 pp.; In English
Report No.(s): DE2007-908124; UCRL-TH-229287; No Copyright; Avail.: National Technical Information Service (NTIS)

Determination of application times-to-solution for large-scale clustered computers continues to be a difficult problem in high-end computing, which will only become more challenging as multi-core consumer machines become more prevalent in the market. Both researchers and consumers of these multi-core systems desire reasonable estimates of how long their programs will take to run (time-to-solution, or TTS), and how many resources will be consumed in the execution. Currently there are few methods of determining these values, and those that do exist are either overly simplistic in their assumptions or require great amounts of effort to parameterize and understand. One previously untried method is queueing network modeling (QNM), which is easy to parameterize and solve, and produces results that typically fall within 10 to 30% of the actual TTS for our test cases. Using characteristics of the computer network (bandwidth, latency) and communication patterns (number of messages, message length, time spent in communication), the QNM model of the NAS-PB CG application was applied to MCR and ALC, supercomputers at LLNL, and the Keck Cluster at USF, with average errors of 2.41%, 3.61%, and -10.73%, respectively, compared to the actual TTS observed. While additional work is necessary to improve the predictive capabilities

of QNM, current results show that QNM has a great deal of promise for determining application TTS for multi-processor computer systems.
NTIS
Computer Networks; Queueing Theory

20080020405 Lawrence Livermore National Lab., Livermore, CA USA
VACET Software Engineering Group's Progress Report: March 2007
Childs, H.; Apr. 10, 2007; 5 pp.; In English
Report No.(s): DE2007-908905; UCRL-TR-229828; No Copyright; Avail.: Department of Energy Information Bridge

Each document in this series will summarize a teleconference of the VACET Software Engineering Group (SEG), which in turn summarizes the progress of the previous month. For March 2007, the teleconference took place on April 4th.
NTIS
Computer Programming; Software Engineering

20080020436 NASA, Washington, DC USA
ARA type protograph codes
Divsalar, Dariush, Inventor; Abbasfar, Aliazam, Inventor; Jones, Christopher R., Inventor; Dolinar, Samuel J., Inventor; Thorpe, Jeremy C., Inventor; Andrews, Kenneth S., Inventor; Yao, Kung, Inventor; March 11, 2008; 49 pp.; In English
Patent Info.: Filed June 24, 2005; US-Patent-7,343,539; US-Patent-Appl-SN-11/166,040; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080020436

An apparatus and method for encoding low-density parity check codes. Together with a repeater, an interleaver and an accumulator, the apparatus comprises a precoder, thus forming accumulate-repeat-accumulate (ARA codes). Protographs representing various types of ARA codes, including AR3A, AR4A and ARJA codes, are described. High performance is obtained when compared to the performance of current repeat-accumulate (RA) or irregular-repeat-accumulate (IRA) codes.
Official Gazette of the U.S. Patent and Trademark Office
Accumulators; Coding; Repeaters

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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*.

20080020038 Naval Postgraduate School, Monterey, CA USA
Data Integrity in RFID Systems
Alchazidis, Nikolaos; Sep 2006; 113 pp.; In English; Original contains color illustrations
Report No.(s): AD-A477338; No Copyright; Avail.: Defense Technical Information Center (DTIC)

One of the main problems that affect the data integrity of passive RFID systems is the collision between the tags. A popular anticollision algorithm which dominates the standards in HF and UHF passive RFID systems is Framed Slotted Aloha (FSA) and some variations of FSA. Throughput and Average time delay of the RFID system which determines the performance/efficiency of the system are reduced rapidly when the number of tags inside the interrogation zone is increased. Using larger frame sizes is not always the solution. This thesis discusses and compares the existing protocols, and proposes a variation of FSA, called Progressing Scanning (PS) algorithm. The PS algorithm divides the tags in the interrogation zone into smaller groups, and gives the ability to the reader to communicate each time with one of them. For performance analysis, the PS algorithm was evaluated with the parameters of a typical passive RFID system at 2.45GHz . The results showed that the PS algorithm can improve the efficiency of the RFID system and provide a reliable solution for cases with a high density of tags in the area
DTIC
Data Systems; Frequencies; Performance Tests; Radio Frequencies; Readers

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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.

20080018946 Teledyne Scientific and Imaging, LLC, Thousand Oaks, CA USA
Ocean Wave Energy Harvesting Devices
Cheung, Jeffrey T; Childress III, Earl F; Jan 2008; 98 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): HR0011-06-C-0030; DARPA ORDER-V233/00
Report No.(s): AD-A476891; SC71273; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476891

Development of a mechanically sound buoy design. which generated 10W average power in Beaufort Sea State I. and showed potential for up to 20W in Sea State 4. Development of a wave energy harvesting buoy capable of generating 2W in Sea State I. and with proper mechanical alignment able to generate over 4W. Development of two modeling capabilities: a classical mechanical model used lbr optimizing the electromagnetic design,. and a hydrodynamic model to predict device performance given a set of buoy/generator design characteristics and environmental conditions. The latter model allows input of actual wave spectra. winds and currents. It also has the capability to simulate mooring designs and their impact on power production. A literature search to determine available wave energy in the 1-3 second wave period band was sufficient to meet the 20W power requirements in Sea State 1. The result of this study indicated a device with conversion efficiency on order of 10% could generate 20W on average from waves with conversion efficiency on order of 10% could generate 20W on average from waves with periods faster than 3 seconds.
DTIC
Computerized Simulation; Energy Transfer; Ocean Surface; Oceans; Water Waves

20080018950 Old Dominion Univ., Norfolk, VA, USA
NATO RTO Modelling and Simulation Conference. Technical Evaluation Report
Tolk, Andreas; Oct 2006; 17 pp.; In English; Original contains color illustrations
Report No.(s): AD-A476646; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476646

No abstract available
Computerized Simulation; Conferences; Military Operations; Military Technology; North Atlantic Treaty Organization (NATO); Research and Development; Simulation

20080019746 Aalborg Univ., Aalborg, Denmark
Investigative Data Mining Toolkit: A Software Prototype for Visualizing, Analyzing and Destabilizing Terrorist Networks
Memon, Nasrullah; Larsen, Henrik L; Dec 1, 2006; 69 pp.; In English; Original contains color illustrations
Report No.(s): AD-A477075; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477075

No abstract available
Computer Programs; Data Mining; Kits; Knowledge Based Systems; Prototypes

20080019749 Defence Research and Development Canada, Ottawa, Ontario Canada
Automating the Presentation of Computer Networks
Vandenberghe, G; Treurniet, J; Dec 1, 2006; 35 pp.; In English; Original contains color illustrations
Report No.(s): AD-A477079; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477079

No abstract available
Computer Networks; Display Devices

20080019751 Taylor (Martin) Consulting, Toronto, Ontario Canada
A Framework for Network Visualisation: Progress Report
Taylor, M M; Dec 1, 2006; 61 pp.; In English; Original contains color illustrations
Report No.(s): AD-A477085; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477085
No abstract available
Computer Networks; Display Devices; Inspection; Visual Observation

20080019752 Mitre Corp., Bedford, MA USA
Scalable HAIPE Discovery
Nakamoto, Glen; Dec 1, 2006; 30 pp.; In English; Original contains color illustrations
Report No.(s): AD-A477086; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477086
No abstract available
Coding; Communication Networks; Communication Satellites; Cryptography; Internets; Protocol (Computers); Quality Control; Telecommunication

20080019754 Malardalen Univ., Vasteras, Sweden
Real-Time Extraction of Course Track Networks in Confined Waters as Decision Support for Vessel Navigation in 3-D Nautical Chart
Porathe, Thomas; Dec 1, 2006; 30 pp.; In English; Original contains color illustrations
Report No.(s): AD-A477090; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477090
No abstract available
Confinement; Display Devices; Extraction; Human Factors Engineering; Nautical Charts; Navigation; Navigation Satellites; Real Time Operation

20080019759 Defence Research and Development Canada, Ottawa, Ontario Canada
Network Vulnerability and Risk Assessment
Alward, Randy G; Carley, Kathleen M; Madsen, Fredrik; Taylor, Vincent K; Vandenberghe, Grant; Dec 1, 2006; 7 pp.; In English
Report No.(s): AD-A477100; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477100
No abstract available
Computer Networks; Risk; Risk Assessment; Vulnerability

20080019799 Federal Aviation Administration, Oklahoma City, OK USA
The Impact of Training on General Aviation Pilots' Ability to Make Strategic Weather-Related Decisions
Ball, Jerry; Feb 2008; 22 pp.; In English
Report No.(s): AD-A477162; DOT-FAA-AM-08-3; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477162
Inadvertent flight into hazardous weather can have devastating results for general aviation pilots (NTSB, 2005; Goh and Wiegmann, 2001). In fact, weather is the leading cause of fatalities in general aviation. The purpose of this study was to determine if a graphical weather display combined with an instructional training paradigm could improve pilots' ability to maintain a safe flying distance from convective thunderstorm activity. Previous research suggested that giving pilots the ability to see accurately the weather they are flying in and around may tempt some pilots to try to fly through small breaks in the convective activity. Indeed, Beringer and Ball (2004) found that pilots using graphical weather could be classified into two types of users (tactical vs. strategic). Tactical users were those pilots who used the information to try and navigate through or very close to the hazardous weather. Strategic users were those pilots who used the graphical information to plan and maintain a safe distance (20 nautical miles or greater) from the storm. An instructional slide presentation based on the Aeronautical Information Manual (AIM, 7-1-27) guidelines was developed with the intent of modifying the behavior of users classified as 'tactical.' Fifty-seven general aviation pilots were evaluated on a low-visibility visual flight rules (VFR) scenario where they encountered an encroaching thunderstorm traversing their flight plan. The pilots were separated into two groups,

tactical or strategic users, according to how they responded to a simulated scenario of a VFR flight using a graphical weather display. Half of the pilots in each group then received training to see if it would decrease the incidence of tactical usage. Additionally, a control group was evaluated that flew the multifunction display without the graphical weather information.
DTIC
Decision Making; Education; General Aviation Aircraft; Navigation; Pilots; Weather

20080019971 Humansystems, Inc., Guelph, Ontario Canada
Evaluation of Symbol Sets for Naval Tactical Displays
McFadden, Sharon M; Jeon, Jennifer; Li, Annie; Minniti, Annalisa; Jan 2008; 80 pp.; In English; Original contains color illustrations
Report No.(s): AD-A477198; DRDC-TORONTO-TR-2007-046; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The four experiments reported in this paper were conducted in support of the COMmand Decision Aiding Technology (COMDAT) (11bg) Technology Demonstrator Project (TDP) and the Halifax Class Modernization Command and Control System (HMCCS) programme. The first experiment assessed the relative visibility of the basic Naval Tactical Data System (NTDS) and MIL-STD-2525B (2525B) tactical symbols. Performance with the colour-coded versions of the two symbol sets was not significantly different. However, the air and subsurface symbols were less discriminable than the surface symbols. Recommendations for improving the discrimination of the different warfare area symbols are included. One potential advantage of the 2525B symbols is the possibility of adding additional information about the track platform to the basic symbol shape. The remaining experiments assessed the visibility of the basic symbols with iconic information added and the visibility of the icons themselves. Adding iconic information did not have a large effect on the efficiency with which the basic symbols were located except when the icon shape replaced the symbol shape. Performance in locating and recognizing individual icons depended on their complexity and their uniqueness. It was recommended that only a small number of highly discriminable icons be used at any one time. The use of icons without the symbol frame should be restricted to non tactical information and such icons should probably not be colour coded. Further research is required to determine how to implement these recommendations.
DTIC
Display Devices; Military Operations; Symbols; Tactics

20080019973 Air Univ., Maxwell AFB, AL USA
Software as an Exploitable Source of Intelligence
Jan 2004; 3 pp.; In English
Report No.(s): AD-A477205; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Software, even without being installed or used, can reveal information that we do not wish to be disclosed. Our security practices tend to separate data from software. We think of data as content, meaning, something of operational value that can be exploited by an adversary. We tend to think of a computer program as something that performs tasks and manipulates data, not as something that has inherent informational value. But, we can't escape the simple fact that software exists; it is a collection of computer instructions and supporting data. As such, it is a thing, something that has the potential to be broken into, taken apart, scrutinized, cannibalized for parts, or otherwise used for purposes not originally intended. Software vulnerability attacks (SVA) start with software in the same form as it would be given to a legitimate user, then subject it to a number of static and dynamic tests with the intent to yield a description of how the software might be open to unintended use. SVAs are different from the traditional notion of network hacking, where a computer is being broken into over a communication network. SVAs are more subtle in that the attacker has physical possession of the software and is examining it for vulnerabilities in circumstances that are unobserved, and potentially unobservable. SVAs draw from the work of software security, reverse engineering, design reclamation, and software testing to answer the question, 'what does the product reveal about itself?' In general, SVAs seek information leading to three forms of software exploitation: intrusion penetration, component penetration, and intellectual property penetration.
DTIC
Computer Information Security; Computer Programming; Exploitation; Intelligence; Software Engineering

20080019977 Naval Postgraduate School, Monterey, CA USA
QoS-Enabled Integration of Wireless Sensor Networks with the Internet
AlMaharmeh, Bassam; Sep 2005; 115 pp.; In English; Original contains color illustrations
Report No.(s): AD-A477214; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Recent developments in sensor networking for both military and civilian applications emphasized the need for a reliable

integration of sensor networks with the Internet. For sensor networks deployed in various military applications, it is important that collected information be delivered as fast as possible with minimum delays. Information collected by sensor networks has different priority levels and hence QoS profiles must be provided in accordance with those priorities. In this study, an integration module is proposed. The objective of the module is to provide preferential services for high-priority traffic. The integration process consists of three phases: registration, control, and monitor. The three phases will be conducted by three software components: the registration service manager (RSM), the QoS control manager (QCM), and the network monitor manager (NMM). The three software components run on a stand-alone laptop and together form the integration controller (IC), which is the core of the integration module
DTIC
Computer Programs; Internets; Military Technology; Radiotelephones

20080020028 Navy Personnel Research Studies and Technology, Millington, TN USA
A Study of Alternatives for Projected Rotation Dates Used in Navy Enlisted Personnel Distribution
Myers, Rodney S; Sep 2007; 49 pp.; In English; Original contains color illustrations
Report No.(s): AD-A477323; NPRST-TN-07-14; No Copyright; Avail.: Defense Technical Information Center (DTIC)
Personnel assignments in the Navy frequently result in Sailors being detached from their command before their replacement actually arrives. This practice is referred to as billet 'gapping.' Conversely, some assignments result in personnel arriving in advance of the detachment of the individual they are replacing, which is referred to as billet 'overlapping.' In the case of gapping, the command is expected to accomplish its appointed mission with less than the prescribed personnel. In overlapping, the Navy is essentially paying two Sailors to perform one job. In the former case, the Navy experiences an effectiveness loss; in the latter case the Navy faces an efficiency degradation. Additionally, unplanned losses occur which increase the number of gapped billets. When an unplanned loss occurs in a critical billet, skill area, or rating, commands experiencing the loss are severely challenged to accomplish their mission, particularly warfighting functions. The problem under analysis is characterized as available Sailor inventory versus billet requirements during the period of time known as the assignment window. The current policy for the assignment window is the period commencing 9-months prior to a Sailor's planned rotation date (PRD). During this 9-month period, detailers evaluate a Sailor for follow-on job assignments. However, the job a Sailor ultimately receives is subject to the demand for his or her skills, when a Sailor is available for reassignment, and the available jobs. The 9-month assignment window allows the detailer, Sailor, and commands time to negotiate the Sailor's ensuing assignment. This report describes the development of a computer simulation called the Rotation Window Analysis Model. The model was developed to analyze the impact of an assignment window on the enlisted detailing process. Through the development of the simulation model, analysis of the probable impact of adjusting Sailor PRDs was evaluated.
DTIC
Alternatives; Computerized Simulation; Military Personnel; Navy; Personnel; Rotation

20080020216 Defence Research Analysis Establishment, Ottawa, Ontario, Canada
Effectiveness of JSAF as an Open Architecture, Open Source Synthetic Environment in Defense Experimentation
Hassaine, Fawzi; Abdellaoui, Nacer; Yavas, Altan; Hubbard, Paul; Vallerand, Anderw L; Oct 2006; 34 pp.; In English; Original contains color illustrations
Report No.(s): AD-A476570; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476570
No abstract available
Computerized Simulation; Military Operations

20080020437 Physical Sciences, Inc., Andover, MA USA
Reconfigurable environmentally adaptive computing
Coxe, Robin L., Inventor; Galica, Gary E., Inventor; March 11, 2008; 16 pp.; In English
Patent Info.: Filed November 30, 2004; US-Patent-7,343,579; US-Patent-Appl-SN-10/999,463; No Copyright; Avail.:
CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080020437
Described are methods and apparatus, including computer program products, for reconfigurable environmentally adaptive computing technology. An environmental signal representative of an external environmental condition is received. A processing configuration is automatically selected, based on the environmental signal, from a plurality of processing configurations. A reconfigurable processing element is reconfigured to operate according to the selected processing

configuration. In some examples, the environmental condition is detected and the environmental signal is generated based on the detected condition.
Official Gazette of the U.S. Patent and Trademark Office
Computation; Computer Programs; Computers; Computer Systems Programs

20080020468 Institute of Space Medico-Engineering, Beijing, China
A Study of Computer Detecting Methods for Animal Swimming Experiment
ZHANG, Yu; CHEN, Shang-guang; LI, Da-chen; Space Medicine and Medical Engineering, Volume 20, No. 6; December 2007, pp. 436-440; In Chinese; See also 20080020461; Copyright; Avail.: Other Sources

Proposed to study a a computer-based testing system for an animal swimming test with mice by integrating the knowledge of computer science and image processing with that of traditional Chinese medicine. The moving objects of the swimming mice were extracted by computer and the gained information was analyzed. The computer controlled animal swimming testing system was developed and a new index-evaluation method which is more sensitive to mice swimming resistance were established. The computer detecting method yielded higher automation and more samples to be detected, obtained more detecting indices and more comprehensive and accurate data providing a new effective measure for the animal swimming experiment in the pharmacological research of Chinese medicinal herbs.
Author
Computer Techniques; Detection; Image Processing; Pharmacology; Research; Animals; Swimming

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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.

20080018949 University of Southern California, Los Angeles, CA USA
Abstract Machines for Polymorphous Computing
Crago, Stephen; Dec 2007; 57 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8750-01-C-0171; DARPA ORDER-L171; Proj-AMPC
Report No.(s): AD-A476899; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476899

The Abstract Machines for Polymorphous Computing (AMP) project made important contributions to the understanding of the programming of polymorphous computing architectures. Polymorphous architectures are a promising technology for exploiting explicit on-chip parallelism, which the microprocessor industry has recognized is necessary for the survival of the industry. The AMP project developed software tools to explore programming methodologies for polymorphous architectures, including Morphware. The AMP project mapped application to polymorphous architectures and demonstrated significant, scalable speedups. Finally, the AMP project developed prototype hardware that enabled the development of realistic and complex applications for polymorphous architectures.
DTIC
Computers; Polymorphism

20080019968 Naval Surface Warfare Center, Dahlgren, VA USA
The Computing Systems and Networks Division
Aug 1991; 19 pp.; In English
Report No.(s): AD-A477123; NAVSWC-MP-91-196; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This brochure describes the mission and workings of the Computing Systems and Networks Division of the Naval Surface Warfare Center (NAVSWC) in Dahlgren, Virginia. The Division works towards the following objectives: (1) to provide and maintain Center-wide networking and high performance computer access to all Center employees, (2) to perform research and development in networking technology, and (3) to evaluate computer technology and implement new computational tools and capabilities. The Division consists of three Branches: Networks, Scientific Computing Systems, and Engineering and Analysis. Although each Branch is responsible for individually distinct products and services that will be highlighted in this brochure, these groups work together as an interdisciplinary team to effectively accomplish the objectives of the Division's challenging job assignments. The Division's computing and networking facilities and resources service the entire Center with high performance computational capability and provide network connectivity to the majority of the Center's population. These

networks provide connectivity not only to the Computing Systems and Networks Division's central computer facility but also to other project specific systems at the Center. The Division also provides worldwide connectivity through the Defense Data Network (DDN) MILNET. Division personnel operate all levels of computer processing from unclassified to top secret, and they operate networks classified to the secret level.
DTIC
Communication Networks; Computer Networks; Computers; Telecommunication

20080020005 Program Executive Office for C4I and Space, San Diego, CA USA
Forensic Capabilities For Service-Oriented Architectures
Michael, J B; Shing, M; Wijesekera, D; Feb 25, 2008; 23 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N66001-07-WR-00222
Report No.(s): AD-A477280; NPS-CS-08-004; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report describes a framework to provide on-line forensic capabilities to service oriented architecture via Forensic Web Services (FWS) and runtime execution monitoring. The FWS is a new type of web services to be used by other web services (of an independent agency) to securely maintain transactional records of interest between other web services. The framework uses runtime execution monitoring to search the transactional log for interesting (or suspicious) service invocation sequences to recreate non-repudiable evidence of transactional history for use in a court of law.
DTIC
Service Oriented Architecture

20080020045 Baker (Wilfred) Engineering, Inc., San Antonio, TX USA
Self-Adaptive Systems for Information Survivability: PMOP and AWDRAT
Shrobe, Howard; Laddaga, Robert; Balzer, Robert; Goldman, Neil; Wile, Dave; Tallis, Marcelo; Hollebeek, Tim; Egyed, Alexander; Apr 10, 2007; 13 pp.; In English
Contract(s)/Grant(s): FA8750-04-2-0240; FA8750-04-C-0252
Report No.(s): AD-A477352; MIT-CSAIL-TR-2007-023; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Information systems form the backbones of the critical infrastructures of modern societies. Unfortunately, these systems are highly vulnerable to attacks that can result in enormous damage. Furthermore, traditional approaches to information security have not provided all the protections necessary to defeat and recover from a concerted attack; in particular, they are largely irrelevant to the problem of defending against attacks launched by insiders. This paper describes two related systems -- PMOP and AWDRAT -- that were developed during the DARPA Self-Regenerative Systems program. PMOP defends against insider attacks while AWDRAT is intended to detect compromises to software systems. Both rely on self-monitoring, diagnosis and self-adaptation. We describe both systems and show the results of experiments with each.
DTIC
Adaptation; Information Systems

20080020085 Memphis Univ., Memphis, TN USA
Center for Advanced Sensors Year Two Funding (FY2006)
Halford, Carl; Feb 26, 2008; 154 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W911NF-05-2-0019
Report No.(s): AD-A477479; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Center for Advanced Sensors presents the research results for the second year of effort. Research is reported on networked sensors, modeling performance for sensors with image fusion, THz imager modeling, ISR sensor performance requirements and mammalian vision. The Annual Program Plan goals and objectives were met. Milestones included: (1) building an ontology-based sensor network prototype environment, (2) modeling sensor fusion through image quality metrics, (3) incorporating image processing enhancements in ISR sensor models, (4) characterizing LCD monitors, (5) established the spatial and temporal resolution requirements for tracking targets with ISR sensors (6) characterized different techniques for infrared signature reduction, and (7) researched natural visual sensory representations for neural assemblies.
DTIC
Detectors; Image Processing; Prototypes

20080020511 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Collaborative, Trust-Based Security Mechanisms for a National Utility Intranet
Coates, Gregory M; Sep 2007; 262 pp.; In English
Report No.(s): AD-A476942; AFIT/GIA/ENG/07-05; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476942

This thesis investigates security mechanisms for utility control and protection networks using IP-based protocol interaction. It proposes flexible, cost-effective solutions in strategic locations to protect transitioning legacy and full IP-standards architectures. It also demonstrates how operational signatures can be defined to enact organizationally-unique standard operating procedures for zero failure in environments with varying levels of uncertainty and trust. The research evaluates layering encryption, authentication, traffic filtering, content checks, and event correlation mechanisms over time-critical primary and backup control/protection signaling to prevent disruption by internal and external malicious activity or errors. Finally, it shows how a regional/national implementation can protect private communities of interest and foster a mix of both centralized and distributed emergency prediction, mitigation, detection, and response with secure, automatic peer-to-peer notifications that share situational awareness across control, transmission, and reliability boundaries and prevent wide-spread, catastrophic power outages.
DTIC
Computer Networks; Data Transmission; Security; Utilities

63
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*.

