National Aeronautics and Space Administration
Langley Research Center
Scientific and Technical Information Program Office

Scientific and Technical Aerospace Reports

STAR

Volume 46 Number 10

May 26, 2008

WHAT'S INSIDE

NASA STI Program ... in Profile

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STAR includes citations to R&D results reported in:

- NASA, NASA contractor, and NASA grantee reports
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- Translations
- NASA-owned patents and patent applications
- Other U.S. Government agency and foreign patents and patent applications
- Domestic and foreign dissertations and theses

The NASA STI Program

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

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NASA Center for AeroSpace Information (CASI)

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National Technical Information Service (NTIS)

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

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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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Chemistry and Materials

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Life Sciences

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.

SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

A Biweekly Publication of the National Aeronautics and Space Administration

VOLUME 46, NUMBER 10 MAY 26, 2008

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.

20080016696 Conte (Francis L.), Swampscott, MA, USA
Bifurcated Outlet Guide Vanes
Koshoffer, J. M., Inventor; Mar. 10, 2004; 11 pp.; In English
Contract(s)/Grant(s): N00019-96-C-0176
Patent Info.: Filed Filed 10 Mar 04; US-Patent-Appl-SN-10-797 703
Report No.(s): PB2007-104780; No Copyright; Avail.: CASI: A03, Hardcopy

A turbine rear frame includes a row of outlet guide vanes extending between outer and inner bands. Each of the vanes is bifurcated into a forward prow integrally joined to an aft stern by a septum there between. The prow and stern collectively define the aerodynamic profile of each vane which is locally interrupted at the septum.
NTIS
Guide Vanes; Turbines; Aerodynamics

20080017019 Japan Aerospace Exploration Agency, Tokyo, Japan
Performance and Control System of JAXA 1mX1m Supersonic Wind Tunnel After Some Improvements
Watanabe, M.; Tate, A.; Hamamoto, S.; Sakai, K.; Hashidate, M.; Mar. 01, 2006; 34 pp.; In Japanese
Report No.(s): PB2007-107350; JAXA-RR-02-024; No Copyright; Avail.: National Technical Information Service (NTIS)

The supersonic wind tunnel at JAXA has been improved in FY 1999 by replacing the nozzle section, extending the settling chamber and renewing the control unit. Through the improvement, total pressure is stabilized within 5 seconds and thereafter kept +0.1% around the target pressure form M=1.4 to 4.0. The flow in the test section is highly two-dimensional both horizontally and vertically. Total pressure distribution in the test section settles within 2% of the each average values at M=1.4 to 4.0. Furthermore, one-man-operations had been made possible by this upgrade.
NTIS
Supersonic Flow; Supersonic Wind Tunnels; Wind Tunnels

20080017037 Wichita State Univ., Wichita, KS, USA
Preliminary Guidelines and Recommendations for the Development of Material and Process Specifications for Carbon Fiber-Reinforced Liquid Resin Molded Materials
Bogucki, G.; Bayldon, J.; Gintert, L.; Ward, S.; McCarvill, W.; May 01, 2007; 124 pp.; In English
Report No.(s): PB2007-111136; No Copyright; Avail.: National Technical Information Service (NTIS)

This document recommends guidance and criteria for the development of material and process specifications and material acceptance documents for liquid resins and continuous carbon fiber reinforcement materials used in liquid molding processes to manufacture structures for aircraft and space structures. The guidelines and recommendations are meant to be a documentation of current knowledge and application of sound engineering principles to the development and implementation of composite material procurement and process specifications. This document can also be used to develop common industry specifications. This report is limited to recommendations and guidance on the development of material and process specifications. The guidelines and recommendations contained in this document should not be viewed as Federal Aviation Administration policy or as the only acceptable method for composite material specifications and qualification procedures. They are meant to be a documentation of current knowledge and application of sound engineering principles to the development and implementation of composite material procurement specifications specific to the liquid resins and continuous

fiber reinforcements used in liquid molding processes. The goal of any material procurement document is to provide the necessary controls to ensure the material used to establish the qualification data and certification data has not changed beyond its normal variability. The goal of any process specification is to ensure that the process remains in control and produces material consistent with specified requirements.
NTIS
Carbon; Carbon Fibers; Fiber Composites; Reinforcing Fibers; Resins; Specifications

20080017199 Johns Hopkins Univ., Laurel, MD, USA
Developing Optimized Trajectories Derived from Mission and Thermo-Structural Constraints
Lear, Matthew H.; McGrath, Brian E.; Anderson, Michael P.; Green, Peter W.; April 28, 2008; 7 pp.; In English; 15th AIAA International Space Planes and Hypersonic Systems and Technologies Conference, 28 Apr.?1 May 2008, Dayton, OH, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 599489.02.07.07.08.02; Copyright; Avail.: CASI: A02, Hardcopy

In conjunction with NASA and the Department of Defense, the Johns Hopkins University Applied Physics Laboratory (JHU/APL) has been investigating analytical techniques to address many of the fundamental issues associated with solar exploration spacecraft and high-speed atmospheric vehicle systems. These issues include: thermo-structural response including the effects of thermal management via the use of surface optical properties for high-temperature composite structures; aerodynamics with the effects of non-equilibrium chemistry and gas radiation; and aero-thermodynamics with the effects of material ablation for a wide range of thermal protection system (TPS) materials. The need exists to integrate these discrete tools into a common framework that enables the investigation of interdisciplinary interactions (including analysis tool, applied load, and environment uncertainties) to provide high fidelity solutions. In addition to developing robust tools for the coupling of aerodynamically induced thermal and mechanical loads, JHU/APL has been studying the optimal design of high-speed vehicles as a function of their trajectory. Under traditional design methodology the optimization of system level mission parameters such as range and time of flight is performed independently of the optimization for thermal and mechanical constraints such as stress and temperature. A truly optimal trajectory should optimize over the entire range of mission and thermo-mechanical constraints. Under this research, a framework for the robust analysis of high-speed spacecraft and atmospheric vehicle systems has been developed. It has been built around a generic, loosely coupled framework such that a variety of readily available analysis tools can be used. The methodology immediately addresses many of the current analysis inadequacies and allows for future extension in order to handle more complex problems.
Author
Aerodynamics; Aerothermodynamics; Design Optimization; High Temperature; Temperature Control; Thermal Protection; Trajectories; Spacecraft Design; Aircraft Design

20080017510 Lockheed Martin Corp., Hampton, VA, USA
Piloted Simulation of Various Synthetic Vision Systems Terrain Portrayal and Guidance Symbology Concepts for Low Altitude En-Route Scenario
Takallu, M. A.; Glaab, L. J.; Hughes, M. F.; Wong, D. T.; Bartolone, A. P.; May 2008; 121 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 609866.02.07.07.01
Report No.(s): NASA/TP-2008-215127; L-19329; Copyright; Avail.: CASI: A06, Hardcopy

In support of the NASA Aviation Safety Program's Synthetic Vision Systems Project, a series of piloted simulations were conducted to explore and quantify the relationship between candidate Terrain Portrayal Concepts and Guidance Symbology Concepts, specific to General Aviation. The experiment scenario was based on a low altitude en route flight in Instrument Metrological Conditions in the central mountains of Alaska. A total of 18 general aviation pilots, with three levels of pilot experience, evaluated a test matrix of four terrain portrayal concepts and six guidance symbology concepts. Quantitative measures included various pilot/aircraft performance data, flight technical errors and flight control inputs. The qualitative measures included pilot comments and pilot responses to the structured questionnaires such as perceived workload, subjective situation awareness, pilot preferences, and the rare event recognition. There were statistically significant effects found from guidance symbology concepts and terrain portrayal concepts but no significant interactions between them. Lower flight technical errors and increased situation awareness were achieved using Synthetic Vision Systems displays, as compared to the baseline Pitch/Roll Flight Director and Blue Sky Brown Ground combination. Overall, those guidance symbology concepts that have both path based guidance cue and tunnel display performed better than the other guidance concepts.
Author
Aircraft Safety; Enhanced Vision; Flight Instruments; Display Devices; Aircraft Pilots; Pilot Performance; Simulation; General Aviation Aircraft

20080017938 Federal Aviation Administration, Cambridge, MA, USA

Thrust Reverser Analysis for Implementation in the Aviation Environmental Design Tool (AEDT)

Noel, G. J.; Boeker, E.; Jun. 01, 2007; 8 pp.; In English

Report No.(s): PB2007-111124; RTV-4F-FA4T-LR1; No Copyright; Avail.: CASI: A02, Hardcopy

The USA Department of Transportation, John A. Volpe National Transportation Systems Center (Volpe Center), Environmental Measurement and Modeling Division, in support of the Federal Aviation Administrations (FAA) Office of Environment and Energy (AEE), has conducted an analysis on thrust reverser usage and how it is to be implemented within the Aviation Environmental Design Tool (AEDT).

NTIS

Thrust Reversal; Environment Models; Management

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.

20080016630 Federal Aviation Administration, Washington, DC USA

Runway Safety Blueprint, 2002-2004

Jul. 01, 2002; 39 pp.; In English

Report No.(s): PB2007-111336; No Copyright; Avail.: National Technical Information Service (NTIS)

Both the severity and the frequency of runway incursions were decreased in Calendar Year (CY) 2001 from CY 2000. However, it is far too soon to declare that a trend towards a systemic reduction is underway. The NAS continues to experience about one Category A or B runway incursion per week at towered airports, thereby making runway incursions a continuing threat to aviation safety. While work continues to identify why incursions happen and what steps can be taken to prevent them, there is enough fundamental information known to provide clear direction for planned interventions. Key points are: Operational performance in the airport movement area must be further improved to reduce runway incursions; Runway incursions are systemic, recurring events that are unintentional by-products of NAS operations; Operations must be standardized to reduce risk at a time when growth is challenging runway and infrastructure expansion; Collision-avoidance safeguards need to be developed for the high-energy segment of runways, where aircraft are accelerating for take-off or decelerating after landing; Human factors is the common denominator in every runway incursion. On the basis of data analyses carried out by the FAA and its partners in the aviation community, a core strategy has been developed for improving runway safety. It is structured around eight long-term goals and a set of supporting objectives.

NTIS

Blueprints; Runways; Safety

20080017038 Hi-Tec Systems, Egg Harbor Township, NJ, USA

Discussion of Approaches to Estimate the Aircraft Stopping Distances Under Standard Operating Procedures

Cheng, A.; May 01, 2007; 17 pp.; In English

Report No.(s): PB2007-111135; No Copyright; Avail.: CASI: A03, Hardcopy

The Federal Aviation Administration is currently engaged in research of aircraft operational landing performance, aiming to increase the safety and efficiency of aircraft operations in terminal areas. One of the primary research objectives was to identify the operational landing distances achieved in line operations under standard operating procedures. The landing distance is defined as the total distance, from the runway threshold, needed for an aircraft to make a full stop during a landing operation. This distance consists of two components: the touchdown point (i.e., airborne distance) from runway threshold and the stopping distance after touchdown. Although several algorithms have been recently developed to identify aircraft touchdown points via available landing parameters, solutions to adequately determine the aircraft stopping distance are still greatly sought after. This technical note addresses the difficulties of estimating the operational aircraft stopping distance and discusses approaches to resolve the problem. In particular, a new method is proposed to estimate the aircraft stopping distance via studying the deceleration pattern during rollout. The deceleration pattern provides a useful means to estimate the operational stopping distance since it is the realization of a pilots decision and command under the specific landing conditions, including the piloting techniques, weather conditions, runway situation, air traffic control demands, etc. There are several advantages to this approach. First, the deceleration pattern identified by ground speed information contains relatively little

contamination of measurement noise so that a troublesome noise-filtering process is generally not required. Second, this approach is simple and straightforward because it does not depend on the availability of additional information regarding external factors that affect the deceleration performances. Assumptions and investigation results are demonstrated with operational landing examples.
NTIS
Air Traffic Control; Ground Speed; Runways; Deceleration; Research Aircraft

20080017468 National Transportation Safety Board, Washington, DC USA
Annual Review of Aircraft Accident Data: U.S. General Aviation, Calendar Year 2002
Nov. 29, 2006; 60 pp.; In English
Report No.(s): PB2007-100696; NTSB/ARG-06/02; No Copyright; Avail.: CASI: A04, Hardcopy

The National Transportation Safety Board's 2002 Annual Review of Aircraft Accident Data for U.S. General Aviation is a statistical compilation and review of general aviation accidents that occurred in 2002 involving U.S.-registered aircraft. As a summary of all U.S. general aviation accidents for 2002, the review is designed to inform general aviation pilots and their passengers and to provide detailed information to support future government, industry, and private research efforts and safety improvement initiatives.
NTIS
Aircraft Accidents; General Aviation Aircraft

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.

20080016646 Federal Aviation Administration, Washington, DC, USA
FAA (Federal Aviation Administration) Runway Safety Report: Runway Incursion Trends and Initiatives at Towered Airports in the USA, FY 2001 through FY 2004
Aug. 01, 2005; 139 pp.; In English
Report No.(s): PB2007-111335; No Copyright; Avail.: National Technical Information Service (NTIS)

Reducing the Risks of Runway Incursions and Runway Collisions is a top priority of the Federal Aviation Administration (FAA). Runway safety management is a dynamic process that involves analyzing runway incursions, understanding the factors that contribute to runway collision risks, and taking actions to reduce these risks. Runway incursion severity ratings (Category A through D) indicate the potential for a collision or the margin of safety associated with an event. The FAA aims to reduce the severity, number, and rate of runway incursions through the mitigation of errors that contribute to collision risks.
NTIS
Aircraft Safety; Flight Safety; Pavements; Runway Incursions; Runways; Trends

20080016647 Mitre Corp., McLean, VA, USA
Capacity Needs in the National Airspace System: An Analysis of Airports and Metropolitan Area Demand and Operational Capacity in the Future, 2007-2025
May 01, 2007; 50 pp.; In English
Report No.(s): PB2007-111334; No Copyright; Avail.: National Technical Information Service (NTIS)

In 2003, the Federal Aviation Administration (FAA) convened a team to begin the Future Airport Capacity Task (FACT). The team was led by the FAAs Airports organization (ARP) and included representatives from the Air Traffic Organization (ATO) and the MITRE Corporations Center for Advanced Aviation System Development (CAASD). FACT is an assessment of the future capacity of the Nations airports and metropolitan areas. Its goal is to determine which airports and metropolitan areas have the greatest need for additional capacity. By embarking on this initiative, the FAA wanted to assure that the long-term capacity of the U.S. aviation system matched forecasts of demand. This document is the first update to the original study, Capacity Needs in the National Airspace System, An Analysis of Airport and Metropolitan Area Demand and Operational Capacity in the Future (FACT 1), published in 2004. This update is called FACT 2. In response to comments received about the original study, the FACT 2 report provides more transparency in the methodology and analysis. It includes

updated data, revised timeframes, and refined analytical methods. Further, specific results and assumptions were shared with those airports identified from the analysis to gather additional input that might impact the findings.
NTIS
Aerospace Systems; Air Transportation; Airports; Airspace; Cities; Commercial Aircraft

20080016697 Department of Agriculture, Brownsville, TX, USA
Japanese Beetle Program Manual for Airports (12/2004-01)
Jan. 01, 2004; 130 pp.; In English
Report No.(s): PB2007-110406; No Copyright; Avail.: CASI: A07, Hardcopy

The primary objective of this APHIS-PPQ manual is to protect the agriculture of the Western USA by preventing the artificial spread of the Japanese beetle from the Eastern USA. Artificial spread is the movement of an organism to a new area by other than natural means; in this case, artificial spread refers specifically to the movement of JBs on aircraft. This Japanese Beetle Program Manual will help APHIS-PPQ personnel and cooperators prevent the artificial spread of the JB. Nine Western States need to be protected from infestation by the Japanese beetle: Arizona, California, Colorado, Idaho, Montana, Nevada, Oregon, Utah, and Washington; therefore, these States are known as the Protected States. Specifically, this manual will address the following tasks: Monitoring airports in JB-infested areas; Determining the risk at JB-infested airports; Issuing Emergency Action Notifications (EANs); Canceling Emergency Action Notifications; Monitoring airports in JB-free areas; Treating aircraft; Treating grounds; Using Compliance Agreements (CAs).
NTIS
Airports; Beetles; Insects; Japan; Manuals; Infestation

20080017005 NASA Dryden Flight Research Center, Edwards, CA, USA
Initial Experimental Airworthiness Certification Guidance for UAS. UAS Experimental Certification Process and Guidance
June 09, 2005; 24 pp.; In English
Report No.(s): DFRC-239; PD014; Paper No. G-02; Copyright; Avail.: CASI: A03, Hardcopy

This paper addresses the regulatory processes and requirements already in place by which an applicant might obtain experimental airworthiness certification for a civil Unmanned Aircraft System (UAS). It is more extensive and subsequent to an earlier, similar deliverable, PD007, which was an interim study of the same topic. Since few regulatory airworthiness and operating standards exist for UAS like those for traditional manned aircraft and since most UAS have historically been developed and operated under military auspices, civil use of UAS in the NAS is a new and unfamiliar challenge requiring specific and unique considerations. Experimental certification is the most basic level of FAA approval toward routine UAS operation in the NAS. The paper reviews and explains existing FAA requirements for an applicant seeking experimental airworthiness approval and details the process for submission of necessary information. It summarizes the limited purposes for which experimental aircraft may be used and addresses pertinent aspects of UAS design, construction and operation in the NAS in harmony with traditional manned aircraft. Policy IPT position is that UAS, while different from manned aircraft, can use the same initial processes to gain civil operating experience under the experimental approval. Particular note is taken of those UAS-unique characteristics which require extra attention to assure equivalent safety of operation, such as the UAS control station and sense-and-avoid. The paper also provides ‘best practices’ guidance for UAS manufacturers and FAA personnel in two appendices. The material in Appendix A is intended to provide guidance on assuring UAS safety to FAA, and provides FAA personnel with a suggested list of items to review, with a focus on UAS unique factors, prior to issuance of an experimental airworthiness certificate. Appendix B provides an outline for a program letter which a manufacturer could use in preparing the application for an UAS experimental airworthiness certificate.
Author
Aircraft Reliability; Certification; Civil Aviation; Pilotless Aircraft; Unmanned Aircraft Systems; Aircraft Performance; National Airspace System

20080017058 SRA International, Inc., Egg Harbor Twp., NJ, USA
Comparative Design Study for Airport Pavement
Ricalde, L.; Garg, N.; Kawa, I.; May 01, 2007; 70 pp.; In English
Report No.(s): PB2007-111132; No Copyright; Avail.: National Technical Information Service (NTIS)

A comparative analysis of the results of different design methods is a powerful tool for evaluating and developing new pavement design procedures. A sensitivity, or comparative, analysis was employed during the development of Federal Aviation

Administration (FAA) Advisory Circular (AC) 150.5320-16 and its computer program LEDFAA. The FAA is currently developing a new Portland cement concrete design procedure based on the three-dimensional finite element method (FEDFAA) and has modified the original subgrade vertical strain-based failure criteria used for flexible pavement design. This report includes a comparison and evaluation of both new construction and overlay designs over a broad range of input conditions. Since the FAA design procedure requires the use of a stabilized base and subbase for airport pavements accommodating aircraft heavier than 100,000 lb, the sensitivity of a stabilized base/subbase on the pavement life or thickness was also studied. Design thickness comparisons, using different models, are provided to show how the sensitivity analysis results influence the design model. This report focuses on the results of the comparative analyses for both new and overlay pavements. Other parameters analyzed in this report include subgrade strength, aircraft type, annual departure levels for single aircraft, narrow- and wide-body aircraft traffic mixes, and thickness and strength of stabilized and aggregate base and subbase layers. Numerical sensitivity comparisons among different failure models included in conventional design methods (AC 150.5320-6D) and standard LEDFAA (AC 150.5320-6D, Change 3) were also conducted. It has been found that, under certain conditions, computational results can differ, depending on the model and the range of input parameters that were evaluated. The comparative analysis results will be used to calibrate the parameters to be used in the new failure models and to provide guidance on the selection of design inputs.
NTIS
Airports; Pavements; Runways; Landing Sites; Concretes

20080017059 William J. Hughes Technical Center, Atlantic City, NJ, USA; Hi-Tec Systems, Egg Harbor Township, NJ, USA
14 CFR Part 137 Aviation System Functional Model
Woodford, S.; Kolli, V.; Agava, C.; May 01, 2007; 248 pp.; In English
Report No.(s): PB2007-111133; No Copyright; Avail.: National Technical Information Service (NTIS)
A task was recently awarded to support the Risk Management Decision Support for the General Aviation (GA) Research and Development Program. The purpose of this task is to provide research, project planning, and program support to accomplish task GA-01, which involves Title 14 Code of Federal Regulations Part 137 Aviation System Functional Model Development.
NTIS
General Aviation Aircraft; Risk; Research and Development; Systems Engineering

20080017109 NASA Dryden Flight Research Center, Edwards, CA, USA
Sense-and-Avoid Equivalent Level of Safety Definition for Unmanned Aircraft Systems. Revision 9
January 14, 2005; 176 pp.; In English; Original contains color and black and white illustrations
Report No.(s): DFRC-239; PD002; Copyright; Avail.: CASI: A09, Hardcopy
Since unmanned aircraft do not have a pilot on-board the aircraft, they cannot literally comply with the ‘see and avoid’ requirement beyond a short distance from the location of the unmanned pilot. No performance standards are presently defined for unmanned Sense and Avoid systems, and the FAA has no published approval criteria for a collision avoidance system. Before the FAA can develop the necessary guidance (rules / regulations / policy) regarding the see-and-avoid requirements for Unmanned Aircraft Systems (UAS), a concise understanding of the term ‘equivalent level of safety’ must be attained. Since this term is open to interpretation, the UAS industry and FAA need to come to an agreement on how this term can be defined and applied for a safe and acceptable collision avoidance capability for unmanned aircraft. Defining an equivalent level of safety (ELOS) for sense and avoid is one of the first steps in understanding the requirement and developing a collision avoidance capability. This document provides a functional level definition of see-and-avoid as it applies to unmanned aircraft. The sense and avoid ELOS definition is intended as a bridge between the see and avoid requirement and the system level requirements for unmanned aircraft sense and avoid systems. Sense and avoid ELOS is defined in a rather abstract way, meaning that it is not technology or system specific, and the definition provides key parameters (and a context for those parameters) to focus the development of cooperative and non-cooperative sense and avoid system requirements.
Author
Unmanned Aircraft Systems; Pilotless Aircraft; Collision Avoidance; National Airspace System; Aircraft Safety