20080018969 Vanderbilt Univ., Nashville, TN USA
Architecture for Multiple Interacting Robot Intelligences
Peters, Richard Alan, II, Inventor; February 5, 2008; 12 pp.; In English
Contract(s)/Grant(s): NCC9-30199
Patent Info.: Filed December 31, 2003; US-Patent-7,328,196; US-Patent-Appl-SN-10/749,326; No Copyright; Avail.:
CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080018969

An architecture for robot intelligence enables a robot to learn new behaviors and create new behavior sequences autonomously and interact with a dynamically changing environment. Sensory information is mapped onto a Sensory Ego-Sphere (SES) that rapidly identifies important changes in the environment and functions much like short term memory. Behaviors are stored in a database associative memory (DBAM) that creates an active map from the robot's current state to a goal state and functions much like long term memory. A dream state converts recent activities stored in the SES and creates or modifies behaviors in the DBAM.
Official Gazette of the U.S. Patent and Trademark Office
Artificial Intelligence; Machine Learning; Robots

20080020044 Baker (Wilfred) Engineering, Inc., San Antonio, TX USA
Learning Complex Cell Invariance from Natural Videos: A Plausibility Proof
Masquelier, Timothee; Serre, Thomas; Thorpe, Simon; Poggio, Tomaso; Dec 26, 2007; 22 pp.; In English
Contract(s)/Grant(s): FA8650-06-C-7632
Report No.(s): AD-A477351; MIT-CSAIL-TR-2007-060; CBCL-269; No Copyright; Avail.: Defense Technical Information Center (DTIC)

One of the most striking features of the cortex is its ability to wire itself. Understanding how the visual cortex wires up through development and how visual experience refines connections into adulthood is a key question for Neuroscience. While computational models of the visual cortex are becoming increasingly detailed, the question of how such architecture could self-organize through visual experience is often overlooked. Here we focus on the class of hierarchical feed-forward models of the ventral stream of the visual cortex, which extend the classical simple-to-complex cells model by Hubel and Wiesel to extra-striate areas, and have been shown to account for a host of experimental data. Such models assume two functional classes of simple and complex cells with specific predictions about their respective wiring and resulting functionalities. In these networks, the issue of learning, especially for complex cells, is perhaps the least well understood. In fact, in most of these

models, the connectivity between simple and complex cells is not learned but rather hard-wired. Several algorithms have been proposed for learning invariances at the complex cell level based on a trace rule to exploit the temporal continuity of sequences of natural images.
DTIC
Cerebral Cortex; Intelligence; Invariance; Learning; Proving; Visual Perception; Visual Stimuli

20080020301 McDermott Will and Emery, LLC, Los Angeles, CA, USA; University of Southern California, Los Angeles, CA USA
Automated Plumbing, Wiring, and Reinforcement
Khoshnevis, B., Inventor; 21 Jan 05; 48 pp.; In English
Contract(s)/Grant(s): NSF-9634962; NSF-9522982
Patent Info.: Filed Filed 21 Jan 05; US-Patent-Appl-SN-11-040 602
Report No.(s): PB2007-112185; No Copyright; Avail.: CASI: A03, Hardcopy

An apparatus may include a nozzle assembly configured to extrude material through an outlet; and a controllable robotic arm coupled to the nozzle assembly, the robotic arm having at one end a gripper configured to pick up an element and deposit the element at a desired position relative to the extruded material. The element may be one of: a reinforcement member for a structure being constructed; a segment of a plumbing pipe; an electric network component; and a tile.
NTIS
Fluid Flow; Patent Applications; Pipelines; Reinforcement (Structures); Wiring

20080020523 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Forensics Image Background Matching Using Scale Invariant Feature Transform (SIFT) And Speeded Up Robust Features (SURF)
Fogg, II, Paul N; Dec 20, 2007; 60 pp.; In English
Report No.(s): AD-A476943; AFIT/GCE/ENG/08-02; No Copyright; Avail.: Defense Technical Information Center (DTIC) ONLINE: http://hdl.handle.net/100.2/ADA476943

In criminal investigations, it is not uncommon for investigators to obtain a photograph or image that shows a crime being committed. Additionally, thousands of pictures may exist of a location, taken from the same or varying viewpoints. Some of these images may even include a criminal suspect or witness. One mechanism to identify criminals and witnesses is to group the images found on computers, cell phones, cameras, and other electronic devices into sets representing the same location. One or more images in the group may then prove the suspect was at the crime scene before, during,and/or after a crime. This research extends three image feature generation techniques, the Scale Invariant Feature Transform (SIFT), the Speeded Up Robust Features (SURF), and the Shi-Tomasi algorithm, to group images based on location. The image matching identifies keypoints in images with changes in the contents, viewpoint, and individuals present at each location. After calculating keypoints for each image, the algorithm stores the strongest features for each image are stored to minimize the space and matching requirements.
DTIC
Image Processing; Pattern Registration

64
NUMERICAL ANALYSIS

Includes iteration, differential and difference equations, and numerical approximation.

20080019756 Naval Undersea Warfare Center, Newport, RI USA
An E-M Algorithm for Joint Model Estimation
Baggenstoss, Paul M; Luginbuhl, T E; Jan 1999; 5 pp.; In English
Report No.(s): AD-A477093; No Copyright; Avail.: Defense Technical Information Center (DTIC) ONLINE: http://hdl.handle.net/100.2/ADA477093

In the unlabeled data problem, data contains signals from various sources whose identities are not known apriori, yet the parameters of the individual sources must be estimated. To do this optimally, it is necessary to optimize the data PDF, which may be modeled as a mixture density, jointly over the parameters of all the signal models. This can present a problem of enormous complexity if the number of signal classes is large. This paper describes a algorithm for jointly estimating the parameters of the various signal types, each with different parameterizations and associated sufficient statistics. In doing so,

it maximizes the likelihood function of all the parameters jointly, but does so without incurring the full dimensionatity ol the problem. It allows lower-dimensional sufficient statistics to be utilized for each signal model, yet still achieves joint optimality. It uses an extension of the class-specific decomposition of the Bayes minimum error probability classifier.
DTIC
Algorithms; Probability Density Functions

20080019783 Colorado State Univ., Fort Collins, CO USA
Geometric, Algebraic and Topological Structure for Signal and Image Processing
Kirby, Michael; Dec 19, 2007; 7 pp.; In English
Contract(s)/Grant(s): FA9550-04-1-0094
Report No.(s): AD-A477141; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477141

Military information collected from streaming video of real-time unmanned aerial reconnaissance, battlefield operations or from multi-spectral satellite imagery, for example, requires intelligent processing by analysts to reduce response time and increase accuracy of interpretation. This research concerns the understanding of, i.e., modeling and classifying of, information in data. Of primary focus has been development of new algorithms for processing large data sets. In particular the proposed techniques emphasize exploiting all available data rather than reducing the data before processing. We have made fundamental progress in the classification problem via encoding sets of images as points on parameter spaces as well as in the model fitting problem using radial basis functions that represent geometry in data.
DTIC
Algebra; Algorithms; Image Processing; Military Technology; Satellite Imagery; Signal Processing; Topology

20080019812 Vero Modo, Inc., Brookline, MA USA
Tempo: A Toolkit for the Timed Input/Output Automata Formalism
Lynch, Nancy A; Shvartsman, Alexander A; Jan 30, 2008; 9 pp.; In English
Contract(s)/Grant(s): FA9550-05-C-0178
Report No.(s): AD-A477189; VM-07-FINAL-REPORT; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477189

Report developed under STTR contract for topic AFO4-T023. This Phase II project developed an integrated development environment, called Tempo, for specifying, analyzing, and verifying complex distributed system designs. This includes a modeling language, a graphical user interface, and computational support tools. This modeling and analysis framework provides an integrated suite of tools and methods. In more detail, this project developed: (a) a formal modeling language, called Tempo, based on the TIOA (Timed Input/Output Automata) formalism, for specifying timed, asynchronous, and interacting systems components, (b) the language processor for Tempo, incorporating syntax and type checking, and providing interfaces to computer-aided design tools, (c) a simulation tool allowing simulation of specifications and paired simulations of a specification and an abstract implementation, (d) an interface to model-checking tool UPAALL, and (e) theorem-proving link through an interface to PVS.
DTIC
Algorithms; Automata Theory; Communication Networks; Computerized Simulation; Formalism; Graphical User Interface; Programming Languages

20080019978 Naval Undersea Warfare Center, Newport, RI USA
Joint Distributions for Two Useful Classes of Statistics, With Applications to Classification and Hypothesis Testing
Nuttall, Albert H; Baggenstoss, Paul M; Jan 10, 2002; 14 pp.; In English
Report No.(s): AD-A477219; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this paper, we analyze the statistics of two general classes of statistics. The first class is ‘M quadratic and linear forms of correlated Gaussian random variables’. Examples include both cyclic and non-cyclic autocorrelation function (ACF) estimates of a correlated Gaussian process or the magnitude-squared of the output samples of a filtered Gaussian process. The second class consists of a subset of order statistics together with a remainder term. An example is the largest M - 1 bins of a discrete Fourier transform (DFT) or discrete wavelet transform (DWT), together with the sum of the remaining energies, forming an M-dimensional statistic. Both classes of statistics are useful in classification and detection of signals. In this paper,

we solve for the joint probability density functions (PDFs) of both classes. Using the PDF projection method, these results can be used to transform the feature PDFs into the corresponding high-dimensional PDFs of the raw input data.
DTIC
Classifications; Hypotheses; Probability Density Functions; Random Variables; Signal Processing

20080020017 North Carolina State Univ., Raleigh, NC USA
An Inverse Problem Statistical Methodology Summary
Banks, H T; Davidian, M; Samuels, Jr , J R; Sutton, Karyn L; Jan 12, 2008; 57 pp.; In English
Contract(s)/Grant(s): FA9550-04-1-0220; NSF-DMS-0112069
Report No.(s): AD-A477302; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper discusses statistical and computational aspects of inverse or parameter estimation problems based on Ordinary Least Squares (OLS) and Generalized Least Squares (GLS) with appropriate corresponding data noise assumptions of constant variance and nonconstant variance (relative error), respectively. Among the topics addressed are mathematical model, statistical model and data assumptions, and some techniques (residual plots, sensitivity analysis, model comparison tests) for verifying these. The ideas are illustrated throughout with the popular logistic growth model of Verhulst and Pearl as well as with a recently developed population-level model of pneumococcal disease spread.
DTIC
Least Squares Method; Mathematical Models; Parameter Identification

20080020120 Iowa Univ., Iowa City, IA USA
Froude Number and Scale Effects and Froude Number 0.35 Wave Elevations and Mean-Velocity Measurements for Bow and Shoulder Wave Breaking of Surface Combatant DTMB 5415
Olivieri, A; Pistani, F; Wilson, R; Benedetti, L; La Gala, F; Campana, E F; Ster, F; Dec 2004; 62 pp.; In English
Contract(s)/Grant(s): N00014-00-1-0344; N00014-01-1-0073
Report No.(s): AD-A477559; IIHR-441; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This study is a good demonstration on how complementary EFD and CFD can provide a powerful and advanced tool in analyzing complex industrial flows. Results are presented from a cooperative study between INSEAN and IIHR about wave and flow field measurement about a surface combatant with focus on the 3D ship wave breaking. At Fr-0.35, free-surface near and far fields have been measured, as well as the velocity in some transversal planes under the bow and shoulder wave. CFD computations have also been used to complete and extend EFD data and to understand some particular features of the flow, such as location of vortices near the free-surface and scars.
DTIC
Bow Waves; Elevation; Flow Distribution; Froude Number; Pulse Rate; Scale Effect; Scalers; Shoulders; Velocity Measurement

20080020218
Experimental Validation of a Time-Accurate Finite Element Model for Coupled Multibody Dynamics and Liquid Sloshing
Wasfy, Tamer M; O'Kins, James; Smith, Scott; Apr 16, 2007; 17 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W56HZV-05-C-0631
Report No.(s): AD-A476577; 2007-01-17039; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476577

A study for validating a time-accurate explicit finite element code for modeling fully-coupled flexible multibody systems carrying liquid-filled tanks is presented. The multibody system includes rigid bodies, flexible bodies, joints, and actuators. Rigid bodies rotational equations of motion are written in a body-fixed frame with the total rigid body rotation matrix updated each time step using incremental rotations. Flexible bodies are modeled using total-Lagrangian spring, truss, beam and hexahedral solid elements. A penalty model is used to impose the joint/contact constraints. An asperity based friction model is used to model joint/contact friction. The fluid governing equations of motion are the incompressible Arbitrary Lagrangian-Eulerian Navier- Stokes equations along with a large-eddy simulation (LES) turbulence model. The fluid's free-surface is modeled using an acceptor-donor volume-of-fluid based algorithm. Coupling between the fluid and solid is achieved by solving Newton's equations of motions at the fluid-solid interface nodes. The validation study is conducted using a multibody system consisting of a rigid baffled tank mounted on suspension springs. The springs are connected to a rigid frame mounted on two linear hydraulic-actuators. Experiments with various input ramp and harmonic excitation from the

actuators are performed and the results of the experiments are compared to the results obtained using the model. The system response is measured using linear-displacement transducers at the springs and two cameras showing side and front views of the tank. The results show that the model can predict with reasonably good accuracy the test system's dynamic response.
DTIC
Accuracy; Finite Element Method; Liquid Sloshing; Mathematical Models; Models

65
STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; time series analysis; and stochastic processes.

20080019750 Naval Undersea Warfare Center, Newport, RI USA
Heuristic Classifier Performance Bounds in High Dimensional Settings
Baggenstoss, Paul M; Mar 12, 2002; 10 pp.; In English
Report No.(s): AD-A477084; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477084

This paper is concerned with probability density estimation in high-dimensional settings. Simplified geometric arguments and supporting examples point to a performance bound which limits algorithm performance to that of either (1) nearest-neighbor or (2) single-kernel PDF estimators. A method of monitoring PDF estimation performance as well as recommendations for neural net and classification algorithm practitioners is provided.
DTIC
Classifiers; Heuristic Methods; Probability Density Functions

20080019764 Air War Coll., Maxwell AFB, AL USA
'Asymmetric Fast Transients' Applied to Reduce DOD Acquisition Cycle Time
Schaff, Jeffrey L; Apr 2005; 60 pp.; In English
Report No.(s): AD-A477106; CADRE/PC-2005-012; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477106

The need to implement a truly agile military acquisition process is at hand. To this end, an innovative tool the Department of Defense (DoD) should consider to reduce risk and shorten acquisition cycle time is the Performance and Reliability Evaluation with Diverse Information Combination and Tracking (PREDICT) methodology. How can PREDICT make the acquisition process more agile when numerous acquisition reform efforts of significant scope have tried and failed? PREDICT's unique feature is the use of formal elicitation of expert knowledge to calculate concept reliability prior to testing. Statistical analysis of the expert knowledge yields a calculation of reliability and uncertainty of the technology or concept. PREDICT is supporting the Los Alamos National Laboratory (LANL) mission of maintaining and certifying the safety and reliability of nuclear weapons without system testing. For DoD, this could provide an alternative methodology for determining technology readiness levels and risk before launching an acquisition effort. This research will explain the PREDICT process, and show how its application to the DoD acquisition process could provide the following benefits: (1) Shorten the Technology Planning Integrated Process Team (TPIPT) and Modernization Planning processes; (2) Enable the assessment of reliability for new concepts at Milestone A and for legacy systems undergoing change, thus eliminating unproductive paths earlier in the process; (3) Optimize test planning and execution by showing testing impact to reliability; and (4) Enable transfer of knowledge as experienced personnel transition out of programs. A classified Los Alamos report will document the results of the PREDICT reliability calculation for the B61-7 and B61-11 modifications to the Life Extension Program. Because of 'need to know,' access to the classified report will be determined on a case-by-case basis after the initial reliability estimate is completed in the fall of 2005.
DTIC
Estimates; Knowledge Based Systems; Procurement; Reliability; Risk; Technology Assessment

20080019976 Rhode Island Univ., Kingston, RI USA
Multidimensional Probability Density Function Approximations for Detection, Classification, and Model Order Selection
Kay, Steven M; Nuttall, Albert H; Baggenstoss, Paul M; Oct 2001; 14 pp.; In English
Report No.(s): AD-A477213; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper addresses the problem of calculating the multidimensional probability density functions (PDFs) of statistics

derived from known many-to-one transformations of independent random variables (RVs) with known distributions. The statistics covered in the paper include reflection coefficients, autocorrelation estimates, cepstral coefficients, and general linear functions of independent RVs. Through PDF transformation, these results can be used for general PDF approximation, detection, classification, and model order selection. A model order selection example that shows significantly better performance than the Akaike and MDL method is included.
DTIC
Classifications; Detection; Probability Density Functions; Probability Theory; Random Variables; Signal Processing

20080019983 Naval Undersea Warfare Center, Newport, RI USA
The Chain-Rule Processor: Optimal Classification Through Signal Processing
Baggenstoss, Paul M; Aug 2002; 6 pp.; In English
Report No.(s): AD-A477235; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The chain-rule processor is a method of constructing an optimal Bayes classifier from a bank of processors. Each processor is a feature extractor designed to separate the given class from a class-dependent reference hypothesis, thereby avoiding the curse of dimensionality. This work builds upon prior work in optimal classifier design using class-specific features. The chain-rule processor is an improvement that recursively applies the PDF projection theorem.
DTIC
Classifications; Pattern Recognition; Probability Density Functions; Signal Processing

20080019985 Naval Undersea Warfare Center, Newport, RI USA
The PDF Projection Theorem and the Class-Specific Method
Baggenstoss, Paul M; Mar 2003; 15 pp.; In English
Report No.(s): AD-A477237; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this paper, we present the theoretical foundation for optimal classification using class-specific features and provide examples of its use. A new probability density function (PDF) projection theorem makes it possible to project probability density functions from a low-dimensional feature space back to the raw data space. An M-ary classifier is constructed by estimating the PDFs of class-specific features, then transforming each PDF back to the raw data space where they can be fairly compared. Although statistical sufficiency is not a requirement, the classifier thus constructed will become equivalent to the optimal Bayes classifier if the features meet sufficiency requirements individually for each class. This classifier is completely modular and avoids the dimensionality curse associated with large complex problems. By recursive application of the projection theorem, it is possible to analyze complex signal processing chains. We apply the method to feature sets including linear functions of independent random variables, cepstrum, and MEL cepstrum. In addition, we demonstrate how it is possible to automate the feature and model selection process by direct comparison of log-likelihood values on the common raw data domain.
DTIC
Classifications; Probability Density Functions; Theorems

20080020039 North Carolina State Univ., Raleigh, NC USA
Comparison of Probabilistic and Stochastic Formulations in Modeling Growth Uncertainty and Variability
Banks, H T; Davis, J L; Ernstberger, S L; Hu, Shuhua; Artimovich, E; Dhar, A K; Browdy, C L; Feb 20, 2008; 23 pp.; In English
Contract(s)/Grant(s): 9R01AI071915-05; AFOSR-FA9550-04-1-0220
Report No.(s): AD-A477339; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We compare two approaches for inclusion of uncertainty/ variability in modeling growth in size-structured population models. One entails imposing a probabilistic structure on growth rates in the population while the other involves formulating growth as a stochastic Markov diffusion process. We present a theoretical analysis that allows one to include comparable levels of uncertainty in the two distinct formulations in making comparisons of the two approaches.
DTIC
Probability Theory; Stochastic Processes; Variability

20080020047 Baker (Wilfred) Engineering, Inc., San Antonio, TX USA

Towards Feature Selection in Actor-Critic Algorithms

Rohanimanesh, Khashayar; Roy, Nicholas; Tedrake, Russ; Nov 1, 2007; 12 pp.; In English

Contract(s)/Grant(s): FA8650-05-C-7262

Report No.(s): AD-A477361; MIT-CSAIL-TR-2007-051; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Choosing features for the critic in actor-critic algorithms with function approximation is known to be a challenge. Too few critic features can lead to degeneracy of the actor gradient, and too many features may lead to slower convergence of the learner. In this paper, the authors show that a well-studied class of actor policies satisfy the known requirements for convergence when the actor features are selected carefully. They demonstrate that two popular representations for value methods -- the barycentric interpolators and the graph Laplacian proto-value functions -- can be used to represent the actor so as to satisfy these conditions. A consequence of this work is a generalization of the proto-value function methods to the continuous action actor-critic domain. Finally, they analyze the performance of this approach using a simulation of a torque-limited inverted pendulum.

DTIC

Algorithms; Approximation; Markov Processes; Neural Nets; Normal Density Functions

20080020048 Naval Undersea Warfare Center, Newport, RI USA

Class-Specific Feature Sets in Classification

Baggenstoss, Paul M; Sep 1998; 5 pp.; In English

Report No.(s): AD-A477363; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The classical Bayesian approach to classification requires knowledge of the probability density function (PDF) of the data or sufficient statistic under all class hypotheses. Because it is difficult or impossible to obtain a single low-dimensional sufficient statistic, it is often necessary to utilize a sub-optimal yet still relatively high-dimensional feature set. The performance of such an approach is severely limited by the ability to estimate the PDF on a high-dimensional space training data. A new theorem shows that by introducing a special 'noise-only' signal class (HO), it is possible to re-formulate the classical approach based upon M sufficient statistics, one corresponding to each signal class. Furthermore, the optimal classifier requires knowledge of only the PDF's of the sufficient statistics under the corresponding signal class and under noise-only condition. We present simulation results of a 9-class synthetic problem showing dramatic improvements over the traditional high-dimensional approach.

DTIC

Classifications; Signal Processing

20080020049 Naval Undersea Warfare Center, Newport, RI USA

The Class-Specific Classifier: Avoiding the Curse of Dimensionality Tutorial

Baggenstoss, Paul M; Aug 15, 2003; 26 pp.; In English; Original contains color illustrations

Report No.(s): AD-A477364; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This article describes a new probabilistic method called the 'class-specific method' (CSM). CSM has the potential to avoid the 'curse of dimensionality' which plagues most classifiers which attempt to determine the decision boundaries in a high-dimensional feature space. In contrast, in CSM, it is possible to build classifiers without a common feature space. Separate low-dimensional features sets may be defined for each class, while the decision functions are projected back to the common raw data space. CSM effectively extends the classical classification theory to handle multiple feature spaces. It is completely general, and requires no simplifying assumption such as Gaussianity or that data lies in linear subspaces.