20080017110 NASA Dryden Flight Research Center, Edwards, CA, USA
Contingency Management Requirements Document: Preliminary Version. Revision F
September 30, 2005; 789 pp.; In English; Original contains color illustrations
Report No.(s): DFRC-239; CM001; Copyright; Avail.: CASI: A99, Hardcopy
This is the High Altitude, Long Endurance (HALE) Remotely Operated Aircraft (ROA) Contingency Management (CM)

Functional Requirements document. This document applies to HALE ROA operating within the National Airspace System (NAS) limited at this time to enroute operations above 43,000 feet (defined as Step 1 of the Access 5 project, sponsored by the National Aeronautics and Space Administration). A contingency is an unforeseen event requiring a response. The unforeseen event may be an emergency, an incident, a deviation, or an observation. Contingency Management (CM) is the process of evaluating the event, deciding on the proper course of action (a plan), and successfully executing the plan.
Author
Contingency; Functional Design Specifications; National Airspace System; Flight Hazards; Unmanned Aircraft Systems; Pilotless Aircraft

20080017115 NASA Dryden Flight Research Center, Edwards, CA, USA
Remotely Operated Aircraft (ROA) Impact on the National Airspace System (NAS) Work Package: Automation Impacts of ROA's in the NAS
[2005]; 16 pp.; In English; Original contains color illustrations
Report No.(s): DFRC-239; IMP003; Copyright; Avail.: CASI: A03, Hardcopy

The purpose of this document is to analyze the impact of Remotely Operated Aircraft (ROA) operations on current and planned Air Traffic Control (ATC) automation systems in the En Route, Terminal, and Traffic Flow Management domains. The operational aspects of ROA flight, while similar, are not entirely identical to their manned counterparts and may not have been considered within the time-horizons of the automation tools. This analysis was performed to determine if flight characteristics of ROAs would be compatible with current and future NAS automation tools. Improvements to existing systems / processes are recommended that would give Air Traffic Controllers an indication that a particular aircraft is an ROA and modifications to IFR flight plan processing algorithms and / or designation of airspace where an ROA will be operating for long periods of time.
Author
Air Traffic Control; Remotely Piloted Vehicles; Drone Aircraft; Unmanned Aircraft Systems; Pilotless Aircraft; National Airspace System; Automation

20080017116 NASA Dryden Flight Research Center, Edwards, CA, USA
Common Operating Picture: UAV Security Study
October 29, 2004; 40 pp.; In English; Original contains color illustrations
Report No.(s): DFRC-239; IMP006; Copyright; Avail.: CASI: A03, Hardcopy

This initial communication security study is a top-level assessment of basic security issues related to the operation of Unmanned Aerial Vehicles (UAVs) in the National Airspace System (NAS). Security considerations will include information relating to the use of International Civil Aviation Organization (ICAO) Aeronautical Telecommunications Network (ATN) protocols and applications identifying their maturity, as well as the use of IPV4 and a version of mobile IPV6. The purpose of this assessment is to provide an initial analysis of the security implications of introducing UAVs into the NAS.
Author
National Airspace System; Pilotless Aircraft; Air Traffic Control; Aircraft Safety; Airspace

20080017117 NASA Dryden Flight Research Center, Edwards, CA, USA
Remotely Operated Aircraft (ROA) Impact on the National Airspace System (NAS) Work Package, 2005: Composite Report on FAA Flight Plan and Operational Evaluation Plan. Version 7.0
[2005]; 56 pp.; In English; Original contains color and black and white illustrations
Report No.(s): DFRC-239; IMP008; Copyright; Avail.: CASI: A04, Hardcopy

The purpose of this document is to present the findings that resulted from a high-level analysis and evaluation of the following documents: (1) The OEP (Operational Evolution Plan) Version 7 -- a 10-year plan for operational improvements to increase capacity and efficiency in U.S. air travel and transport and other use of domestic airspace. The OEP is the FAA commitment to operational improvements. It is outcome driven, with clear lines of accountability within FAA organizations. The OEP concentrates on operational solutions and integrates safety, certification, procedures, staffing, equipment, avionics and research; (2) The Draft Flight Plan 2006 through 2010 -- a multi-year strategic effort, setting a course for the FAA through 2001, to provide the safest and most efficient air transportation system in the world; (3) The NAS System Architecture Version 5 -- a blueprint for modernizing the NAS and improving NAS services and capabilities through the year 2015; and (4) The NAS-SR-1000 System Requirements Specification (NASSRS) -- a compilation of requirements which describe the operational capabilities for the NAS. The analysis is particularly focused on examining the documents for relevance to existing and/or

planned future UAV operations. The evaluation specifically focuses on potential factors that could materially affect the development of a commercial ROA industry, such as: (1) Design limitations of the CNS/ATM system, (2) Human limitations, The information presented was taken from program specifications or program office lead personnel.
Author
National Airspace System; Pilotless Aircraft; Unmanned Aircraft Systems; Documents; Reports; Analyzing

20080017209 NASA Ames Research Center, Moffett Field, CA, USA
Testing HyDE on ADAPT
Sweet, Adam; January 2008; 27 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): 645846.02.07.01.01
Report No.(s): NASA/TM 2008-214570; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080017209

The IVHM Project in the Aviation Safety Program has funded research in electrical power system (EPS) health management. This problem domain contains both discrete and continuous behavior, and thus is directly relevant for the hybrid diagnostic tool HyDE. In FY2007 work was performed to expand the HyDE diagnosis model of the ADAPT system. The work completed resulted in a HyDE model with the capability to diagnose five times the number of ADAPT components previously tested. The expanded diagnosis model passed a corresponding set of new ADAPT fault injection scenario tests with no incorrect faults reported. The time required for the HyDE diagnostic system to isolate the fault varied widely between tests; this variance was reduced by tuning HyDE input parameters. These results and other diagnostic design trade-offs are discussed. Finally, possible future improvements for both the HyDE diagnostic model and HyDE itself are presented.
Author
Diagnosis; Flight Safety; Aircraft Safety

20080017224 NASA Dryden Flight Research Center, Edwards, CA, USA
Abnormal/Emergency Situations. Impact of Unmanned Aircraft Systems Emergency and Abnormal Events on the National Airspace System
February 09, 2006; 31 pp.; In English
Contract(s)/Grant(s): WBS 1.1.9.0
Report No.(s): DFRC-239; PD018; Copyright; Avail.: CASI: A03, Hardcopy

Access 5 analyzed the differences between UAS and manned aircraft operations under five categories of abnormal or emergency situations: Link Failure, Lost Communications, Onboard System Failures, Control Station Failures and Abnormal Weather. These analyses were made from the vantage point of the impact that these operations have on the US air traffic control system, with recommendations for new policies and procedures included where appropriate.
Author
Emergencies; National Airspace System; System Failures; Unmanned Aircraft Systems

20080017225 NASA Dryden Flight Research Center, Edwards, CA, USA
Classification of Unmanned Aircraft Systems. UAS Classification/Categorization for Certification
November 2004; 10 pp.; In English
Report No.(s): DFRC-239; PD006; Paper No. G-01; Copyright; Avail.: CASI: A02, Hardcopy

Category, class, and type designations are primary means to identify appropriate aircraft certification basis, operating rules/limitations, and pilot qualifications to operate in the National Airspace System (NAS). The question is whether UAS fit into existing aircraft categories or classes, or are unique enough to justify the creation of a new category/class. In addition, the characteristics or capabilities, which define when an UAS becomes a regulated aircraft, must also be decided. This issue focuses on UAS classification for certification purposes. Several approaches have been considered for classifying UAS. They basically group into either using a weight/mass basis, or a safety risk basis, factoring in the performance of the UAS, including where the UAS would operate. Under existing standards, aircraft must have a Type Certificate and Certificate of Airworthiness, in order to be used for ‘compensation or hire’, a major difference from model aircraft. Newer technologies may make it possible for very small UAS to conduct commercial services, but that is left for a future discussion to extend the regulated aircraft to a lower level. The Access 5 position is that UAS are aircraft and should be regulated above the weight threshold differentiating them from model airplanes. The recommended classification grouping is summarized in a chart.
Author
Classifications; National Airspace System; Unmanned Aircraft Systems; Remotely Piloted Vehicles; Pilotless Aircraft; Regulations

20080017226 NASA Dryden Flight Research Center, Edwards, CA, USA
Recommendations for Sense and Avoid Policy Compliance
April 30, 2005; 3 pp.; In English
Report No.(s): DFRC-239; PD004; Paper No. SE-2; Copyright; Avail.: CASI: A01, Hardcopy

Since unmanned aircraft do not have a human on board, they need to have a sense and avoid capability that provides an 'equivalent level of safety' (ELOS) to manned aircraft. The question then becomes - is sense and avoid ELOS for unmanned aircraft adequate to satisfy the requirements of 14 CFR 91.113? Access 5 has proposed a definition of sense and avoid, but the question remains as to whether any sense and avoid system can comply with 14 CFR 91.113 as currently written. The Access 5 definition of sense and avoid ELOS allows for the development of a sense and avoid system for unmanned aircraft that would comply with 14 CFR 91.113. Compliance is based on sensing and avoiding other traffic at an equivalent level of safety for collision avoidance, as manned aircraft. No changes to Part 91 are necessary, with the possible exception of changing 'see' to 'sense,' or obtaining an interpretation from the FAA General Counsel that 'sense' is equivalent to 'see.'
Author
Pilotless Aircraft; Collision Avoidance; Policies; Safety

20080017228 NASA Dryden Flight Research Center, Edwards, CA, USA
Registration and Marking Requirements for UAS. Unmanned Aircraft System (UAS) Registration
[2005]; 4 pp.; In English
Report No.(s): DFRC-239; PD009; Copyright; Avail.: CASI: A01, Hardcopy

The registration of an aircraft is a prerequisite for issuance of a U.S. certificate of airworthiness by the FAA. The procedures and requirements for aircraft registration, and the subsequent issuance of registration numbers, are contained in FAR Part 47. However, the process/method(s) for applying the requirements of Parts 45 & 47 to Unmanned Aircraft Systems (UAS) has not been defined. This task resolved the application of 14 CFR Parts 45 and 47 to UAS. Key Findings: UAS are aircraft systems and as such the recommended approach to registration is to follow the same process for registration as manned aircraft. This will require manufacturers to comply with the requirements for 14 CFR 47, Aircraft Registration and 14 CFR 45, Identification and Registration Marking. In addition, only the UA should be identified with the N number registration markings. There should also be a documentation link showing the applicability of the control station and communication link to the UA. The documentation link can be in the form of a Type Certificate Data Sheet (TCDS) entry or a UAS logbook entry. The recommended process for the registration of UAS is similar to the manned aircraft process and is outlined in a 6-step process in the paper.
Author
Unmanned Aircraft Systems; Communication Networks; Civil Aviation; Aircraft Reliability

20080017393 NASA Dryden Flight Research Center, Edwards, CA, USA
Airspace Operations Demo Functional Requirements Matrix
September 2005; 7 pp.; In English
Report No.(s): DFRC-239; FT005; Copyright; Avail.: CASI: A02, Hardcopy

The Flight IPT assessed the reasonableness of demonstrating each of the Access 5 Step 1 functional requirements. The functional requirements listed in this matrix are from the September 2005 release of the Access 5 Functional Requirements Document. The demonstration mission considered was a notional Western US mission (WUS). The conclusion of the assessment is that 90% of the Access 5 Step 1 functional requirements can be demonstrated using the notional Western US mission.
Author
Airspace; Functional Design Specifications

20080017396 NASA Dryden Flight Research Center, Edwards, CA, USA
Notional Airspace Operations Demonstration Plan
Trongale, Nicholas A.; February 19, 2006; 34 pp.; In English; Original contains color illustrations
Report No.(s): DFRC-239; FT007; Copyright; Avail.: CASI: A03, Hardcopy

The airspace operations demonstration (AOD) is intended to show that the Access 5 Step 1 functional requirements can be met. The demonstration will occur in two phases. The initial on-range phase will be carried out in restricted airspace to demonstrate the cooperative collision avoidance (CCA) functional requirements and to provide risk-reduction for the AOD by allowing the test team to rehearse some elements of the demonstration mission. The CCA system to be used in these flights

is based on Automatic Dependent Surveillance-Broadcast (ADS-B) which is a commercially-available system by which airplanes constantly broadcast their current position and altitude to other aircraft and ground resources over a dedicated radio datalink. The final phase will occur in the national airspace (NAS) and will be the formal demonstration of the remainder of the proposed functional requirements. The general objectives of the AOD are as follows: (1) Demonstrate that the UAS can aviate in the NAS (2) Demonstrate that the UAS can navigate in the NAS (3) Demonstrate that the UAS can communicate with the NAS (4) Demonstrate that the UAS can perform selected collision avoidance functions in the NAS (5) Demonstrate that the UAS can evaluate and avoid weather conflicts in the NAS (6) Demonstrate that the UAS can provide adequate command and control in the NAS In addition to the stated objectives, there are a number of goals for the flight demonstration. The demo can be accomplished successfully without achieving these goals, but these goals are to be used as a guideline for preparing for the mission. The goals are: (1) Mission duration of at least 24 hours (2) Loiter over heavy traffic to evaluate the data block issue identified during the Access 5 Airspace Operations Simulations (3) Document the contingency management process and lessons learned (4) Document the coordination process for Ground Control Stations (GCS) handoff (5) Document lessons learned regarding the process of flying in the NAS Preliminary planning for a notional mission to achieve the objectives and goals has been prepared. The planning is intended to serve as a guide for detailed planning of the AOD.
Author

Airspace; Collision Avoidance; Flight Tests; Functional Design Specifications; Pilotless Aircraft; Unmanned Aircraft Systems; Aircraft Safety

20080017398 NASA Dryden Flight Research Center, Edwards, CA, USA

Cooperative Collision Avoidance Technology Demonstration Data Analysis Report

April 09, 2007; 591 pp.; In English; Original contains color and black and white illustrations

Report No.(s): DFRC-239; CCA010; Copyright; Avail.: CASI: A25, Hardcopy

This report details the National Aeronautics and Space Administration (NASA) Access 5 Project Office Cooperative Collision Avoidance (CCA) Technology Demonstration for unmanned aircraft systems (UAS) conducted from 21 to 28 September 2005. The test platform chosen for the demonstration was the Proteus Optionally Piloted Vehicle operated by Scaled Composites, LLC, flown out of the Mojave Airport, Mojave, CA. A single intruder aircraft, a NASA Gulf stream III, was used during the demonstration to execute a series of near-collision encounter scenarios. Both aircraft were equipped with Traffic Alert and Collision Avoidance System-II (TCAS-II) and Automatic Dependent Surveillance Broadcast (ADS-B) systems. The objective of this demonstration was to collect flight data to support validation efforts for the Access 5 CCA Work Package Performance Simulation and Systems Integration Laboratory (SIL). Correlation of the flight data with results obtained from the performance simulation serves as the basis for the simulation validation. A similar effort uses the flight data to validate the SIL architecture that contains the same sensor hardware that was used during the flight demonstration.
Author

Collision Avoidance; Flight Tests; Unmanned Aircraft Systems; Pilotless Aircraft; Airspace; Aircraft Safety; Flight Safety; NASA Programs

20080017401 NASA Dryden Flight Research Center, Edwards, CA, USA

HALE UAS Command and Control Communications: Step 1 - Functional Requirements Document. Version 4.0

February 08, 2006; 51 pp.; In English; Original contains color and black and white illustrations

Report No.(s): DFRC-239; CCC002-Rev4; Copyright; Avail.: CASI: A04, Hardcopy

The High Altitude Long Endurance (HALE) unmanned aircraft system (UAS) communicates with an off-board pilot-in-command in all flight phases via the C2 data link, making it a critical component for the UA to fly in the NAS safely and routinely. This is a new requirement in current FAA communications planning and monitoring processes. This document provides a set of comprehensive C2 communications functional requirements and performance guidelines to help facilitate the future FAA certification process for civil UAS to operate in the NAS. The objective of the guidelines is to provide the ability to validate the functional requirements and in future be used to develop performance-level requirements.
Author

Command and Control; Functional Design Specifications; Pilotless Aircraft; Unmanned Aircraft Systems; Data Links

20080017415 NASA Dryden Flight Research Center, Edwards, CA, USA

Weather Requirements and Procedures for Step 1: High Altitude Long Endurance (HALE) Unmanned Aircraft System (UAS) Flight Operations in the National Air Space (NAS)

April 09, 2007; 78 pp.; In English; Original contains color and black and white illustrations

Report No.(s): DFRC-239; WX001-Rev2; Copyright; Avail.: CASI: A05, Hardcopy

This cover sheet is for version 2 of the weather requirements document along with Appendix A. The purpose of the

requirements document was to identify and to list the weather functional requirements needed to achieve the Access 5 vision of 'operating High Altitude, Long Endurance (HALE) Unmanned Aircraft Systems (UAS) routinely, safely, and reliably in the National Airspace System (NAS) for Step 1.' A discussion of the Federal Aviation Administration (FAA) references and related policies, procedures, and standards is provided as basis for the recommendations supported within this document. Additional procedures and reference documentation related to weather functional requirements is also provided for background. The functional requirements and related information are to be proposed to the FAA and various standards organizations for consideration and approval. The appendix was designed to show that sources of flight weather information are readily available to UAS pilots conducting missions in the NAS. All weather information for this presentation was obtained from the public internet.

Author

Functional Design Specifications; National Airspace System; Pilotless Aircraft; Unmanned Aircraft Systems; Weather; Aircraft Safety; Meteorology; Meteorological Parameters; Synoptic Meteorology

20080017417 NASA Dryden Flight Research Center, Edwards, CA, USA

Functional Requirements Document for HALE UAS Operations in the NAS: Step 1. Version 3

January 2006; 54 pp.; In English; Original contains color illustrations

Report No.(s): DFRC-239; SE002; Copyright; Avail.: CASI: A04, Hardcopy

The purpose of this Functional Requirements Document (FRD) is to compile the functional requirements needed to achieve the Access 5 Vision of 'operating High Altitude, Long Endurance (HALE) Unmanned Aircraft Systems (UAS) routinely, safely, and reliably in the national airspace system (NAS)' for Step 1. These functional requirements could support the development of a minimum set of policies, procedures and standards by the Federal Aviation Administration (FAA) and various standards organizations. It is envisioned that this comprehensive body of work will enable the FAA to establish and approve regulations to govern safe operation of UAS in the NAS on a routine or daily 'file and fly' basis. The approach used to derive the functional requirements found within this FRD was to decompose the operational requirements and objectives identified within the Access 5 Concept of Operations (CONOPS) into the functions needed to routinely and safely operate a HALE UAS in the NAS. As a result, four major functional areas evolved to enable routine and safe UAS operations for an on-demand basis in the NAS. These four major functions are: Aviate, Navigate, Communicate, and Avoid Hazards. All of the functional requirements within this document can be directly traceable to one of these four major functions. Some functions, however, are traceable to several, or even all, of these four major functions. These cross-cutting functional requirements support the 'Command / Control: function as well as the 'Manage Contingencies' function. The requirements associated to these high-level functions and all of their supporting low-level functions are addressed in subsequent sections of this document.

Author

Functional Design Specifications; National Airspace System; Unmanned Aircraft Systems; Pilotless Aircraft; Aircraft Control; Flight Control; Automatic Flight Control

20080017440 Leonelli (F. J.), Waxhaw, NC, USA

Research Report on Safety Management Systems

Jensen, L.; Keller, S.; Leonelli, F. J.; May 1, 2007; 49 pp.; In English

Report No.(s): PB2007-111134; No Copyright; Avail.: CASI: A03, Hardcopy

The purpose of this project was to conduct research to determine the degree to which safety management systems have been implemented in a variety of aviation safety oversight systems outside the USA; to determine the basis and characteristics of those systems; and to what degree similarities and differences exist among those systems, as well as the nature of those differences and similarities.