DTIC

Classifications; Signal Processing

20080020086 Massachusetts Univ., Amherst, MA USA

Combinatorial Markov Random Fields and Their Applications to Information Organization

Bekkerman, Ron; Feb 2008; 166 pp.; In English

Contract(s)/Grant(s): N66001-02-1-8903; HR0011-06-C-0023

Report No.(s): AD-A477480; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We propose a new type of undirected graphical models called a Combinatorial Markov Random Field (Comraf) and discuss its advantages over existing graphical models. We develop an efficient inference methodology for Comrafs based on

combinatorial optimization of information-theoretic objective functions; both global and local optimization schema are discussed. We apply Comrafs to multi-modal clustering tasks: standard (unsupervised) clustering, semi-supervised clustering, interactive clustering, and one-class clustering. For the one-class clustering task, we analytically show that the proposed optimization method is optimal under certain simplifying assumptions. We empirically demonstrate the power of Comraf models by comparing them to other state-of-the-art machine learning techniques, both in text clustering and image clustering domains. For unsupervised clustering, we show that Comrafs consistently and significantly outperform three previous state-of-the-art clustering techniques on six real-world textual datasets. For semi-supervised clustering, we show that the Comraf model is superior to a well-known constrained optimization method. For interactive clustering, Comraf obtains higher accuracy than a Support Vector Machine, trained on a large amount of labeled data. For one-class clustering, Comrafs demonstrate superior performance over two previously proposed methods. We summarize our thesis by giving a comprehensive recipe for machine learning modeling with Comrafs.
DTIC
Combinatorial Analysis; Inference

20080020091 Iowa Univ., Iowa City, IA USA
Statistical Approach for Estimating Intervals of Certification or Biases of Facilities or Measurement Systems Including Uncertainties
Stern, F; Olivieri, A; Shao, J; Longo, J; Ratcliffe, T; Dec 2004; 73 pp.; In English
Report No.(s): AD-A477490; IIHR-TR-442; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A statistical approach for estimating intervals of certification or biases of facilities or measurement systems including uncertainties is set forth based on MxN-order level testing, which is defined as M repetitions of the same N-order level experiment in M different facilities or in the same facility with M different measurement systems. In absence of reference values, mean facility or measurement system used for assessing intervals of certification or biases. Certification or biases of facilities or measurement systems are defined as processes for assessing probabilistic confidence intervals for facilities or measurement systems for specific tests, data reduction equations, conditions, procedures, and uncertainty analysis. Similarly, subgroup analysis performed for isolating and assessing levels of differences due to use of different model sizes (scale effects) or measurement systems. An example provided for towing tank facilities for resistance tests using standard uncertainty analysis procedures based on an international collaboration between three facilities. Although number of facilities minimum, the results demonstrate usefulness of approach and support recommendation of future collaborations between more facilities. Knowledge of intervals of certification or biases is important for design, accrediting facilities or measurement systems, and CFD validation.
DTIC
Bias; Certification; Estimating; Measurement; Statistical Analysis

20080020100 Massachusetts Univ., Amherst, MA USA
Efficient Training Methods for Conditional Random Fields
Sutton, Charles A; Feb 2008; 220 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): HR0011-06-C-0023
Report No.(s): AD-A477513; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Many applications require predicting not a just a single variable, but multiple variables that depend on each other. Recent attention has therefore focused on structured prediction methods. Especially popular have been conditional random fields (CRFs), which are graphical models of the conditional distribution over outputs given a set of observed features. Unfortunately, parameter estimation in CRFs requires repeated inference. Complex graphical structures are increasingly desired in practical applications, but training time often becomes prohibitive. In this thesis, I investigate efficient training methods for conditional random fields with complex graphical structure, focusing on local methods which avoid propagating information globally along the graph. First, I investigate piecewise training, which trains each of a model's factors separately. I present three views of piecewise training: as maximizing the likelihood in a so-called 'node-split graph', as maximizing the Bethe likelihood with uniform messages, and as generalizing the pseudo-moment matching estimator of Wainwright, Jaakkola, and Willsky. Second, I propose piecewise pseudolikelihood, a hybrid procedure which 'pseudolikelihood-izes' the piecewise likelihood, and is therefore more efficient if the variables have large cardinality. Finally, I explore training methods using beliefs arising from stopping BP before convergence. I propose a new schedule for message propagation and present suggestive results applying dynamic schedules to the system of equations that combine inference and learning. I also present two novel families of loopy CRFs, which appear as test cases throughout. First is the dynamic CRF, which combines the factorized state representation of dynamic Bayesian networks with the modeling flexibility of conditional models. The second

of these is the skip-chain CRF, which models the fact that identical words are likely to have the same label, even if they occur far apart.
DTIC
Education; Inference; Prediction Analysis Techniques

20080020347 Bureau of the Census, Washington, DC, USA
Apparel: 2005. Summary. Current Industrial Reports
Jul. 2006; 42 pp.; In English
Report No.(s): PB2007-112309; No Copyright; Avail.: CASI: A03, Hardcopy

The CIR program has been providing monthly, quarterly, and annual measures of industrial activity for many years. Since 1904, with its cotton and fats and oils surveys, the CIR program has formed an essential part of an integrated statistical system involving the quinquennial economic census, manufacturing sector, and the annual survey of manufactures. The CIR surveys, however, provide current statistics at a more detailed product level than either of the other two statistical programs. The primary objective of the CIR program is to produce timely, accurate data on production and shipments of selected products. The data are used to satisfy economic policy needs and for market analysis, forecasting, and decision making in the private sector. The product-level data generated by these surveys are used extensively by individual firms, trade associations, and market analysts in planning or recommending marketing and legislative strategies, particularly if their industry is significantly affected by foreign trade. Although production and shipments information are the two most common data items collected, the CIR program collects other measures also such as inventories, orders, and consumption. These surveys measure manufacturing activity in important commodity areas such as textiles and apparel, chemicals, primary metals, computer and electronic components, industrial equipment, aerospace equipment, and consumer goods.
NTIS
International Trade; Industries; Textiles; Statistical Analysis; Economics; Marketing

20080020527 Michigan State Univ., East Lansing, MI USA
Improved Element-Free Galerkin Method for Electromagnetic NDE Model
Liu, Xin; Deng, Yiming; Zeng, Zhiwei; Udpa, Lalita; Knopp, Jeremy S; Dec 2006; 9 pp.; In English
Contract(s)/Grant(s): Proj-4349
Report No.(s): AD-A476948; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476948

This paper presents improvements made to enhance the Element-Free Galerkin method (EFG) for NDE applications. By using orthogonal basis functions instead of the conventional polynomial basis, the inversion of the ill-conditioned shape function matrix is eliminated. Therefore, the accuracy of the results is improved. Preliminary one-dimensional (1-D) and two-dimensional (2-D) examples are presented to demonstrate the improvement in accuracy and efficiency offered by orthogonal basis functions.
DTIC
Galerkin Method; Nondestructive Tests

66
SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

Includes mathematical modeling of systems; network analysis; mathematical programming; decision theory; and game theory.

20080019722 Air War Coll., Maxwell AFB, AL USA
Networks - The Air Force's Newest Weapon Systems
Gardiner, Von A; Feb 17, 2006; 43 pp.; In English
Report No.(s): AD-A476982; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476982

The current USAF organizational construct for network weapon systems is out of date, inefficient and does not adequately support emerging Information Operations objectives. Specifically, we have independent organizations functioning under completely different chains of command focused on the very same mission sets and objectives. As a result, the Air Force organizational structure, with respect to most network-related activities and operations, is fractured and extremely inefficient. Furthermore, the USAF does not have a centralized authority responsible to orchestrate collaboration and synergy among the various entities responsible for network concept of operations development, engineering and design, procurement, technician

training, tactics, techniques and procedures or doctrine. As a result of what may be view as parochialism or self-preservation, several of these should-be interdependent organizations in fact operate in vacuums, functioning on unsynchronized timelines as self-serving, independent entities. These organizations suffer from what has been referred to as operational and organizational myopia. They remain so functionally or organizationally compartmented and internally focused, working their own respective agendas, that they in fact marginalized their own operational and institutional value to the larger USAF. Although the Air Force is in the midst of transforming the organizational structure to better support networks at the operational level by establishing an AFNetOps Command to oversee and coordinate all network operations under an architecture-based construct, it is not addressing the need to overhaul and realign at the strategic and tactical levels. In essence, the USAF is building a new operational structure on a fractured foundation and is likely destined to deliver suboptimum results.
DTIC
Computer Programming; Costs; Software Engineering; Weapon Systems

20080019753 Naval Surface Warfare Center, Dahlgren, VA USA
Computations and Experiments of Shallow Depth Explosion Plumes
Szymczak, W G; Solomon, J M; Aug 1996; 86 pp.; In English
Report No.(s): AD-A477088; NSWCDD/TR-94/156; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477088

A mathematical model and computational code are validated for predicting shallow depth explosion plume behavior. The model is based on a generalized formulation of hydrodynamics and uses an incompressible liquid assumption. This formulation is well suited for predicting long-time bubble and plume dynamics. Initial conditions for the model are derived from spherically symmetric bubble theory, combined with empirical measurements, The effects of the spray dome caused by the reflection of the initial shock wave off the free surface is modeled empirically as a recess in the surface above the charge. Comparisons to photographs of experiments provide qualitative agreement. Quantitative measurements of plume heights and plume densities using conductivity probes and microwave absorption are also compared to the computational data, Results for both single- and multiple-charge shots are included.
DTIC
Depth; Explosions; Mathematical Models; Plumes

20080019771 State Univ. of New York, Buffalo, NY USA
Runtime Simulation for Post-Disaster Data Fusion Visualization
Kesavadas, Thenkurussi; Kim, Youngseok; Shah, Pritul; Mandiak, Matthew; Llinas, James; Scott, Peter; Oct 2006; 46 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F49620-01-1-0371
Report No.(s): AD-A477117; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477117

No abstract available
Computerized Simulation; Disasters; Display Devices; Earthquakes; Multisensor Fusion; Simulation

20080019788 Defence Research and Development Canada, Toronto, Ontario Canada
Dueler's Dilemma: A One-Person Computer Gaming Platform for Decision Making
Tikuisis, Peter; Keefe, Allan; Nov 2007; 36 pp.; In English; Original contains color illustrations
Report No.(s): AD-A477149; DRDC-T-TM-2007-091; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477149

'Dueler's Dilemma' is one-person computer-based interactive game whereby the player, hereafter referred to as the subject, engages an unseen opponent in a non zero-sum silent shooting duel. Shots fired on a time scale from 0 to 100 by either the subject or opponent have a linearly increasing chance of hitting their target from 0 to 100%, respectively. However, the probability that either target is hit depends on the combination of shooting times that the subject and opponent chooses (e.g., if the opponent shoots first, the subject's only chance of hitting the opponent depends on being missed by the opponent's shot). The shooting times chosen by the opponent generally vary and are concealed from the subject. Further, the probability of being hit changes with each engagement, even if the subject chooses to shoot at the same time as in a previous engagement. However, patterns will emerge with a sufficient number of engagements and the subject's objective is to converge to an optimal shooting time. After each engagement, the subject is presented with a display of the outcome, either in discrete or distributional format. Dueler's Dilemma is presented as a versatile gaming platform suitable for researching life-critical

decision making under time constraints. Its simplistic rule structure complemented by the considerable latitude in shaping the opponent's shooting strategy makes it an attractive investigative tool for exploring behavioural responses regarding force application and force protection, as demonstrated through various scenarios.
DTIC
Computers; Decision Making; Game Theory

20080019790 Defence Research and Development Canada, Toronto, Ontario Canada
CECA Model of the JSTAFF
Bryant, David J; Jan 2008; 60 pp.; In English; Original contains color illustrations
Report No.(s): AD-A477151; DRDC-TR-2006-259; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477151

This report describes a model of decision-making and collaboration within the Joint Staff (JSTAFF). The model was developed within the Critique-Explore-Compare-Adapt (CECA) framework [1], which incorporates important aspects of human cognition. The model was created by identifying correspondences between JSTAFF elements and the CECA framework in terms of information products, groups/agencies making up the JSTAFF, and the processes for creating, maintaining, updating, and transferring information products. The JSTAFF organization proved well-suited to the CECA framework. It was possible to readily identify numerous points of contact between the two in terms of the groups and agencies making up the JSTAFF, the processes used to perform the JSTAFF's functions, and the products that served as physical instantiations of those processes. The JSTAFF diverges from the CECA framework, however, in several key ways. Most notably, there are no products that directly correspond to the conceptual and situation models, which limits communication, comparison, and collaboration within the JSTAFF. It is suggested that the JSTAFF needs formal information products that correspond to the conceptual and situation models. The conceptual model should be formalized as a support tool or system that facilitates operational planning and the graphic representation of plans. The situation model should be formalized as an integrated picture developed by the National Deface Command Centre (NDCC) and thereby serve as a comprehensive model for the operational environment.
DTIC
Cognition; Decision Making; Decision Support Systems; Planning

20080019811 KMG Associates, Kingston, Ontario Canada
Human Factors Implications and Issues in Network Enabled Operations
English, Allan; Gimblett, Richard; Coombs, Howard; Aug 28, 2006; 55 pp.; In English
Contract(s)/Grant(s): W7711-047908/001/TOR
Report No.(s): AD-A477187; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477187

Network Enabled Operations (NEOps) seems poised to become the driving concept behind CF transformation for a number of reasons, not the least of which is Canada's tendency to follow the American lead in new concepts related to war and other operations. This paper concludes that Canada and the CF should be cautious about using NCW as the foundation for NEOps, because the context and needs that are the basis for NCW may not be congruent with Canadian requirements. The paper noted that NCW is not really a theory of war, as its proponents claim, but a series of largely untested hypotheses or assumptions that require validation before they should be accepted as a basis for transformation. Recent Canadian Forces (CF) operations have shown that a 'one size fits all' approach to command and control, as proposed by many NCW advocates, may not be the best approach for networked operations, even in an increasingly integrated joint and combined operating environment. Perhaps most importantly, from a Canadian point of view, using NEOps in the Joint, Interagency, Multinational, and Public (JIMP) or integrated context will require network architects not only to consider the use of information technology as an enabler, but also for them to address the much more complex issue of the creation of effective social networks. In summary, NEOps as a concept has a promising future if it is predicated on Canadian needs and culture. However, there is significant risk in placing too much reliance on concepts like NCW which put the technology before the human requirements. Therefore, future development of the NEOps concept should be firmly rooted in the Canadian context and based on Canadian experience. NEOps concept development should be complemented by the relevant experience of others, but it should avoid slavishly copying other frameworks as DND has sometimes done in the past.
DTIC
Command and Control; Human Factors Engineering; Networks

20080020063 Massachusetts Univ., Amherst, MA USA
Joint Group and Topic Discovery from Relations and Text
McCallum, Andrew; Wang, Xuerui; Mohanty, Natasha; Jan 2006; 18 pp.; In English
Contract(s)/Grant(s): HR0011-06-C-0023; NBCHD030010
Report No.(s): AD-A477401; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We present a probabilistic generative model of entity relationships and textual attributes; the model simultaneously discovers groups among the entities and topics among the corresponding text. Block models of relationship data have been studied in social network analysis for some time, however here we cluster in multiple modalities at once. Significantly, joint inference allows the discovery of groups to be guided by the emerging topics, and vice-versa. We present experimental results on two large data sets: sixteen years of bills put before the U.S. Senate, comprising their corresponding text and voting records, and 43 years of similar data from the United Nations. We show that in comparison with traditional, separate latent-variable models for words or block structures for votes, our Group-Topic model's joint inference improves both the groups and topics discovered. Additionally, we present a non-Markov continuous-time group model to capture shifting group structure over time. DTIC

Group Dynamics; Models; Texts

20080020305 Humansystems, Inc., Guelph, Ontario Canada
Swift Trust in Distributed Ad Hoc Teams
Adams, Barbara D; Waldherr, Sonya; Sartori, Jessica; Thomson, Michael; Oct 4, 2007; 107 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W7711-037893/001/TOR
Report No.(s): AD-A477148; DRDC-CR-2007-139; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477148

Swift trust is trust developed quickly even without direct and personal experience with another person and has been increasingly posited in the literature to be one way in which members of ad hoc teams can quickly form trust (Meyerson, Weick & Kramer, 1996). This pilot study explored whether the regimental identity of teammates could influence levels of 'swift' trust within teams. The secondary focus of this experiment was the impact of potential trust violations. Twenty-four teams of Canadian Forces (CF) reservists each conducted four tactical assault missions in a first-person gaming laboratory. Each 4-person team was composed of 2 CF personnel and 2 confederate researchers (purported to be CF personnel). Members of the team worked in a simulated distributed environment (separated by partitions), and were initially introduced to each other only using a 1 page written profile that described their background and operational experience. Their task in the computer game was to operate as 2 separate fire teams approaching the target area from 2 different sides in order to engage and destroy terrorists. Teammates communicated via radio only but interacted within the simulated mission area through their computer avatars. In order to manipulate regimental identity, the 2 confederate members of the newly formed and distributed team were reported to come from either the same regiment or a different regiment as the actual CF participants. In addition, to investigate whether trust violations affected the development of trust over the four missions, in half of the missions, a confederate team member performed a behavior that could put the team at risk. Questionnaires assessed the impact of regimental identity and potential trust violations on levels of team trust before the mission began (pre-mission), during a mission freeze (about 5 min into the mission) and at the end or post-mission.
DTIC

Game Theory; Personnel; Identities; Freezing

20080020529 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Parallelizing Ant Colony Optimization via Area of Expertise Learning
de Freitas, Adrian A; Sep 13, 2007; 115 pp.; In English; Original contains color illustrations
Report No.(s): AD-A476954; AFIT/GCS/ENG/07-15; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476954

Ant colony optimization algorithms have long been touted as providing an effective and efficient means of generating high quality solutions to NP-hard optimization problems. Unfortunately, while the structure of the algorithm is easy to parallelize, the nature and amount of communication required for parallel execution has meant that parallel implementations developed suffer from decreased solution quality, slower runtime performance, or both. This thesis explores a new strategy for ant colony parallelization that involves Area of Expertise (AOE) learning. The AOE concept is based on the idea that individual agents tend to gain knowledge of different areas of the search space when left to their own devices. After developing a sense of their own expertness on a portion of the problem domain, agents share information and incorporate knowledge from other agents

without having to experience it first-hand. This thesis shows that when incorporated within parallel ACO and applied to multi-objective environments such as a gridworld, the use of AOE learning can be an effective and efficient means of coordinating the efforts of multiple ant colony agents working in tandem, resulting in increased performance. Based on the success of the AOE/ACO combination in gridworld, a similar configuration is applied to the single objective traveling salesman problem. Yet while it was hoped that AOE learning would allow for a fast and beneficial sharing of knowledge between colonies, this goal was not achieved, despite the efforts detailed within. The reason for this lack of performance is due to the nature of the TSP, whose single objective landscape discourages colonies from learning unique portions of the search space. Without this specialization, AOE was found to make parallel ACO faster than the use of a single large colony but less efficient than multiple independent colonies.
DTIC
Colonies; Optimization; Parallel Processing (Computers)

67
THEORETICAL MATHEMATICS

Includes algebra, functional analysis, geometry, topology, set theory, group theory and number theory.

20080019755 Norwegian Defence Research Establishment, Horten, Norway
Reduction of Complexity: An Aspect of Network Visualization
Bjerke, Jan T; Dec 1, 2006; 42 pp.; In English; Original contains color illustrations
Report No.(s): AD-A477092; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477092
No abstract available
Arches; Networks; Topology

20080020042 Baker (Wilfred) Engineering, Inc., San Antonio, TX USA
Set Interfaces for Generalized Typestate and Data Structure Consistency Verification
Lam, Patrick; Zee, Karen; Kuncak, Viktor; Rinard, Martin; Oct 31, 2007; 33 pp.; In English
Contract(s)/Grant(s): F33615-00-C-1692; CCR-0086154
Report No.(s): AD-A477346; MIT-CSAIL-TR-2007-049; No Copyright; Avail.: Defense Technical Information Center (DTIC)
Typestate systems allow the type of an object to change during its lifetime in the computation. Unlike standard type systems, they can enforce safety properties that depend on changing object states. We present a new, generalized formulation of typestate that models the typestate of an object through membership in abstract sets. This abstract set formulation enables developers to reason about cardinalities of sets, and in particular to state and verify the condition that certain sets are empty. We support hierarchical typestate classifications by specifying subset and disjointness properties over the typestate sets. We present our formulation of typestate in the context of the Hob program specification and verification framework. The Hob framework allows the combination of typestate analysis with powerful independently developed analyses such as shape analyses or theorem proving techniques. We implemented our analysis and annotated several programs (75-2500 lines of code) with set specifications. Our implementation includes several optimizations that improve the scalability of the analysis and a novel loop invariant inference algorithm that eliminates the need to specify loop invariants. We present experimental data demonstrating the effectiveness of our techniques.
DTIC
Boolean Algebra; Coding; Consistency; Data Structures

70
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*.

20080020054 Naval Postgraduate School, Monterey, CA USA
A Reliability Study of the RFID Technology
Siew, Ng L; Dec 2006; 77 pp.; In English; Original contains color illustrations
Report No.(s): AD-A477383; No Copyright; Avail.: Defense Technical Information Center (DTIC)
RFID is a transformational technology that can bring about numerous benefits for its users. The US Department of

Defense recognizes the potential benefits and has therefore issued a mandate for its suppliers to be RFID equipped. RFID allows for hands-free data capturing thus enabling the efficient recording of material transactions as well as increased efficiencies within the supply chain. Accurate tag reads are vital for the successful implementation of an RFID system. The factors that affect the read reliability of an RFID system are examined in this paper. The extent to how these factors affect the reliability is studied and the possible methods of mitigating these factors are explored with the aim of increasing the reliability of reading single tags. Specific study into alternative coding and modulation techniques is done and their performance compared with techniques used in the existing technology.
DTIC
Coding; Radio Frequencies; Reliability

20080020089 Maryland Univ. Baltimore County, Catonsville, MD USA
Pulse Compression using a Tapered Microstructure Optical Fiber
Hu, Jonathan; Marks, Brain S; Menyuk, Curtis R; Kim, Jinchae; Carruthers, Thomas F; Wright, Barbara M; Taunay, Thierry F; Friebele, E J; Apr 2006; 12 pp.; In English
Report No.(s): AD-A477486; No Copyright; Avail.: Defense Technical Information Center (DTIC)
We calculate the pulse compression in a tapered microstructure optical fiber with four layers of holes. We show that the primary limitation on pulse compression is the loss due to mode leakage. As a fiber's diameter decreases due to the tapering, so does the air-hole diameter, and at a sufficiently small diameter the guided mode loss becomes unacceptably high. For the four-layer geometry we considered, a compression factor of 10 can be achieved by a pulse with an initial FWHM duration of 3 ps in a tapered fiber that is 28 m long. We find that there is little difference in the pulse compression between a linear taper profile and a Gaussian taper profile. More layers of air-holes allows the pitch to decrease considerably before losses become unacceptable, but only a moderate increase in the degree of pulse compression is obtained.
DTIC
Microstructure; Nonlinear Optics; Optical Fibers; Pulse Compression

20080020118 Oak Ridge National Lab., TN USA
Bioelectromagnetic Effects of EMP: Preliminary Findings
Aldrich, T E; Easterly, C E; Gailey, P C; Hamilton, C B; Jun 1988; 121 pp.; In English
Report No.(s): AD-A477552; ORNL/TM--10784; No Copyright; Avail.: Defense Technical Information Center (DTIC)
This document will describe and discuss available biologic data derived from experiments specifically utilizing EMP simulations to provide exposures; these studies comprise the bulk of Appendix A, a literature review. In addition some literature is reviewed that reports biologic studies using electromagnetic field exposures with characteristics different from EMP simulators. These latter studies were carefully selected for inclusion in this report because the exposures studied were believed to be applicable to EMP. A wide variety of exposure regimens are yet unexplored for possible application in the EMP data base. This discussion will address both public health concerns and potential issues arising from occupational exposures. Recommendations will be provided highlighting future research needed to more fully address the potential health effects related to electromagnetic fields associated with the operation of EMP simulators.
DTIC
Electromagnetic Fields; Electromagnetic Pulses; Occupational Diseases; Simulators

20080020215
Introduction to Pump Rotordynamics
Andres, Luis S; Nov 1, 2006; 27 pp.; In English; Original contains color illustrations
Report No.(s): AD-A476496; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476496
No abstract available
Pumps; Rotation; Rotor Dynamics; Turbomachinery

20080020219 Science Applications International Corp., Cary, NC, USA
Frequency Domain Electromagnetic Sensor Array Development
Wright, David J; Sep 17, 2007; 24 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-MM-1450
Report No.(s): AD-A476601; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476601
A laboratory prototype frequency domain electromagnetic induction sensor array suitable for simultaneous operation with

an array of cesium vapor total field magnetometers has been designed and fabricated and has undergone limited bench testing. The design is based on the GEM-3 active primary field cancellation technology, which creates a 'magnetic cavity' for each receive coil in the array. The array's magnetometers would be mounted inside the receive coils, within the magnetic cavities. This is very important because the primary transmit field would otherwise be strong enough to shift the total magnetic field vector (static magnetic field plus EMI components) outside the operating envelope of the magnetometers. Because the array configuration does not have the symmetry of a standard GEM-3, in-phase drift tends to be more severe. Tests with the prototype array show drift rates roughly one order of magnitude larger than with a standard GEM-3. However, demedian filtering such as that used for the MM-0033 towed GEM-3 array can correct for the drift. The most serious issue for the array is structural rigidity. When the array is bent, the bucking coils do not properly cancel the field from the outer transmit loop. Calculations indicate that bucking errors amounting l0's of ppm can be caused by bending the array by a few tenths of a degree over a distance of about 30 cm. The array would have to be held stiff to this sort of tolerance. For towed applications on land this may be difficult because the array will be subjected to significant bending stresses as it is towed over any realistic terrain. The bouncing and jostling motions for vehicle towed systems tend to have scales comparable to those of buried UXO signals. The situation may not be so serious for marine applications where the array would be buoyed up and not subject to such severe stresses.

DTIC

Frequencies; Magnetic Fields

20080020286 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA; Deutsches Elektronen-Synchrotron, Hamburg, Germany

Development of a Superconducting Connection for Niobium Cavities

Kneisel, P.; Ciovati, G.; Sekutowicz, J.; Matheisen, A.; Singer, X.; January 2007; 3 pp.; In English

Report No.(s): DE2007-908965; No Copyright; Avail.: National Technical Information Service (NTIS)

Several, partially successful attempts have been made in the past to develop a superconducting connection between adjacent niobium cavities with the capability to carry up to 30 mT of the magnetic flux. Such a connection would be particularly of great benefit to layouts of long accelerators like ILC because it would shorten the distances between structures and therefore the total length of an accelerator with the associated cost reductions. In addition the superconducting connection would be ideal for a super-structure two multi-cell cavities connected through a half wavelength long beam pipe providing the coupling. Two welded prototypes of super-structure have been successfully tested with the beam at DESY. The chemical treatment and water rinsing was rather complicated for these prototypes because of the length of the assembly. We have engaged in a program to develop such a connection, initially based on the Nb55Ti material. Several options are pursued such as e.g. a two-cell cavity is being used to explore the reachable magnetic flux for the TESLA like connection with a squeezed niobium gasket between the flanges. Other materials, such as NbZr or NbN are also being considered. In this contribution, we will report about the progress of our investigations.

NTIS

Cavities; Linear Accelerators; Niobium; Superconductivity; Superconductors (Materials)

20080020287 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA

Digital Self Excited Loop for Accelerating Cavity Field Control

Allison, T.; Delayen, J.; Hovater, C.; Musson, J.; Plawski, T.; January 2007; 3 pp.; In English

Report No.(s): DE2007-908964; No Copyright; Avail.: National Technical Information Service (NTIS)

We have developed a digital process that emulates an analog oscillator and ultimately a self excited loop (SEL) for field control. The SEL, in its analog form, has been used for many years for accelerating cavity field control. In essence the SEL uses the cavity as a resonant circuit -- much like a resonant (tank) circuit is used to build an oscillator. An oscillating resonant circuit can be forced to oscillate at different, but close, frequencies to resonance by applying a phase shift in the feedback path. This allows the circuit to be phased-locked to a master reference, which is crucial for multiple cavity accelerators. For phase and amplitude control the SEL must be forced to the master reference frequency, and feedback provided for in both dimensions. The novelty of this design is in the way digital signal processing (DSP) is structured to emulate an analog system. While the digital signal processing elements are not new, to our knowledge this is the first time that the digital SEL concept has been designed and demonstrated. This paper reports on the progress of the design and implementation of the digital SEL for field control of superconducting accelerating cavities.

NTIS

Cavities; Digital Techniques; Oscillators; Superconductors (Materials)

20080020288 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
Preliminary Results from Prototype Niobium Cavities for the JLAB Ampere-Class FEL
Kneisel, P.; Ciovati, G.; Bundy, R.; Clemens, B.; Forehand, D.; January 2007; 3 pp.; In English
Contract(s)/Grant(s): DE-AC05-06OR23177
Report No.(s): DE2007-908963; No Copyright; Avail.: National Technical Information Service (NTIS)

In a previous paper the cavity (1) design for an Ampere-class cryomodule was introduced. We have since fabricated a 1500 MHz version of a single cell cavity with waveguide couplers for HOM and fundamental power, attached to one end of the cavity, a 5-cell cavity made from large grain niobium without couplers and. a 750 MHz single cell cavity without endgroups to get some information about obtainable Q-values, gradients and multipacting behavior at lower frequency. This contribution reports on the various tests of these cavities.
NTIS
Cavities; Free Electron Lasers; Linear Accelerators; Niobium; Prototypes; Superconductors (Materials)

20080020289 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
Multipass Steering Protocols at Jefferson Lab
Bodenstein, R. M.; Tiefenback, M. G.; January 2007; 3 pp.; In English
Contract(s)/Grant(s): DE-AC05-06OR23177
Report No.(s): DE2007-908962; No Copyright; Avail.: National Technical Information Service (NTIS)

The CEBAF recirculating accelerator consists of two CW superconducting RF linacs, through which an electron beam is accelerated for up to 5 passes. Focusing and steering elements affect each pass differently, requiring a multipass steering protocol to correct the orbits. Perturbations include lens misalignments (including long-term ground motion), BPM offsets, and focusing and steering from RF fields inside the cavities. A previous treatment of this problem assumed all perturbations were localized at the quadrupoles and the absence of x-y coupling. Having analyzed the problem and characterized the solutions, we developed an empirical iterative protocol to compare against previous results in the presence of skew fields and cross-plane coupling. We plan to characterize static and acceleration-dependent components of the beam line perturbations to allow systematic and rapid configuration of the accelerator at different linac energy gains.
NTIS
Linear Accelerators; Protocol (Computers); Radio Frequencies; Steering

20080020302 Christensen, OConnor, Johnson, Kindness, PLLC, Seattle, WA, USA; Washington Univ., Seattle, WA, USA
Steady Streaming Particle Traps
Lutz, B. R., Inventor; Schwartz, D. T., Inventor; 18 Jan 05; 15 pp.; In English
Contract(s)/Grant(s): NIH-1-P50-HG02360; NSF-9872385
Patent Info.: Filed Filed 18 Jan 05; US-Patent-Appl-SN-11-038-454
Report No.(s): PB2007-112183; No Copyright; Avail.: CASI: A03, Hardcopy

A microfluidic fluid flow system (100) is disclosed having a fluid chamber or channel (150) with inlet and outlet ports (104, 106), allowing the fluid channel to be filled with a fluid. One or more flow obstructions or perturbances, such as cylinders (152), are provided in the channel. An oscillatory boundary condition is applied, for example, with a piezoelectric driver (130), that is selected to induce a conservative, low-intensity steady streaming flow in the channel. The low-intensity streaming flow produces distinct eddies that can be utilized, for example, for fluid-dynamically trapping or retaining particles (90) such as cells (92) at well defined locations in the channel. The system may be used to trap and study individual cells or for concentrating or filtering particles in a fluid.
NTIS
Microelectronics; Patent Applications; Traps

20080020338 Lawrence Livermore National Lab., Livermore, CA USA
Lawrence Livermore National Laboratory: Laboratory Directed Research and Development (LDRD) FY2006 Annual Report
Jan. 2007; 308 pp.; In English
Report No.(s): DE2007-908915; UCRL-TR-113717-06; No Copyright; Avail.: Department of Energy Information Bridge

The FY2006 Laboratory Directed Research and Development (LDRD) Annual Report provides a summary of LDRD-funded projects for the fiscal year and consists of two parts: Overview: An introduction to the LDRD Program, the LDRD portfolio-management process, program statistics for the year, and highlights of accomplishments for the year. Project

Summaries: A summary of each project, submitted by the principal investigator. Project summaries include the scope, motivation, goals, relevance to Department of Energy/National Nuclear Security Administration and Lawrence Livermore National Laboratory mission areas, the technical progress achieved in FY2006, and a list of publications that resulted from the research in FY2006. Summaries are organized in sections by research category (in alphabetical order). Within each research category, the projects are listed in order of their LDRD project category: Strategic Initiative (SI), Exploratory Research (ER), Laboratory-Wide Competition (LW), and Feasibility Study (FS). Within each project category, the individual project summaries appear in order of their project tracking code, a unique identifier that consists of three elements. The first is the fiscal year the project began, the second represents the project category, and the third identifies the serial number of the proposal for that fiscal year.
NTIS
Abstracts; Research Projects; Project Management

20080020353 Rose-Hulman Inst. of Tech., Terre Haute, IN, USA; Stanford Univ., Stanford, CA USA
Thermal Analysis of the ILC Superconducting Magnets
Ross, I.; Aug. 24, 2006; 22 pp.; In English
Report No.(s): DE2007-908222; SLAC/TN-06-018; No Copyright; Avail.: National Technical Information Service (NTIS)
Critical to a particle accelerators functioning, superconducting magnets serve to focus and aim the particle beam. The Stanford Linear Accelerator Center (SLAC) has received a prototype superconducting quadrupole designed and built by the Centro de Investigaciones Energticas, Medioambientales y Tecnolgicas (CIEMAT) to be evaluated for the International Linear Collider (ILC) project. To ensure proper functioning of the magnet, the device must be maintained at cryogenic temperatures by use of a cooling system containing liquid nitrogen and liquid helium. The cool down period of a low temperature cryostat is critical to the success of an experiment, especially a prototype setup such as this one. The magnet and the dewar each contain unique heat leaks and material properties. These differences can lead to tremendous thermal stresses. The system was analyzed mathematically, leading to ideal liquid helium and liquid nitrogen flow rates during the magnets cool-down to 4.2 K, along with a reasonable estimate of how long this cool-down will take. With a flow rate of ten gaseous liters of liquid nitrogen per minute, the nitrogen shield will take approximately five hours to cool down to 77 K. With a gaseous helium flow rate of sixty liters per minute, the magnet will take at least nineteen hours to cool down to a temperature of 4.2 K.
NTIS
Superconducting Magnets; Thermal Analysis

20080020369 Lawrence Livermore National Lab., Livermore, CA USA
Study of Transport Behavior and Conversion Efficiency in Pillar Structured Neutron Detectors
Nikolic, R. J.; May 01, 2007; 11 pp.; In English
Report No.(s): DE2007-908135; UCRL-TR-230619; No Copyright; Avail.: National Technical Information Service (NTIS)
Room temperature, high efficiency and scalable radiation detectors can be realized by manipulating materials at the micro scale. With micro-semiconductor-pillars, we will advance the thermal neutron detection efficiency of semiconductor detectors to over 70% with 50 micrometer in detector thickness. New material science, new transport behavior, neutron to alpha conversion dynamics and their relationship with neutron detection will be discovered with the proposed structures.
NTIS
Detection; Energy Conversion Efficiency; Neutron Counters; Neutrons; Thermal Neutrons

20080020374 Lawrence Livermore National Lab., Livermore, CA USA
High Energy Nuclear Database: A Testbed for Nuclear Data Information Technology
Brown, D. A.; Vogt, R.; Beck, B.; Pruet, J.; Apr. 19, 2007; 6 pp.; In English
Report No.(s): DE2007-908130; UCRL-PROC-230106; No Copyright; Avail.: Department of Energy Information Bridge
We describe the development of an on-line high-energy heavy-ion experimental database. When completed, the database will be searchable and cross-indexed with relevant publications, including published detector descriptions. While this effort is relatively new, it will eventually contain all published data from older heavy-ion programs as well as published data from current and future facilities. These data include all measured observables in proton-proton, proton-nucleus and nucleus-nucleus collisions. Once in general use, this database will have tremendous scientific payoff as it makes systematic studies easier and allows simpler benchmarking of theoretical models for a broad range of experiments. Furthermore, there is a growing need for compilations of high-energy nuclear data for applications including stockpile stewardship, technology development for inertial confinement fusion, target and source development for upcoming facilities such as the International

Linear Collider and homeland security. This database is part of a larger proposal that includes the production of periodic data evaluations and topical reviews. These reviews would provide an alternative and impartial mechanism to resolve discrepancies between published data from rival experiments and between theory and experiment. Since this database will be a community resource, it requires the high-energy nuclear physics communitys financial and manpower support. This project serves as a testbed for the further development of an object-oriented nuclear data format and database system. By using off-theshelf software tools and techniques, the system is simple, robust, and extensible. Eventually we envision a Grand Unified Nuclear Format encapsulating data types used in the ENSDF, ENDF/B, EXFOR, NSR and other formats, including processed data formats.
NTIS
Data Bases; Information Systems

20080020379 Lawrence Livermore National Lab., Livermore, CA USA
FY06 LDRD Final Report: Broadband Radiation and Scattering
Madsen, N.; Fasenfest, B.; White, D.; Stowell, M.; Sharpe, R.; Mar. 15, 2007; 8 pp.; In English
Report No.(s): DE2007-908122; UCRL-TR-229094; No Copyright; Avail.: Department of Energy Information Bridge
This is the final report for LDRD 01-ERD-005. The Principle Investigator was Robert Sharpe. Collaborators included Niel Madsen, Benjamin Fasenfest, John D. Rockway, of the Defense Sciences Engineering Division (DSED), Vikram Jandhyala and James Pingenot from the University of Washington, and Mark Stowell of the Center for Applications Development and Software Engineering (CADSE). It should be noted that Benjamin Fasenfest and Mark Stowell were partially supported under other funding. The purpose of this LDRD effort was to enhance LLNLs computational electromagnetics capability in the area of broadband radiation and scattering. For radiation and scattering problems our transient EM codes are limited by the approximate Radiation Boundary Conditions (RBC's) used to model the radiation into an infinite space. Improved RBCs were researched, developed, and incorporated into the existing EMSolve finite-element code to provide a 10-100x improvement in the accuracy of the boundary conditions. Section I provides an introduction to the project and the project goals. Section II provides a summary of the projects research and accomplishments as presented in the attached papers.
NTIS
Broadband; Electromagnetic Radiation; Finite Element Method; Scattering

20080020383 Lawrence Livermore National Lab., Livermore, CA USA
Ignition Failure Mode Radiochemical Diagnostics Initial Assessment
Fortner, R.; Bernstein, L.; Cerjan, C.; Haan, S. W.; Harding, R.; Apr. 23, 2007; 12 pp.; In English
Report No.(s): DE2007-908127; UCRL-TR-230178; No Copyright; Avail.: National Technical Information Service (NTIS)
Radiochemical diagnostic signatures are well known to be effective indicators of nuclear ignition and burn reaction conditions. Nuclear activation is already a reliable technique to measure yield. More comprehensively, though, important quantities such as fuel areal density and ion temperature might be separately and more precisely monitored by a judicious choice of select nuclear reactions. This report details an initial assessment of this approach to diagnosing ignition failures on point-design cryogenic National Ignition Campaign targets. Using newly generated nuclear reaction cross section data for Scandium and Iridium, modest uniform doping of the innermost ablator region provides clearly observable reaction product differences between robust burn and failure for either element. Both equatorial and polar tracer loading yield observable, but indistinguishable, signatures for either choice of element for the preliminary cases studied.
NTIS
Diagnosis; Failure Modes; Ignition; Nuclear Reactions; Radiochemistry

20080020386 Lawrence Livermore National Lab., Livermore, CA USA
Lattice QCD Thermodynamics: P4 Action for New Beta and MILC NT=6
Soltz, R.; Vranas, P.; Gupta, R.; May 07, 2007; 7 pp.; In English
Report No.(s): DE2007-908116; UCRL-TR-230742; No Copyright; Avail.: Department of Energy Information Bridge
No abstract available
Quantum Chromodynamics; Thermodynamics

20080020398 Lawrence Livermore National Lab., Livermore, CA USA
Multilayers for Next Generation X-ray Sources
Bajt, S.; Chapman, N.; Spiller, E.; Hau-Riege, S.; Alameda, J.; May 08, 2007; 12 pp.; In English
Report No.(s): DE2007-908117; UCRL-CONF-230785; No Copyright; Avail.: Department of Energy Information Bridge
Multilayers are artificially layered structures that can be used to create optics and optical elements for a broad range of

x-ray wavelengths, or can be optimized for other applications. The development of next generation x-ray sources (synchrotrons and x-ray free electron lasers) requires advances in x-ray optics. Newly developed multilayerbased mirrors and optical elements enabled efficient band-pass filtering, focusing and time resolved measurements in recent FLASH (Free Electron LASer in Hamburg) experiments. These experiments are providing invaluable feedback on the response of the multilayer structures to high intensity, short pulsed x-ray sources. This information is crucial to design optics for future x-ray free electron lasers and to benchmark computer codes that simulate damage processes.
NTIS
Free Electron Lasers; X Ray Sources; X Ray Lasers; Synchrotrons

20080020399 Fermi National Accelerator Lab., Batavia, IL, USA
Test of Purging a Small Tank with Argon
Jaskierny, W.; Jostlein, H.; Pordes, S.; Radpidis, P. A.; Tope, T.; Oct. 28, 2006; 3 pp.; In English
Report No.(s): DE2007-903417; FERMILAB-TM-2384-E; No Copyright; Avail.: National Technical Information Service (NTIS)

One of the challenges facing our large liquid argon TPC is to remove the atmosphere of air to the point where the remaining oxygen can be removed by chemical or filtration techniques economically and in a reasonable time. This note describes a simple demonstration of purging the tank with argon gas inserted smoothly at the bottom of the tank to achieve concentrations of oxygen in the few 10's of ppm level. The purging is well described by an analytic diffusion model. The number of volume changes required to reach 100 ppm is a factor of 3 fewer than predicted in a perfect mixing model.
NTIS
Argon; Purging

20080020400 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
JLAMP: An Amplifier-Based FEL in the JLAB SRF ERL Driver
Jordan, K.; Benson, S. V.; Douglas, D.; Evtushenko, P.; Harnandez-Garcia, C.; January 2007; 3 pp.; In English
Report No.(s): DE2007-908674; No Copyright; Avail.: National Technical Information Service (NTIS)

Notional designs for energy-recovering linac (ERL) -driven high average power free electron lasers (FELs) often invoke amplifier-based architectures. To date, however, amplifier FELs have been limited in average power output to values several orders of magnitude lower than those demonstrated in optical-resonator based systems; this is due at least in part to the limited electron beam powers available from their driver accelerators. In order to directly contrast the performance available from amplifiers to that provided by high-power cavity-based resonators, we have developed a scheme to test an amplifier FEL in the JLab SRF ERL driver. We describe an accelerator system design that can seamlessly and non-invasively integrate a 10 m wiggler into the existing system and which provides, at least in principle, performance that would support high-efficiency lasing in an amplifier configuration. Details of the design and an accelerator performance analysis will be presented.
NTIS
Free Electron Lasers; Linear Accelerators

20080020404 Lawrence Livermore National Lab., Livermore, CA USA
Nanosecond Ultrasonics to Study Phase Transitions in Solid and Liquid Systems at High Pressure and Temperature
Bonner, B. P.; Berge, P. A.; Carlson, S. C.; Farber, D. L.; Akella, J.; Apr. 13, 2007; 29 pp.; In English
Report No.(s): DE2007-908907; UCRL-TR-229901; No Copyright; Avail.: National Technical Information Service (NTIS)

This report describes the development of a high-frequency ultrasonic measurement capability for application to the study of phase transitions at elevated pressure and temperature. We combined expertise in various aspects of static high-pressure technique with recent advances in wave propagation modeling, ultrasonic transducer development, electronic methods and broadband instrumentation to accomplish the goals of this project. The transduction and electronic systems have a demonstrated bandwidth of 400 MHz, allowing investigations of phenomena with characteristic times as short as 2.5 nS. A compact, pneumatically driven moissanite anvil cell was developed and constructed for this project. This device generates a high-pressure environment for mm dimension samples to pressures of 3 GPa. Ultrasonic measurements were conducted in the moissanite cell, an LLNL multi-anvil device and in a modified piston cylinder device. Measurements for water, and elemental tantalum, tin and cerium demonstrate the success of the methods. The a-a phase transition in cerium was clearly detected at around 0.7 GPa with 75 MHz longitudinal waves. These results have direct application to important problems in LLNL programs, as well as seismology and planetary science.
NTIS
Geophysics; High Pressure; Phase Transformations; Ultrasonics

20080020408 Lawrence Livermore National Lab., Livermore, CA USA
Influence of Self Damage on Pu (AM) Observed through Magnetization Measurements
McCall, S. K.; Sykora, R. E.; Fluss, M. J.; Chung, B. W.; Chapline, G. F.; Apr. 02, 2007; 5 pp.; In English
Report No.(s): DE2007-908898; UCRL-CONF-229633; No Copyright; Avail.: National Technical Information Service (NTIS)

In the Pu1-xAmx system, stable fcc phases are obtained for 0.05 < x < 0.75, and the lattice parameters increase with the Am.content. Both elements decay -emission creating cascades of vacancies, interstitials, and their aggregates. As damage accumulates, it is accompanied by an increase in the magnetic susceptibility. Preliminary results of radiation damage studies on the magnetic properties of Pu(Am) alloys are reported here.
NTIS
Condensed Matter Physics; Damage; Magnetization; Superconductivity

20080020409 National Nuclear Security Administration, Las Vegas, NV, USA
Science and Technology Review, May 2007. Simulating Quantum Technologies
May 2007; 32 pp.; In English
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): DE2007-908895; No Copyright; Avail.: National Technical Information Service (NTIS)

Contents: Laboratory Science Entwined with Rise in Computing; 'A Quantum Contribution to Technology'.- Quantum mechanics simulations are making the leap from basic to applied nanoscale science. 'U.S. Weapons Plutonium Aging Gracefully' - Advances in plutonium science provide greater reassurance about the safety and reliability of America's nuclear weapons stockpile. 'Imaging Complex Biomolecules in a Flash' A new technique uses extremely bright, ultrashort x-ray pulses to image viruses and complex biomolecules down to the atomic scale. 'Lipid Rafts Observed in Cell Membranes' - Researchers from Lawrence Livermore and the University of California at Davis study the 'Exchanging Insights on Quantum Behavior' Edward Teller's work in condensed-matter physics.
NTIS
Research and Development; Simulation; Technologies