NTIS

Aircraft Safety; Flight Safety; Management Systems; Research Management; Safety Management

20080017467 National Transportation Safety Board, Washington, DC USA

Annual Review of Aircraft Accident Data: U.S. Air Carrier Operations, Calendar Year 2002

Sep. 14, 2006; 64 pp.; In English

Report No.(s): PB2007-100695; NTSB/ARC-06/02; No Copyright; Avail.: CASI: A04, Hardcopy

The National Transportation Safety Boards Review of 2002 Aircraft Accident Data: U.S. Air Carrier Operations covers aircraft operated by U.S. air carriers under Title 14, Parts 121 and 135, of the Code of Federal Regulations (CFR). Air carriers

are generally defined as operators that fly aircraft in revenue service. To provide an historical context for this 2002 review, data for the years 1993-2002 are also presented. A list of 2002 air carrier accidents is presented in appendix A.
NTIS
Air Transportation; Airline Operations; Commercial Aircraft; Aircraft Accidents; Aircraft Safety; Civil Aviation

20080017860 National Transportation Safety Board, Washington, DC USA
Annual Review of Aircraft Accident Data: U.S. General Aviation, Calendar Year 2003
Nov. 29, 2006; 56 pp.; In English
Report No.(s): PB2007-105388; NTSB/ARG-07/01; No Copyright; Avail.: CASI: A04, Hardcopy

The National Transportation Safety Board's 2003 Annual Review of Aircraft Accident Data for U.S. General Aviation is a statistical compilation and review of general aviation accidents that occurred in 2003 involving U.S.-registered aircraft. As a summary of all U.S. general aviation accidents for 2003, the review is designed to inform general aviation pilots and their passengers and to provide detailed information to support future government, industry, and private research efforts and safety improvement initiatives.
NTIS
Aircraft Accidents; General Aviation Aircraft; Aircraft Safety; Flight Safety; Aircraft Hazards

20080017861 National Transportation Safety Board, Washington, DC USA
Annual Review of Aircraft Accident Data: U.S. Air Carrier Operations, Calendar Year 2003
Dec. 12, 2006; 66 pp.; In English
Report No.(s): PB2007-105389; NTSB/ARC-07/01; No Copyright; Avail.: CASI: A04, Hardcopy

The National Transportation Safety Board's Review of 2003 Aircraft Accident Data: U.S. Air Carrier Operations covers aircraft operated by U.S. air carriers under Title 14, Parts 121 and 135, of the Code of Federal Regulations (CFR). Air carriers are generally defined as operators that fly aircraft in revenue service. To provide an historical context for this 2003 review, data for the years 1994-2003 are also presented. A list of 2003 air carrier accidents is presented in appendix A.
NTIS
Air Transportation; Airline Operations; Commercial Aircraft; Aircraft Accidents; Aircraft Safety; Flight Safety

04
AIRCRAFT COMMUNICATIONS AND NAVIGATION

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

20080016729 NASA Dryden Flight Research Center, Edwards, CA, USA
Step 1:Human System Integration (HSI) FY05 Pilot-Technology Interface Requirements for Collision Avoidance
August 31, 2007; 26 pp.; In English; Original contains color illustrations
Report No.(s): DFRC-239; HSI013; Copyright; Avail.: CASI: A03, Hardcopy

This document provides definition of technology human interface requirements for Collision Avoidance (CA). This was performed through a review of CA-related, HSI requirements documents, standards, and recommended practices. Technology concepts in use by the Access 5 CA work package were considered... Beginning with the HSI high-level functional requirement for CA, and CA technology elements, HSI requirements for the interface to the pilot were identified. Results of the analysis describe (1) the information required by the pilot to have knowledge CA system status, and (2) the control capability needed by the pilot to obtain CA information and affect an avoidance maneuver. Fundamentally, these requirements provide the candidate CA technology concepts with the necessary human-related elements to make them compatible with human capabilities and limitations. The results of the analysis describe how CA operations and functions should interface with the pilot to provide the necessary CA functionality to the UA-pilot system .Requirements and guidelines for CA are partitioned into four categories: (1) General, (2) Alerting, (3) Guidance, and (4) Cockpit Display of Traffic Information. Each requirement is stated and is supported with a rationale and associated reference(s).
Author
Air Traffic; Collision Avoidance; Controllability; Human Performance; Display Devices

20080017113 Mitre Corp., McLean, VA, USA

Preliminary C3 Loading Analysis for Future High-Altitude Unmanned Aircraft in the NAS

Ho, Yan-Shek; Gheorghisor, Izabela; Box, Frank; February 2006; 39 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NND05CR15S; 1206H008-AA

Report No.(s): MP 06W0000032; MN06W32; Copyright; Avail.: CASI: A03, Hardcopy

This document provides a preliminary assessment and summary of the command, control, and communications (C(sup 3)) loading requirements of a generic future high-altitude, long-endurance unmanned aircraft (UA) operating at in the National Airspace System. Two principal types of C(sup 3) traffic are considered in our analysis: communications links providing air traffic services (ATS) to the UA and its human pilot, and the command and control data links enabling the pilot to operate the UA remotely. we have quantified the loading requirements of both types of traffic for two different assumed levels of UA autonomy. Our results indicate that the potential use of UA-borne relays for the ATS links, and the degree of autonomy exercised by the UA during the departure and arrival phases of its flight, will be among the key drivers of C(sup 3) loading and bandwidth requirements.

Author

Pilotless Aircraft; Bandwidth; Command and Control; Communication Networks; High Altitude

20080017227 NASA Dryden Flight Research Center, Edwards, CA, USA

Recommendations for UAS Crew Ratings. Pilot Ratings and Authorization Requirements for UAS

[2005]; 54 pp.; In English

Report No.(s): DFRC-239; PD010; Copyright; Avail.: CASI: A04, Hardcopy

This position paper is intended to recommend the minimum certificate and rating requirements for a pilot to operate an Unmanned Aircraft System (UAS) in the National Airspace System. The paper will recommend the minimum requirements based on the Knowledge, Skills, and Abilities (KSA) required of a UAS pilot and show how those compare to the KSAs required by regulation for manned-aircraft pilots. The paper will provide substantiation based on studies conducted using analyses, simulation and flight experience. The paper is not yet complete; only initial working material is included. The material provided describes the body of work completed thus far and the plan for remaining tasks to complete the recommendation. The HSI Pilot KSA document provides an analysis of the knowledge, skills, and abilities required for UAS operation in the NAS. It is the source document used for the position paper.

Author

Pilotless Aircraft; Flight Simulation; Pilots; Ratings; Education; National Airspace System

20080017231 NASA Dryden Flight Research Center, Edwards, CA, USA

High Altitude Long Endurance (HALE) Unmanned Aircraft System (UAS): Pilot Knowledge, Skills and Abilities

December 2005; 75 pp.; In English; Original contains color illustrations

Report No.(s): DFRC-239; HSI008; HSI008; Copyright; Avail.: CASI: A04, Hardcopy

This report summarizes the initial work accomplished by the ACCESS 5 Human System Integration (HSI) team to identify Unmanned Aircraft System (UAS) Pilot Knowledge, Skill and Ability (KSA), Training and Medical requirements. To derive this information the following tasks were accomplished: a) Mission and Function analyses were performed; b) Applicable FARs and FAA Advisory Circulars (ACs) were reviewed; c) Meetings were conducted with NASA and FAA Human Factors personnel; d) Surveys were completed by ACCESS 5 HSI Working group UA Pilots; e) Coordination meetings were conducted with the ACCESS 5 Policy IPT. The results of these efforts were used to develop a summary of the current qualifications. for an individual to function as a Pilot In Command (PIC) for UAs currently flown by UNITE companies, to develop preliminary Pilot KSAs for each phase of flight, and to delineate preliminary Pilot Training and Medical requirements. These results are to be provided to the Policy IPT to support their development of recommendations for UA Pilot Rating Criteria, training and medical qualifications. It is expected that the initially an instrument rated pilot will be required to serve as the PIC. However, as operational experience is gained, and automation is applied to accomplish various system functions, it is expected that pilot rating criteria could be lessened.

Author

Pilotless Aircraft; Pilot Ratings; Qualifications; Policies; Pilot Training; Human Factors Engineering; Education; Systems Integration; High Altitude

20080017233 NASA Dryden Flight Research Center, Edwards, CA, USA
HSI Guidelines Outline for the Air Vehicle Control Station. Version 2
January 2006; 164 pp.; In English
Report No.(s): DFRC-239; HSI003 Rev2; Copyright; Avail.: CASI: A08, Hardcopy

This document provides guidance to the FAA and manufacturers on how to develop UAS Pilot Vehicle Interfaces to safely and effectively integrate UASs into the NAS. Preliminary guidelines are provided for Aviate, Communicate, Navigate and Avoid Hazard functions. The pilot shall have information and control capability so that pilot-UA interactions are not adverse, unfavorable, nor compromise safety. Unfavorable interactions include anomalous aircraft-pilot coupling (APC) interactions (closed loop), pilot-involved oscillations (categories I, II or III), and non-oscillatory APC events (e.g., divergence). - Human Systems Integration Pilot-Technology Interface Requirements for Command, Control, and Communications (C3)
Author
Command and Control; Feedback Control; Systems Integration; Pilotless Aircraft; Pilots

20080017279 NASA Dryden Flight Research Center, Edwards, CA, USA
Human System Integration: Regulatory Analysis
February 2005; 43 pp.; In English; Original contains color illustrations
Report No.(s): DFRC-239; HSI006; Copyright; Avail.: CASI: A03, Hardcopy

This document was intended as an input to the Access 5 Policy Integrated Product team. Using a Human System Integration (HIS) perspective, a regulatory analyses of the FARS (specifically Part 91), the Airman s Information Manual (AIM) and the FAA Controllers Handbook (7110.65) was conducted as part of a front-end approach needed to derive HSI requirements for Unmanned Aircraft Systems (UAS) operations in the National Airspace System above FL430. The review of the above aviation reference materials yielded eighty-four functions determined to be necessary or highly desirable for flight within the Air Traffic Management System. They include categories for Flight, Communications, Navigation, Surveillance, and Hazard Avoidance.
Author
Unmanned Aircraft Systems; Human Factors Engineering; National Airspace System; Navigation; Telecommunication; Flight Crews; Flight Hazards; Air Traffic Control

20080017280 Lockheed Martin Corp., USA
Human Systems Integration: Requirements and Functional Decomposition
Berson, Barry; Gershzohn, Gary; Boltz, Laura; Wolf, Russ; Schultz, Mike; February 2005; 23 pp.; In English
Report No.(s): DFRC-239; HSI007; Copyright; Avail.: CASI: A03, Hardcopy

This deliverable was intended as an input to the Access 5 Policy and Simulation Integrated Product Teams. This document contains high-level pilot functionality for operations in the National Airspace System above FL430. Based on the derived pilot functions the associated pilot information and control requirements are given.
Author
Pilots; National Airspace System; User Requirements; Policies; Systems Integration; High Altitude; Pilotless Aircraft

20080017281 NASA Dryden Flight Research Center, Edwards, CA, USA
Human Systems Integration: Unmanned Aircraft Control Station Certification Plan Guidance
December 2005; 78 pp.; In English; Original contains color illustrations
Report No.(s): DFRC-239; HSI009; Copyright; Avail.: CASI: A05, Hardcopy

This document provides guidance to the FAA on important human factors considerations that can be used to support the certification of a UAS Aircraft Control Station (ACS). This document provides a synopsis of the human factors analysis, design and test activities to be performed to provide a basis for FAA certification. The data from these analyses, design activities, and tests, along with data from certification/qualification tests of other key components should be used to establish the ACS certification basis. It is expected that this information will be useful to manufacturers in developing the ACS Certification Plan,, and in supporting the design of their ACS.
Author
Pilotless Aircraft; Human Factors Engineering; Certification; Aircraft Control

20080017282 NASA Dryden Flight Research Center, Edwards, CA, USA
Access 5 - Step 1: Human Systems Integration Program Plan (HSIPP)
February 2005; 32 pp.; In English; Original contains color illustrations
Report No.(s): DFRC-239; HSI001; Copyright; Avail.: CASI: A03, Hardcopy

This report describes the Human System Interface (HSI) analysis, design and test activities that will be performed to support the development of requirements and design guidelines to facilitate the incorporation of High Altitude Long Endurance (HALE) Remotely Operated Aircraft (ROA) at or above FL400 in the National Airspace System (NAS). These activities are required to support the design and development of safe, effective and reliable ROA operator and ATC interfaces. This plan focuses on the activities to be completed for Step 1 of the ACCESS 5 program. Updates to this document will be made for each of the four ACCESS 5 program steps.
Author
Human Factors Engineering; Systems Integration; National Airspace System; High Altitude; Air Traffic Control; Pilotless Aircraft; Pilots

20080017283 NASA Dryden Flight Research Center, Edwards, CA, USA
Work Package 5: Contingency Management. Mission Planning Requirements Document: Preliminary Version. Revision A
March 31, 2005; 37 pp.; In English; Original contains black and white illustrations
Report No.(s): DFRC-239; CM003; Copyright; Avail.: CASI: A03, Hardcopy

The purpose of this document is to identify the general flight/mission planning requirements for same-day file-and-fly access to the NAS for both civil and military High-Altitude Long Endurance (HALE) Unmanned Aircraft System (UAS). Currently the scope of this document is limited to Step 1, operations above flight level 43,000 feet (FL430). This document describes the current applicable mission planning requirements and procedures for both manned and unmanned aircraft and addresses HALE UAS flight planning considerations in the future National Airspace System (NAS). It also discusses the unique performance and operational capabilities of HALE UAS associated with the Access 5 Project, presents some of the projected performance characteristics and conceptual missions for future systems, and provides detailed analysis of the recommended mission planning elements for operating HALE UAS in the NAS.
Author
Pilotless Aircraft; National Airspace System; Mission Planning; High Altitude

20080017284 NASA Dryden Flight Research Center, Edwards, CA, USA
Step 1: Human System Interface (HSI) Functional Requirements Document (FRD). Version 2
January 2006; 23 pp.; In English; Original contains color illustrations
Report No.(s): DFRC-239; HSI005-Rev2; Copyright; Avail.: CASI: A03, Hardcopy

This Functional Requirements Document (FRD) establishes a minimum set of Human System Interface (HSI) functional requirements to achieve the Access 5 Vision of ‘operating High Altitude, Long Endurance (HALE) Unmanned Aircraft Systems (UAS) routinely, safely, and reliably in the National Airspace System (NAS)’. Basically, it provides what functions are necessary to fly UAS in the NAS. The framework used to identify the appropriate functions was the ‘Aviate, Navigate, Communicate, and Avoid Hazards’ structure identified in the Access 5 FRD. As a result, fifteen high-level functional requirements were developed. In addition, several of them have been decomposed into low-level functional requirements to provide more detail.
Author
Unmanned Aircraft Systems; High Altitude; National Airspace System; Functional Design Specifications

20080017359 NASA Dryden Flight Research Center, Edwards, CA, USA
Step 1: Human System Integration Simulation and Flight Test Progress Report
November 30, 2005; 130 pp.; In English; Original contains color illustrations
Report No.(s): DFRC-239; HSI010; Copyright; Avail.: CASI: A07, Hardcopy

The Access 5 Human Systems Integration Work Package produced simulation and flight demonstration planning products for use throughout the program. These included: Test Objectives for Command, Control, Communications; Pilot Questionnaire for Command, Control, Communications; Air Traffic Controller Questionnaire for Command, Control, Communications; Test Objectives for Collision Avoidance; Pilot Questionnaire for Collision Avoidance; Plans for Unmanned Aircraft Systems

Control Station Simulations Flight Requirements for the Airspace Operations Demonstration
Author
Collision Avoidance; Command and Control; Flight Operations; Unmanned Aircraft Systems; Airspace

20080017381 NASA Dryden Flight Research Center, Edwards, CA, USA
Step 1: Human System Integration Pilot-Technology Interface Requirements for Weather Management
August 31, 2005; 23 pp.; In English; Original contains color illustrations
Report No.(s): DFRC-239; HSI011; Copyright; Avail.: CASI: A03, Hardcopy

This document involves definition of technology interface requirements for Hazardous Weather Avoidance. Technology concepts in use by the Access 5 Weather Management Work Package were considered. Beginning with the Human System Integration (HIS) high-level functional requirement for Hazardous Weather Avoidance, and Hazardous Weather Avoidance technology elements, HSI requirements for the interface to the pilot were identified. Results of the analysis describe (1) the information required by the pilot to have knowledge of hazardous weather, and (2) the control capability needed by the pilot to obtain hazardous weather information. Fundamentally, these requirements provide the candidate Hazardous Weather Avoidance technology concepts with the necessary human-related elements to make them compatible with human capabilities and limitations. The results of the analysis describe how Hazardous Weather Avoidance operations and functions should interface with the pilot to provide the necessary Weather Management functionality to the UA-pilot system. Requirements and guidelines for Hazardous Weather Avoidance are partitioned into four categories: (1) Planning En Route (2) Encountering Hazardous Weather En Route, (3) Planning to Destination, and (4) Diversion Planning Alternate Airport. Each requirement is stated and is supported with a rationale and associated reference(s).
Author
Human Performance; Systems Integration; Routes; Controllability; Airports

20080017382 NASA Dryden Flight Research Center, Edwards, CA, USA
Step 1: Human System Integration (HSI) FY05 Pilot-Technology Interface Requirements for Contingency Management
August 31, 2005; 17 pp.; In English; Original contains color illustrations
Report No.(s): DFRC-239; HSI012; Copyright; Avail.: CASI: A03, Hardcopy

This document involves definition of technology interface requirements for Contingency Management. This was performed through a review of Contingency Management-related, HSI requirements documents, standards, and recommended practices. Technology concepts in use by the Contingency Management Work Package were considered. Beginning with HSI high-level functional requirements for Contingency Management, and Contingency Management technology elements, HSI requirements for the interface to the pilot were identified. Results of the analysis describe (1) the information required by the pilot to have knowledge of system failures and associated contingency procedures, and (2) the control capability needed by the pilot to obtain system status and procedure information. Fundamentally, these requirements provide the candidate Contingency Management technology concepts with the necessary human-related elements to make them compatible with human capabilities and limitations. The results of the analysis describe how Contingency Management operations and functions should interface with the pilot to provide the necessary Contingency Management functionality to the UA-pilot system. Requirements and guidelines for Contingency Management are partitioned into four categories: (1) Health and Status and (2) Contingency Management. Each requirement is stated and is supported with a rationale and associated reference(s).
Author
Human Performance; Controllability; Functional Design Specifications; Pilots; Unmanned Aircraft Systems

20080017389 NASA Dryden Flight Research Center, Edwards, CA, USA
Step 1: Human System Integration (HSI) FY05 Pilot-Technology Interface Requirements for Command, Control, and Communications (C3)
August 31, 2005; 23 pp.; In English; Original contains color illustrations
Report No.(s): DFRC-239; HSI014; Copyright; Avail.: CASI: A03, Hardcopy

The document provides the Human System Integration(HSI) high-level functional C3 HSI requirements for the interface to the pilot. Description includes (1) the information required by the pilot to have knowledge C3 system status, and (2) the control capability needed by the pilot to obtain C3 information. Fundamentally, these requirements provide the candidate C3 technology concepts with the necessary human-related elements to make them compatible with human capabilities and limitations. The results of the analysis describe how C3 operations and functions should interface with the pilot to provide the

necessary C3 functionality to the UA-pilot system. Requirements and guidelines for C3 are partitioned into three categories: (1) Pilot-Air Traffic Control (ATC) Voice Communications (2) Pilot-ATC Data Communications, and (3) command and control of the unmanned aircraft (UA). Each requirement is stated and is supported with a rationale and associated reference(s).
Author
Pilotless Aircraft; Human Performance; Aircraft Control; Command and Control; Voice Communication; Pilots; Functional Design Specifications; Air Traffic Control

20080017400 NASA Dryden Flight Research Center, Edwards, CA, USA
Current Hale ROA Voice and Control Communication Practices and Performance: White Paper
April 09, 2007; 25 pp.; In English
Report No.(s): DFRC-239; CCC001; Copyright; Avail.: CASI: A03, Hardcopy

The objective of this white paper is to help achieve the ACCESS 5 goal by sharing the UNITE members knowledge of current HALE ROA communication systems with other ACCESS 5 participants so that all interested parties start from a common understanding as we begin the clarification of requirements for voice and C2 communication. This white paper is also intended to describe the point of departure for any future developments that need to be realized to achieve the long term ACCESS 5 goal. Although this white paper describes the current systems, the functional and performance requirements that are also being developed under ACCESS 5 may not require the same levels of functionality and performance as currently exist. The paper addresses the following: 1) A description of a typical current HALE ROA communications system, 2) HALE ROA communications systems performance metrics, 3) HALE ROA communications systems performance, and 5) A comparison of current HALE ROA communications systems with current regulations.
Author
Voice Communication; Voice Control; Functional Design Specifications; Telecommunication

20080017410 NASA Dryden Flight Research Center, Edwards, CA, USA
Step 1: C3 Flight Demo Data Analysis Plan
June 30, 2005; 19 pp.; In English; Original contains color and black and white illustrations
Report No.(s): DRFC-239; CCC004; DFRC-X34ALTV-CHUTE-002; 1-C3-DAP-000; Copyright; Avail.: CASI: A03, Hardcopy

The Data Analysis Plan (DAP) describes the data analysis that the C3 Work Package (WP) will perform in support of the Access 5 Step 1 C3 flight demonstration objectives as well as the processes that will be used by the Flight IPT to gather and distribute the data collected to satisfy those objectives. In addition to C3 requirements, this document will encompass some Human Systems Interface (HSI) requirements in performing the C3 flight demonstrations. The C3 DAP will be used as the primary interface requirements document between the C3 Work Package and Flight Test organizations (Flight IPT and Non-Access 5 Flight Programs). In addition to providing data requirements for Access 5 flight test (piggyback technology demonstration flights, dedicated C3 technology demonstration flights, and Airspace Operations Demonstration flights), the C3 DAP will be used to request flight data from Non- Access 5 flight programs for C3 related data products
Author
Flight Plans; Flight Tests; Airspace

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.

20080016642 Carlson, Gaskey and Olds, P.C., Birmingham, MI, USA
Bearing Seal with Backup Device
Anderson, J. H., Inventor; Picard, H. R., Inventor; Mar. 16, 2004; 5 pp.; In English
Contract(s)/Grant(s): F33657-91-C-007
Patent Info.: Filed Filed 16 Mar 04; US-Patent-Appl-SN-10-801 237
Report No.(s): PB2007-104786; No Copyright; Avail.: CASI: A01, Hardcopy

A bearing seal assembly includes a pair segmented circumferential or a carbon ring seals to contain oil in the bearing compartments of a gas turbine engine or other mechanical device. The pair of seals, an oil-side seal and an air-side seal, are

axially-spaced between the oil and the air in the housing. Air at an elevated pressure is introduced between the seals. This elevated air pressure urges the seals axially apart from one another and radially inward to improve the seal. A backup seal is provided adjacent either the oil-side seal or the air-side seal. In the event of failure of either the oil-side seal or the air-side seal which results in the loss of air pressure, the backup seal will provide at least a minimum level of seal between the oil compartment and the air in the housing.
NTIS
Seals (Stoppers); Oils; Bearings; Lubrication

20080016704 Department of Agriculture, Brownsville, TX, USA
Aerial Application Manual. Interim Edition (10/2006)
Jan. 01, 2006; 408 pp.; In English
Report No.(s): PB2007-110469; No Copyright; Avail.: CASI: A18, Hardcopy

The Aerial Application Manual (AAM) is a reference to be used by USDA-APHIS-PPQ Program Managers and Air Operations to plan and conduct aerial applications that support domestic, emergency, and biological control programs, Frequently, these individuals will be delegated as the Contracting Officers Representative (COR). Users will follow information contained in this guide or tailor the information (where permitted) to their individual programs needs. The content of the Aerial Application Manual (AAM) provides general approaches that apply to most all domestic, emergency, and biological control programs. Topics that may vary from program-to-program are the type of aircraft; pesticides approved for use and how to handle those pesticides; monitoring; and setup.
NTIS
Manuals; Pesticides; Project Management; Spraying

20080017012 NASA Langley Research Center, Hampton, VA, USA
Vertical Drop Testing and Analysis of the WASP Helicopter Skid Gear
Fuchs, Yvonne T.; Jackson, Karen E.; April 29, 2008; 13 pp.; In English; American Helicopter Society 64th Annual Forum, 29 Apr. - 1 May 2008, Montreal, Canada; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 877868.02.07.07.05.02; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080017012

Human occupant modeling and injury risk assessment have been identified as areas of research for improved prediction of rotorcraft crashworthiness within the NASA Aeronautics Program's Subsonic Rotary Wing Project. As part of this effort, an experimental program was conducted to assess the impact performance of a skid gear for use on the WASP kit-built helicopter, which is marketed by HeloWerks, Inc. of Hampton, Virginia. Test data from a drop test at an impact velocity of 8.4 feet-per-second were used to assess a finite element model of the skid gear test article. This assessment included human occupant analytic models developed for execution in LS-DYNA. The test article consisted of an aluminum skid gear mounted beneath a steel plate. A seating platform was attached to the upper surface of the steel plate, and two 95th percentile Hybrid III male Aerospace Anthropomorphic Test Devices (ATDs) were seated on the platform and secured using a four-point restraint system. The goal of the test-analysis correlation is to further the understanding of LS-DYNA ATD occupant models and responses in the vertical (or spinal) direction. By correlating human occupant experimental test data for a purely vertical impact with the LS-DYNA occupant responses, improved confidence in the use of these tools and better understanding of the limitations of the automotive-based occupant models for aerospace application can begin to be developed.
Author
Drop Tests; Helicopters; Skidding; Landing Gear; Crashworthiness; Impact Tolerances; Helicopter Design; Aircraft Safety

20080017041 Federal Aviation Administration, Washington, DC, USA
Moving America Safely: Annual Performance Report, 2005. FAA (Federal Aviation Administration) Air Traffic Organization
Jan. 01, 2005; 36 pp.; In English
Report No.(s): PB2007-111329; No Copyright; Avail.: CASI: A03, Hardcopy

Fiscal year 2005 was a banner year for the Air Traffic Organization, matched by an unprecedented safety record. For the fourth year in a row, there were no fatal flight-related accidents in the commercial aviation system a system that handled more than 18 million flights in fiscal year 2005 alone. While the recent accident in Lexington is a stark reminder of the need to continuously improve, aviation remains the safest way to travel. In 2005, we installed more than 2,300 new systems and

equipment, hired 438 new controllers and saved the airline industry billions of dollars in fuel costs. All of this was done while trimming our management ranks and reducing overhead costs.
NTIS
Air Traffic; Safety

20080017052 Dynamic Response, Inc., Sherman Oaks, CA, USA
Development of Ditching and Water Impact Design Limit Curves for Civil Rotorcraft
Wittlin, G.; Gamon, M.; May 01, 2007; 137 pp.; In English
Report No.(s): PB2007-111126; No Copyright; Avail.: National Technical Information Service (NTIS)

This report describes the further development of Design Limit Envelopes (DLE) for rotorcraft. A Bell Helicopter (BH) 205 was used as a prototype rotorcraft configuration upon which KRASH models were developed and analyses were performed. Included in the KRASH analysis of ditching and severe, but survivable, water impacts are structural integrity levels and occupant protection considerations. The DLE defines the vertical velocity versus longitudinal velocity relationship for which acceptable structural and occupant protection are provided. Previously, two full-scale, fully instrumented water impact tests of a helicopter were performed. KRASH models were established and their results correlated with the test results. A correlation between test and analysis results was performed to validate the models and to develop an understanding of the significance of the test measurements, the analytical representation, and the differences between the two. Further confidence in the correlation procedures was established under a Federal Aviation Administration (FAA)-sponsored effort in which a comprehensive evaluation of various correlation techniques was performed. In addition, Title 14 Code of Federal Regulations Parts 27 and 29 requirements and compliance procedures were evaluated in a previous FAA-sponsored effort and shown to have limitations. Under this former effort, preliminary water impact DLEs were proposed based on UH-1H helicopter tests and analyses. Under this current effort, a set of KRASH BH-205 helicopter structural and occupant models were established based on available data. These models were used to perform analyses for various sets of survivable water impact conditions.
NTIS
Civil Aviation; Rotary Wing Aircraft; Water

20080017056 Boeing Co., Seattle, WA, USA
Indications of Propulsion System Malfunctions - Sustained Thrust Anomaly Study
Ostrom, G. B.; Mason, J.; Clark, S.; Clark, S.; May 01, 2007; 262 pp.; In English
Report No.(s): PB2007-111130; No Copyright; Avail.: National Technical Information Service (NTIS)

The feasibility of providing specific indications to flight crews when a propulsion system malfunction occurs was evaluated. The Boeing Phase 1 Report, Indications of Propulsion System Malfunctions, DOT/FAA/AR-03/72, reviewed and analyzed propulsion system malfunctions (PSM) plus inappropriate crew response (ICR) accident and incident events for the potential of PSM annunciations to prevent ICR. This Phase 2 work involved the development of PSM detection and annunciation strategies. The focus of Phase 2 work was placed on sustained thrust anomalies (STA) identified to be the most common factor and significant contributor in PSM+ICR events. This report documented the results of the Phase 2 study. The research included propulsion system malfunction detection criteria derived from: propulsion system operational criteria; crew operational criteria; and new indication concept criteria. The research also included sets of potential detection strategies to meet the established propulsion and crew operational criteria; technology risk assessment and down selection of strategies; and development, demonstration, and validation plan for the selected strategies.
NTIS
Flight Crews; Malfunctions; Propulsion; Propulsion System Performance; System Failures; Human Reactions; Detection; Fault Detection

20080017057 Quebec Univ., Chicoutimi, Quebec, Canada
Investigation of a New Formulation Reference Fluid for Use in Aerodynamic Acceptance Evaluation of Aircraft Ground Deicing and Anti-Icing Fluids
Beisswenger, A.; Laforte, J. L.; Trenblay, M. M.; Perron, J.; May 01, 2007; 34 pp.; In English
Report No.(s): PB2007-111131; No Copyright; Avail.: National Technical Information Service (NTIS)

A new formulation fluid is proposed for use as the reference fluid for aerodynamic testing and qualification of commercial aircraft deicing and anti-icing fluids. The new formulation fluid is to replace the currently used reference fluid, MIL-A-8243D, which allows for large variation in its composition. The MIL-A-8243D fluid, manufactured up to 2005, is no longer commercially available because its chief user, the USA Military, now uses qualified commercial Society of Automotive

Engineers deicing and anti-icing fluids. The new formulation fluid, a mixture of 68% propylene, 20% tripropylene glycol, and 12% demineralized water, is chemically compatible with current glycol-based fluids. Furthermore, it can be produced more simply and accurately than the more complex military (MIL) formulation it replaces. Having the same viscosity as MIL-A-8243D, the new formulation reference has been found to be essentially aerodynamically indistinguishable from the MIL fluid in validation test runs in which both fluids were tested with a candidate fluid for high-speed ramp aerodynamic standard qualification. The measurements and validation testing accomplished in the present study support the adoption of the new fluid for use as the reference fluid for the high-speed ramp standard aerodynamic qualification test in place of the current MIL fluid. An investigation similar to the one described in this report could establish if the new fluid also can be used as the reference fluid for the low-speed ramp standard aerodynamic qualification test.
NTIS
Commercial Aircraft; Deicers; Deicing; Ice Prevention; Antiicing Additives

20080017394 NASA Dryden Flight Research Center, Edwards, CA, USA
Cooperative Collision Avoidance Step 1 - Technology Demonstration Flight Test Report. Revision 1
Trongale, Nicholas A.; March 24, 2006; 25 pp.; In English; Original contains color and black and white illustrations
Report No.(s): DFRC-239; FT006; Copyright; Avail.: CASI: A03, Hardcopy

The National Aeronautics and Space Administration (NASA) Access 5 Project Office sponsored a cooperative collision avoidance flight demonstration program for unmanned aircraft systems (UAS). This flight test was accomplished between September 21st and September 27th 2005 from the Mojave Airport, Mojave, California. The objective of these flights was to collect data for the Access 5 Cooperative Collision Avoidance (CCA) Work Package simulation effort, i.e., to gather data under select conditions to allow validation of the CCA simulation. Subsequent simulation to be verified were: Demonstrate the ability to detect cooperative traffic and provide situational awareness to the ROA pilot; Demonstrate the ability to track the detected cooperative traffic and provide position information to the ROA pilot; Demonstrate the ability to determine collision potential with detected cooperative traffic and provide notification to the ROA pilot; Demonstrate that the CCA subsystem provides information in sufficient time for the ROA pilot to initiate an evasive maneuver to avoid collision; Demonstrate an evasive maneuver that avoids collision with the threat aircraft; and lastly, Demonstrate the ability to assess the adequacy of the maneuver and determine that the collision potential has been avoided. The Scaled Composites, LLC Proteus Optionally Piloted Vehicle (OPV) was chosen as the test platform. Proteus was manned by two on-board pilots but was also capable of being controlled from an Air Vehicle Control Station (AVCS) located on the ground. For this demonstration, Proteus was equipped with cooperative collision sensors and the required hardware and software to place the data on the downlink. Prior to the flight phase, a detailed set of flight test scenarios were developed to address the flight test objectives. Two cooperative collision avoidance sensors were utilized for detecting aircraft in the evaluation: Traffic Alert and Collision Avoidance System-II (TCAS-II) and Automatic Dependent Surveillance Broadcast (ADS-B). A single intruder aircraft was used during all the flight testing, a NASA Gulfstream III (G-III). During the course of the testing, six geometrically different near-collision scenarios were evaluated. These six scenarios were each tested using various combinations of sensors and collision avoidance software. Of the 54 planned test points 49 were accomplished successfully. Proteus flew a total of 21.5 hours during the testing and the G-III flew 19.8 hours. The testing fully achieved all flight test objectives. The Flight IPT performed an analysis to determine the accuracy of the simulation model used to predict the location of the host aircraft downstream during an avoidance maneuver. The data collected by this flight program was delivered to the Access 5 Cooperative Collision Avoidance (CCA) Work Package Team who was responsible for reporting on their analysis of this flight data.
Author
Collision Avoidance; Flight Tests; Situational Awareness; Unmanned Aircraft Systems; Warning Systems; Surveillance; NASA Programs

20080017397 NASA Dryden Flight Research Center, Edwards, CA, USA
Sense and Avoid Safety Analysis for Remotely Operated Unmanned Aircraft in the National Airspace System. Version 5
Carreno, Victor; February 13, 2006; 50 pp.; In English; Original contains color and black and white illustrations
Report No.(s): DFRC-239; CCA004-Rev5; Copyright; Avail.: CASI: A03, Hardcopy

This document describes a method to demonstrate that a UAS, operating in the NAS, can avoid collisions with an equivalent level of safety compared to a manned aircraft. The method is based on the calculation of a collision probability for a UAS , the calculation of a collision probability for a base line manned aircraft, and the calculation of a risk ratio given by: Risk Ratio = P(collision_UAS)/P(collision_manned). A UAS will achieve an equivalent level of safety for collision risk if the

Risk Ratio is less than or equal to one. Calculation of the probability of collision for UAS and manned aircraft is accomplished through event/fault trees.
Author
Pilotless Aircraft; National Airspace System; Remotely Piloted Vehicles; Risk; Safety; Collisions

20080017411 NASA Dryden Flight Research Center, Edwards, CA, USA
C2 Link Security for UAS: Technical Literature Study and Preliminary Functional Requirements. Version 0.9 (Working Draft)
September 15, 2005; 23 pp.; In English; Original contains color illustrations
Report No.(s): DFRC-239; CCC005; Copyright; Avail.: CASI: A03, Hardcopy

This document provides a study of the technical literature related to Command and Control (C2) link security for Unmanned Aircraft Systems (UAS) for operation in the National Airspace System (NAS). Included is a preliminary set of functional requirements for C2 link security.
Author
Command and Control; National Airspace System; Warning Systems; Unmanned Aircraft Systems; Functional Design Specifications

20080017414 NASA Dryden Flight Research Center, Edwards, CA, USA
Frequency Allocations for Unmanned Aircraft Systems in the National Airspace. Access 5 White Paper to the WRC Advisory Committee
February 15, 2006; 4 pp.; In English
Report No.(s): DFRC-239; CCC008; Copyright; Avail.: CASI: A01, Hardcopy

A critical aspect of the Access 5 program is identifying appropriate spectrum for civil and commercial purposes. However, currently, there is no spectrum allocated for the command/control link between the aircraft control station and the unmanned aircraft. Until such frequency spectrum is allocated and approved, it will be difficult for the UAS community to obtain civil airworthiness certification and operate in the NAS on a routine basis. This document provides a perspective from the UAS community on Agenda Items being considered for the upcoming World Radiocommunication Conference 2007 (WRC 07). Primarily, it supports the proposal to add Aeronautical Mobile (Route) Services (AM(R)S) to existing bands that could be used for UAS Line-of-Sight operations. It also recommends the need to identify spectrum that could be used for an Aeronautical Mobile Satellite (Route) Service (AMS(R)S) that would allow UAS to operate Beyond Line-of-Sight. If spectrum is made available to provide these services, it will then be incumbent upon the UAS community to justify their use of this spectrum as well as the assurance that they will not interfere with other users of this newly allocated spectrum.
Author
Command and Control; Unmanned Aircraft Systems; Pilotless Aircraft; Frequency Distribution; Aircraft Reliability; Aircraft Control

20080017500 NASA Dryden Flight Research Center, Edwards, CA, USA
NASA Global Hawk Project Overview
Frate, John Del; Naftel, Chris; April 14, 2008; 13 pp.; In English; 3rd NASA-NICT Joint Workshop on HALE UAV and Wireless Systems, 14-18 Apr. 2008, Honolulu, HI, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080017500

This viewgraph presentation reviews the Global Hawk project planning. Global Hawk is the only available system capable of simultaneously meeting the requirements for high altitude (65K ft), long endurance (>31 hours), power (10 KVA), and a large payload capacity (2000 lbs). There are important science data gathering and satellite validation requirements that can only be met with the combination of capabilities provided by the Global Hawk system. Global Hawk will give a unique range, shown in maps, at a high altitude. An overview of the design of the aircraft, and the ground station is given. The flights are scheduled to begin in 2009, and will carry instruments that will be used to validate the Aura satellite data and also be used in hurricane and severe storm research.
CASI
Aircraft Design; High Altitude; Project Planning; Airborne Radar; Remote Sensing; Airborne Equipment

20080017867 Connecticut Office of Policy and Management, Hartford, CT, USA
High Technology Centrifugal Compressor for Commercial Air Conditioning Systems
Apr. 15, 2006; 24 pp.; In English
Contract(s)/Grant(s): DE-FC26-02GO12014
Report No.(s): DE2007-902086; No Copyright; Avail.: Department of Energy Information Bridge

R&D Dynamics, Bloomfield, CT in partnership with the State of Connecticut has been developing a high technology, oil-free, energy-efficient centrifiigal compressor called CENVA for commercial air conditioning systems under a program funded by the U.S. Department of Energy. The CENVA compressor applies the foil bearing technology used in all modern aircraft, civil and military, air conditioning systems. The CENVA compressor will enhance the efficiency of water and air cooled chillers, packaged roof top units, and other air conditioning systems by providing an 18% reduction in energy consumption in the unit capacity range of 25 to 350 tons of refrigeration.
NTIS
Air Conditioning; Air Conditioning Equipment; Centrifugal Compressors; Commerce; Compressors; Technology Assessment

20080017970 Coburn (Thompson) LLP, Saint Louis, MO, USA
Landing Assist Apparatus with Releasable Slip Ring
Tebon, D., Inventor; 3 Jun 04; 35 pp.; In English
Contract(s)/Grant(s): DAAH23-99-C-0111
Patent Info.: Filed Filed 3 Jun 04; US-Patent-Appl-SN-10 860 461
Report No.(s): PB2007-109399; No Copyright; Avail.: CASI: A03, Hardcopy

An aircraft landing assist apparatus is designed to be retrofit to existing aircraft having internal constructions that have been modified to support the apparatus. The apparatus is designed so that on rough landings of the aircraft on a ship deck, the apparatus will collapse in a controlled manner to avoid any damage to ammunition and/or fuel storage areas of the aircraft.
NTIS
Patent Applications; Aircraft Landing

20080017971 Rolnicki, Joseph M. & Coburn, Thompson, LLP, St. Louis, MO, USA
Landing Assist Apparatus Eccentric Bushing
Tebon, D., Inventor; 3 Jun 04; 35 pp.; In English
Contract(s)/Grant(s): DMH23-99-C-0111
Patent Info.: Filed Filed 3 Jun 04; US-Patent-Appl-SN-10 860 454
Report No.(s): PB2007-109400; No Copyright; Avail.: CASI: A03, Hardcopy

An aircraft landing assist apparatus is designed to be retrofit to existing aircraft having internal constructions that have been modified to support the apparatus. The apparatus is designed so that on rough landings of the aircraft on a ship deck, the apparatus will collapse in a controlled manner to avoid any damage to ammunition and/or fuel storage areas of the aircraft.
NTIS
Bushings; Aircraft Landing; Landing Gear; Aircraft Parts; Aircraft Equipment; Aircraft Design

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.

20080017021 Bachman and Lapointe, P.C., New Haven, CT, USA
Drillable Super Blades
Draper, S. D., Inventor; Kvasnak, W. S., Inventor; Jun. 17, 2004; 8 pp.; In English
Contract(s)/Grant(s): N00019-01-C-01; F33615-95-C-2503
Patent Info.: Filed Filed 17 Jun 04; US-Patent-Appl-SN-10-871 163
Report No.(s): PB2007-109352; No Copyright; Avail.: CASI: A02, Hardcopy

A turbine engine component, such as a blade or a vane, is provided by the present invention. The turbine engine component has a pressure side and a suction side. Each of the pressure and suction sides has an external wall and an internal wall. A first set of fluid passageways is located on the pressure side between the external wall and the internal wall. A second

set of fluid passageways is located on the suction side between the external wall and the internal wall. Each of the fluid passageways in the first set and in the second set has a wavy configuration. The turbine engine component may also have one or more wavy trailing edge cooling passageways for cooling a trailing edge portion of the component.
NTIS
Gas Turbine Engines; Vanes; Blades

20080017024 General Electric Corp. and Development, Niskayuna, NY, USA
Method and Apparatus for Reducing Gas Turbine Engine Emissions
Colibaba-Evulet, A., Inventor; Bowman, M. J., Inventor; Sanderson, S. R., Inventor; Dean, A. J., Inventor; Jun. 02, 2005; 17 pp.; In English
Contract(s)/Grant(s): DE-FC02-00CH11063
Patent Info.: Filed Filed 2 Jun 05; US-Patent-Appl-SN-11-143 266
Report No.(s): PB2007-105243; No Copyright; Avail.: CASI: A03, Hardcopy

A low emission turbine includes a reverse flow can-type combustor that generally includes a primary and secondary fuel delivery system that can be independently controlled to produce low CO, UHC, and NOx emissions at design set point and at conditions other than design set point. The reverse flow can-type combustor generally includes an annularly arranged array of swirler and mixer assemblies within the combustor, wherein each swirler and mixer in the array includes a primary and secondary fuel delivery system that can be independently controlled. Also disclosed herein is a can-type combustor that includes fluid passageways that perpendicularly impinge the backside of a heat shield. Processes for operating the can-type combustors are also disclosed.
NTIS
Combustion Chambers; Combustion Products; Exhaust Emission; Exhaust Gases; Gas Turbine Engines

20080017025 Bachman and Lapointe, P.C., New Haven, CT, USA
Turbine Engine Nozzle
Peters, D. W., Inventor; Dec. 14, 2004; 7 pp.; In English
Contract(s)/Grant(s): N00019-02-C-3003
Patent Info.: Filed Filed 14 Dec 04; US-Patent-Appl-SN-11-013 224
Report No.(s): PB2007-105244; No Copyright; Avail.: CASI: A02, Hardcopy

A convergent/divergent nozzle for a gas turbine engine has a throat portion of non-constant radius of curvature varying from an upstream high value to an intermediate low value and then to a downstream high value.
NTIS
Gas Turbine Engines; Turbine Engines; Nozzles

20080017036 Bachman and Lapointe, P.C., New Haven, CT, USA
Cooling Passageway Turn
Kvasnak, W. S., Inventor; Landis, K. K., Inventor; Przirembel, H. R., Inventor; Jun. 14, 2001; 10 pp.; In English
Contract(s)/Grant(s): N00019-97-C-0050
Patent Info.: Filed Filed 14 Jun 01; US-Patent-Appl-SN-10-867 282
Report No.(s): PB2007-109358; No Copyright; Avail.: CASI: A02, Hardcopy

An internally-cooled turbomachine element has an airfoil extending between inboard and outboard ends. A cooling passageway is at least partially within the airfoil and has at least a first turn. Means are in the passageway for limiting a turning a loss of the first turn. The turbomachine element may result from a reengineering of an existing element configuration lacking such means.
NTIS
Airfoils; Cooling; Passageways; Patent Applications; Turbomachinery

20080017858 Honeywell International, Inc., Morristown, NJ, USA
Temperature Variance Reduction using Penetration Dilution Jets
Schumacher, J. C., Inventor; Critchley, I. L., Inventor; Walhood, D. G., Inventor; Mar. 17, 2004; 10 pp.; In English
Contract(s)/Grant(s): N00019-02-C-3002
Patent Info.: Filed Filed 17 Mar 04; US-Patent-Appl-SN-10-803 428
Report No.(s): PB2007-105165; No Copyright; Avail.: CASI: A02, Hardcopy

A variable penetration dilution jet array for a single can and scroll assembly includes a plurality of differentially sized dilution openings around the circumference of the combustor can. The alternating smaller and larger openings provide for circumferential and radial mixing uniformity with the smaller openings giving shallow penetration and the larger openings enabling deep core penetration. The larger openings provide dilution air to the hot gas flow core without the need for an increase in combustor pressure drop. The smaller openings provide a film cooling flow to the downstream scroll, reducing dedicated scroll cooling requirements.
NTIS
Dilution; Jet Flow; Penetration; Temperature Profiles

08
AIRCRAFT STABILITY AND CONTROL

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

20080017221 NASA Dryden Flight Research Center, Edwards, CA, USA
Aeroservoelastic Stability Analysis of the X-43A Stack
Pak, Chan-gi; April 2008; 21 pp.; In English; Original contains color and black and white illustrations
Report No.(s): NASA/TM-2008-214635; H-2837; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080017221

The first air launch attempt of an X-43A stack, consisting of the booster, adapter and Hyper-X research vehicle, ended in failure shortly after the successful drop from the National Aeronautics and Space Administration Dryden Flight Research Center (Edwards, California) B-52B airplane and ignition of the booster. The stack was observed to begin rolling and yawing violently upon reaching transonic speeds, and the grossly oscillating fins of the booster separated shortly thereafter. The flight then had to be terminated with the stack out of control. Very careful linear flutter and aeroservoelastic analyses were subsequently performed as reported herein to numerically duplicate the observed instability. These analyses properly identified the instability mechanism and demonstrated the importance of including the flight control laws, rigid-body modes, structural flexible modes and control surface flexible modes. In spite of these efforts, however, the predicted instability speed remained more than 25 percent higher than that observed in flight. It is concluded that transonic shock phenomena, which linear analyses cannot take into account, are also important for accurate prediction of this mishap instability.
Author
Aeroservoelasticity; Failure; Flutter Analysis; Transonic Speed; Unsteady Aerodynamics; Failure Analysis; Airfoil Oscillations; Aerodynamic Stability

09
RESEARCH AND SUPPORT FACILITIES (AIR)

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

20080017327 NASA Dryden Flight Research Center, Edwards, CA, USA
NASA Dryden Flight Loads Laboratory
Horn, Tom; February 29, 2008; 14 pp.; In English; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080017327

This viewgraph presentation reviews the work of the Dryden Flight Loads Laboratory. The capabilities and research interests of the lab are: Structural, thermal, & dynamic analysis; Structural, thermal, & dynamic ground-test techniques; Advanced structural instrumentation; and Flight test support.
Author
Aerodynamic Loads; Dynamic Tests; Flight Tests; Ground Tests; Research Facilities; Test Facilities

12
ASTRONAUTICS (GENERAL)

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

20080016791 Sandia National Labs., Albuquerque, NM USA

Advanced Diagnostics for Impact-Flash Spectroscopy on Light-Gas Guns

Wanke, M. C.; Grine, A. D.; Mangan, M. A.; Chhabildas, L. C.; Reinhart, W. D.; Mar. 01, 2007; 89 pp.; In English

Report No.(s): DE2007-903428; SAND2007-0835; No Copyright; Avail.: National Technical Information Service (NTIS)

This study is best characterized as new technology development for implementing new sensors to investigate the optical characteristics of a rapidly expanding debris cloud resulting from hypervelocity impact regimes of 7 to 11 km/s. Our gas guns constitute a unique test bed that match operational conditions relevant to hypervelocity impact encountered in space engagements. We have demonstrated the use of (1) terahertz sensors, (2) silicon diodes for visible regimes, (3) germanium and InGaAs sensors for the near infrared regimes, and (4) the Sandia lightning detectors which are similar to the silicon diodes. The combination and complementary use of all these techniques has the strong potential of thermally characterizing the time dependent behavior of the radiating debris cloud. Complementary spectroscopic measurements provide temperature estimates of the impact generated debris by fitting its spectrum to a blackbody radiation function. This debris is time-dependent as its transport/expansion behavior is changing with time. The rapid expansion behavior of the debris cools the cloud rapidly, changing its thermal/temperature characteristics with time. A variety of sensors that span over a wide spectrum, varying from visible regime to THz frequencies, now gives us the potential to cover the impact over a broader temporal regime starting from high pressures (Mbar) high temperatures (eV) to low pressures (mbar) low temperatures (less than room temperature) as the debris expands and cools.