20080020410 Sandia National Labs., Albuquerque, NM USA
Sandia National Laboratories Laboratory Directed Research and Development (LDRD) Annual Report, 2006
Westrich, H. R.; Mar. 2007; 825 pp.; In English
Report No.(s): DE2007-908869; SAND2007-1774; No Copyright; Avail.: National Technical Information Service (NTIS)

This report summarizes progress from the Laboratory Directed Research and Development (LDRD) program during fiscal year 2006. In addition to a programmatic and financial overview, the report includes progress reports from 430 individual R&D projects in 17 categories.
NTIS
Laboratories; Research and Development

20080020420 Carnegie-Mellon Univ., Pittsburgh, PA, USA
Measurement of the Bs anti-Bs Oscillation Frequency Using Semileptonic Decays
Tiwari, V.; May 30, 2007; 265 pp.; In English
Report No.(s): DE2007-908840; FERMILAB-THESIS-2007-09; FERMILAB-THESIS-2007-68; No Copyright; Avail.: National Technical Information Service (NTIS)

This thesis reports a time dependent measurement of the B (sup 0)(sub s) - overbar B (sup 0)(sub s) oscillation frequency Delta m(sub s) using semileptonic decays B(sup 0)(sub s) yields D(sup-)(sub s) l(sup +).
NTIS
Elementary Particles; Frequencies; Marking; Oscillations; Particle Decay

20080020421 Fermi National Accelerator Lab., Batavia, IL, USA
Analytical Approach to Understanding Tevatron Integrated Luminosity
Syphers, M. J.; May 11, 2007; 15 pp.; In English
Report No.(s): DE2007-908837; FERMILAB-FN-0802; No Copyright; Avail.: National Technical Information Service (NTIS)

The recent record-setting performance of the Fermilab Tevatron is the culmination of a long series of efforts to optimize

the many parameters that go into generating integrated luminosity for the colliding beams experiments. The instantaneous luminosity is a function of the number of particles of each particle species, the physical extent at the collision point of the transverse and longitudinal particle distributions, and the bunch collision frequency. Meanwhile, the integrated luminosity also depends upon the rate at which particles are lost due to collisions or other means, as well as the rate at which the initial store luminosity can be restored after the end intentional or otherwise of the previous store. While many numerical computer models already exist that are used to help optimize the performance of the Tevatron complex, here we take an analytical approach in an attempt to illustrate the most fundamental aspects of integrating luminosity in the Tevatron. We find that the essential features, including recent values of the weekly integrated luminosity, can be understood in a transparent way from basic operational parameters such as antiproton stacking rate and beam emittance growth rate in the Tevatron.
NTIS
Luminosity; Particle Accelerators; Computerized Simulation; Mathematical Models; Collision Rates; Collisions

20080020423 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
Development of a Superconducting Connection for NIOBIUM Cavities
Kneisel, P.; Ciovati, G.; Sekutowicz, J.; Matheisen, A.; Singer, X.; Jun. 18, 2007; 3 pp.; In English
Report No.(s): DE2007-908792; JLAB-ACC-07-657; No Copyright; Avail.: National Technical Information Service (NTIS)
Several, partially successful attempts have been made in the past to develop a superconducting connection between adjacent niobium cavities with the capability to carry up to 30 mT of the magnetic flux. Such a connection would be particularly of great benefit to layouts of long accelerators like ILC because it would shorten the distances between structures and therefore the total length of an accelerator with the associated cost reductions. In addition the superconducting connection would be ideal for a super-structure two multi-cell cavities connected through a half wavelength long beam pipe providing the coupling. Two welded prototypes of super-structure have been successfully tested with the beam at DESY. The chemical treatment and water rinsing was rather complicated for these prototypes because of the length of the assembly. We have engaged in a program to develop such a connection, initially based on the Nb55Ti material. Several options are pursued such as e.g. a two-cell cavity is being used to explore the reachable magnetic flux for the TESLA like connection with a squeezed niobium gasket between the flanges. Other materials, such as NbZr or NbN are also being considered. In this contribution, we will report about the progress of our investigations.
NTIS
Cavities; Linear Accelerators; Niobium; Superconductivity; Superconductors (Materials)

20080020424 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
CEBAF New Digital LLRF System Extended Functionality
Allison, T.; Davis, K.; Dong, H.; Hovater, C.; King, L.; January 2007; 4 pp.; In English
Contract(s)/Grant(s): DE-AC05-06OR23177
Report No.(s): DE2007-908791; No Copyright; Avail.: National Technical Information Service (NTIS)
The new digital LLRF system for the CEBAF 12GeV accelerator will perform a variety of tasks, beyond field control. In this paper we present the superconducting cavity resonance control system designed to minimize RF power during gradient ramp and to minimize RF power during steady state operation. Based on the calculated detuning angle, which represents the difference between reference and cavity resonance frequency, the cavity length will be adjusted with a mechanical tuner. The tuner has two mechanical driving devices, a stepper motor and a piezo-tuner, to yield a combination of coarse and fine control. Although LLRF piezo processing speed can achieve 10 kHz bandwidth, only 10 Hz speed is needed for 12 GeV upgrade. There will be a number of additional functions within the LLRF system; heater controls to maintain cryomodule's heat load balance, ceramic window temperature monitoring, waveguide vacuum interlocks, ARC detector interlock and quench detection. The additional functions will be divided between the digital board, incorporating an Altera FPGA and an embedded EPICS IOC. This paper will also address hardware evolution and test results performed with different SC cavities.
NTIS
Digital Systems; Digital Techniques; Linear Accelerators; Radio Frequencies

20080020425 Stanford Linear Accelerator Center, Menlo Park, CA, USA; Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA; Old Dominion Univ., Norfolk, VA, USA
Transverse Effect due to Short-range Resistive Wall Wakefield
Wu, J.; Chao, A. W.; Delayen, J. R.; January 2007; 3 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-908790; No Copyright; Avail.: National Technical Information Service (NTIS)
For accelerator designs with ultra short electron beams, beam dynamics study has to invoke the short-range wakefields.

In this paper, we first obtain the short-range dipole mode resistive wall wakefield. Analytical approach is then developed to study the single bunch transverse beam dynamics due to this short-range resistive wall wake. The results are applied to the LCLS undulator.
NTIS
Walls; Electron Beams; Wakes

20080020426 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA; Old Dominion Univ., Norfolk, VA, USA; Stanford Linear Accelerator Center, Menlo Park, CA, USA
Transverse Effects Due to Random Displacement of Resistive Wall Segments and Focusing Elements
Delayen, J. R.; Wu, J.; January 2007; 3 pp.; In English
Contract(s)/Grant(s): DE-AC05-06OR23177
Report No.(s): DE2007-908789; No Copyright; Avail.: National Technical Information Service (NTIS)

In this paper, we study the single bunch transverse beam dynamics in the presence of random displacements of resistive wall segments and focusing elements. Analytical formulas are obtained for long-range resistive wall wake, together with numerical results for short-range resistive wall wake. The results are applied to the LCLS project and some other proposed accelerators.
NTIS
Bunching; Displacement; Walls

20080020440 NASA, Washington, DC USA
Gas volume contents within a container, smart volume instrument
Kelley, Anthony R., Inventor; Van Buskirk, Paul D., Inventor; March 25, 2008; 11 pp.; In English
Patent Info.: Filed August 30, 2005; US-Patent-7,347,089; US-Patent-Appl-SN-11/215,749; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080020440

A method for determining the volume of an incompressible gas in a system including incompressible substances in a zero-gravity environment. The method includes inducing a volumetric displacement within a container and measuring the resulting pressure change. From this data, the liquid level can be determined.
Official Gazette of the U.S. Patent and Trademark Office
Displacement; Liquid Levels; Weightlessness

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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*.

20080020387 NASA Langley Research Center, Hampton, VA, USA
Laser-Induced Thermal Acoustic Measurements in a Highly Back-Pressured Scramjet Isolator Model: A Research Plan
Middleton, Troy F.; Balla, Robert J.; Baurle, Robert A.; Wilson, Lloyd G.; May 12, 2008; 11 pp.; In English; 55th JANNAF Propulsion Meeting/42nd Combustion/30th Airbreathing Propulsion/30th Exhaust Plume Technology/24th Propulsion Systems Hazards/12th SPIRITS User Group Joint Subcommittee Meeting, 12-16 May 2008, Newton, MA, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 599489.02.07.07.03.03.0
Report No.(s): JANNAF-984; Copyright; Avail.: CASI: A03, Hardcopy

Under the Propulsion Discipline of NASA s Fundamental Aeronautics Program s Hypersonics Project, a test apparatus, for testing a scramjet isolator model, is being constructed at NASA's Langley Research Center. The test apparatus will incorporate a 1-inch by 2-inch by 15-inch-long scramjet isolator model supplied with 2.1 lbm/sec of unheated dry air through a Mach 2.5 converging-diverging nozzle. The planned research will incorporate progressively more challenging measurement techniques to characterize the flow field within the isolator, concluding with the application of the Laser-Induced Thermal Acoustic (LITA) measurement technique. The primary goal of this research is to use the data acquired to validate Computational Fluid Dynamics (CFD) models employed to characterize the complex flow field of a scramjet isolator. This

paper describes the test apparatus being constructed, pre-test CFD simulations, and the LITA measurement technique.
Author
Supersonic Combustion Ramjet Engines; Acoustic Measurement; Computational Fluid Dynamics; Convergent-Divergent Nozzles; Hypersonics; Isolators; Temperature Measurement

20080020438 NASA, Washington, DC USA
Auditory alert systems with enhanced detectability
Begault, Durand R., Inventor; March 18, 2008; 12 pp.; In English
Patent Info.: Filed March 28, 2001; US-Patent-7,346,172; US-Patent-Appl-SN-09/822,470; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080020438

Methods and systems for distinguishing an auditory alert signal from a background of one or more non-alert signals. In a first embodiment, a prefix signal, associated with an existing alert signal, is provided that has a signal component in each of three or more selected frequency ranges, with each signal component in each of three or more selected level at least 3-10 dB above an estimated background (non-alert) level in that frequency range. The alert signal may be chirped within one or more frequency bands. In another embodiment, an alert signal moves, continuously or discontinuously, from one location to another over a short time interval, introducing a perceived spatial modulation or jitter. In another embodiment, a weighted sum of background signals adjacent to each ear is formed, and the weighted sum is delivered to each ear as a uniform background; a distinguishable alert signal is presented on top of this weighted sum signal at one ear, or distinguishable first and second alert signals are presented at two ears of a subject.
Official Gazette of the U.S. Patent and Trademark Office
Auditory Signals; Warning Systems; Frequency Ranges; Detection

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*.

20080020103 Oak Ridge National Lab., TN USA
Atomic Data for Fusion. Volume 5: Collisions of Carbon and Oxygen Ions with Electrons, H, H2 and He
Phaneuf, R A; Janev, R K; Pindzola, M S; Feb 1987; 635 pp.; In English
Contract(s)/Grant(s): DE-AC05-84OR21400
Report No.(s): AD-A477523; ORNL-6090/V5; ORNL-6086-VOL-5; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report provides a handbook for fusion research of recommended cross-section and rate-coefficient data for collisions of carbon and oxygen ions with electrons, hydrogen atoms and molecules, and helium atoms. Published experimental and theoretical data have been collected and evaluated, and recommended data are presented in tabular, graphical, and parametrized form. Processes considered include excitation, ionization, and charge exchange at collision energies appropriate to applications in fusion-energy research.
DTIC
Atomic Physics; Carbon; Collisions; Electrons; Hydrogen; Ions; Multisensor Fusion; Nuclear Fusion; Oxygen Ions

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*.

20080018967 Alabama Univ., Huntsville, AL, USA
Optical Detection of Formaldehyde
Patty, Kira D.; Gregory, Don A.; March 18, 2008; 33 pp.; In English; SPIE Defense and Security Symposium 2008, 16-20 Mar. 2008, Orlando, FL, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): 24192; NNM05AA22A; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080018967

The potential for buildup .of formaldehyde in closed space environments poses a direct health hazard to personnel. The

National Aeronautic Space Agency (NASA) has established a maximum permitted concentration of 0.04 ppm for 7 to 180 days for all space craft. Early detection is critical to ensure that formaldehyde levels do not accumulate. above these limits. New sensor technologies are needed to enable real time,in situ detection in a compact and reusable form factor. Addressing this need,research into the use of reactive fluorescent dyes which reversibly bind to formaldehyde (liquid or gas) has been conducted to support the development of a formaldehyde.sensor. In the presence of formaldehyde the dyes' characteristic fluorescence peaks shift providing the basis for an optical detection. Dye responses to formaldehyde exposure were characterized; demonstrating the optical detection of formaldehyde in under 10 seconds and down to concentrations of 0.5 ppm. To .incorporate the dye .in.an optical sensor device requires. a means of containing and manipulating the dye. Multiple form factors using two dissimilar s~bstrates were considered to determine a suitable configuration. A prototype sensor was demonstrated and considerations for a field able sensor were presented. This research provides a necessary first step toward the development of a compact, reusable; real time optical formaldehyde sensor suitable for use in the U.S. space program, Author

Formaldehyde; Optical Measurement; Real Time Operation; Closed Ecological Systems; Exposure; Reactivity; Optical Measuring Instruments

20080019787 Humansystems, Inc., Guelph, Ontario Canada

Active Camouflage for Infantry Headwear Applications

McKee, Kent W; Tack, David W; Feb 2007; 28 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W7711-03-7880-001-TOR

Report No.(s): AD-A477147; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA477147

This report was prepared as a trade study review of current and projected active camouflage systems. While numerous applications were discussed, the focus was for systems that could be used by infantry soldiers, and specifically for infantry helmet applications. A review of the current and projected active camouflage systems revealed that there are many systems under development for aviation, maritime, and ground operations. Early prototypes for infantry soldiers were presented in detail. A system overview was prepared in order to present camera, image processing, and display solutions. Finally, a discussion focusing on technology limitations, applications, and future considerations was presented. This trade study showed that numerous technologies for active camouflage systems are under development; however major technical roadblocks must be addressed before systems will be ready for infantry applications.

DTIC

Camouflage; Helmets; Light Emitting Diodes; Personnel; Protective Clothing

20080019982 Seabrook Engineering, Seabrook, MD USA

Adaptive Optics Performance Model for Optical Interferometry

Mozurkewich, D; Restaino, S R; Gilbreath, G C; Jan 2004; 8 pp.; In English

Report No.(s): AD-A477231; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We argue that adding large apertures with adaptive optics to an optical interferometer improves the performance of the interferometer in two ways: it improves the signal to noise of bright, low-visibility fringes and it also improves the sensitivity of the interferometer. A simple model is presented to support this conclusion.

DTIC

Adaptive Optics; Interferometers; Interferometry; Optical Measurement; Performance Prediction

20080019992 Naval Research Lab., Washington, DC USA

Alignment of Vacuum Feed Stations on the Navy Prototype Optical Interferometer

Clark III, James A; Murphy, James; Ha, Long; Walton, Joshua P; Howard, James; Armstrong, J T; Gilbreath, G C; Hindsley, Robert B; Pauls, Thomas A; Jan 2004; 7 pp.; In English

Report No.(s): AD-A477246; No Copyright; Avail.: Defense Technical Information Center (DTIC)

At the Navy Prototype Optical Interferometer (NPOI) we have developed a two-stage method for preparation and installation of the optical feed relay stations (elevators). This method reduces contamination, increases consistency, and allows greater management in testing and upgrades. In stage one, we prepare a pre-alignment facility in a laboratory. Using this facility we accurately position the feed stations, internal optics and detector optics relative to the NPOI array line-of-sight. The feed station is cleaned, assembled, internally aligned, tested and placed in its vacuum canister. It is stored under vacuum until transported to the array. In stage two, we align the station on the array by global five-axis adjustments of the vacuum canister.

No further independent internal alignments are necessary. The canister is continuously under vacuum during global alignments. We describe the methodology and techniques for installing the optical feed stations.
DTIC
Alignment; Interferometers; Navy; Optical Measurement; Optical Measuring Instruments; Prototypes; Vacuum

20080020043 Naval Research Lab., Washington, DC USA
Simulated Multi-Beam Observations of Be Stars in the H-alpha Line using the Navy Prototype Optical Interferometer
Gilbreath, G C; Pauls, Thomas A; Armstrong, J T; Mozurkewich, David; Benson, James A; Hindsley, Robert; Driscoll, Daniel; Jan 2003; 12 pp.; In English
Report No.(s): AD-A477349; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Navy Prototype Optical Interferometer has recently been equipped with specially-designed filters that pass H-ALPHA emission in a 2.5 nm band, suppress the continuum 50 nm to either side, and pass the continuum further from the H-ALPHA line. These filters allow fringe tracking on continuum light while taking data at H-ALPHA. Five-and sixaperture NPOI configurations have also been implemented recently. The improvement in U-V coverage with these configurations promises greater image fidelity in multi-spectral imaging as well as in specific lines, such as the very interesting H alpha line. Using an array simulator operating in the AIPS++ environment, we simulate observations of H-alpha emission, assuming approximate source structure taken from earlier work in the literature. These simulations demonstrate the increased imaging capability of multi-aperture arrays and help define optimum H-alpha observation strategies.
DTIC
B Stars; H Alpha Line; Interferometers; Navy; Optical Measurement; Optical Measuring Instruments; Prototypes; Ultraviolet Radiation

20080020344 University of Central Florida, Orlando, FL, USA
Ultra-High Temperature Sensors Based on Optical Property Modulation and Vibration-Tolerant Interferometry (Semi-Annual Report, October 1, 2006-March 31, 2007)
May 21, 2007; 33 pp.; In English
Contract(s)/Grant(s): DE-FC26-03NT41923
Report No.(s): DE2007-908233; No Copyright; Avail.: Department of Energy Information Bridge

The goals of the this part of the Continuation Phase 2 period (Oct. 1, 06 to March 31, 07) of this project were to (a) fabricate laser-doped SiC wafers and start testing the SiC chips for individual gas species sensing under high temperature and pressure conditions and (b) demonstrate the designs and workings of a temperature probe suited for industrial power generation turbine environment. A focus of the reported work done via Kar UCF LAMP lab. is to fabricate the embedded optical phase or doped microstructures based SiC chips, namely, Chromium (C) , Boron (B) and Aluminium (Al) doped 4H-SiC, and to eventually deploy such laser-doped chips to enable gas species sensing under high temperature and pressure. Experimental data is provided from SiC chip optical response for various gas species such as pure N2 and mixtures of N2 and H2, N2 and CO, N2 and CO2, and N2 and CH4. Another main focus of the reported work was a temperature sensor probe assembly design and initial testing. The probe transmit-receive fiber-optics were designed and tested for electrically controlled alignment. This probe design was provided to overcome mechanical vibrations in typical industrial scenarios. All these goals have been achieved and are described in detail in the report.
NTIS
Chips; Fabrication; Interferometry; Modulation; Optical Properties; Silicon Carbides; Temperature Sensors; Vibration

20080020351 Stanford Linear Accelerator Center, Menlo Park, CA, USA; Northwestern Univ., Chicago, IL, USA
Comparison of Non-Redundant Array and Double Pinhole Coherence Measurements with Soft X-rays
Weil, G.; Aug. 25, 2006; 12 pp.; In English
Report No.(s): DE2007-908223; SLAC-TN-06-029; No Copyright; Avail.: National Technical Information Service (NTIS)

Experiments on the future Linac Coherent Light Source (LCLS) and other Free Electron Lasers will need to be performed on a single-shot basis. The double pinhole method of measuring spatial coherence requires a separate measurement, with a different pinhole separation distance, for each length scale sampled. This limits its utility for LCLS. A potential alternative uses a Non-Redundant Array (NRA) of apertures designed to probe the coherence over the range of length scales defined by their physical extent, in a single measurement. This approach was tested by comparing diffraction patterns from soft x-rays incident on double pinhole and NRA absorption mask structures. The double pinhole fringe visibility data serve as discrete reference

points that verify the continuous spectrum of the NRA coherence data. The results present a quantitative analysis of the double pinhole coherence measurements and a qualitative comparison to the NRA images.
NTIS
Free Electron Lasers; Pinholes; X Rays

20080020367 Lawrence Livermore National Lab., Livermore, CA USA
Damage-resistant Single-pulse Optics for X-Ray Free Electron Lasers
Hau-Riege, S.; London, R.; Bogan, M.; Chapman, H.; Bergh, M.; May 08, 2007; 9 pp.; In English
Report No.(s): DE2007-908137; UCRL-CONF-230792; No Copyright; Avail.: National Technical Information Service (NTIS)

Short-pulse ultraviolet and x-ray free electron lasers of unprecedented peak brightness are in the process of revolutionizing physics, chemistry, and biology. Optical components for these new light sources have to be able to withstand exposure to the extremely high-fluence photon pulses. Whereas most optics have been designed to stay intact for many pulses, it has also been suggested that single-pulse optics that function during the pulse but disintegrate on a longer timescale, may be useful at higher fluences than multiple-pulse optics. In this paper we will review damage resistant single-pulse optics that recently have been demonstrated at the FLASH soft-x-ray laser facility at DESY, including mirrors, apertures, and nanolenses. It was found that these objects stay intact for the duration of the 25-fs FLASH pulse, even when exposed to fluences that exceed the melt damage threshold by fifty times or more. We present a computational model for the FLASH laser-material interaction to analyze the extent to which the optics still function during the pulse. Comparison to experimental results obtained at FLASH shows good quantitative agreement.
NTIS
Damage; Free Electron Lasers; X Ray Lasers; Optics

20080020429 ITT Manufacturing Enterprises, Inc., Wilmington, DE USA
Optical nulling apparatus and method for testing an optical surface
Olczak, Eugene, Inventor; Hannon, John J., Inventor; Dey, Thomas W., Inventor; Jensen, Arthur E., Inventor; February 26, 2008; 12 pp.; In English
Contract(s)/Grant(s): NAS5-02200
Patent Info.: Filed November 7, 2005; US-Patent-7,336,370; US-Patent-Appl-SN-11/268,014; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080020429

An optical nulling apparatus for testing an optical surface includes an aspheric mirror having a reflecting surface for imaging light near or onto the optical surface under test, where the aspheric mirror is configured to reduce spherical aberration of the optical surface under test. The apparatus includes a light source for emitting light toward the aspheric mirror, the light source longitudinally aligned with the aspheric mirror and the optical surface under test. The aspheric mirror is disposed between the light source and the optical surface under test, and the emitted light is reflected off the reflecting surface of the aspheric mirror and imaged near or onto the optical surface under test. An optical measuring device is disposed between the light source and the aspheric mirror, where light reflected from the optical surface under test enters the optical measuring device. An imaging mirror is disposed longitudinally between the light source and the aspheric mirror, and the imaging mirror is configured to again reflect light, which is first reflected from the reflecting surface of the aspheric mirror, onto the optical surface under test.
Official Gazette of the U.S. Patent and Trademark Office
Optical Equipment; Mirrors; Light Sources; Reflection; Imaging Techniques

20080020431 California Inst. of Tech., Pasadena, CA USA
Wafer bonded epitaxial templates for silicon heterostructures
Atwater, Harry A., Jr., Inventor; Zahler, James M., Inventor; Morral, Anna Fontcubera I, Inventor; March 11, 2008; 20 pp.; In English
Contract(s)/Grant(s): NAS3-02201
Patent Info.: Filed December 7, 2004; US-Patent-7,341,927; US-Patent-Appl-SN-11/004,808; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080020431