NTIS

Diagnosis; Impact Tests; Light Gas Guns; Spectroscopy

14
GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and test chambers and simulators. Also includes extraterrestrial bases and supporting equipment. For related information see also *09 Research and Support Facilities (Air)*.

20080016928 National Security Technologies, LLC, Las Vegas, NV, USA; Polestar Applied Technology, Inc., Las Vegas, NV, USA

Nuclear Rocket Facility Decommissioning Project. Controlled Explosive Demolition of Neutron Activated Shield Wall

Kruzic, M.; Nelson, J.; Simonsen, R.; Jan. 01, 2007; 4 pp.; In English

Report No.(s): DE2007-901874; DOE/NV/25946-114; No Copyright; Avail.: Department of Energy Information Bridge

Located in Area 25 of the Nevada Test Site (NTS), the Test Cell A (TCA) Facility was used in the early to mid-1960s for the testing of nuclear rocket engines, as part of the Nuclear Rocket Development Program, to further space travel. Nuclear rocket testing resulted in the activation of materials around the reactors and the release of fission products and fuel particles in the immediate area. Identified as Corrective Action Unit 115, the TCA facility was decontaminated and decommissioned (D&D) from December 2004 to July 2005 using the Streamlined Approach for Environmental Restoration (SAFER) process, under the Federal Facility Agreement and Consent Order. The SAFER process allows environmental remediation and facility closure activities (i.e., decommissioning) to occur simultaneously provided technical decisions are made by an experienced decision maker within the site conceptual site model, identified in the Data Quality Objective process. Facility closure involved a seven-step decommissioning strategy.

NTIS

Decommissioning; Neutrons; Walls; Nuclear Rocket Engines; Nuclear Propulsion; Decontamination

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*.

20080017093 American Inst. of Aeronautics and Astronautics, Reston, VA, USA
New Life for Hubble: Anatomy of a Mission
Seitzen, Frank, Jr.; Aerospace America; April 2008; Volume 46, No. 4, pp. 32-37; In English; Original contains color illustrations; Copyright; Avail.: Other Sources

This article reviews the Hubble Space Telescope servicing missions, and the plans for the final servicing mission that will extend the life of the orbiting observatory.
Author
Hubble Space Telescope; Space Maintenance; Space Transportation System; Space Shuttle Missions; Planning

20080017111 NASA Dryden Flight Research Center, Edwards, CA, USA
Collision Avoidance Functional Requirements for Step 1. Revision 6
February 13, 2006; 975 pp.; In English; Original contains color and black and white illustrations
Report No.(s): DFRC-239; CCA002-Rev6; Copyright; Avail.: CASI: A99, Hardcopy

This Functional Requirements Document (FRD) describes the flow of requirements from the high level operational objectives down to the functional requirements specific to cooperative collision avoidance for high altitude, long endurance unmanned aircraft systems. These are further decomposed into performance and safety guidelines that are backed up by analysis or references to various documents or research findings. The FRD should be considered when establishing future policies, procedures, and standards pertaining to cooperative collision avoidance.
Author
Collision Avoidance; High Altitude; Unmanned Aircraft Systems; Functional Design Specifications

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*.

20080017112 NASA Dryden Flight Research Center, Edwards, CA, USA
HALE UAS Concept of Operations. Version 3.0
February 2006; 110 pp.; In English; Original contains color and black and white illustrations
Report No.(s): DFRC-239; SE001; Copyright; Avail.: CASI: A06, Hardcopy

This document is a system level Concept of Operations (CONOPS) from the perspective of future High Altitude Long Endurance (HALE) Unmanned Aircraft Systems (UAS) service providers and National Airspace System (NAS) users. It describes current systems (existing UAS), describes HALE UAS functions and operations to be performed (via sample missions), and offers insight into the user s environment (i.e., the UAS as a system of systems). It is intended to be a source document for NAS UAS operational requirements, and provides a construct for government agencies to use in guiding their regulatory decisions, architecture requirements, and investment strategies. Although it does not describe the technical capabilities of a specific HALE UAS system (which do, and will vary widely), it is intended to aid in requirements capture and to be used as input to the functional requirements and analysis process. The document provides a basis for development of functional requirements and operational guidelines to achieve unrestricted access into the NAS. This document is an FY06 update to the FY05 Access 5 Project-approved Concept of Operations document previously published in the Public Domain on the Access 5 open website. This version is recommended to be approved for public release also. The updates are a reorganization of materials from the previous version with the addition of an updated set of operational requirements, inclusion of sample mission scenarios, and identification of roles and responsibilities of interfaces within flight phases.
Author
High Altitude; Unmanned Aircraft Systems; Functional Design Specifications

20
SPACECRAFT PROPULSION AND POWER

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

20080016682 Government Accountability Office, Washington, DC, USA

Biofuels: DOE Lacks a Strategic Approach to Coordinate Increasing Production with Infrastructure Development and Vehicle Needs

Jun. 01, 2007; 56 pp.; In English

Report No.(s): PB2007-111086; GAO-07-713; No Copyright; Avail.: CASI: A04, Hardcopy

The U.S. transportation sector is almost entirely dependent on oil, a condition that poses significant economic and environmental risks. Biofuels, such as ethanol and biodiesel, have the potential to displace oil use in transportation fuel. GAO was asked to describe the status of and impediments to expanding biofuel production, distribution infrastructure, and compatible vehicles as well as federal policy options to overcome the impediments. GAO was also asked to assess the extent to which the Department of Energy (DOE) has developed a strategic approach to coordinate the expansion of biofuel production, infrastructure, and vehicles and has evaluated the effectiveness of biofuel tax credits. GAO interviewed representatives and reviewed studies and data from DOE, states, industry, and other sources. Combined ethanol and biodiesel production increased rapidly from about 3.4 billion gallons in 2004 to about 4.9 billion gallons in 2006, but these biofuels--primarily ethanol--composed only about 3 percent of 2006 U.S. gasoline and diesel transportation fuel use. Due to limitations on the production and use of corn--the primary feedstock used to produce ethanol in the USA--15 billion to 16 billion gallons is the generally agreed maximum amount of U.S. corn ethanol production. Using cellulosic feedstocks, such as corn stalks or other plant material, could expand the amount of ethanol produced, but the production costs are currently twice those of corn ethanol. Policies that support cellulosic ethanol research have the potential to increase the future availability of cost-competitive ethanol. Existing biofuel distribution infrastructure has limited capacity to transport the fuels and deliver them to consumers.

NTIS

Biomass; Costs; Diesel Fuels; Industries

20080017918 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

The Space Technology 7 Disturbance Reduction System

Folkner, William M.; July 21, 2004; 20 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/40733

This viewgraph presentation reviews the design and development of the Disturbance Reduction System (DRS). The colloidal microthrusters will allow for precise, quiet spacecraft position and attitude control. The DRS will be attached to ESAS's SMART-2 spacecraft.

CASI

Attitude Control; Microrocket Engines; Spacecraft Control

20080017949 Gray Research, Inc., Huntsville, AL, USA

Electric Propulsion Performance from Geo-transfer to Geosynchronous Orbits

Dankanich, John W.; Carpenter, Christian B.; September 17, 2007; 1 pp.; In English; 2007 International Electric Propulsion Conference, 17-20 Sept. 2007, Florence, Italy; Copyright; Avail.: Other Sources; Abstract Only

For near-Earth application, solar electric propulsion advocates have focused on Low Earth Orbit (LEO) to Geosynchronous (GEO) low-thrust transfers because of the significant improvement in capability over chemical alternatives. While the performance gain attained from starting with a lower orbit is large, there are also increased transfer times and radiation exposure risk that has hindered the commercial advocacy for electric propulsion stages. An incremental step towards electric propulsion stages is the use of integrated solar electric propulsion systems (SEPS) for GTO to GEO transfer. Thorough analyses of electric propulsion systems options and performance are presented. Results are based on existing or near-term capabilities of Arcjets, Hall thrusters, and Gridded Ion engines. Parametric analyses based on 'rubber' thruster and launch site metrics are also provided.

Author

Solar Electric Propulsion; Arc Jet Engines; Hall Thrusters; Ion Engines; Transfer Orbits

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*.

20080016628 Wisconsin Univ., Madison, WI, USA

Bayesian Approach to Surface X-ray Diffraction: A Combined Experimental and Theoretical Methodology (Final Report, September 15, 2001-September 14, 2005)

Lyman, P. F.; Saldin, D. K.; Jan. 01, 2006; 18 pp.; In English

Contract(s)/Grant(s): DE-FG02-01ER45926

Report No.(s): DE2007-895207; No Copyright; Avail.: National Technical Information Service (NTIS)

We report on the development of an iterative method to directly invert surface x-ray diffraction (SXRD) data and thereby provide a map of electron density in the near-surface region of a solid. We have termed this method PARADIGM, which stands for Phase and Amplitude Recovery And Diffraction Image Generation Method. Significant advances in the PARADIGM theory were made during the grant period, and experimental milestones have also been achieved. The two components of the research program worked in concert, each spurring progress in the other. The method works by iteratively recovering the phases of surface scattering factors. Initially, random phases are assigned to the structure factors. After subtracting off the known bulk component, a Fourier transform converts these factors into an estimate of the real-space electron density map. This map is subjected to a support constraint, which holds that the electron density may only be non-zero near the solid surface. The modified electron density is then subjected to an inverse Fourier transform, and the bulk contributions are added back in. This renders an improved estimate of the phases of the surface structure factors. A constraint in reciprocal space is then applied, namely, the amplitudes of the scattering factors are set equal to the experimentally observed ones. This cycle is repeated, transforming between real and reciprocal space and applying constraints in each, until convergence is reached. The result renders a good initial model of the unknown surface structure. Such a direct method is important because conventional structural refinement methods rely on having a guess of the starting structure that sufficiently good that it may be refined into a model with the correct atomic positions. If the starting model has, for example, the wrong number or identity of atoms in the surface unit cell, it can never refine to the correct model. Even in cases where the starting model contains the correct number and identity of atoms, it is relatively easy for refinement routines to get trapped in false minima; finding a global minimum of a multi-parameter phase space is a notoriously difficult problem. The utility of the present method, then, stems from its ability to, independently of preconceived notions, identify robust starting models for testing by conventional refinement techniques. The method has been shown to work well on three independent experimental data sets. First, the efficacy of the method was demonstrated on a known reconstruction, the well-known missing-row Au(110)-(2x1) surface. The method recovered all known structural features of this reconstruction. Next, the method was applied to two heretofore unknown reconstructions of the Au(110) surface that are induced by Sb adsorption, the c(2x2) and the (rt(3)xrt(3))R54.7 reconstructions. In each case, the direct method provided an excellent starting model for later refinement by conventional means.

NTIS

Bayes Theorem; X Ray Diffraction; Iterative Solution; Materials Tests; Surface Properties

20080016654 Pearne and Gordon, LLP, Cleveland, OH, USA

Single Substrate Liquid Crystal Display

Doane, J. W., Inventor; Khan, A. A., Inventor; Shiyanovskaya, I., Inventor; Schneider, T., Inventor; Pishnyak, O., Inventor; Jan. 28, 2005; 35 pp.; In English

Contract(s)/Grant(s): DAAB 07-03-C-J406

Patent Info.: Filed Filed 28 Jan 05; US-Patent-Appl-SN-11-046 487

Report No.(s): PB2007-109322; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention relates to a display film that may be transferred by lamination or otherwise onto a substrate. The display film is formed of a stack of layers that can include different types, arrangements, and functionality within the stack depending upon factors including the characteristics of the substrate (e.g., upper or lower, transparent or opaque, substrates) and addressing of the display (e.g., active or passive matrix, electrical or optical addressing). The layers of the stacked display film include one or more electrode layers and one or more liquid crystal layers and, in addition, may include various combinations of an adhesive layer, preparation layer, casting layer, light absorbing layer, insulation layers, and protective layers. The liquid crystal layer can include cholesteric or other liquid crystal material. The liquid crystal layer can be a

dispersion of liquid crystal in a polymer matrix formed by a variety of techniques. The display film may interact with components mounted on or laminated to the substrate, including a solar cell, active matrix backplane and electrodes. The display film may be mounted onto flexible or drapable substrates such as fabric and can itself be drapable. A liquid crystal display includes the display film and a single substrate for supporting the display film. Thus, the invention offers substantial flexibility in fabrication and design that has not been previously possible in the display industry.
NTIS
Liquid Crystals; Patent Applications; Single Crystals; Substrates

20080016702 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA; California Univ., Berkeley, CA, USA; Lawrence Livermore National Lab., Livermore, CA USA
Superheating and Supercooling of Ge Nanocrystals Embedded in SiO2
Xu, Q.; Sharp, I. D.; Yuan, C. W.; Yi, D. O.; Liao, C. Y.; Jan. 01, 2006; 5 pp.; In English
Report No.(s): DE2007-902451; No Copyright; Avail.: National Technical Information Service (NTIS)

Free-standing nanocrystals exhibit a size-dependant thermodynamic melting point reduction relative to the bulk melting point that is governed by the surface free energy. The presence of an encapsulating matrix, however, alters the interface free energy of nanocrystals and their thermodynamic melting point can either increase or decrease relative to bulk. Furthermore, kinetic contributions can significantly alter the melting behaviours of embedded nanoscale materials. To study the effect of an encapsulating matrix on the melting behaviour of nanocrystals, we performed in situ electron diffraction measurements on Ge nanocrystals embedded in a silicon dioxide matrix. Ge nanocrystals were formed by multi-energy ion implantation into a 500 nm thick silica thin film on a silicon substrate followed by thermal annealing at 900 deg. C for 1 h. We present results demonstrating that Ge nanocrystals embedded in SiO2 exhibit a 470 K melting/solidification hysteresis that is approximately symmetric about the bulk melting point. This unique behaviour, which is thought to be impossible for bulk materials, is well described using a classical thermodynamic model that predicts both kinetic supercooling and kinetic superheating. The presence of the silica matrix suppresses surface pre-melting of nanocrystals. Therefore, heterogeneous nucleation of both the liquid phase and the solid phase are required during the heating and cooling cycle. The magnitude of melting hysteresis is governed primarily by the value of the liquid Ge/solid Ge interface free energy, whereas the relative values of the solid Ge/matrix and liquid Ge/matrix interface free energies govern the position of the hysteresis loop in absolute temperature.
NTIS
Embedding; Germanium; Nanocrystals; Silicon Dioxide; Supercooling; Superheating

20080016722 Houston Univ., TX, USA
New Cathode Materials for Intermediate Temperature Solid Oxide Fuel Cells. (Final Report for October 1, 2003 to December 30, 2006)
Jacobson, A. J.; Jan. 01, 2006; 51 pp.; In English
Contract(s)/Grant(s): DE-FC26-03NT41960
Report No.(s): DE2007-901629; No Copyright; Avail.: National Technical Information Service (NTIS)

The objectives of the project are to discover new oxide cathode materials that meet a performance target of 1.0 W/cm2 at 0.7 V in combination with YSZ at 700 oC and with CGO, LSGM electrolytes at 600 oC. An ancillary objective of the project is to increase fundamental understanding of the intrinsic transport properties of mixed electronic ionic conducting oxides and oxide-oxide interfaces that can be used to accelerate further progress in the development of cost effective high performance solid oxide fuel cells. In Phase I, we measured the surface exchange rates, diffusion coefficients and interfacial transport for an initial set of perovskite related oxide materials (K1 compositions). In Phase II we synthesized and characterized new cathode materials (P1 and P2 compositions) and measured their kinetic parameters. The chemical compatibility with different electrolytes was determined. Based on the results, a subset of the best materials was selected for single cell tests. The phase III objective was to evaluate the performance of the best materials identified in Phase I and II.
NTIS
Cathodic Coatings; Solid Oxide Fuel Cells

20080016751 Townsend and Townsend and Crew, LLP, San Francisco, CA, USA; California Univ., Oakland, CA, USA
Compositions and Methods for Determining Substrate Specificity of Hydrolytic Enzymes
Barrios, A. M., Inventor; Craik, C. S., Inventor; Nov. 15, 2004; 31 pp.; In English
Contract(s)/Grant(s): A135707; CA72006

Patent Info.: Filed Filed 15 Nov 04; US-Patent-Appl-SN-10-989 590
Report No.(s): PB2007-105186; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention relates to a novel compound comprising a detectable moiety covalently linked to a structural moiety. Upon cleavage of the covalent bond linking the two moieties, the detectable moiety becomes capable of complexing a lanthanide ion, and the lanthanide-detectable moiety complex provides a detectable signal. The structural moiety of the compound is a homo- or hetero-multimer of amino acids, nucleotides, or saccharides. A library comprising at least two member compounds with different structural moieties is also provided in this application. Further described are methods for identifying the substrate specificity of a hydrolytic enzyme by using the library of the present invention to determine the preferred structural moiety for any particular enzyme having the potential capability of cleaving the covalent bond between the detectable moiety and the structural moiety of the member compounds, as well as methods for using the novel compound of this invention for detecting in a sample the presence of a pre-determined hydrolytic enzyme, whose preferred substrate specificity is known and represented by the structural moiety of the compound.
NTIS
Enzymes; Substrates; Covalent Bonds; Amino Acids; Molecular Structure

20080016804 Pennsylvania State Univ., State College, PA, USA
Development of Advanced Wear and Corrosion Resistant Systems Through Laser Surface Alloying and Materials Simulation. Final Technical Report
Martukanitz, R.; Babu, S.; May 03, 2007; 132 pp.; In English
Report No.(s): DE2007-903051; No Copyright; Avail.: National Technical Information Service (NTIS)

Laser surfacing in the form of cladding, alloying, and modifications are gaining widespread use because of its ability to provide high deposition rates, low thermal distortion, and refined microstructure due to high solidification rates. Because of these advantages, laser surface alloying is considered a prime candidate for producing ultra-hard coatings through the establishment or in situ formation of composite structures. Therefore, a program was conducted by the Applied Research Laboratory, Pennsylvania State University and Oak Ridge National Laboratory to develop the scientific and engineering basis for performing laser-based surface modifications involving the addition of hard particles, such as carbides, borides, and nitrides, within a metallic matrix for improved wear, fatigue, creep, and corrosion resistance. This has involved the development of advanced laser processing and simulation techniques, along with the refinement and application of these techniques for predicting and selecting materials and processing parameters for the creation of new surfaces having improved properties over current coating technologies.
NTIS
Alloying; Corrosion Resistance; Laser Materials; Lasers; Simulation; Surface Properties; Wear Resistance

20080016810 Sandia National Labs., Albuquerque, NM USA
Process Qualification and Testing of LENS Deposited Ay1E125 D-Bottle Brackets
Gill, D. D.; Smugeresky, J. E.; Atwood, C. J.; Jew, M. D.; Scheffel, S.; Nov. 01, 2006; 38 pp.; In English
Report No.(s): DE2007-901972; SAND2006-6431; No Copyright; Avail.: National Technical Information Service (NTIS)

The LENS Qualification team had the goal of performing a process qualification for the Laser Engineered Net Shaping(LENS) process. Process Qualification requires that a part be selected for process demonstration. The AY1E0125 D-Bottle Bracket from the W80-3 was selected for this work. The repeatability of the LENS process was baselined to determine process parameters. Six D-Bottle brackets were deposited using LENS, machined to final dimensions, and tested in comparison to conventionally processed brackets. The tests, taken from ES1E0003, included a mass analysis and structural dynamic testing including free-free and assembly-level modal tests, and Haversine shock tests. The LENS brackets performed with very similar characteristics to the conventionally processed brackets. Based on the results of the testing, it was concluded that the performance of the brackets made them eligible for parallel path testing in subsystem level tests. The testing results and process rigor qualified the LENS process as detailed in EER200638525A.
NTIS
Bottles; Brackets; Laser Beams; Lasers; Lenses; Machining; Nuclear Weapons; Performance Tests