A heterostructure device layer is epitaxially grown on a virtual substrate, such as an InP/InGaAs/InP double

heterostructure. A device substrate and a handle substrate form the virtual substrate. The device substrate is bonded to the handle substrate and is composed of a material suitable for fabrication of optoelectronic devices. The handle substrate is composed of a material suitable for providing mechanical support. The mechanical strength of the device and handle substrates is improved and the device substrate is thinned to leave a single-crystal film on the virtual substrate such as by exfoliation of a device film from the device substrate. An upper portion of the device film exfoliated from the device substrate is removed to provide a smoother and less defect prone surface for an optoelectronic device. A heterostructure is epitaxially grown on the smoothed surface in which an optoelectronic device may be fabricated.
Official Gazette of the U.S. Patent and Trademark Office
Optoelectronic Devices; Indium Gallium Arsenides; Mechanical Devices; Single Crystals; Defects; Fabrication

75
PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

20080018953 American Systems Corp., Chantilly, VA, USA; Army Research Lab., Aberdeen Proving Ground, MD USA
Influence of Pulse Length on Electrothermal Plasma Jet Impingement Flow
Chang, Lang-Mann; Howard, Stephen L; Dec 2007; 26 pp.; In English; Original contains color illustrations
Report No.(s): AD-A476677; ARL-TR-4348; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476677

An experimental investigation has been performed to gain insight into the flows resulting from a plasma jet impinging on a flat plate at representative incident angles of 90 degrees, 60 degrees, and 45 degrees in the open air for two plasma pulse lengths (~0.3 and 1.0 ms). Specifically, the investigation examined the influence of the pulse length on the flow characteristics that may affect the plasma propellant interactions occurring in the electrothermal chemical charge system. Comparisons for the two pulse lengths were made with data including flow pattern, pressure distribution, light intensity, and flow signature on the impingement plate. Distinct differences in these data were observed between the two pulse lengths. Overall results showed that although the plasma with a shorter pulse length was more powerful, it had a shorter time duration of flow interaction. Therefore, the pulse length can be a key parameter to be optimized in order to effectively ignite a charge system with a minimum requirement of electrical energy. Differences in the results from variable incident angles of jet impingement were also evident.
DTIC
Flow Distribution; Jet Impingement; Length; Magnetohydrodynamic Flow; Plasma Jets

20080020300 Los Alamos National Lab., NM USA
Processing Materials Inside an Atmospheric-Pressure Radiofrequency Nonthermal Plasma Discharge
Selwyn, G. S., Inventor; Henins, I., Inventor; Park, J., Inventor; Herrmann, H. W., Inventor; 2 Feb 01; 10 pp.; In English
Contract(s)/Grant(s): DE-W-7405-ENG-36
Patent Info.: Filed Filed 2 Feb 01; US-Patent-Appl-SN-09-776-086
Report No.(s): PB2007-112189; No Copyright; Avail.: CASI: A02, Hardcopy

Apparatus for the processing of materials involving placing a material either placed between an radio-frequency electrode and a ground electrode, or which is itself one of the electrodes. This is done in atmospheric pressure conditions. The apparatus effectively etches or cleans substrates, such as silicon wafers, or provides cleaning of spools and drums, and uses a gas containing an inert gas and a chemically reactive gas.
NTIS
Atmospheric Pressure; Patent Applications; Plasma Jets; Plasma Physics; Radio Frequencies

20080020373 Lawrence Livermore National Lab., Livermore, CA USA
Evaluation of ITER MSE Viewing Optics
Allen, S.; Lerner, S.; Morris, L.; Jayakumar, J.; Holcomb, C.; Mar. 28, 2007; 72 pp.; In English
Report No.(s): DE2007-908133; UCRL-TR-229495; No Copyright; Avail.: National Technical Information Service (NTIS)
No abstract available
Fusion Reactors; Stark Effect; Thermonuclear Reactions; Tokamak Devices; Viewing

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*.

20080020402 Lawrence Livermore National Lab., Livermore, CA USA
Final Report: Biological and Synthetic Nanostructures Controlled at the Atomistic Level
Williamson, A.; van Buuren, T.; Apr. 15, 2007; 26 pp.; In English
Report No.(s): DE2007-908913; UCRL-TR-229912; No Copyright; Avail.: National Technical Information Service (NTIS)

Nanotechnology holds great promise for many application fields, ranging from the semiconductor industry to medical research and national security. Novel, nanostructured materials are the fundamental building blocks upon which all these future nanotechnologies will be based. In this Strategic Initiative (SI) we conducted a combined theoretical and experimental investigation of the modeling, synthesis, characterization, and design techniques which are required to fabricate semiconducting and metallic nanostructures with enhanced properties. We focused on developing capabilities that have broad applicability to a wide range of materials and can be applied both to nanomaterials that are currently being developed for nanotechnology applications and also to new, yet to be discovered, nanomaterials. During this 3 year SI project we have made excellent scientific progress in each of the components of this project. We have developed first-principles techniques for modeling the structural, electronic, optical, and transport properties of materials at the nanoscale. For the first time, we have simulated nanomaterials both in vacuum and in aqueous solution. These simulation capabilities harness the worldleading computational resources available at LLNL to model, at the quantum mechanical level, systems containing hundreds of atoms and thousands of electrons. Significant advances in the density functional and quantum Monte Carlo techniques employed in this project were developed to enable these techniques to scale up to simulating realistic size nanostructured materials. We have developed the first successful techniques for chemically synthesizing crystalline silicon and germanium nanoparticles and nanowires. We grew the first macroscopic, faceted superlattice crystals from these nanoparticles. We have also advanced our capabilities to synthesize semiconductor nanoparticles using physical vapor deposition techniques so that we are now able to control of the size, shape and surface structure of these nanoparticles. We have made advances in characterizing the surface of nanoparticles using x-ray absorption experiments.

NTIS
Germanium; Nanoparticles; Nanostructures (Devices); Silicon

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*.

20080019786 State Univ. of New York, Stony Brook, NY USA
Novel Approaches to Quantum Computation Using Solid State Qubits
Averin, D V; Han, S; Likharev, K K; Lukens, J E; Semenov, V K; Dec 31, 2007; 12 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0439
Report No.(s): AD-A477145; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477145

This is a final performance report on a DURINT project, which summarizes its main achievements, including: the design of sophisticated instrumentation for the control and measurements of superconductor flux qubits, the refinement of qubit fabrication technology, the demonstration of coherent operation of qubits both in frequency and time domain, and the design and analysis of new superconductor devices for processing and measurement of quantum information. Despite several challenges still faced by superconductor-based quantum computing, the project has been a major step toward addressing the still unsolved problems of the field.

DTIC
Quantum Computation; Solid State; Superconductors (Materials)

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*.

20080018947 SRI International Corp., Menlo Park, CA USA
Prime: A PMESII (Political, Military, Economic, Social, Infrastructural and Informational) Model Development Environment
Harrison, Ian; Jan 2008; 49 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8750-06-C-0071; Proj-558S
Report No.(s): ADA476892; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476892

As a key component of effects-based operations (EBO) is to allow analysts to examine the effects that different courses of action would have on a situation from multiple viewpoints, PRIME is a software tool for political, military, economic, social, infrastructural, and informational (PMESII) modeling that supports this need by looking beyond the traditional narrow horizon of examining only the military effects of planned actions. PRIME supports modeling of military actions, as well as diplomatic, information, and economic actions. This effort looked at the expected use cases for a PMESII modeling tool to help identify requirements. An existing structured-argument modeling tool, SEAS, was utilized as the underlying technology base, and the design modified to meet the identified software requirements. This report describes the software design and functionality of the resulting tool. Future research activities that would test the usefulness of PRIME are also discussed,
DTIC
Computer Programs; Economics; Software Development Tools

20080019728 Air Univ., Maxwell AFB, AL USA
Perfecting War: The Search for a Technological Solution to a Human Endeavor
Schnitzer, Eric J; Feb 25, 2005; 54 pp.; In English
Report No.(s): AD-A477002; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477002

This paper discusses the role of technology in war War is a uniquely human endeavor Technology offers the promise of easy victory Humans are perceived as messy and difficult to control, while technology is perceived as clean and easy to control This paper explores both human and technology impacts on warfare in the past, present, and future The challenge for military strategists is to understand the correct emphasis to put on technology while pursuing a human outcome.
DTIC
Military Personnel; Military Technology; Position Sensing

20080019739 Air Force Academy, CO USA
Dismantling Terrorism: Developing Actionable Solutions for Today's Plague of Violence
Scott, Frances K; Nov 2007; 43 pp.; In English
Report No.(s): AD-A477049; SPECIAL-BIB-SER-108; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477049

This bibliography presents books, government documents, reports, and journal articles on various aspects of terrorism. The bibliography is divided into the following sections: causes and origins of terrorism, geographical distribution of terrorist groups, terrorist financing, terrorist groups and networks, the psychology of terrorism, prevention of terrorism, remedies for terrorism, terrorist violence, and bibliographies and reference works.
DTIC
Terrorism; Violence

20080019743 RAND Corp., Santa Monica, CA USA
Portfolio-Analysis Methods for Assessing Capability Options
Davis, Paul K; Shaver, Russell D; Beck, Justin; Jan 2008; 204 pp.; In English
Contract(s)/Grant(s): W74V8H-06-0002
Report No.(s): AD-A477066; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477066

The research reported in this monograph is part of RAND's continuing work on practical theory and methods for

capabilities-based planning in the Department of Defense (DoD) and other organizations. Its particular contribution is to describe and illustrate in some detail an analytic framework and methodology for defensewide capability-area reviews including DoD's experimental Concept Decision Reviews and related evaluations of alternatives (Krieg, 2007). The monograph also describes newly developed enabling tools -- one for generating and screening preliminary options and one for evaluating in a portfolio-analysis structure those options that pass screening. Variants of the methods can be applied for analysis across capability areas or for strategic-level defense planning, i.e., force planning to establish the overall mix and balance of capabilities. Finally, the monograph illustrates concepts with applications to the capability areas of Global Strike and Ballistic Missile Defense (BMD).
DTIC
Decision Theory; Military Operations; Planning

20080019745 Air Command and Staff Coll., Maxwell AFB, AL USA
Network-Centric Operations -- Promise, Chimera, and Achilles' Heel: Challenges and Pitfalls for Networks and Information Infrastructure
Silbaugh, Eric E; Apr 2005; 45 pp.; In English
Report No.(s): AD-A477071; AU/ACSC/5472-2341/2005-04; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477071
Network-Centric Operations (NCO) concepts and capabilities are central to Department of Defense (DoD) transformation efforts and are predicted by advocates to have a wide-ranging impact on the conduct of warfare and military forces. The authors highlight the centrality of NCO to DoD transformation efforts using examples from Joint Vision 2010/2020, the Secretary of Defense's Office of Force Transformation, and Service transformation documents. They examine NCO concepts to identify core characteristics and the underlying capabilities levied on the supporting network. They then analyze several required capabilities to identify challenges and potential impacts should U.S. networks fail to achieve the required performance or collapse under attack. The authors illustrate these challenges using examples from Operation Enduring Freedom and Operation Iraqi Freedom. NCO relies heavily on collaboration and information sharing and creates a radical and challenging set of requirements for supporting networks and information infrastructure. Current and near-term capabilities leave a significant gap between the network and the information infrastructure envisioned and required by NCO. Without this underlying infostructure, the projected benefits of NCO concepts will not be realized and any dependent military capabilities will suffer. The authors conclude by providing recommendations for mitigating some of the identified capability gaps and vulnerabilities.
DTIC
Communication Networks; Computer Networks

20080019748 Danish Defence Research Establishment, Copenhagen, Denmark
Technical Evaluation Report (Workshop on Visualising Network Information)
Rasmussen, Lisbeth M; Dec 1, 2006; 5 pp.; In English
Report No.(s): AD-A477078; IST-063; RWS-010; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477078
No abstract available
Inspection; Military Technology; Visual Observation

20080019769 Defence Research and Development Canada, Valcartier, Quebec Canada
Characterisation and Showcasing of Network Visualisation Approaches for Command and Control
Bouchard, Alain; Vernik, Rudi; Oct 18, 2006; 43 pp.; In English; Original contains color illustrations
Report No.(s): AD-A477114; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477114
No abstract available
Command and Control; Display Devices

20080019770 Canadian Army Operational Research Establishment, Ottawa, Ontario Canada
Situation Awareness. Report of Break-Out Group 4
Horeczy, Christopher A; Lem, Marcus; McMullen, Sonya; Porathe, Thomas; Stamm, Joachim; Varga, Margaret; Oct 2006; 13 pp.; In English; Original contains color illustrations
Report No.(s): AD-A477115; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477115
No abstract available
Display Devices; Situational Awareness

20080019772 Norwegian Defence Research Establishment, Oslo, Norway
Reliability and Uncertainty in Situation Awareness of Network Visualization. Report of Break-Out Group 2
Bjoerke, Jan T; Jacobson, Zack; McMullen, Mac J; Memon, Nasrullah; Opitz, Felix; Rasmussen, Lisbeth M; Oct 2006; 12 pp.; In English; Original contains color illustrations
Report No.(s): AD-A477118; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477118
No abstract available
Reliability; Situational Awareness

20080019773 Taylor (Martin) Consulting, Toronto, Ontario Canada
Framework-Survey Integration Group Report. Report of Break-Out Group 1
Taylor, M M; Vanderbilt, Amy K; Nixon, Mark R; Zeltzer, David; Bouchard, Alain; Oct 2006; 13 pp.; In English; Original contains color illustrations
Report No.(s): AD-A477119; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477119
No abstract available
Information Management; Surveys; User Requirements

20080019777 Pennsylvania State Univ., University Park, PA USA
Reliability and Uncertainty in Situational Awareness
Hall, David; Akbar Hussain, D M; Johansen, Tom; Kamp, Vera; Kesavadas, T; Dec 1, 2006; 22 pp.; In English; Original contains color illustrations
Report No.(s): AD-A477131; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477131
No abstract available
Information Systems; Reliability; Situational Awareness

20080019785 Humansystems, Inc., Guelph, Ontario Canada
CF Procedures and Practices Involving Information Aggregation
Bandali, F; Bruyn, L; Vokac, R; Keeble, R; Zobarich, R; Berger, N; Rehak, L; Lamoureux, Tabbeus; Mar 2007; 231 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W7711-037911/001/TOR
Report No.(s): AD-A477143; DRDC-CR-2007-049; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477143
The operational effectiveness of the Canadian Forces (CF) depends on being able to make timely and appropriate decisions. Decision making can benefit from full knowledge of all variables involved in the decision. However in a practical setting, especially under time constraints, an individual rarely has access to all relevant information or may find it difficult to judge the reliability of all the information. To manage the information demands that arise out of complex situations, expertise is often divided among several people who are knowledgeable in their field, and therefore can contribute only what they know about a situation. Hence, information must be combined from several sources to compose the big picture before an appropriate decision can be reached. Good aggregation methods allow each expert to express their opinions and appropriately weigh each option to produce the final aggregated decision. The Canadian Forces (CF) actively engages in information aggregation related activities. In situations of peace, conflict and war, the CF carries out a series of sub activities performed by experts, automated systems, and groups representing a variety of disciplines. Successful mission accomplishment is dependent on aggregating the

outcomes of these sub activities and executing accordingly to achieve strategic goals. Although CF operations exhibit information aggregation related activities, there is a lack of information regarding the aggregation methods currently used by the CF. In order to bridge gaps in knowledge, this report examines information aggregation and its related activities from two CF perspectives: the Intelligence Cycle (IC) and the Operational Planning Process (OPP). Accordingly, a doctrinal review and Subject Matter Expert (SME) interviews were conducted. The purpose of the doctrinal review was to identify CF procedures that were rich in information aggregation related activities.
DTIC
Decision Making; Intelligence; Procedures; System Effectiveness

20080019793 Humansystems, Inc., Guelph, Ontario Canada
Human Factors Research Conducted under the COMDAT Technology Demonstrator Project
Matthews, Michael L; Rehak, Lisa; McFadden, Sharon; Dec 2007; 113 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W7711-03-7882-001-TOR
Report No.(s): AD-A477155; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477155

The purpose of the Command Decision Aiding Technology (COMDAT) Technology Demonstrator Project (TDP) was to research and demonstrate multi-source data fusion (MSDF) technologies and carry out human factors (HF) studies to support upgrades to the Halifax Class Command and Control System (CCS), in the area of battle space awareness. Since the requisite HF knowledge to support this TDP did not exist, the HF component included the generation of the founding knowledge necessary for decision aid development in future projects. The major work items included: 1) the conduct of cognitive and functional task analyses to define the information requirements of the major Operations Room positions on Halifax Class ships; 2) the development of human-in-the-loop measures of performance in order to evaluate strategies for conducting performance evaluations, define current performance in the Operations Room, and evaluate technologies including MSDF; 3) recommendations for improvements to human computer interfaces in the existing CCS and the Technology Demonstrator (TD); 4) the development of a concept of operations for user involvement in MSDF; and 5) support for an evaluation of operator-system picture compilation performance using the final TD. The detailed results of the HF work have been published in a series of reports over the course of the project which lasted from June 2000 to March 2007. This final report provides a summary of the reports along with related material that informed and supplemented this work, some lessons learned, and recommendations for future work. Overall, we have a better understanding of the usefulness of the methods that were investigated as well as considerably more knowledge about the information requirements and processes involved in building the tactical picture in the Halifax Class Operations Room.
DTIC
Command and Control; Decision Making; Human Factors Engineering; Multisensor Fusion; Proving

20080019795 PLATH Gmbh, Hamburg, Germany
KDD - Overcoming Massive Data Streams for Intelligence Tasks
Kamp, Vera; Dec 1, 2006; 33 pp.; In English; Original contains color illustrations
Report No.(s): AD-A477157; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477157

No abstract available
Data Flow Analysis; Detection; Intelligence; Protocol (Computers); Radio Signals; Reconnaissance

20080019801 Alward, [Randy G.], Ontario Canada
A Need for Better Network Visualization
Alward, Randy G; Oct 2006; 35 pp.; In English; Original contains color illustrations
Report No.(s): AD-A477172; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477172

No abstract available
Communication Networks; Computer Networks; Information Management; Security

20080019803 Pennsylvania State Univ., University Park, PA USA

A Three Pronged Approach for Improved Data Understanding: 3-D Visualization, Use of Gaming Techniques, and Intelligent Advisory Agents

Hall, David L; McNeese, Michael; Yen, John; El-Nasr, Magy S; Oct 2006; 36 pp.; In English; Original contains color illustrations

Report No.(s): AD-A477174; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA477174

No abstract available

Cognition; Data Processing; Decision Support Systems; Scientific Visualization

20080019974 Humansystems, Inc., Guelph, Ontario Canada

Review of Spatial-Database System Usability: Recommendations for the ADDNS Project

Abdalla, R M; Niall, K K; Dec 2007; 56 pp.; In English; Original contains color illustrations

Report No.(s): AD-A477207; DRDC-TORONTO-TR-2007-141; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Geospatial information systems (GIS) are a relatively new technology. The key GIS technology strengths are its capabilities to store attributes of various spatial features, provide spatial-analysis functionality and offer multiple-perspective, two-dimensional (2D) and three-dimensional (3D) visualizations. This report presents an overview of the basic concepts of GIS and spatial databases, provides an analytical usability evaluation and critically analyses different spatial- database applications for different fields, with special emphasis on defence-related applications. We provide a comprehensive spatial-database evaluation methodology. Basic and advanced functions for GIS operations are analysed, with a focus on selected major GIS products and selected common database systems. Optimal system-requirement recommendations for spatial-database design are provided, with particular attention paid to the needs of the Advanced Deployable Day and Night Simulation (ADDNS) project. This report provides a detailed overview of spatial-database technologies to assist decision-makers with selecting the best system for a particular task.

DTIC

Data Bases; Information Systems; Spatial Distribution

20080019989 Tech Reach, Inc., State College, PA USA

Cognitive Engineering Research Methodology: A Proposed Study of Visualization Analysis Techniques

Hall, Cristin M; McMullen, Sonya A; Hall, David L; Oct 2006; 37 pp.; In English; Original contains color illustrations

Report No.(s): AD-A477243; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

Cognition; Data Processing

20080019996 Naval Surface Warfare Center, Dahlgren, VA USA

1991 Report to The Community

Mar 25, 1991; 38 pp.; In English

Report No.(s): AD-A477264; NAVSWC-MP-91-097; No Copyright; Avail.: Defense Technical Information Center (DTIC)

For more than 70 years, the Naval Surface Warfare Center (NAVSWC) and its community neighbors in Virginia's Northern Neck and southern Maryland have prospered in a much-treasured partnership that is secured by the common bonds of friendship, patriotism, national defense, and economics. Together, we have a lot to be proud of-this community's military and civilians have emulated the highest standard of outstanding achievement to safeguard America's technological edge. The history of the past seven decades has been punctuated by certain and steady progress for both the installation and its community neighbors as NAVSWC grew from a small proving ground for testing naval guns to one of the largest research and development (R&D) centers in the USA. The history of the future is certain to be punctuated by the hopes and dreams of even more steady progress as NAVSWC excels to its missions to be the principal Navy RDT&E Center for surface ship combat systems, ordnance, mines, and strategic systems support. NAVSWC (formerly the Naval Surface Weapons Center) was established in 1974 with the merger of the Naval Ordnance Laboratory (NOL) at White Oak, Maryland and the Naval Weapons Laboratory (NWL) at Dahlgren, Virginia. This consolidation of human resources, facilities, and research, development, test, and evaluation (RDT&E) in support of the Fleet enhances the tradition of excellence at each laboratory.

DTIC

Defense Program; Economics; Public Relations

20080019998 EADS Deutschland G.m.b.H, Ulm, Germany

Information Fusion and Visualisation in Anti Asymmetric Warfare

Opitz, Felix; Trapp, Thilo; Daestner, Kaeye; Kausch, Thomas; Dec 1, 2006; 49 pp.; In English; Original contains color illustrations

Report No.(s): AD-A477272; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

Asymmetry; Multisensor Fusion; Warfare

20080020041 Baker (Wilfred) Engineering, Inc., San Antonio, TX USA

Toward Secure Services from Untrusted Developers

Brodsky, Micah; Efstathopoulos, Petros; Kaashoek, Frans; Kohier, Eddie; Krohn, Maxwell; Mazieres, David; Morris, Robert; VanDeBogart, Steve; Yip, Alexander; Aug 6, 2007; 23 pp.; In English

Contract(s)/Grant(s): CNS-0430425

Report No.(s): AD-A477345; MIT-CSAIL-TR-2007-041; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We present a secure service prototype built from untrusted, contributed code. The service manages private data for a variety of different users, and user programs frequently require access to other users' private data. However, aside from covert timing channels, no part of the service can corrupt private data or leak it between users or outside the system without permission from the data's owners. Instead, owners may choose to reveal their data in a controlled manner. This application model is demonstrated by Muenster, a job search website that protects both the integrity and secrecy of each user's data. In spite of running untrusted code, Muenster and other services can prevent overt leaks because the untrusted modules are constrained by the operating system to follow pre-specified security policies, which are nevertheless flexible enough for programmers to do useful work. We build Muenster atop Asbestos, a recently described operating system based on a form of decentralized information flow control [5].

DTIC

Coding; Security

20080020057 Greater San Antonio Hospital Council, TX USA

Implementation of a Regional Healthcare Information Organization in South Central Texas

Barry, Michael R; Dec 6, 2007; 49 pp.; In English

Report No.(s): AD-A477386; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The purpose of this Graduate Management Project is to delineate the strategic plan necessary to successfully implement the South Central Texas Regional Healthcare Information Organization (RHIO) under the auspices of the Greater San Antonio Hospital Council and the Greater San Antonio Healthcare Foundation. The strategic planning process used for this endeavor is the Ginter, Swayne, and Duncan process outlined in Strategic Management of Healthcare Organizations (2002). The RHIO concept is not a new concept, however recent advances in technology are now making interconnected health communities a reality. Currently there are no efforts in Texas to connect communities through health information technology (IT). The Greater San Antonio Hospital Council has taken the innovative step toward the development of a RHIO to reach the goals of reducing healthcare costs, improving quality, reducing medical errors, and improving patient safety through interconnected, interoperable health IT, such as the electronic health records (EHR), and personal health records (PHR).

DTIC

Health; Information Systems; Management Systems; Medical Services

20080020062 Army Medical Command, Fort Sam Houston, TX USA

A Proposed Conceptual Model to Measure Unwarranted Practice Variation

Barr, Andrew M; May 3, 2007; 58 pp.; In English

Report No.(s): AD-A477397; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Unwarranted clinical practice variation is a well documented detractor from positive clinical outcomes. A challenge exists, however, in differentiating appropriate practice variation from unwarranted practice variation. Unwarranted practice variation can be defined as illogical deviation from clinical practice norms that do not support evidence-based medicine or patient desires. Employing a unit of analysis of the U.S. Army healthcare system and utilizing research by Wennberg and the Institute of Medicine, a model describing healthcare quality in terms of unwarranted practice variation and healthcare outcomes is

posited as a framework for future investigation and study. Study limitations and recommendations for further study are discussed.
DTIC
Clinical Medicine; Models

20080020065 Massachusetts Univ., Amherst, MA USA
The Smoothed Dirichlet Distribution: Understanding Cross-Entropy Ranking in Information Retrieval
Nallapati, Ramesh; Jul 2006; 129 pp.; In English
Contract(s)/Grant(s): N66001-99-1-8912; N66001-02-1-8903
Report No.(s): AD-A477407; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Unigram Language modeling is a successful probabilistic framework for Information Retrieval (IR) that uses the multinomial distribution to model documents and queries. An important feature in this approach is the usage of the empirically successful cross-entropy function between the query model and document models as a document ranking function. However, this function does not follow directly from the underlying models and as such there is no justification available for its usage till date. Another related and interesting observation is that the naive Bayes model for text classification uses the same multinomial distribution to model documents but in contrast, employs document-log-likelihood that follows directly from the model, as a scoring function. Curiously, the document-log-likelihood closely corresponds to cross entropy, but to an asymmetric counterpart of the function used in language modeling. It has been empirically demonstrated that the version of cross entropy used in IR is a better performer than document-log-likelihood, but this interesting phenomenon remains largely unexplained.
DTIC
Dirichlet Problem; Entropy; Information Retrieval; Mathematical Models; Ranking

20080020069 Johns Hopkins Univ., Baltimore, MD USA
Implementation of Get with the Guideline Acute Myocardial Infarction Program at Johns Hopkins Hospital and Its Effect on Core Measures
Richter, Jason P; May 25, 2007; 38 pp.; In English
Report No.(s): AD-A477429; No Copyright; Avail.: Defense Technical Information Center (DTIC)

John Hopkins Hospital implemented the Get with the Guidelines (GWTG) evidence-based program for use with patients who have Acute Myocardial Infarction (AMI), a component of Congenital Heart Disease (CHD). CHD is the single leading cause of death for persons in the USA. The GWTG program is a web-based tool developed by the American Heart Association (AHA) that allows for data entry and benchmarking of AHA guidelines. The stated goal of the evidence-based program is to save patient lives and can be reached through the identification of delays in treatment and failure to provide secondary prevention therapies. A reduction in door-to-balloon time and compliance with arrival and discharge medication protocol is important because research shows that these save patient lives. Through the use of the GWTG program and other process improvements, Johns Hopkins Hospital is on its way to becoming a national benchmark hospital for core measure arrival and discharge medications, and has a plan in place to reduce the door-to-balloon time to meet established AHA guidelines.
DTIC
Hospitals; Information Systems; Myocardial Infarction; Patients; Therapy

20080020093 Massachusetts Univ., Amherst, MA USA
Million Query Track 2007 Overview
Allan, James; Carterette, Ben; Aslam, Javed A; Pavlu, Virgil; Dachev, Blagovest; Kanoulas, Evangelos; Jan 2007; 21 pp.; In English
Contract(s)/Grant(s): HR0011-06-C-0023; IIS-0534482
Report No.(s): AD-A477493; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Million Query (1MQ) track ran for the first time in TREC 2007. It was designed to serve two purposes. First, it was an exploration of ad-hoc retrieval on a large collection of documents. Second, it investigated questions of system evaluation, particularly whether it is better to evaluate using many shallow judgments or fewer thorough judgments. Participants in this track were assigned two tasks: (1) run 10,000 queries against a 426Gb collection of documents at least once and (2) judge documents for relevance with respect to some number of queries. Section 1 describes how the corpus and queries were selected, details the submission formats, and provides a brief description of all submitted runs. Section 2 provides an overview of the judging process, including a sketch of how it alternated between two methods for selecting the small set of documents

to be judged. Sections 3 and 4 provide details of those two selection methods, developed at UMass and NEU, respectively. The sections also provide some analysis of the results. In Section 6 we present some statistics about the judging process, such as the total number of queries judged, how many by each approach, and so on. We present some additional results and analysis of the overall track in Sections 7 and 8.
DTIC
Information Retrieval; Systems Analysis

20080020095 Massachusetts Univ., Amherst, MA USA
Autocorrelation and Regularization of Query-Based Information Retrieval Scores
Diaz, Fernando; Feb 2008; 146 pp.; In English
Contract(s)/Grant(s): N66001-99-1-8912; N66001-02-1-8903
Report No.(s): AD-A477497; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Query-based information retrieval refers to the process of scoring documents given a short natural language query. Query-based information retrieval systems have been developed to support searching diverse collections such as the world wide web, personal email archives, news corpora, and legal collections. This thesis is motivated by one of the tenets of information retrieval: the cluster hypothesis. We define a design principle based on the cluster hypothesis which states that retrieval scores should be locally consistent. We refer to this design principle as score autocorrelation. Our experiments show that the degree to which retrieval scores satisfy this design principle correlates positively with system performance. We use this result to define a general, black box method for improving the local consistency of a set of retrieval scores. We refer to this process as local score regularization. We demonstrate that regularization consistently and significantly improves retrieval performance for a wide variety of baseline algorithms. Regularization is closely related to classic techniques such as pseudo-relevance feedback and cluster-based retrieval. We demonstrate that the effectiveness of these techniques may be explained by their regularizing behavior. We argue that regularization should be adopted either as a generic post-processing step or as a fundamental design principle for retrieval models.
DTIC
Autocorrelation; Information Retrieval

20080020098 Massachusetts Univ., Amherst, MA USA
Topic Models in Information Retrieval
Wei, Xing; Aug 2007; 145 pp.; In English
Contract(s)/Grant(s): N66001-02-1-8903
Report No.(s): AD-A477505; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Topic modeling demonstrates the semantic relations among words, which should be helpful for information retrieval tasks. We present probability mixture modeling and term modeling methods to integrate topic models into language modeling framework for information retrieval. A variety of topic modeling techniques, including manually-built query models, term similarity measures and latent mixture models, especially Latent Dirichlet Allocation (LDA), a formal generative latent mixture model of documents, have been proposed or introduced into IR tasks. We investigated and evaluated them on several TREC collections within presented frameworks, and show that significant improvements over previous work can be obtained. Practical problems such as efficiency and scaling considerations are discussed and compared for different topic models. Other recent topic modeling techniques are also discussed.
DTIC
Information Retrieval; Models; Semantics

20080020113 Massachusetts Univ., Amherst, MA USA
Retrieval Performance Prediction and Document Quality
Zhou, Yun; Sep 2007; 150 pp.; In English
Contract(s)/Grant(s): HR0011-06-C-0023
Report No.(s): AD-A477543; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The ability to predict retrieval performance has potential applications in many important IR (Information Retrieval) areas. In this thesis, we study the problem of predicting retrieval quality at the granularity of both the retrieved document set as a whole and individual retrieved documents. At the level of ranked lists of documents, we propose several novel prediction models that capture different aspects of the retrieval process that have a major impact on retrieval effectiveness. These techniques make performance prediction both effective and efficient in various retrieval settings including a Web search

environment. As an application, we also provide a framework to address the problem of query expansion prediction. At the level of documents, we predict the quality of documents in the context of Web ad-hoc retrieval. We explore document features that are predictive of quality. Furthermore, we propose a document quality language model to improve retrieval effectiveness by incorporating quality information.
DTIC
Computer Programs; Information Retrieval; Mathematical Models; Performance Prediction

20080020213
Out of Bounds: Innovation and Change in Law Enforcement Intelligence Analysis
Osborne, Deborah; Mar 2006; 190 pp.; In English
Report No.(s): AD-A476634; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476634

Since 9/11, national security agencies and law enforcement agencies are seeking to build unprecedented partnerships. The urgent need to identify and prevent potentially destructive actions by those who threaten to harm us as a nation on our own territory demands new alliances. New ways of thinking to achieve a more secure homeland are not only desirable, but also essential to our continued survival. This book explores analytical capabilities in law enforcement, with a focus on local applications. Along with those in the political and media arenas, the 9/11 Commission has not recognized that intelligence analytical capacities exist in state and local law enforcement, and little mention of this emerging resource exists in the literature of the war on terrorism, or the Long War. The purpose of this book is to inform the larger community of federal government agencies, including law enforcement, national security, and other interested entities, as well as the citizens of this country and beyond, about the intelligence analytical capabilities existing in local and state levels of law enforcement. This work challenges the thinking of the national Intelligence Community and its analysts, as well as the law enforcement community, by using an organizational change management process called Appreciative Inquiry. Appreciative Inquiry focuses on using imagination, the very thing found lacking in the U.S. Intelligence Community in evaluations of intelligence failures. The first stage of this process, the discovery stage, is incorporated into this work through success stories revealed in the author's interviews with analysts and experts who have contributed to real-world analytical work in law enforcement. Those success stories illustrate local law enforcement analytical capabilities.
DTIC
Intelligence; Law (Jurisprudence)

20080020304 Naval Postgraduate School, Monterey, CA USA
Strategic Change and the Joint Terrorism Task Force: Ideas and Recommendations
D'Angelo, Anthony P; Sep 2007; 149 pp.; In English; Original contains color illustrations
Report No.(s): AD-A477108; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477108

The September 11, 2001, terrorist attacks were a watershed event in this country's history that significantly affected law enforcement agencies and organizations at all levels, including the FBI and the multidisciplinary Joint Terrorism Task Forces. The terrorist attacks served as a catalyst for evaluating cultural, psychological and organizational processes, policies and procedures that influenced the FBI and impacted the JTTF program. In 2006 a comprehensive study was conducted to investigate whether FBI provided JTTF members with the necessary tools to support their investigations. The study identified a number of deficiencies. In order to adapt and combat an emergent asymmetric threat, the JTTF must identify and analyze specific actions and best practices necessary to prepare, execute, and support strategic change and innovation and overcome obstacles that impede the process. It is also necessary to identify and implement best and/or smart practices, especially those plans, policies, and procedures that ensure the skills, experience, and expertise of task force participants are maximized and seamlessly integrated into the JTTF program. The implementation of standardized written procedures that detail roles, responsibilities, training, orientation, and access to databases and information sharing will better enable participants to efficiently contribute to the JTTF mission. Institutionalizing an innovative culture and framework that provides the flexibility to evaluate and develop necessary skills and competencies in participant stakeholders is essential for the future success of the JTTF program.
DTIC
Terrorism; Surveillance; Intelligence

20080020307 Library of Congress, Washington, DC USA
Information Warfare and Cyberwar: Capabilities and Related Policy Issues
Wilson, Clay; Jul 19, 2004; 22 pp.; In English
Report No.(s): AD-A477185; CRS-RL31787; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA477185

This report describes the emerging areas of information warfare and cyberwar in the context of U.S. national security. It assesses known U.S. capabilities and plans, and suggests related policy issues of potential interest to Congress. This report will be updated to accommodate significant changes. Military planning is shifting away from the Cold War view that power is derived from platforms, and more toward the view that combat power can be enhanced by communications networks and technologies that control access to, and directly manipulate information. As a result, information itself is now both a tool and a target of warfare. As concepts emerge, new uses of technology to disrupt the flow of information to affect the ability or willingness of an adversary to fight is referred to by several names: information warfare, cyberwar, and netwar. The U.S. Department of Defense uses the term Information Operations, and has grouped related activities into five core capabilities: Psychological Operations, Military Deception, Operational Security, Computer Network Operations, and Electronic Warfare. Some weapons used for IO are referred to as non-kinetic, and include high power microwave (HPM) or directed electromagnetic energy weapons (EMP) that, in short pulses, can overpower and permanently degrade computer circuitry, or in other applications, can cause temporary physical discomfort.
DTIC
Electronic Warfare; Policies; Warfare

88
SPACE SCIENCES (GENERAL)

Includes general research topics related to the natural space sciences. For specific topics in space sciences see *categories 89 through 93*.

20080019649 NASA Langley Research Center, Hampton, VA, USA
Reconstruction of the Genesis Entry
Desai, Prasun N.; Qualls, Garry D.; Schoenenberger, Mark; January 2007; 19 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 439654.02.07.01.01; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080019649

An overview of the reconstruction analyses performed for the Genesis capsule entry is described. The results indicate that the actual entry prior to the drogue deployment failure was very close to the pre-entry predictions. The capsule landed 8.3 km south of the desired target at Utah Test and Training Range. Analysis on infrared video footage (obtained from the tracking stations) during the descent estimated the onset of the capsule tumble at Mach 0.9. Frequency analysis on the infrared video data indicates that the aerodynamics generated for the Genesis capsule reasonably predicted the drag and static stability. Observations of the heatshield support the pre-entry simulation estimates of a small hypersonic angles-of-attack, since there is very little, if any, charring of the shoulder region or the aftbody. Through this investigation, an overall assertion can be made that all the data gathered from the Genesis entry is consistent with flight performance that was close to the nominal preentry prediction. Consequently, the design principles and methodologies utilized for the flight dynamics, aerodynamics, and aerothermodynamics analyses have been corroborated.
Author
Space Capsules; General Overviews; Aerothermodynamics; Genesis Mission; NASA Space Programs

20080019725 Academy of Sciences (USSR), Irkutsk, Russian Federation
GPS Users Positioning Errors during Disturbed Near-Earth Space Conditions
Afraimovich, E L; Demyanov, V V; Tatarinov, P V; Astafieva, E I; Zhivetiev, I V; Jun 1, 2006; 15 pp.; In English; Original contains color illustrations
Report No.(s): AD-A476988; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476988

No abstract available
Artificial Satellites; Earth Orbits; Errors; Global Positioning System; Navigation Satellites; Positioning

89
ASTRONOMY

Includes observations of celestial bodies; astronomical instruments and techniques; radio, gamma-ray, x-ray, ultraviolet, and infrared astronomy; and astrometry.

20080019979 State Univ. of New York, Stony Brook, NY USA
Early Type Stars as Calibrators for Ground-Based Interferometry
Yoon, Jinmi; Peterson, Deane M; Amstrong, Thomas; Clark III, James H; Gilbreath, Charmaine; Pauls, Thomas; Schmitt, Henrique R; Jan 2006; 8 pp.; In English
Report No.(s): AD-A477225; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Visibility measurements with Michelson interferometers, particularly the measurement of fringe contrast, are affected by various atmospheric and instrumental effects, all of which reduce the measured contrast. To compensate for this, stars with known or predictable diameters (calibrators) are observed so that the overall reduction in the visibility can be measured. Objects with the smallest possible diameters are preferred as calibrators, since the predicted visibilities become less sensitive to any uncertainties. Therefore, unreddened, early type stars are usually chosen if they are available because they are relatively bright for a given angular diameter. However early type stars bring additional complications. Rapid rotation, common with these stars can cause variations in the visibility amplitudes due to oblateness and surface brightness asymmetries that are larger than implied by the usual error estimates. In addition, rotation can introduce significant phase offsets. Using Roche models, von Zeipel theory, and the observed constraints of V, B-V, and v sin i, it is possible to put limits on the size of these effects and even estimate the distribution of possible visibilities. To make this easily available to the community, we are in the process of creating a catalog of possible calibrators, including histograms of the visibilities, calculated for configurations used at a number of observatories. We show the examples of several early type stars which are potential calibrators using parameters appropriate for the Navy Prototype Optical Interferometer.
DTIC
Calibrating; Early Stars; Interferometry

20080019980 Naval Research Lab., Washington, DC USA
Toward Complex Visibilities Using Optical Interferometry: Multi-Wavelength Phase Referencing
Pauls, Thomas A; Schmitt, Henrique R; Tycner, Christopher; Armstrong, J T; Benson, James A; Clark, James H; Gilbreath, G Charmaine; Hindsley, Robert B; Hutter, Donald J; Jorgensen, Anders M; Jan 2006; 7 pp.; In English
Report No.(s): AD-A477229; NRL-RN-06-1226-1990; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We report on experiments in multi-wavelength phase referencing using the Navy Prototype Optical Interferometer (NPOI). In these experiments we use the unique capability of the NPOI to simultaneously observe 16 spectral channels covering 512-850 nm on multiple baselines simultaneously. We present observations of the well-known Be star Zeta-Tauri using custom filters which allow us to isolate the H-alpha line in a single spectral channel while the other channels observe the stellar continuum. Since the central star is unresolved, we can use the data in the continuum channels to calibrate the spectral line data. Using the phase information recovered in this way, it is possible for the first time to use standard techniques to construct simple images of the line-emitting region around the star.
DTIC
Astronomical Observatories; Interferometers; Navy; Optical Measurement; Prototypes; Visibility

20080019981 Naval Research Lab., Washington, DC USA
Using Differential Phases in Optical Interferometry
Schmitt, Henrique R; Pauls, Thomas A; Tycner, Christopher; Armstrong, J T; Benson, James A; Clark, James H; Hindsley, Robert B; Hutter, Donald J; Peterson, Deane M; Jorgensen, Anders M; Jan 2006; 9 pp.; In English
Report No.(s): AD-A477230; NRL-RN-06-1226-1814; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We present the results of differential phase experiments done with data from the Navy Prototype Optical Interferometer (NPOI). We take advantage of the fact that this instrument simultaneously records 16 spectral channels in the wavelength range 550-850nm, for multiple baselines. We discuss the corrections applied to the data, and show the results obtained for Vega and the Be star beta-Lyrae.
DTIC
Astronomical Observatories; Differential Interferometry; Interferometers; Navy; Optical Measurement; Prototypes

20080019984 State Univ. of New York, Stony Brook, NY USA

Resolving the Effects of Rotation in Early Type Stars

Peterson, Deane M; Hummel, Christian A; Pauls, Thomas; Armstrong, Thomas; Benson, James; Gilbreath, Charmaine; Hindsley, Robert; Hutter, Donald; Mozurkewich, David; Jan 2004; 9 pp.; In English

Report No.(s): AD-A477236; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We review the theory of rotating stars, first developed 80 years ago. Predictions include a specific relation between shape and angular velocity and between surface location and effective temperature and effective gravity. Seen at arbitrary orientation rapidly rotating stars will display ellipsoidal shapes and possibly quite asymmetric intensity distributions. The flattening due to rotation has recently been detected at PTI and VLTI. With the increasing baselines available in the visible and the implementation of closure phase measurements at the NPOI it is now possible to search for the surface brightness effects of rotation. Roche theory predicts only large scale deviations from the usual centro-symmetric limb-darkened models, ideal when the stellar disks are only coarsely imaged as now. We report here observations of Altair and Vega with the NPOI using baselines that detect fringes beyond the first Airy zero in both objects. Asymmetric, non-classical intensity distributions are detected. Both objects appear to be rotating at a large fraction of their breakup velocity. Vega is nearly pole on, accounting for its low apparent rotational velocity. Altair's inclination is intermediate, allowing high S/N detection of all the predicted features of a Roche spheroid. We describe how these objects will test this fundamental theory and how Vega's role as a standard will need reinterpretation.

DTIC

Darkening; Early Stars; Gravitation; Interferometry; Resolution; Roche Limit; Rotation

20080020011 Naval Research Lab., Washington, DC USA

Estimation of Fringe Parameters

Mozurkewich, D; Armstrong, J T; Gilbreath, G C; Pauls, T A; Jan 2004; 11 pp.; In English

Report No.(s): AD-A477296; NRL-RN-04-1226-1873; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this report we explore replacing the widely used optimal V2 estimator with a model-fitting approach. We show that it is possible to fit the fringe power spectra with a physically reasonable model. This approach eliminates the biggest problem with the standard squared visibility estimator - determining the additive, detector-noise bias. We examine the dependence of the bias on count rate for consistency between on- and off-fringe measurements. The change of bias with fringe frequency provides additional information about the performance of the detectors. We have also applied a similar approach to the bias correction for the triple product, with comparable results.

DTIC

Estimates; Independent Variables

20080020012 Naval Research Lab., Washington, DC USA

Fringe Fitting for Coherent Integrations with the NPOI

Jorgensen, A M; Mozurkewich, D; Armstrong, T; Hindsley, R; Pauls, T; Gilbreath, C; Restaino, S; Jan 2004; 13 pp.; In English

Report No.(s): AD-A477297; NRL-RN-03-1221.1-2639; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We have developed a method for performing long coherent integrations with the Navy Prototype Optical Interferometer (NPOI), which is based on fitting a model fringe pattern to the NPOI data frames. The procedure is quite computationally intensive, but gives a better estimation of the phase than the conventional method of locating the peak of the group delay power. We mention briefly some of the most important past work on coherent integration, and then describe our method. We conclude that the fitting approach produces a phase with fewer outliers than the Fourier-transform group delay approach. We show how the instrumental squared visibility varies as a function of the fringe model used, and show that it provides a better SNR than the FT method. The phase determination will always be imperfect, and thus cause a reduction in the visibility amplitude relative to the true instrumental visibility. We illustrate a method for calibrating the visibility amplitude. With long coherent integrations the phase of the visibility can be extracted. We show examples of visibility phases and how to correct them for phase variations in the instrument. Finally, we illustrate a method for measuring stellar diameters very precisely, to one part in at least several hundred.

DTIC

Fitting; Interferometers; Interferometry; Navy; Optical Measurement; Prototypes

20080020013 Naval Research Lab., Washington, DC USA

H-alpha Observations Using Closure Phases at the NPOI

Gilbreath, G; Pauls, Thomas A; Armstrong, J T; Mozurkewich, David; Clark, James H; Hindsley, Robert B; Hutter, Donald J; Jan 2004; 9 pp.; In English

Report No.(s): AD-A477298; NRL-RN-04-1226-2132; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We have enhanced the spectral resolution of the Navy Prototype Optical Interferometer (NPOI) at the H-alpha line to 3 nm (FWHM). We use customized filters that suppresses light in the ~600-725 nm window except for light at the H-alpha wavelength (656.3 nm). The bands shortward of 600 nm and longward of 725 nm are used for fringe tracking and for calibrating the system fringe visibility. We have used these filters to observe H-alpha emission from circumstellar material around Be stars. Closure phases from our initial observations of the Be star zeta Tau with three array elements suggest that the H-alpha emission is not centered on the star. We will show these three-element results, as well as recently-acquired data from the NPOI using 4, 5, and 6 stations.