20080016826 California Univ., Berkeley, CA USA
Mechanical Properties and Microstructure of Nitinol for Biomedical Stent Applications
Robertson, S. W.; January 2006; 123 pp.; In English
Report No.(s): DE2007-901533; No Copyright; Avail.: National Technical Information Service (NTIS)

This dissertation was motivated by the alarming number of biomedical device failures reported in the literature, coupled

with the growing trend towards the use of Nitinol for endovascular stents. The research is aimed at addressing two of the primary failure modes in Nitinol endovascular stents: fatigue-crack growth and overload fracture. The small dimensions of stents, coupled with their complex geometries and variability among manufacturers, make it virtually impossible to determine generic material constants associated with specific devices. Instead, the research utilizes a hybrid of standard test techniques (fracture mechanics and x-ray micro-diffraction) and custom-designed testing apparatus for the determination of the fracture properties of specimens that are suitable representations of self-expanding Nitinol stents. Specifically, the role of texture (crystallographic alignment of atoms) and the austenite-to-martensite phase transformation on the propagation of cracks in Nitinol was evaluated under simulated body conditions and over a multitude of stresses and strains. The results determined through this research were then used to create conservative safe operating and inspection criteria to be used by the biomedical community for the determination of specific device vulnerability to failure by fracture and/or fatigue.
NTIS
Mechanical Properties; Microstructure; Nitinol Alloys; Fracturing; Medical Equipment

20080016913 Wilson, Sonsini, Goodrich and Rosati, Palo Alto, CA, USA
Nucleic Acid Analysis Using Terminal-Phosphate-Labeled Nucleotides
Korlach, J., Inventor; Webb, W. W., Inventor; Levene, M., Inventor; Turner, S., Inventor; Craighead, H. G., Inventor; Mar. 25, 2005; 26 pp.; In English
Contract(s)/Grant(s): NSF-BIR-8800278; DE-066898-003891
Patent Info.: Filed Filed 25 Mar 05; US-Patent-Appl-SN-11-089 871
Report No.(s): PB2007-108797; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention is directed to a method of sequencing a target nucleic acid molecule having a plurality of bases. In its principle, the temporal order of base additions during the polymerization reaction is measured on a molecule of nucleic acid, i.e. the activity of a nucleic acid polymerizing enzyme on the template nucleic acid molecule to be sequenced is followed in real time. The sequence is deduced by identifying which base is being incorporated into the growing complementary strand of the target nucleic acid by the catalytic activity of the nucleic acid polymerizing enzyme at each step in the sequence of base additions. A polymerase on the target nucleic acid molecule complex is provided in a position suitable to move along the target nucleic acid molecule and extend the oligonucleotide primer at an active site. A plurality of labelled types of nucleotide analogs are provided proximate to the active site, with each distinguishable type of nucleotide analog being complementary to a different nucleotide in the target nucleic acid sequence. The growing nucleic acid strand is extended by using the polymerase to add a nucleotide analog to the nucleic acid strand at the active site, where the nucleotide analog being added is complementary to the nucleotide of the target nucleic acid at the active site. The nucleotide analog added to the oligonucleotide primer as a result of the polymerizing step is identified. The steps of providing labelled nucleotide analogs, polymerizing the growing nucleic acid strand, and identifying the added nucleotide analog are repeated so that the nucleic acid strand is further extended and the sequence of the target nucleic acid is determined.
NTIS
Molecules; Nucleic Acids; Nucleotides; Phosphates

20080016921 Agilent Technologies, Inc., Loveland, CO, Loveland, CO, USA
Quality Control Method for Array Manufacture
Delligner, D. J., Inventor; Boyes, B. E., Inventor; Nicol, G. R., Inventor; Feb. 23, 2004; 29 pp.; In English
Contract(s)/Grant(s): N39998-01-9-7068
Patent Info.: Filed Filed 23 Feb 04; US-Patent-Appl-SN-10-785 898
Report No.(s): PB2007-108792; No Copyright; Avail.: CASI: A03, Hardcopy

A method of analyzing an array during and/or after fabrication to obtain information relating to the quality of the array manufacturing process is described. The method includes providing an array of features on a substrate, wherein each feature has one or more polynucleotides bound to the substrate. At least one of the features of the provided array is a cleavable feature. The cleavable feature has one or more polynucleotides bound to the substrate via a cleavable linker. The cleavable feature is then contacted with a matrix material, and a MALDI-MS protocol is used to obtain information about the one or more polynucleotides of the cleavable feature. This information may then be used to evaluate the manufacturing process.
NTIS
Desorption; Ionization; Lasers; Manufacturing; Mass Spectroscopy; Quality Control; Substrates

20080016925 Kirkpatrick and Lockhart Nicholson, Pittsburgh, PA, USA; Carnegie-Mellon Univ., Pittsburgh, PA USA
Polythiophenes, Block Copolymers Made Therefrom, and Methods of Forming the Same
McCullough, R. D., Inventor; Liu, J., Inventor; Ewbank, P. C., Inventor; Shelina, E. E., Inventor; Mar. 23, 2005; 25 pp.; In English
Contract(s)/Grant(s): NSF-CHE-0107178
Patent Info.: Filed Filed 23 Mar 05; US-Patent-Appl-SN-11-088 341
Report No.(s): PB2007-108826; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention relates to polythiophenes, particularly regioregular head-to-tail poly(3-alkylthiophenes) (HT-PATs), block copolymers made therefrom, and their methods of formation. The present invention provides HT-PATs with well-defined, specific end-groups, functionalization of the defined HT-PATs, and incorporation of end group functionalized HT-PATs into block copolymers with structural polymers. The intrinsically conductive diblock and triblock copolymers, formed from the HT-PATs, have excellent conductivity and low polydispersities that are useful in a number of applications. The block copolymers of the present invention have been found to exhibit conductivities that range from a low of 10(sup -8) S/cm for certain applications to as high as several hundred S/cm or more.

NTIS
Block Copolymers; Copolymers; Conductivity

20080016948 Reinhart, Boerner, Van Deuren S.C., Milwaukee, MI, USA
Oligo(p-Phenylene Vinylene) Amphiphiles and Methods for Self-Assembly
Stupp, S. I., Inventor; Hulvat, J. F., Inventor; Sofos, M., Inventor; Tajima, K., Inventor; 6 Dec 04; 14 pp.; In English
Contract(s)/Grant(s): DE-FG02-00ER45810
Patent Info.: Filed Filed 6 Dec 04; US-Patent-Appl-SN-11-005 558
Report No.(s): PB2007-105232; No Copyright; Avail.: CASI: A03, Hardcopy

Amphiphilic oligo(p-phenylene vinylene) compounds and methods of use en route to self-assembled composites and device fabrication.

NTIS
Patent Applications; Phenyls; Self Assembly

20080016949 Hodgson Russ LLP, Buffalo, NY, USA
Protein Imprinted Polymers with Integrated Emission Sites
Bright, F. V., Inventor; 7 Jan 05; 20 pp.; In English
Contract(s)/Grant(s): CHE-0078101; CHE-0315129
Patent Info.: Filed Filed 7 Jan 05; US-Patent-Appl-SN-11-031 318
Report No.(s): PB2007-105240; No Copyright; Avail.: CASI: A03, Hardcopy

This invention provides protein or polypeptide imprinted polymers with integrated emission sites (PIPIES) for detecting the presence of a protein or polypeptide analyte comprising templated sites which are specific for the analyte. At or near the templated sites are selectively placed reporter molecules. A method is also disclosed for the preparation of the PIPIES and the use of these for the detection of analytes.

NTIS
Polypeptides; Proteins

20080016989 Washington Group International, Savannah River Site, Aiken, SC, USA
Synthesis of Safety Analysis and Fire Hazard Analysis Methodologies
Coutts, D. A.; Vincent, A. M.; Apr. 17, 2007; 11 pp.; In English
Contract(s)/Grant(s): DE-AC09-96SR18500
Report No.(s): DE2007-903093; WSRC-STI-2007-00040; No Copyright; Avail.: Department of Energy Information Bridge

Successful implementation of both the nuclear safety program and fire protection program is best accomplished using a coordinated process that relies on sound technical approaches. When systematically prepared, the documented safety analysis (DSA) and fire hazard analysis (FHA) can present a consistent technical basis that streamlines implementation. If not coordinated, the DSA and FHA can present inconsistent conclusions, which can create unnecessary confusion and can

promulgate a negative safety perception. This paper will compare the scope, purpose, and analysis techniques for DSAs and FHAs. It will also consolidate several lessons-learned papers on this topic, which were prepared in the 1990s.
NTIS
Fires; Hazards; Safety

20080016997 Sandia National Labs., Albuquerque, NM USA
Laser Enineered Net Shaping (LENS) for the Repair and Modification of NWC Metal Components
Gill, D. D.; Atwood, C. J.; Smugeresky, J. E.; Nov. 01, 2006; 29 pp.; In English
Report No.(s): DE2007-901971; SAND2006-6551; No Copyright; Avail.: Department of Energy Information Bridge

Laser Engineered Net Shaping (LENS) is a layer additive manufacturing process that creates fully dense metal components using a laser, metal powder, and a computer solid model. This process has previously been utilized in research settings to create metal components and new material alloys. The Qualification of LENS for the Repair and Modification of Metal NWC Components project team has completed a Technology Investment project to investigate the use of LENS for repair of high rigor components. The team submitted components from four NWC sites for repair or modification using the LENS process. These components were then evaluated for their compatibility to high rigor weapons applications. The repairs included hole filling, replacement of weld lips, addition of step joints, and repair of surface flaws and gouges. The parts were evaluated for mechanical properties, corrosion resistance, weldability, and hydrogen compatibility. This document is a record of the LENS processing of each of these component types and includes process parameters, build strategies, and lessons learned. Through this project, the LENS process was shown to successfully repair or modify metal NWC components.
NTIS
Computer Aided Manufacturing; Laser Beams; Lasers; Lenses; Machining; Metals; Nuclear Weapons

20080016998 Lawrence Livermore National Lab., Livermore, CA USA; California Univ., Berkeley, CA, USA
Nanostructured Materials for Hydrogen Storage
Williamson, A. J., Inventor; Reboredo, F. A., Inventor; Mar. 15, 2005; 14 pp.; In English
Contract(s)/Grant(s): W-7405-ENG-48
Patent Info.: Filed Filed 15 Mar 05; US-Patent-Appl-SN-11-081 489
Report No.(s): PB2007-105213; No Copyright; Avail.: CASI: A03, Hardcopy

A system for hydrogen storage comprising a porous nano-structured material with hydrogen absorbed on the surfaces of the porous nano-structured material. The system of hydrogen storage comprises absorbing hydrogen on the surfaces of a porous nano-structured semiconductor material.
NTIS
Hydrogen; Porosity

20080017020 Fish and Neave IP Group, Ropes, Boston, MA, USA
Particles for the Delivery of Active Agents
Cattaneo, M. V., Inventor; May 6, 2005; 17 pp.; In English
Contract(s)/Grant(s): NIH-2R44 CA086653
Patent Info.: Filed Filed 6 May 05; US-Patent-Appl-SN-11-123 958
Report No.(s): PB2007-109340; No Copyright; Avail.: CASI: A03, Hardcopy

Particles of less than 100 microns, where an active agent is coated with a matrix of cationic and anionic polymers, are efficient vehicles for delivering active agents to tissues such as skin and mucosal membranes. Such particles are able to deliver compounds to skin with little associated irritation. Prior art topical formulations typically have the disadvantage of causing significant skin irritation.
NTIS
Drugs; Negative Ions

20080017029 McLeod and Moyne, P.C., Okekmos, MI, USA; Michigan State Univ., East Lansing, MI, USA
Anhydride Functionalized Polyhydroxyalkanoates, Preparation and Use Thereof
Mohanty, A. K., Inventor; Drzal, L. T., Inventor; Desai, S. M., Inventor; Misra, M., Inventor; Mulukutla, P., Inventor; Feb. 11, 2005; 36 pp.; In English
Contract(s)/Grant(s): NSF-REMISE 0225925; RD-83090401

Patent Info.: Filed Filed 11 Feb 05; US-Patent-Appl-SN-11-056-622
Report No.(s): PB2007-105256; No Copyright; Avail.: CASI: A03, Hardcopy

A process and composition using anhydride grafted polyhydroxyalkanoate (PHA) polymer (grafted polymer) which has been extruded with a PHA polymer (non-grafted) and a dried cellulose fiber which reacts with the maleated PHA is described. The composites formed have improved mechanical properties.

NTIS

Anhydrides; Grafting

20080017498 Sandia National Labs., Albuquerque, NM USA

Modeling of Friction-Induced Deformation and Microstructures

Prasad, S. V.; Michael, J. R.; Majumdar, B. S.; Battaile, C. C.; Moody, N. R.; Dec. 01, 2006; 96 pp.; In English
Report No.(s): DE2007-902880; SAND2006-7028; No Copyright; Avail.: National Technical Information Service (NTIS)

The objective of this LDRD funded research was to model friction-induced microstructures. In order to accomplish this objective, novel experimental techniques were developed to make friction measurements on single crystal surfaces along specific crystallographic surfaces. Focused ion beam techniques were used to prepare cross-sections of wear scars, and electron backscattered diffraction (EBSD) and TEM to understand the deformation, orientation changes, and recrystallization that are associated with sliding wear. The extent of subsurface deformation and the coefficient of friction were strongly dependent on the crystal orientation. These experimental observations and insights were used to develop and validate phenomenological models.

NTIS

Deformation; Friction; Microstructure

20080017827 Minnesota Univ., Minneapolis, MN, USA

Penetration of Nanoparticles through Respirator Filter Media

Pui, D. Y. H.; Kim, S. C.; Apr. 02, 2006; 29 pp.; In English
Contract(s)/Grant(s): NIOSH-254-2005-MI-11698
Report No.(s): PB2007-111637; No Copyright; Avail.: CASI: A03, Hardcopy

In this study, nanoparticle penetration was tested for with a wide range of filter media (four fiberglass filter media, four electret filter media and one nanofiber filter media) using silver nanoparticles from 3 nm to 20 nm at face velocities of 5.3, 10 and 15 cm/s. The silver particles were generated by heating a pure silver powder source via an electric furnace with a temperature of 870 degrees C, which is the optimal temperature for generating adequate amounts of silver nanoparticles for the size range specified above. After size classification using a nano-DMA, the particle counts were measured by a UCPC both upstream and downstream of the test filter to determine the nanoparticle penetration for each particular particle size. Particle sampling time continued long enough to detect more than 10(5) counts at the upstream and 10 counts at the downstream sampling point so that 99.99% efficiency can be detected with the high efficiency filter. Each test was repeated more than five times by different operators, at different dates and with different samples from each filter medium in order to reduce any possible error. The results show a very high uniformity with small error bars for all filter media tested in this study. The particle penetration decreases continuously down to 3 nm as expected by the traditional filtration theory, and together with a companion modeling study by Wang et al. (2006), we found no evidence of nanoparticle thermal rebound down to 3 nm.

NTIS

Nanoparticles; Penetration; Respirators; Air Filters

20080017828 Wisconsin Univ., Madison, WI, USA

Effects of Ground Granulated Blast Furnace Slag in Portland Cement Concrete (PCC) - Expanded Study

LaBarca, I. K.; Foley, R. D.; Cramer, S. M.; Jun. 01, 2007; 88 pp.; In English
Contract(s)/Grant(s): SPR-0092-05-01
Report No.(s): PB2007-111639; No Copyright; Avail.: National Technical Information Service (NTIS)

This research examined the properties of concrete containing grade 120 slag cement at replacement levels of 0%, 30%, and 50%. The primary concrete properties studied were compressive strength, split-tensile strength, and deicer scaling resistance. Material variations included four sources of ordinary portland cement and two types of coarse aggregate. Strength properties were studied at room temperature and 40 degrees F mix and curing conditions. Deicer scaling resistance was studied for concrete cured under six curing conditions. Carbonation of concrete cured under these six conditions was also investigated. It was determined that concrete containing 30% and 50% replacement of OPC with grade 120 slag cement had a decreased

initial compressive and tensile strength compared to OPC concrete. However, by 14 days, the grade 120 slag cement concrete strength equaled or surpassed that of OPC concrete. Compared to OPC concrete, the time to reach 3000psi traffic opening strength was delayed by 1 to 2 days for 30% replacement and by 3 to 4 days for 50% replacement. Deicer scaling resistance decreased as the level of slag cement replacement increased. Curing methods which limited carbonation produced concrete with the highest level of scaling resistance. Air-cured concrete had higher scaling resistance than concrete cured with commercial curing compounds. The scaling resistance of all grade 120 slag cement concrete was within acceptable limits. Variations in portland cement source caused changes in strength and scaling resistance properties. Variation in coarse aggregate influenced compressive and tensile strengths but did not influence the deicer scaling resistance. Comparisons with previous research on grade 100 slag are included.
NTIS
Cements; Concretes; Furnaces; Slags

20080017831 Environmental Protection Agency, Washington, DC USA
Toxic Substances Control Act (TSCA): ASCII Text Data, July 2007, PMN Number to EPA Accession Number Link (Raw Data on CD-ROM)
Jul. 01, 2007; In English
Report No.(s): PB2007-500057; No Copyright; Avail.: National Technical Information Service (NTIS)

The TSCA Chemical Substance Inventory provides chemical identity information for the non-confidential substances on the TSCA Master Inventory File. The datafile contains no TSCA Confidential Business Information. New versions of the TSCA Inventory are issued at approximately six month intervals. The data provided for each chemical substance include the CAS Registry Number, Preferred CA Index Name, molecular formula, and other appropriate information, such as valid chemical names reported by submitters. The entries are in ascending CAS Registry Number order. The PMN Number to EPA Accession Number Link provides a cross-reference of these number for commenced PMNs on the confidential portion of the TSCA Master Inventory File. Neither this cross-reference nor the additional information included is TSCA Confidential Business Information.
NTIS
CD-ROM; Inventories; Texts; Toxicity

20080017854 Reed Intellectual Property Law Group, Palo Alto, CA, USA
Preparation of Crosslinked Particles from Polymers Having Activatible Crosslinking Groups
Hawker, C. J., Inventor; Miller, R. D., Inventor; Hedrick, J. L., Inventor; Yee-Way, V., Inventor; Feb. 09, 2004; 16 pp.; In English
Contract(s)/Grant(s): NIST-70NANB8H4013
Patent Info.: Filed Filed 9 Feb 04; US-Patent-Appl-SN-10-775 713
Report No.(s): PB2007-104820; No Copyright; Avail.: CASI: A03, Hardcopy

Crosslinked particles are provided that are useful in the manufacture of dielectric materials for use in electronic devices such as integrated circuits. The crosslinked particles are prepared by activating crosslinkable groups on synthetic polymer molecules, where the crosslinkable groups are inert until activated and, when activated, undergo an irreversible intramolecular crosslinking reaction to form crosslinked particles.
NTIS
Crosslinking; Polymers

20080017863 Pabst Patent Group, LLP, Atlanta, GA, USA
Targeted and High Density Drug Loaded Polymeric Materials
Saltzman, W. M., Inventor; Fahmy, T., Inventor; Fong, P., Inventor; Jun. 30, 2005; 28 pp.; In English
Contract(s)/Grant(s): NIH-EB00487; NIH-CA-5287
Patent Info.: Filed Filed 30 Jun 05; US-Patent-Appl-SN-11-170 817
Report No.(s): PB2007-109474; No Copyright; Avail.: CASI: A03, Hardcopy

Polymeric delivery devices have been developed which combine high loading/high density of molecules to be delivered with the option of targeting. As used herein, 'high density' refers to microparticles having a high density of ligands or coupling agents, which is in the range of 1000-10,000,000, more preferably between 10,000 and 1,000,000 ligands per square micron of microparticle surface area. A general method for incorporating molecules into the surface of biocompatible polymers using materials with an HLB of less than 10, more preferably less than 5, such as fatty acids, has been developed. Because of its

ease, generality and flexibility, this method has widespread utility in modifying the surface of polymeric materials for applications in drug delivery and tissue engineering, as well other other fields. Targeted polymeric microparticles have also been developed which encapsulate therapeutic compounds such as drugs, cellular materials or components, and antigens, and have targeting ligands directly bound to the microparticle surface. Preferred applications include use in tissue engineering matrices, wound dressings, bone repair or regeneration materials, and other applications where the microparticles are retained at the site of application or implantation. Another preferred application is in the use of microparticles to deliver anti-proliferative agents to the lining of blood vessels following angioplasty, transplantation or bypass surgery to prevent or decrease restenosis, and in cancer therapy.
NTIS
Copolymers; Drugs; Molecular Biology; Medical Science; Polymer Blends

20080017865 Reed Intellectual Property Law Group, Palo Alto, CA, USA
Catalytic Depolymerization of Polymers Containing Electrophilic Linkages Using Nucleophilic Reagents
Hedrick, J. L., Inventor; Nyce, G. W., Inventor; Waymouth, R. M., Inventor; Aug. 18, 2005; 17 pp.; In English
Contract(s)/Grant(s): NSF-DMR-980677
Patent Info.: Filed Filed 18 Aug 05; US-Patent-Appl-SN-11-208 268
Report No.(s): PB2007-109488; No Copyright; Avail.: CASI: A03, Hardcopy

A method is provided for carrying out depolymerization of a polymer containing electrophilic linkages in the presence of a catalyst and a nucleophilic reagent, wherein production of undesirable byproducts resulting from polymer degradation is minimized. The reaction can be carried out at a temperature of 80 degrees C or less, and generally involves the use of an organic, nonmetallic catalyst, thereby ensuring that the depolymerization product(s) are substantially free of metal contaminants. In an exemplary depolymerization method, the catalyst is a carbene compound such as an N-heterocyclic carbene, or is a precursor to a carbene compound. The method provides an important alternative to current recycling techniques such as those used in the degradation of polyesters, polyamides, and the like.
NTIS
Catalysis; Depolymerization; Linkages; Reagents; Carbenes; Catalytic Activity

20080017866 Whitham, Curtis and Christofferson, P.C., Reston, VA, USA
Thermoplastic Copolymers Through Stoichiometric Reactions Between Diisocyanates and Oligomeric Diols and Diamines
Yilgor, I., Inventor; Yilgor, E., Inventor; Wilkes, G. L., Inventor; Sheth, J. P., Inventor; Jun. 16, 2005; 18 pp.; In English
Contract(s)/Grant(s): DAAD19-02-0275
Patent Info.: Filed Filed 16 Jun 05; US-Patent-Appl-SN-11-153 896
Report No.(s): PB2007-109489; No Copyright; Avail.: CASI: A03, Hardcopy

A segmented copolymer can be produced without needing a chain extender. The conventional view that a chain extender was needed to construct a segmented copolymer has been disproven. For example, by certain reactions of a diisocyanate with oligomeric and polymeric diols or diamines, segmented copolymers can be produced without needing a chain extender. Segmented copolymers not containing ethylene glycol, 1,4-butanediol and ethylene diamine can be produced.
NTIS
Copolymers; Diamines; Diisocyanates; Stoichiometry; Thermoplastic Resins; Thermoplasticity; Chemical Reactions; Oligomers

20080017966 Leone, Joseph T., Madison, WI, USA
Bifunctional-Modified Hydrogels
Kao, E. J., Inventor; Phillips, J. M., Inventor; Li, J., Inventor; Lok, D., Inventor; Gundloori, R., Inventor; 30 Mar 05; 49 pp.; In English
Contract(s)/Grant(s): NIH EB000290
Patent Info.: Filed Filed 30 Mar 05; US-Patent-Appl-SN-11 093 531
Report No.(s): PB2007-109391; No Copyright; Avail.: CASI: A03, Hardcopy

Disclosed are hydrogels wherein a polymer matrix is modified to contain a bifunctional poly(alkylene glycol) molecule covalently bonded to the polymer matrix. The hydrogels can be cross-linked using, for example, glutaraldehyde. The hydrogels may also be crosslinked via an interpenetrating network of a photopolymerizable acrylates. The hydrogels may also

be modified to have pharmacologically-active agents covalently bonded to the poly(alkylene glycol) molecules or entrained within the hydrogel. Living cells may also be entrained within the hydrogels.
NTIS
Gels; Patent Applications; Covalent Bonds

20080017967 Christensen, OConnor, Johnson, Kindness, PLLC, Seattle, WA, USA; Washington Univ., Seattle, WA, USA
Hydrogels Formed by Non-Covalent Linkages
Ratner, B. D., Inventor; Nair, P. D., Inventor; Boeckl, M. S., Inventor; Leber, E. R., Inventor; 9 Aug 05; 15 pp.; In English
Contract(s)/Grant(s): EEC-9529161
Patent Info.: Filed Filed 9 Aug 05; US-Patent-Appl-SN-11 199 613
Report No.(s): PB2007-109394; No Copyright; Avail.: CASI: A03, Hardcopy

In one aspect, the present invention provides hydrogels comprising polymer molecules and bridging molecules, wherein substantially all the polymer molecules are cross-linked by hydrogen bonds between polymer molecules and bridging molecules, wherein each bridging molecule is linked to at least two polymer molecules, and wherein there are substantially no covalent linkages between the polymer molecules. In some embodiments, the polymer molecules are poly(vinyl alcohol) (PVA) and the bridging molecules are amino acids. Some embodiments of the invention provide devices comprising hydrogels, and pharmaceutical compositions comprising biologically active molecules within hydrogels. Another aspect provides methods for forming hydrogels of the invention.
NTIS
Covalence; Gels; Linkages; Patent Applications

24
COMPOSITE MATERIALS

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

20080016827 Lane (Philip Douglas), Potomac Falls, VA, USA
Continuously Formed Metal Matrix Composite Shapes
Gordon, B. L., Inventor; Wolfe, G. W., Inventor; Nov. 24, 2004; 9 pp.; In English
Contract(s)/Grant(s): DAAD-19-0102-0006
Patent Info.: Filed Filed 24 Nov 04; US-Patent-Appl-SN-10-995 279
Report No.(s): PB2007-108833; No Copyright; Avail.: CASI: A02, Hardcopy

Metal matrix composites having open or closed channels extending longitudinal through the length of the composite as well as methods and apparatus for forming the same are described. The shaped metal matrix composites are made of continuous fiber reinforced metal matrix composite materials. They have an integrally formed, non-cast, metal matrix composite body portion where the walls have a substantially uniform distribution of continuous fibers in a matrix metal throughout the volume of the walls and have at least one channel extending through the body of the shaped metal matrix composite.
NTIS
Metal Matrix Composites; Shapes

20080016990 West Virginia Univ., Morgantown, WV USA; West Virginia Univ., Morgantown, WV, USA
Innovative Structural and Joining Concepts for Lightweight Design of Heavy Vehicle Systems
Prucz, J. C.; Shoukry, S. N.; William, G. W.; Evans, T. H.; Sep. 01, 2006; 83 pp.; In English
Report No.(s): DE2007-902081; FC26-05NT42476; No Copyright; Avail.: National Technical Information Service (NTIS)

The extensive research and development effort was initiated by the U.S. Department of Energy (DOE) in 2002 at West Virginia University (WVU) in order to investigate practical ways of reducing the structural weight and increasing the durability of heavy vehicles through the judicious use of lightweight composite materials. While this project was initially focused on specific Metal Matrix Composite (MMC) material, namely Aluminum/Silicon Carbide (Al/SiC) commercially referenced as 'LANXIDE', the current research effort was expanded from the component level to the system level and from MMC to other composite material systems. Broadening the scope of this research is warranted not only by the structural and economical deficiencies of the 'LANXIDE' MMC material, but also by the strong coupling that exists between the material and the geometric characteristics of the structure. Such coupling requires a truly integrated design approach, focused on the heaviest sections of a van trailer. Obviously, the lightweight design methods developed in this study will not be implemented

by the commercial industry unless the weight savings are indeed impressive and proven to be economically beneficial in the context of Life Cycle Costs (LCC).
NTIS
Composite Materials; Structural Analysis; Structural Design

20080017049 3M Innovative Properties Co., Saint Paul, MN, USA
Cable and Method of Making the Same
Johnson, D. E., Inventor; Kosek, Z. M., Inventor; McCullough, C., Inventor; Jun. 17, 2004; 20 pp.; In English
Contract(s)/Grant(s): DE-FC02-02CH11111
Patent Info.: Filed Filed 17 Jun 04; US-Patent-Appl-SN-10-870 263
Report No.(s): PB2007-109362; No Copyright; Avail.: CASI: A03, Hardcopy

Cable and method for cable. Embodiments of the cable are useful, for example, as an overhead power transmission line.
NTIS
Cables (Ropes); Electric Power Transmission; Ceramic Fibers

20080017051 Wichita State Univ., Wichita, KS, USA
Guidelines and Recommended Criteria for the Development of a Material Specification for Carbon Fiber/Epoxy Unidirectional Prepregs Update
McCarvill, W.; Ward, S.; Bogucki, G.; Tomblin, J.; May 01, 2007; 72 pp.; In English
Report No.(s): PB2007-111125; No Copyright; Avail.: CASI: A04, Hardcopy

This report establishes recommendations to guide the development of composite prepreg material specifications. This is intended to advance the work that has been done through previous Federal Aviation Administration and National Aeronautics and Space Administration programs such as the Advanced General Aviation Transport Experiment. These programs have established methodologies for developing design allowable data, control of the data, and sharing the resulting database. In the current work, a generalized approach to the development of a shared composite material database is proposed. It is intended to remove the restrictions placed on those general aviation methods to allow a broader market to use the shared database. This document recommends guidance and criteria for the development of material specifications for carbon fiber/epoxy unidirectional prepreg tape materials to be used on aircraft structures. These recommendations were prepared by a team of industry experts. The guidelines and recommendations are meant to be a documentation of current knowledge and application of sound engineering principles to the development and implementation of composite material procurement specifications. A list of material control areas needing improvement and enhancement is given in appendix A. This document can also be used to develop common industry specifications. This document is limited to recommendations and guidance on the development of the material specification. Additional guidance on the development of process specifications, instructions, and controls for making high-quality laminates can be found in the companion report Guidelines for the Development of Process Specifications, Instructions, and Controls for the Fabrication of Fiber-Reinforced Polymer Composites, DOT/FAA/AR-02/110.
NTIS
Carbon Fibers; Epoxy Matrix Composites; Fiber Composites; Prepregs; Specifications

20080017055 Wichita State Univ., Wichita, KS, USA
Guidelines and Recommended Criteria for the Development of a Material Specification for Carbon Fiber/Epoxy Fabric Prepregs
Ward, S.; McCarvil, W.; Tomblin, J.; May 01, 2007; 85 pp.; In English
Report No.(s): PB2007-111129; No Copyright; Avail.: CASI: A05, Hardcopy

The building block approach is used within the composite aircraft industry for the substantiation of composite structure. A key element supporting the building block approach is material and process specifications. Material and process specifications are interwoven throughout the qualification and validation process. They are used to define the materials attributes, define the qualification characterization tests, purchase the material, and define and control the processes used for the fabrication. It is critical that the qualification specimens fabricated through the various levels of the building block approach use the same process, which is representative of the one that will be used in the fabrication of production aircraft and rotorcraft. This document recommends guidance and criteria for the development of material specifications for carbon fiber/epoxy prepreg fabric materials to be used on aircraft structures. This report is intended to be a companion to previous Federal Aviation Administration reports which established methodology for developing material allowable data, control of the data, and sharing the resulting database, DOT/FAA/AR-02/109 and DOT/FAA/AR-02/110. These reports provide

recommendations for prepreg tape materials and processing. The guidelines and recommendations are meant to be a documentation of current knowledge and practices, and application of sound engineering principles to the development and implementation of composite material procurement specifications. A list of material control areas needing improvement and enhancement is provided for discussion. This document can also be used to develop common industry specifications.
NTIS
Carbon Fibers; Epoxy Matrix Composites; Fabrics; Fiber Composites; Prepregs; Specifications

20080017096 NASA Langley Research Center, Hampton, VA, USA
Ceramic Matrix Composite (CMC) Thermal Protection Systems (TPS) and Hot Structures for Hypersonic Vehicles
Glass, David E.; April 28, 2008; 36 pp.; In English; 15th AIAA International Space Planes and Hypersonic Systems and Technologies Conference, 28 Apr.?1 May 2008, Dayton, OH, USA; Original contains color and black and white illustrations
Report No.(s): AIAA Paper 2008-2682; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080017096

Thermal protection systems (TPS) and hot structures are required for a range of hypersonic vehicles ranging from ballistic reentry to hypersonic cruise vehicles, both within Earth's atmosphere and non-Earth atmospheres. The focus of this paper is on air breathing hypersonic vehicles in the Earth's atmosphere. This includes single-stage to orbit (SSTO), two-stage to orbit (TSTO) accelerators, access to space vehicles, and hypersonic cruise vehicles. This paper will start out with a brief discussion of aerodynamic heating and thermal management techniques to address the high heating, followed by an overview of TPS for rocket-launched and air-breathing vehicles. The argument is presented that as we move from rocket-based vehicles to air-breathing vehicles, we need to move away from the insulated airplane approach used on the Space Shuttle Orbiter to a wide range of TPS and hot structure approaches. The primary portion of the paper will discuss issues and design options for CMC TPS and hot structure components, including leading edges, acreage TPS, and control surfaces. The current state-of-the-art will be briefly discussed for some of the components. The two primary technical challenges impacting the use of CMC TPS and hot structures for hypersonic vehicles are environmental durability and fabrication, and will be discussed briefly.
Author
Ceramic Matrix Composites; Thermal Protection; Hot Surfaces; Hypersonic Vehicles; Low Earth Orbits

20080017875 McKee, Voorhees and Sease, P.L.C., Des Moines, IA, USA
Ultra-Hard Boride-Based Metal Matrix Reinforcement
Cook, B. A., Inventor; Russell, A. M., Inventor; Harringa, J. L., Inventor; Biner, B., Inventor; Anderson, I., Inventor; Jun. 18, 2004; 7 pp.; In English
Contract(s)/Grant(s): W-7405-ENG-82; DOE-EE ED 19/2803/AMES
Patent Info.: Filed Filed 18 Jun 04; US-Patent-Appl-SN-10-871 933
Report No.(s): PB2007-109364; No Copyright; Avail.: CASI: A02, Hardcopy

A composite of M/AlMgB(sub 14) or M alloy/AlMgB(sub 14) is synthesized, where M=Al, Ti, W, or Cu. Small particles and/or fibers of AlMgB(sub 14) are distributed throughout a metal matrix to strengthen the resulting composite.
NTIS
Borides; Hardness; Metal Matrix Composites

25
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*.

20080016633 Quine Intellectual Property Law Group, P. C., Alameda, CA, USA
Glycoprotein Synthesis (PAT-APPL-11-093 798)
Schultz, P. G., Inventor; Wang, L., Inventor; Zhang, Z., Inventor; Mar. 29, 2005; 51 pp.; In English
Contract(s)/Grant(s): NIH-GM44154; NIH-BM62159
Patent Info.: Filed Filed 29 Mar 05; US-Patent-Appl-SN-11-093 798
Report No.(s): PB2007-108802; No Copyright; Avail.: CASI: A04, Hardcopy

Methods for making glycoproteins, both in vitro and in vivo, are provided. One method involves incorporating an unnatural amino acid into a protein and attaching one or more saccharide moieties to the unnatural amino acid. Another

method involves incorporating an unnatural amino acid that includes a saccharide moiety into a protein. Proteins made by both methods can be further modified with additional sugars.
NTIS
In Vitro Methods and Tests; In Vivo Methods and Tests; Proteins

20080016634 Quine Intellectual Property Law Group, P. C., Alameda, CA, USA
Glycoprotein Synthesis (PAT-APPL-11-094-676)
Schultz, P. G., Inventor; Wang, L., Inventor; Zhang, Z., Inventor; Mar. 29, 2005; 51 pp.; In English
Contract(s)/Grant(s): NIH-GN44154; NIH-GM62159
Patent Info.: Filed Filed 29 Mar 05; US-Patent-Appl-SN-11-094 676
Report No.(s): PB2007-108803; No Copyright; Avail.: CASI: A04, Hardcopy

Methods for making glycoproteins, both in vitro and in vivo, are provided. One method involves incorporating an unnatural amino acid into a protein and attaching one or more saccharide moieties to the unnatural amino acid. Another method involves incorporating an unnatural amino acid that includes a saccharide moiety into a protein. Proteins made by both methods can be further modified with additional sugars.
NTIS
In Vitro Methods and Tests; In Vivo Methods and Tests; Proteins; Protein Synthesis

20080016710 Savannah River National Lab., Aiken, SC, USA
Role of Manganese Reduction/Oxidation (REDOX) on Foaming and Melt Rate in High Level Waste (HLW) Melters
Jantzen, C. M.; Stone, M. E.; Mar. 01, 2007; 85 pp.; In English
Report No.(s): DE2007-903096; WSRC-STI-2006-00066; No Copyright; Avail.: National Technical Information Service (NTIS)

High-level nuclear waste is being immobilized at the Savannah River Site (SRS) by vitrification into borosilicate glass at the Defense Waste Processing Facility (DWPF). Control of the REDuction/OXidation (REDOX) equilibrium in the DWPF melter is critical for processing high level liquid wastes. Foaming, cold cap roll-overs, and off-gas surges all have an impact on pouring and melt rate during processing of high-level waste (HLW) glass. All of these phenomena can impact waste throughput and attainment in Joule heated melters such as the DWPF. These phenomena are caused by gas-glass disequilibrium when components in the melter feeds convert to glass and liberate gases such as H2O vapor (steam), CO2, O2, H2, NOx , and/or N2. During the feed-to-glass conversion in the DWPF melter, multiple types of reactions occur in the cold cap and in the melt pool that release gaseous products. The various gaseous products can cause foaming at the melt pool surface. Foaming should be avoided as much as possible because an insulative layer of foam on the melt surface retards heat transfer to the cold cap and results in low melt rates. Uncontrolled foaming can also result in a blockage of critical melter or melter off-gas components. Foaming can also increase the potential for melter pressure surges, which would then make it difficult to maintain a constant pressure differential between the DWPF melter and the pour spout. Pressure surges can cause erratic pour streams and possible pluggage of the bellows as well.
NTIS
Borosilicate Glass; Foaming; Grasslands; Manganese; Oxidation; Oxidation-Reduction Reactions; Rivers; Vitrification

20080016715 Hawaii Univ., Honolulu, HI, USA
Catalytically Enhanced Systems for Hydrogen Storage. Final Report, August 1, 2000-September 30, 2005
Jensen, C. M.; Andrei, C.; Cantelii, R.; Brinks, H.; Eaton, S.; Apr. 01, 2007; 86 pp.; In English
Report No.(s): DE2007-890543; No Copyright; Avail.: National Technical Information Service (NTIS)

Previous U.S. DOE sponsored research at the University of Hawaii resulted in the development of methods of doping of sodium aluminum hydride, NaAlH4 with titanium, zirconium and other catalysts such that: dehydriding occurs at temperatures as low as 100 degrees C; rehydriding requires less than 1 h; and >4 weight percent hydrogen can be repeatedly cycled through dehydriding/rehydriding. These materials appeared to be on the threshold of practical viability as hydrogen carriers for onboard fuel cells. However, it was apparent that further kinetic enhancement was required to achieve commercial viability. Thus, one of the primary goals of this project was to develop the requisite improved catalysts. Over the course of this project, a variety of titanium and zirconium dopant precursors were investigated. Moreover, the approach was to conduct guided search for improved catalysts by obtaining a fundamental understanding of the chemical nature of the titanium dopants and their mechanism of action. Therefore, the projected also aimed to determined the chemical nature of the titanium species that are formed upon mechanical milling of NaAlH4 with the dopant precursors through synchrotron X-ray and neutron diffraction as

well as transmission electron microscopy, scanning electron microscopy, and electron paramagnetic resonance (EPR) spectroscopy.
NTIS
Catalysts; Catalytic Activity; Hydrogen

20080016716 Los Alamos National Lab., NM USA; Florida Univ., Gainesville, FL, USA
Influence of Radiation on Pit Solution Chemistry as it Pertains to the Transition from Metastable to Stable Pitting in Steels (January 15, 2005-July 14, 2006)
Hanrahan, R.; Jan. 01, 2007; 13 pp.; In English
Contract(s)/Grant(s): DE-FG02-05ER64003
Report No.(s): DE2007-892996; No Copyright; Avail.: National Technical Information Service (NTIS)

Previous work relevant to current efforts is summarized. A description of an improved version of a new electrochemical probe, the ArtPit, is given. The distinct feature of the probe for investigating metastable pitting of carbon steels is specified and compared to other approaches. The electrochemical response of the ArtPit under the gamma irradiation and elevated temperature conditions that occur at high level waste (HLW) storage tanks is presented. In particular, the Tafel slope determinations and chemical analyses of the ArtPit confined volume electrolyte are described. Based on results a possible approach for reducing the corrosion rate of HLW tank walls is suggested. Additional statistical analysis of the occurrence of short duration (passivated pits) and long term (stable pitting) electrochemical pulses (current surges) during exposure confirm that radiation enhances the occurrence of both more and smaller sized pits due to increased likelihood of repassivation.
NTIS
Corrosion; Metastable State; Pitting; Radiation Chemistry; Radioactive Wastes; Solutions; Steels; Waste Management

20080016752 Dewitt, Ross and Stevens, S.C., Madison, WI, USA
Low Temperature Hydrogen Production from Oxygenated Hydrocarbons
Cortright, R. D., Inventor; Dumesic, J. A., Inventor; May 9, 2005; 39 pp.; In English
Contract(s)/Grant(s): DE-FG02-84ER13183
Patent Info.: Filed Filed 9 May 05; US-Patent-Appl-SN-11-124 717
Report No.(s): PB2007-105187; No Copyright; Avail.: CASI: A03, Hardcopy

Disclosed is a method of producing hydrogen from oxygenated hydrocarbon reactants, such as methanol, glycerol, sugars (e.g. glucose and xylose), or sugar alcohols (e.g. sorbitol). The method takes place in the condensed liquid phase. The method includes the steps of reacting water and a water-soluble oxygenated hydrocarbon in the presence of a metal-containing catalyst. The catalyst contains a metal selected from the group consisting of Group VIIIB transitional metals, alloys thereof, and mixtures thereof. The disclosed method can be run at lower temperatures than those used in the conventional steam reforming of alkanes.
NTIS
Hydrocarbons; Hydrogen Production; Low Temperature; Oxygenation

20080016761 Hoag (Foley), LLP, Boston, MA, USA
Naphthofluorescein-Based Metal Sensors, and Methods of Making and Using the Same
Lippard, S. J., Inventor; Chang, C. J., Inventor; Nolan, E. M., Inventor; Jan. 19, 2005; 38 pp.; In English
Patent Info.: Filed Filed 19 Jan 05; US-Patent-Appl-SN-11-039 396
Report No.(s): PB2007-108786; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention is directed, in part, to naphthofluorescein-based ligands for detection of metal ions, and methods of making and using the same.
NTIS
Detection; Ligands; Metal Ions

20080016800 CH2M/Hill Hanford Group, Inc., Richland, WA, USA
Fractional Crystallization Flowsheet Tests with Actual Tank Waste
Herting, D. L.; Apr. 01, 2007; 68 pp.; In English
Contract(s)/Grant(s): DE-AC27-99RL14047
Report No.(s): DE2007-902901; RPP-RPT-31352 REV 1; No Copyright; Avail.: National Technical Information Service (NTIS)

Laboratory-scale flowsheet tests of the fractional crystallization process were conducted with actual tank waste samples

in a bot cell at the 2224 Laboratory. The process is designed to separate medium-curie liquid waste into a low-curie stream for feeding to supplemental treatment and a high-curie stream for double-shell tank storage. Separations criteria (for Cesium-137 sulfate and sodium) were exceeded in all three of the flowsheet tests that were performed.
NTIS
Crystallization; Radioactive Wastes; Decontamination; Radiochemistry; Waste Disposal; Radioactive Materials

20080016807 Knolls Atomic Power Lab., Niskayuna, NY, USA
Radiochemical Analysis Methodology for Uranium Depletion Measurements
Wachel, S.; Jan. 09, 2007; 141 pp.; In English
Contract(s)/Grant(s): DE-AC10-00SN39357
Report No.(s): DE2007-903081; LM-06K140; No Copyright; Avail.: Department of Energy Information Bridge