DTIC

H Alpha Line; Interferometers; Interferometry; Navy; Optical Measurement; Prototypes

20080020014 Naval Research Lab., Washington, DC USA

NPOI: Recent Technology and Science

Benson, J A; Hutter, D J; Johnston, K J; Zavala, R T; White, N M; Pauls, T A; Gilbreath, G C; Armstrong, J T; Hindsley, R B; Jan 2004; 9 pp.; In English

Report No.(s): AD-A477299; NRL-RN-04-1226-2137; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We describe recent science projects that the Navy Prototype Optical Interferometer (NPOI) scientific staff and collaborators are pursuing. Recent results from the wide angle astrometric program and imaging programs (rapid rotators, binaries and Be stars) will be summarized. We discuss some of the technology that enables the NPOI to operate routinely as an observatory astronomical instrument.

DTIC

Interferometers; Interferometry; Navy; Optical Measurement; Prototypes

20080020015 Naval Research Lab., Washington, DC USA

Precision Narrow-Angle Astrometry of Binary Stars with the Navy Prototype Optical Interferometer

Armstrong, J T; Clark, III, James H; Gilbreath, G C; Hindsley, Robert B; Hutter, Donald J; Mozurkewich, David; Pauls, Thomas A; Jan 2004; 8 pp.; In English

Report No.(s): AD-A477300; NRL-RN-04-1226-1863; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Navy Prototype Optical Interferometry (NPOI) group has started an astrometric search for planets in binary star systems based on the idea of using the binary components as position references for one another and looking for deviations from Keplerian motion. Our search will complement the radial velocity (vR) searches in three ways. We will observe stars of all spectral types; vR searches are limited to the FGKM range, where stars exhibit narrow spectral lines. We will search for planets in relatively large orbits (more than about 4 AU) where our method is most sensitive; vR searches are most sensitive to close-in planets. Finally, we will examine binary star systems, which with a few exceptions have been excluded from vR surveys. Our targets are binaries with both components in the interferometric field of view, producing a periodic variation in the fringe visibility (V 2) across the (u, v) plane. Past NPOI results from closer binaries (separations in the tens of mas) show residuals of tens of microarc-seconds about the best-fit orbits. The larger separations we are observing produce more V 2 oscillations across the (u, v) plane, offering the possibility of higher precision. We discuss the level of precision in test observations and the steps that will be needed to convert precision into accuracy.

DTIC

Angles (Geometry); Astrometry; Binary Stars; Interferometers; Interferometry; Navy; Optical Measurement; Optical Measuring Instruments; Precision; Prototypes

20080020016 Naval Research Lab., Washington, DC USA

Use of Two Deformable Mirrors AO System for an Interferometric Test-Bed

Restaino, Sergio R; Wick, Dave V; Martinez, Ty; Payne, Don T; Gilbreath, G C; Jan 2004; 10 pp.; In English

Report No.(s): AD-A477301; NRL-RN-04-1226-2044; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this paper, we present results on a test-bed for the use of adaptive optics (AO) in optical interferometry. The test-bed is based on two deformable mirrors made by OKO technologies. The two mirrors are simultaneously controlled by the same

computer and control software. The experimental set is based on our portable adaptive optics system. The goal of this test-bed is to study and characterize the effects of aberrations on the fringe contrast and the effects and characterization of the use of AO for improving fringe contrast. In this paper we will report some field test of our portable AO system. We will also describe the test-bed and some of the experimental results obtained so far.
DTIC
Deformable Mirrors; Interferometers; Interferometry; Optical Measurement; Test Stands

20080020021 Naval Observatory, Flaggstaff, AZ USA
Rotational Modulation of M/L Dwarfs Due to Magnetic Spots
Lane, C; Hallinan, G; Zavala, R T; Butler, R F; Boyle, R P; Bourke, S; Antonova, A; Doyle, J G; Vrba, F J; Golden, A; Oct 20, 2007; 5 pp.; In English
Report No.(s): AD-A477306; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We find periodic I-band variability in two ultracool dwarfs, TVLM 513-46546 and 2MASS J00361617+1821104, on either side of the M/L dwarf boundary. Both of these targets are short-period radio transients, with the detected I-band periods matching those found at radio wavelengths. We attribute the detected I-band periodicities to the periods of rotation of the dwarfs, supported by radius estimates and measured values for the objects. Based on the detected period of rotation in the I band, along with confirmation of strong magnetic fields from recent radio observations, we argue for magnetically induced spots as the cause of this periodic variability. The I-band rotational modulation of the L3.5 dwarf 2MASS J00361617+1821104 appeared to vary in amplitude with time. We conclude that the most likely cause of the I-band variability for this object is magnetic spots, possibly coupled with time-evolving features such as dust clouds.
DTIC
Dwarf Stars; M Stars; Magnetic Fields; Modulation; Rotation

20080020510 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Keck Interferometer Science: Present and Future
Akeson, Rachel L.; June 21, 2004; 7 pp.; In English; Astronomical Telescopes and Instrumentation, 21-25 Jun. 2004, Glasgow, UK; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40737

The Keck Interferometer is a NASA funded project developed by the Jet Propulsion Laboratory, the William M. Keck Observatory and the Michelson Science Center at the California Institute of Technology. A technical description of the interferometer is given elsewhere in this volume. This paper will discuss the science topics and goals of the Keck Interferometer project, including a brief description of the Key Science projects, the science projects executed to date and the current availability of the interferometer for new projects. The Keck Interferometer Project consists of the Keck-Keck Interferometer, which combines the two Keck lo-meter telescopes on an 85-meter baseline, and the Outrigger Telescopes Project, a proposal to add four to six 1.8-meter telescopes that would work in conjunction with the two Kecks.
Author
Infrared Telescopes; Astronomical Interferometry; Astronomical Observatories

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ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

20080019986 Los Alamos National Lab., NM USA
Characterization of the NPOI Fringe Scanning Stroke
Jorgensen, Anders M; Mozurkewich, Dave; Murphy, James; Sapantaie, Marc; Armstrong, J T; Gilbreath, G C; Hindsley, Robert; Pauls, Thomas A; Schmitt, Henrique; Hutter, Donald J; May 2006; 14 pp.; In English
Report No.(s): AD-A477238; NRL 06-1226-2023; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We report on the results of an experiment to characterize the fringe scanning stroke on the Navy Prototype Optical Interferometer (NPOI) Fast Delay Line (FDL) strokes. The NPOI uses a heterodyne metrology laser system in its operations. It consists of a HeNe laser with a 2 MHz heterodyne component generated by an Acousto-Optic Modulator (AOM). One polarization is used as the 2 MHz clock, and the other is sent through the feed system twice and bounces off the piezo stroke modulators. We sampled both signals at 50 MHz, and obtained stroke and cart combined motion at the frequency of the stroke modulated 2 MHz heterodyne signal. By counting zero-crossings in the reference and feed system signals, a rough position

(to a wavelength) can be obtained. This can be further refined to the few-nanometer level by measuring the relative phases of the reference and feed system signals. This results in approximately 4000 positions measurements per 2 ms stroke with a precision of approximately 1 nm. We recorded stroke positions for approximately 500 strokes (1 s), for all but one of the six FDLs, under a variety of conditions: different stroke amplitudes, different cart speeds, and different cart positions in the FDLs. We then analyzed these data from a total of 100 tests to understand the deviation of the actual stroke from the ideal stroke. We found that the mean stroke differs from the ideal stroke, and that consecutive strokes differ from each other. We computed the effect of the non-ideal stroke on the science data. A non-ideal stroke results in leakage of fringe power between fringe frequencies. This leakage is not significant during most normal operations of the NPOI. However, when the squared visibilities of baselines on the same spectrograph differ by large amounts (a factor of 10), care should be taken. Ideally, high- and low-visibility baselines should be placed on different spectrographs.
DTIC
Interferometers; Optical Measurement

20080019988 Naval Observatory, Washington, DC USA
The Navy Prototype Optical Interferometer: Recent Developments Since 2004
Johnston, K J; Benson, J A; Hutter, D J; Tycner, C; Zavala, R T; White, N M; Armstrong, J T; Pauls, T A; Gilbreath, G C; Hindsley, R B; May 2006; 11 pp.; In English
Report No.(s): AD-A477241; NRL 06-1226-1989; No Copyright; Avail.: Defense Technical Information Center (DTIC)
The technical status of the Navy Prototype Optical Interferometer (NPOI) since the last SPIE meeting is summarized along with the current science programs. The instrument is operated in an automatic observational mode, obtaining over 10,000 stellar observations in the period, June 2004 through March 2006. The scientific program has been directed at astrometry, TPF candidate stars, binary stars and other interesting targets such as Be stars. A significant database of NPOI observations obtained in 1997-2004 is being analyzed for binaries and single stars such as rapid rotating stars: Altair and Vega.
DTIC
Interferometers; Navy; Optical Measurement; Prototypes

20080020262 Los Alamos National Lab., NM USA
Coherent Integrations, Fringe Modeling, and Bootstrapping With the NPOI
Jorgensen, Anders M; Mozurkewich, Dave; Schmitt, Henrique; Armstrong, J T; Gilbreath, G C; Hindsley, Robert; Pauls, Thomas A; Peterson, Deane M; May 2006; 13 pp.; In English
Report No.(s): AD-A477239; NRL 06-1226-2061; No Copyright; Avail.: Defense Technical Information Center (DTIC)
Atmospheric turbulence is a major impediment to ground-based optical interferometry. It causes fringes to move on ms time-scales, forcing very short exposures. Because of the semi-random phase shifts, the traditional approach averages exposure power spectra to build signal-to-noise ratio (SNR). This incoherent average has two problems: (1) A bias of correlated noise is introduced which must be subtracted. The smaller the visibility/the fainter the target star, the more difficult bias subtraction becomes. SNR builds only slowly in this case. Unfortunately, these most difficult small visibility baselines contain most of the image information. (2) Baseline phase information is discarded. These are serious challenges to imaging with ground based optical interferometers. But if we were able to determine fringe phase, we could shift and integrate all the short exposures. We would then eliminate the bias problem, improve the SNR, and we would have preserved most of the phase information. This coherent averaging becomes possible with multi-spectral measurements. The group delay presents one option for determining phase. A more accurate approach is to use a time-dependent model of the fringe. For the most interesting low-visibility baselines, the atmospheric phase information can be bootstrapped from phase determinations on high-visibility baselines using the closure relation. The NPOI, with 32 spectral channels and a bootstrapping configuration, is well-suited for these approaches. We will illustrate how the fringe modeling approach works, compare it to the group-delay approach, and show how these approaches can be used to derive bias-free visibility amplitude and phase information. Coherent integration provides the highest signal-to-noise (SNR) improvement precisely in the situations where SNR builds most slowly using incoherent averaging. Coherent integration also
DTIC
Signal to Noise Ratios; Atmospheric Turbulence; Interferometry; Time Dependence

20080020364 Stanford Univ., Stanford, CA USA
Panchromatic Views of Large-scale Extragalactic Jets
Cheung, C. C.; Jun. 2007; 4 pp.; In English
Contract(s)/Grant(s): DE-AC07-76SF00515
Report No.(s): DE2007-908221; SLAC/PUB-12526; No Copyright; Avail.: National Technical Information Service (NTIS)

Highlights of recent observations of extended jets in AGN are presented. Specifically, we discuss new spectral constraints enabled by Spitzer, studies of the highest-redshift (z approx. 4) radio/X-ray quasar jets, and a new VLBA detection of superluminal motion in the M87 jet associated with a recent dra- matic X-ray outburst. Expanding on the title, inverse Compton emission from extended radio lobes is considered and a testable prediction for the gamma-ray emission in one exemplary example is presented. Prospects for future studies with ALMA and low-frequency radio interferometers are briefly described.
NTIS
Extragalactic Radio Sources; Radio Jets (Astronomy)

20080020365 Stanford Univ., Stanford, CA USA
FIRST 'Winged' and 'X'-shaped Radio Source Candidates
Cheung, C. C.; Springmann, A.; May 2007; 2 pp.; In English
Report No.(s): DE2007-908220; SLAC-PUB-12536; No Copyright; Avail.: National Technical Information Service (NTIS)

A small number of double-lobed radio galaxies are found with an additional pair of extended low surface brightness wings of emission giving them a distinctive X-shaped appearance. One popular explanation for the unusual morphologies posits that the central supermassive black hole (SMBH)/accretion disk system underwent a recent realignment; in a merger scenario, the active lobes mark the post-merger axis of the resultant system (e.g., Merritt & Ekers 2002). However, this and other interpretations are not well tested on the few (about one dozen) known examples. In part to remedy this deficiency, a large sample of winged and X-shaped radio sources is being compiled for a systematic study. An initial sample of 100 new candidates is described as well as some of the follow-up work being pursued to test the different scenarios.
NTIS
Galaxies; Radio Galaxies; Accretion Disks

20080020401 Lawrence Livermore National Lab., Livermore, CA USA
Incidence of Multiplicity among Bright Stellar Systems
Eggleton, P. P.; Kisseleva-Eggleton, L.; Dearborn, X.; Apr. 17, 2007; 12 pp.; In English
Report No.(s): DE2007-908914; UCRL-PROC-230005; No Copyright; Avail.: Department of Energy Information Bridge

We consider the multiplicity of stellar systems with (combined) magnitude brighter than 6.00 in Hipparcos magnitudes. We identify 4555 such bright systems, and the frequencies of multiplicities 1, 2, . . . , 7 are found to be 2722, 1412, 299, 86, 22, 12 and 2. We discuss the uncertainties, which are substantial. We also consider the distributions of periods of orbits and sub-orbits. We note that for the even more restricted set of 474 systems with VH 4.00 the proportions of higher multiples up to sextuple are progressively larger (213, 176, 52, 18, 9, 6), suggesting substantial incompleteness in even the relatively well-studied larger sample. We attempt to construct a Monte-Carlo algorithm that will generate systems with the observed multiplicities and orbital parameters, taking account of selection effects. Such an algorithm necessarily has several free parameters, some of which are poorly constrained. In particular, the restriction to VH less or minus 6 means that our sample contains hardly any systems where all components are low-mass main-sequence stars (K or M). Data on multiplicity is important as a constraint on (a) the star-formation problem, (b) the problem of the evolution of the Galactic stellar population. and (c) the interaction of dynamics and evolution through the effect of Kozai cycles. We discuss these topics briefly.
NTIS
Stellar Systems; Brightness; Star Formation; Hipparcos Satellite; Main Sequence Stars

20080020403 Lawrence Livermore National Lab., Livermore, CA USA
Destruction of 3He by Rayleigh-Taylor Instability on the First Giant Branch
Eggleton, P. P.; Dearborn, D. S. P.; Lattanzio, J. C.; Apr. 18, 2007; 10 pp.; In English
Report No.(s): DE2007-908910; UCRL-CONF-230059; No Copyright; Avail.: National Technical Information Service (NTIS)

Low-mass stars, (approximately) 1 - 2 solar masses, near the Main Sequence are efficient at producing 3He, which they mix into the convective envelope on the giant branch and distribute into the Galaxy by way of envelope loss. This process

is so efficient that it is difficult to reconcile the observed cosmic abundance of 3He with the predictions of Big Bang nucleosynthesis. In this paper we find, by modeling a red giant with a fully three-dimensional hydrodynamic code and a full nucleosynthetic network, that mixing arises in the supposedly stable and radiative zone between the hydrogen-burning shell and the base of the convective envelope. This mixing is due to Rayleigh-Taylor instability within a zone just above the hydrogen-burning shell. In this zone the burning of the 3He left behind by the retreating convective envelope is predominantly by the reaction 3He + 3He -> 4He + 1H + 1H, a reaction which, untypically for stellar nuclear reactions, lowers the mean molecular weight, leading to a local minimum. This local minimum leads to Rayleigh-Taylor instability, and turbulent motion is generated which will continue ultimately up into the normal convective envelope. Consequently material from the envelope is dragged down sufficiently close to the burning shell that the 3He in it is progressively destroyed. Thus we are able to remove the threat that 3He production in low-mass stars poses to the Big Bang nucleosynthesis of 3He. Some slow mixing mechanism has long been suspected, that connects the convective envelope of a red giant to the burning shell. It appears to be necessary to account for progressive changes in the 12C/13C and 14N/12C ratios on the First Giant Branch.We suggest that these phenomena are also due to the Rayleigh-Taylor-unstable character of the 3He-burning region.
NTIS
Destruction; Helium Isotopes; Taylor Instability

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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*.

20080018968 Gray Research, Inc., Huntsville, AL, USA
Lunar Habitat Airlock/Suitlock
Griffin, Brand Norman; March 03, 2008; 12 pp.; In English; Earth and Space Conference 2008: 11th International Conference on Engineering, Science, Construction, and Operations in Challenging Environments, 3-5 Mar. 2008, Long Beach, CA, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNM05AB50C; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080018968

Airlocks for lunar Extravehicular Activity (EVA) will be significantly different than previous designs. Until now, airlocks operated infrequently and only in the 'clean' weightless environment, but lunar airlocks are planned to be used much more often (every other day) in a dusty, gravity environment. Concepts for airlocks were analyzed by the NASA, JSC Habitability Focus Element during recent lunar outpost studies. Three airlock types were identified; an Airlock (AL) or independent pressure vessel with one hatch to the outside and the other to the Habitat. A Suitlock (SL) which shares a pressure bulkhead with the Habitat allowing rear-entry suits to remain on the dusty side while the crew enters/exits the Habitat. The third option is the Suitport (SP) which offers direct access from the habitable volume into an externally mounted suit. The SP concept was not compared, however between the AL and SL, the AL was favored.
Author
Air Locks; Extravehicular Activity; Habitats; Lunar Bases; Manned Space Flight

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SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots. For related information see *93 Space Radiation*.

20080018955 California Univ., Los Angeles, CA, USA
The Solar Wind and Geomagnetic Activity as a Function of Time Relative to Corotating Interaction Regions
McPherron, Robert L.; Weygand, James; Recurrent Magnetic Storms: Corotating Solar Wind Streams; September 26, 2006, pp. 125-138; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NNG04GA93G; ATM 02-1798; ATM 02-08501; ATM-0120950; Copyright; Avail.: Other Sources

Corotating interaction regions during the declining phase of the solar cycle are the cause of recurrent geomagnetic storms and are responsible for the generation of high fluxes of relativistic electrons. These regions are produced by the collision of a high-speed stream of solar wind with a slow-speed stream. The interface between the two streams is easily identified with plasma and field data from a solar wind monitor upstream of the Earth. The properties of the solar wind and interplanetary

magnetic field are systematic functions of time relative to the stream interface. Consequently the coupling of the solar wind to the Earth's magnetosphere produces a predictable sequence of events. Because the streams persist for many solar rotations it should be possible to use terrestrial observations of past magnetic activity to predict future activity. Also the high-speed streams are produced by large unipolar magnetic regions on the Sun so that empirical models can be used to predict the velocity profile of a stream expected at the Earth. In either case knowledge of the statistical properties of the solar wind and geomagnetic activity as a function of time relative to a stream interface provides the basis for medium term forecasting of geomagnetic activity. In this report we use lists of stream interfaces identified in solar wind data during the years 1995 and 2004 to develop probability distribution functions for a variety of different variables as a function of time relative to the interface. The results are presented as temporal profiles of the quartiles of the cumulative probability distributions of these variables. We demonstrate that the storms produced by these interaction regions are generally very weak. Despite this the fluxes of relativistic electrons produced during those storms are the highest seen in the solar cycle. We attribute this to the specific sequence of events produced by the organization of the solar wind relative to the stream interfaces. We also show that there are large quantitative differences in various parameters between the two cycles.
Author
Solar Wind; Geomagnetism; Time Dependence; Statistical Distributions; Interplanetary Magnetic Fields; Earth Magnetosphere; High Energy Electrons; Probability Distribution Functions; Plasmas (Physics); Magnetic Variations

20080019653 California Univ., Los Angeles, CA, USA
Solar Wind Drivers for Steady Magnetospheric Convection
McPherron, Robert L.; O'Brien, T. Paul; Thompson, Scott; Lui, A. T. Y., Editor; Multiscale Coupling of Sun-Earth Processes; January 2005, pp. 113 - 124; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NNG04GA93G; ATM 0208501; Copyright; Avail.: Other Sources

Steady magnetospheric convection (SMC) also known as convection bays, is a particular mode of response of the magnetosphere to solar wind coupling. It is characterized by convection lasting for times longer than a typical substorm recovery during which no substorms expansions can be identified. It is generally believed that the solar wind must be unusually steady for the magnetosphere to enter this state. However, most previous studies have assumed this is true and have used such conditions to identify events. In a preliminary investigation using only the AE and AL indices to select events we have shown that these expectations are generally correct. SMC events seem to be associated with slow speed solar wind and moderate, stable IMF Bz. In this report we extend our previous study including additional parameters and the time variations in various statistical quantities. For the intervals identified as SMCs we perform a detailed statistical analysis of the properties of different solar wind variables. We compare these statistics to those determined from all data, and from intervals in which substorms but not SMCs are present. We also consider the question of whether substorms are required to initiate and terminate an SMC. We conclude that the intervals we have identified as SMC are likely to be examples of the original Dungey concept of balanced reconnection at a pair of x-lines on the day and night side of the Earth.
Author
Solar Wind; Statistical Analysis; Convection; Magnetic Storms

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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*.

20080019648 NASA Langley Research Center, Hampton, VA, USA
Eta Meson Production in Proton-Proton and Nuclear Collisions
Norbury, John W.; Dick, Frank; May 2008; 14 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): WBS 651549.02.07.01
Report No.(s): NASA/TP-2008-215310; L-19474; Copyright; Avail.: CASI: A03, Hardcopy

Total cross sections for eta meson production in proton - proton collisions are calculated. The eta meson is mainly produced via decay of the excited nucleon resonance at 1535 MeV. A scalar quantum field theory is used to calculate cross sections, which also include resonance decay. Comparison between theory and experiment is problematic near threshold when resonance decay is not included. When the decay is included, the comparison between theory and experiment is much better.
Author
Eta-Mesons; Quantum Theory; Collisions; Cross Sections; Protons; Extraterrestrial Radiation

20080020407 Lawrence Livermore National Lab., Livermore, CA USA

Cosmic Ray Induced Neutron and Gamma-Ray Bursts in a Lead Pile

Chapline, G.; Hagmann, C.; Kerr, P.; Snyderman, N. J.; Wurtz, R.; May 11, 2007; 7 pp.; In English

Report No.(s): DE2007-908901; UCRL-TR-230895; No Copyright; Avail.: National Technical Information Service (NTIS)

The neutron background is created primarily by cosmic rays interactions. Of particular interest for SNM detection is an understanding of burst events that resemble fission chains. We have been studying the interaction of cosmic rays with a lead pile that is efficient at creating neutron bursts from cosmic ray interactions. The neutron burst size depends on the configuration of the lead. We have found that the largest bursts appear to have been created by primaries of energy over 100 GeV that have had a diffractive interaction with the atmosphere. The large events trigger muon coincidence paddles with very high efficiency, and the resulting interactions with the lead pile can create over 10, 000 neutrons in a burst.

NTIS

Cosmic Rays; Gamma Ray Bursts; Lead (Metal); Neutrons

Subject Term Index

Personal Author Index