This report provides sufficient material for a test sponsor with little or no radiochemistry background to understand and follow physics irradiation test program execution. Most irradiation test programs employ similar techniques and the general details provided here can be applied to the analysis of other irradiated sample types. Aspects of program management directly affecting analysis quality are also provided. This report is not an in-depth treatise on the vast field of radiochemical analysis techniques and related topics such as quality control. Instrumental technology is a very fast growing field and dramatic improvements are made each year, thus the instrumentation described in this report is no longer cutting edge technology. Much of the background material is still applicable and useful for the analysis of older experiments and also for subcontractors who still retain the older instrumentation.
NTIS
Chemical Analysis; Depletion; Radiochemistry; Uranium

20080016813 Texas Univ., Austin, TX, USA
From First Principles Design to Realization of Bimetallic Catalysts for Ultrahigh Selectivity - Final Project Report
Crooks, R. M.; Apr. 11, 2007; 9 pp.; In English
Contract(s)/Grant(s): DE-FG02-05ER15683
Report No.(s): DE2007-901980; DOE/ER/15683; No Copyright; Avail.: Department of Energy Information Bridge

The overall objective of this project was to synthesize and characterize structurally well-defined, bimetallic catalysts. These materials, which we call dendrimer-encapsulated nanoparticles (DENs) are synthesized within dendrimer templates by coordination of metal ions to the interior tertiary amines of the dendrimer, followed by reduction. This approach yields monometallic and bimetallic nanoparticles that have a high degree of uniformity in size, structure, and composition.
NTIS
Bimetals; Catalysts; Nanoparticles; Dendrimers; Chemical Composition; Electrochemistry

20080016912 Pauley, Petersen and Erickson, Hoffman Estates, IL, USA
Methods of Synthesizing and Using Derivatives of (2-(2-Aminioethoxy)Ethoxy) Acetic Acid
Aldrich, J. V., Inventor; Kumar, V., Inventor; Mar. 29, 2005; 13 pp.; In English
Contract(s)/Grant(s): NIH-NIDA-DA-10035
Patent Info.: Filed Filed 29 Mar 05; US-Patent-Appl-SN-11-092 254
Report No.(s): PB2007-108782; No Copyright; Avail.: CASI: A03, Hardcopy

A synthetic reaction to produce (2-(2-aminoethoxy)ethoxy) acetic acid (AEEA) derivatives. This synthetic reaction does not require isolation and purification of intermediates. The AEEA derivatives can be used to synthesize high load polystyrene-polyethylene glycol-like resins having excellent swelling characteristics.
NTIS
Acetic Acid; Derivation

20080016914 Brown Raysman Millstein Felder and Steiner, LLP, Morristown, NJ, USA
Novel Anti-Arrythmic and Heart Failure Drugs that Target the Leak in the Ryanodine Receptor (RYR2)
Marks, A. R., Inventor; Landry, D. W., Inventor; Deng, S. X., Inventor; Cheng, Z. Z., Inventor; Mar. 23, 2005; 38 pp.; In English
Contract(s)/Grant(s): NIH-PO1-HL67849-01

Patent Info.: Filed Filed 23 Mar 05; US-Patent-Appl-SN-11-088 123
Report No.(s): PB2007-108798; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention provides novel 1,4-benzothiazepine intermediates and derivatives, methods for synthesizing same, and methods for assaying same. The present invention also provides methods for using these novel compounds to limit or prevent a decrease in the level of RyR2-bound FKBPl2.6 in a subject; to prevent exercise-induced sudden cardiac death in a subject; and to treat or prevent heart failure, atrial fibrillation, or exercise-induced cardiac arrhythmia in a subject. The present invention further provides methods for identifying an agent that enhances binding of RyR2 and FKBP12.6, and agents identified by these methods. Additionally, the present invention provides methods for identifying agents for use in treating or preventing heart failure, atrial fibrillation, or exercise-induced cardiac arrhythmia, and in preventing exercise-induced sudden cardiac death. Also provided are agents identified by such methods.

NTIS

Arrhythmia; Drugs; Failure; Heart; Leakage; Targets

20080017017 Mueting, Raasch and Gebhardt, P.A., Minneapolis, MN, USA; Purdue Research Foundation, Lafayette, IN, USA

Protein Identification from Protein Product Ion Spectra

Reid, G. E., Inventor; Hogan, J. M., Inventor; McLuckey, S. A., Inventor; May 20, 2003; 25 pp.; In English
Contract(s)/Grant(s): GM45372
Patent Info.: Filed Filed 20 May 03; US-Patent-Appl-SN-10-514-693
Report No.(s): PB2007-105281; No Copyright; Avail.: CASI: A03, Hardcopy

Mass spectrometry is used to identify a protein of interest. The protein is first ionized then fragmented into protein product ion. Masses of the observed product ions are compared to product ion masses calculated in silico for database protein sequences to identify product ion matches within a predetermined mass tolerance. An algorithm that weights the product ion to matches based upon one or more factors such as product ion abundance, favored cleavage sites, product ion type, precursor ion charge state and polarity is used to score the possible matches to database proteins in order to identify the protein of interest. The invention represents a 'top down' approach and is particularly well-suited for identification of a protein in a complex mixture.

NTIS

Mass Spectroscopy; Patent Applications; Proteins

20080017028 Hoag (Foley), LLP, Boston, MA, USA

Copper-Catalyzed Formation of Carbon Heteroatom and Carbon-Carbon Bonds

Buchwlad, S. L., Inventor; Klapars, A., Inventor; Antilla, J. C., Inventor; Job, G. E., Inventor; Wolter, M., Inventor; Jan. 04, 2005; 125 pp.; In English
Contract(s)/Grant(s): R01-GM58160
Patent Info.: Filed Filed 4 Jan 05; US-Patent-Appl-SN-11-028-500
Report No.(s): PB2007-105255; No Copyright; Avail.: CASI: A06, Hardcopy

The present invention relates to copper-catalyzed carbon-heteroatom and carbon-carbon bond-forming methods. In certain embodiments, the present invention relates to copper-catalyzed methods of forming a carbon-nitrogen bond between the nitrogen atom of an amide or amine moiety and the activated carbon of an aryl, heteroaryl, or vinyl halide or sulfonate. In additional embodiments, the present invention relates to copper-catalyzed methods of forming a carbon-nitrogen bond between a nitrogen atom of an acyl hydrazine and the activated carbon of an aryl, heteroaryl, or vinyl halide or sulfonate. In other embodiments, the present invention relates to copper-catalyzed methods of forming a carbon-nitrogen bond between the nitrogen atom of a nitrogen-containing heteroaromatic, e.g., indole, pyrazole, and indazole, and the activated carbon of an aryl, heteroaryl, or vinyl halide or sulfonate. In certain embodiments, the present invention relates to copper-catalyzed methods of forming a carbon-oxygen bond between the oxygen atom of an alcohol and the activated carbon of an aryl, heteroaryl, or vinyl halide or sulfonate. The present invention also relates to copper-catalyzed methods of forming a carbon-carbon bond between a reactant comprising a nucleophilic carbon atom, e.g., an enolate or malonate anion, and the activated carbon of an aryl, heteroaryl, or vinyl halide or sulfonate. Importantly, all the methods of the present invention are relatively inexpensive to practice due to the low cost of the copper comprised by the catalysts.

NTIS

Bonding; Carbon; Catalysis; Chemical Bonds; Copper; Joints (Junctions)

20080017040 Rice Univ., Houston, TX USA

Nanotechnology: From the Laboratory to New Commercial Frontiers. Southern Regional Workshop. Held in Houston, Texas on May 23, 2002. National Nanotechnology Initiative

Feb. 28, 2003; 138 pp.; In English; Nanotechnology: From the Laboratory to New Commercial Frontiers. Southern Regional Workshop., May 23, 2002. National Nanotechnology Initiative, Houston, Texas

Report No.(s): PB2007-111337; No Copyright; Avail.: National Technical Information Service (NTIS)

Rice University hosted a National Nanotechnology Initiative Southern Regional Nanotechnology Workshop: From the Laboratory to New Commercial Frontiers on May 23, 2002. This was the second regional workshop sponsored by the National Nanotechnology Initiative, U.S. Department of Commerce, the Federal Aviation Administration, U.S. Department of Energy, National Science Foundation, and the National Nanotechnology Coordination Office. The first was held at the University of California at Los Angeles in September 2001 and two more are planned for the Midwest and the Northeast. The Rice University Workshop convened nearly 400 leaders from industry, government, academe and the financial community to consider the future of nanotechnology. In particular, the workshop explored trends, opportunities, and challenges regarding the translation of laboratory research in nanotechnology into commercial products that can benefit society. The Workshop focused on four areas of application or concern: energy/petrochemicals, molecular electronics, medicine/life sciences, and aerospace/materials science. Aspects of human capital needs (workforce education and training) were of interest for all four application areas.

NTIS

Nanotechnology; Spacecraft Construction Materials; Molecular Electronics

20080017043 National Renewable Energy Lab., Golden, CO USA

Thermochemical Ethanol via Indirect Gasification and Mixed Alcohol Synthesis of Lignocellulosic Biomass

Phillips, S.; Aden, A.; Jechura, J.; Dayton, D.; Eggeman, T.; Apr. 01, 2007; 132 pp.; In English

Contract(s)/Grant(s): DE-AC36-99-GO10337

Report No.(s): DE2007-902168; NREL/TP-510-41168; No Copyright; Avail.: National Technical Information Service (NTIS)

This process design and technoeconomic evaluation addresses the conversion of biomass to ethanol via thermochemical pathways that are expected to be demonstrated at the pilot level by 2012.

NTIS

Alcohols; Biomass; Ethyl Alcohol; Gasification; Thermochemistry

20080017078 Carnegie-Mellon Univ., Pittsburgh, PA, USA

Molecular Level Design of Heterogeneous Chiral Catalysis. (Final Report, September 15, 2003-November 15, 2006)

Sholl, D. S.; Gellman, A. J.; Jan. 01, 2006; 14 pp.; In English

Contract(s)/Grant(s): DE-FG02-03ER15473

Report No.(s): DE2007-901867; No Copyright; Avail.: National Technical Information Service (NTIS)

The production of enantiomerically pure chiral compounds is of great importance in the pharmaceutical industry. Although processes involving chiral catalysis and separations involving solid surfaces are known, the molecular-scale details of these processes are not well understood. This lack of understanding strongly limits the development of new chiral processes. Our collaborative research effort examines several intertwined aspects of chirality and enantioselectivity at catalytically active metal surfaces. At Carnegie Mellon, our efforts focus on the development of chirally imprinted metal powders as materials for chiral columns and the experimental and theoretical study of small chiral molecules adsorbed on well-characterized metal surfaces, both achiral and chiral. These efforts are being performed in close collaboration with our team members at the University of California Riverside and the University of Wisconsin Milwaukee.

NTIS

Catalysis; Chirality; Enantiomers; Heterogeneity; Industries; Molecular Structure; Pharmacology

20080017446 CH2M/Hill Hanford Group, Inc., Richland, WA, USA

Interim Report, Hanford Tanks AY-102 and AP-101: Effect of Chemistry and Other Variables on Corrosion and Stress Corrosion Cracking

Harty, M. H.; Mar. 30, 2007; 39 pp.; In English

Report No.(s): DE2007-903344; RPP-RPT-31932; No Copyright; Avail.: Department of Energy Information Bridge

The Hanford tank reservation contains approximately 50 million gallons of liquid legacy radioactive waste from cold war

weapons production, which is stored in 177 underground storage tanks. Current plans call for eventual vitrification processing and ultimate disposat of the resulting waste glass logs at the Yucca Mountain Repository. The double shelled carbon steel tanks presently used for storage will continue in operation until the vitrification plant construction is finalized and waste processing operations completed. Due to various chemical reactions taking place inside the tank, the waste chemistry will tend to change over time, especially given the currently estimated 2023 time horizon anticipated for tank operations to continue. In addition, the present chemistries for some of the tank waste types are no longer in specification with respect to corrosion mitigation (e.g. maintaining pH levels above 13). Thus, there is concern within DOE and regulatory bodies that tank integrity will be compromised given these changes in chemistry. Furthermore, if tank integrity is potentially compromised, there is a need to define mitigation procedures. Thus, the objective of this work is to determine the range of conditions where the tank steel is susceptible to localized corrosion and SCC in simulants for wastes in tanks AY-1Q2 and AP-101.
NTIS
Carbon Steels; Corrosion; Radioactive Wastes; Stress Corrosion Cracking; Waste Management

20080017447 Savannah River National Lab., Aiken, SC, USA
Investigating Hydrogen Generation and Corrosion in the Treatment Tank and the Potential Formation of a Floating Layer in Neutralization Tank During Waste Tank Heel Chemical Cleaning
Herman, D. T.; Wiersma, B. J.; Fondeur, F. F.; Wittkop, J. C.; Pareizs, J. M.; Apr. 30, 2007; 142 pp.; In English
Report No.(s): DE2007-903402; WSRC-STI-2007-00209; No Copyright; Avail.: National Technical Information Service (NTIS)

The Savannah River Site (SRS) will remove sludge as part of waste tank closure operations. Typically the bulk sludge is removed by mixing it with water to create a slurry and transporting the slurry to a downstream tank for processing. Experience shows that a residual heel may remain that cannot be removed by this conventional technique. In the past, SRS used oxalic acid solutions to disperse or dissolve the sludge heel to complete the waste removal. To better understand the actual conditions of oxalic acid cleaning of carbon steel tanks, the authors developed and conducted an experimental program to determine its effectiveness in dissolving sludge, the hydrogen generation rate, the generation rate of other gases, the carbon steel corrosion rate, the impact of mixing on chemical cleaning, the impact of temperature, and the types of precipitates formed during the neutralization process.
NTIS
Chemical Cleaning; Cleaning; Corrosion; Floating; Hydrogen; Radioactive Wastes; Sludge

20080017448 Sandia National Labs., Albuquerque, NM USA
Fuel Traps: Mapping Stability via Water Association
Rempe, S. L.; Sabo, D.; Clawson, J. S.; Greathouse, J. A.; Leung, K.; Mar. 01, 2007; 69 pp.; In English
Report No.(s): DE2007-903433; SAND2007-1643; No Copyright; Avail.: National Technical Information Service (NTIS)

Hydrogen storage is a key enabling technology required for attaining a hydrogen-based economy. Fundamental research can reveal the underlying principles controlling hydrogen uptake and release by storage materials, and also aid in characterizing and designing novel storage materials. New ideas for hydrogen storage materials come from exploiting the properties of hydrophobic hydration, which refers to waters ability to stabilize, by its mode of association, specific structures under specific conditions. Although hydrogen was always considered too small to support the formation of solid clathrate hydrate structures, exciting new experiments show that water traps hydrogen molecules at conditions of low temperatures and moderate pressures. Hydrogen release is accomplished by simple warming. While these experiments lend credibility to the idea that water could form an environmentally attractive alternative storage compound for hydrogen fuel, which would advance our nations goals of attaining a hydrogen-based economy, much work is yet required to understand and realize the full potential of clathrate hydrates for hydrogen storage.
NTIS
Energy Storage; Hydrogen; Stability; Water

20080017469 Scott [Eddie E.], Livermore, CA, USA; California Univ., Oakland, CA, USA
Protein Crystallography Prescreen Kit
Segelke, B. W., Inventor; Krupka, H. I., Inventor; Rupp, B., Inventor; Mar. 17, 2005; 9 pp.; In English
Contract(s)/Grant(s): DOE-CN-W-7405-ENG-48

Patent Info.: Filed Filed 17 Mar 05; US-Patent-Appl-SN-11-084 479
Report No.(s): PB2007-104799; No Copyright; Avail.: CASI: A02, Hardcopy

A kit for prescreening protein concentration for crystallization includes a multiplicity of vials, a multiplicity of pre-selected reagents, and a multiplicity of sample plates. The reagents and a corresponding multiplicity of samples of the protein in solutions of varying concentrations are placed on sample plates. The sample plates containing the reagents and samples are incubated. After incubation the sample plates are examined to determine which of the sample concentrations are too low and which the sample concentrations are too high. The sample concentrations that are optimal for protein crystallization are selected and used.

NTIS

Crystallography; Kits; Patent Applications; Proteins

20080017490 Sandia National Labs., Albuquerque, NM USA

Low-Power Pressure- and Temperature-Programmed Separation System for a Micro Gas Chromatograph

Potkay, J. A.; Lambertus, G. R.; Sacks, R. D.; Wise, K. D.; Robinson, A. L.; Oct. 01, 2006; 128 pp.; In English
Report No.(s): DE2007-902593; SAND2006-7538; No Copyright; Avail.: National Technical Information Service (NTIS)

This thesis presents the theory, design, fabrication and testing of the microvalves and columns necessary in a pressure- and temperature-programmed micro gas chromatograph (mGC). Two microcolumn designs are investigated: a bonded Si-glass column having a rectangular cross section and a vapor-deposited silicon oxynitride (Sion) column having a roughly circular cross section. Both microcolumns contain integrated heaters and sensors for rapid, controlled heating. The 3.2 cm x 3.2 cm, 3 m-long siliconglass column, coated with a non-polar polydimethylsiloxane (PDMS) stationary phase, separates 30 volatile organic compounds (VOCs) in less than 6 min. This is the most efficient micromachined column reported to date, producing greater than 4000 plates/m. The 2.7 mm x 1.4 mm Sion column eliminates the glass sealing plate and silicon substrate using deposited dielectrics and is the lowest power and fastest GC column reported to date; it requires only 11 mW to raise the column temperature by 100oC and has a response time of 11s and natural temperature ramp rate of 580oC/min. A 1 m-long PDMS-coated Sion microcolumn separates 10 VOCs in 52s. A system-based design approach was used for both columns. The 7.5 mm x 10.3 mm integrated microvalve enables low-power pressure programming of the dual-column ensemble and is the first microvalve to utilize a hybrid actuation mechanism consisting of a thermopneumatic drive with an electrostatic hold. The valve has an open flow rate of 8 sccm at 4.6 torr, a leak rate of 1.3x10-3 sccm at 860 torr, a closed-to-open fluidic resistance ratio greater than one million, an actuation time of 430 ms, and a hold power of 60 mW while closed. In addition, the valve requires no power to open, 108 mJ to close, and has a built-in position sensor with a sensitivity of 1.3 fF/torr. The design of an improved microvalve that should require only 35 mJ to close in 140 ms, a hold power of 6 mW without electrostatic latching, and no hold power with an electrostatic voltage of 180V is presented. Overall, the valve and columns presented in this dissertation set the stage for high-performance, portable, vapor analysis instruments.

NTIS

Gas Chromatography; Low Pressure; Separators

20080017838 Sandia National Labs., Albuquerque, NM USA

Hydrocarbon Characterization Experiments in Fully Turbulent Fires

Ricks, A. J.; Blanchat, T. K.; May 01, 2007; 34 pp.; In English
Report No.(s): DE2007-907820; SAND2007-2391; No Copyright; Avail.: National Technical Information Service (NTIS)

As the capabilities of numerical simulations increase, decision makers are increasingly relying upon simulations rather than experiments to assess risks across a wide variety of accident scenarios including fires. There are still, however, many aspects of fires that are either not well understood or are difficult to treat from first principles due to the computational expense. For a simulation to be truly predictive and to provide decision makers with information which can be reliably used for risk assessment the remaining physical processes must be studied and suitable models developed for the effects of the physics. The model for the fuel evaporation rate in a liquid fuel pool fire is significant because in well-ventilated fires the evaporation rate largely controls the total heat release rate from the fire. A set of experiments are outlined in this report which will provide data for the development and validation of models for the fuel regression rates in liquid hydrocarbon fuel fires. The experiments will be performed on fires in the fully turbulent scale range (> 1 m diameter) and with a number of hydrocarbon fuels ranging from lightly sooting to heavily sooting. The importance of spectral absorption in the liquid fuels and the vapor dome above the pool will be investigated and the total heat flux to the pool surface will be measured. The importance of convection within the liquid fuel will be assessed by restricting large scale liquid motion in some tests. These data sets will provide a sound, experimentally proven basis for assessing how much of the liquid fuel needs to be modeled to enable a predictive simulation

of a fuel fire given the couplings between evaporation of fuel from the pool and the heat release from the fire which drives the evaporation.
NTIS
Characterization; Fires; Hydrocarbons; Turbulence

20080017852 Foley and Lardner, LLP, Madison, WI, USA; Wisconsin Univ., Madison, WI, USA
Diazaphosphacycles (PAT-APPL-10-914 048)
Landis, C. R., Inventor; Jin, W., Inventor; Owen, J. S., Inventor; Clark, T. P., Inventor; Aug. 6, 2004; 61 pp.; In English
Contract(s)/Grant(s): DE-FG02-99-ER14949
Patent Info.: Filed Filed 6 Aug 04; US-Patent-Appl-SN-10-914 048
Report No.(s): PB2007-104807; No Copyright; Avail.: CASI: A04, Hardcopy

Diazaphosphacycles comprising compounds having the formula XI and salts of the compound are provided, wherein the variables W, T, R(sup 1), R(sup 14), and R(sup 15) are as described herein. Transition metal catalysts incorporating such diazaphosphacycles and methods of use thereof are also disclosed. There are further provided compositions comprising diazaphosphacycles covalently attached to a solid support and methods of use thereof.
NTIS
Phosphines; Transition Metals

20080017853; Maryland Univ., Baltimore, MD, USA
Radiative Decay Engineering
Lakowicz, J. R., Inventor; Nov. 18, 2004; 56 pp.; In English
Contract(s)/Grant(s): NCRR-RR-08119
Patent Info.: Filed Filed 18 Nov 04; US-Patent-Appl-SN-10-990 549
Report No.(s): PB2007-104813; No Copyright; Avail.: CASI: A04, Hardcopy

Compositions and methods for increasing the fluorescence intensity of molecules are provided. In particular, compositions and methods directed to increasing the intrinsic fluorescence of biomolecules and low quantum yield fluorophores are described. The intrinsic fluorescence of biomolecules is increased by positioning a metal particle and a biomolecule at a distance apart sufficient to increase the radiative decay rate of the biomolecule. Methods for the identification of nucleic acids are also provided. The compositions and methods can also be used to increase the emission of any fluorophore, such as the extrinsic probes used to label biomolecules.
NTIS
Fluorescence; Molecules

20080017855 Rosenberg (Frank), Moraga, CA, USA
Tailored Fischer-Tropsch Synthesis Product Distribution
Wong, Y., Inventor; Cao, C., Inventor; Li, X. S., Inventor; Elliott, D. C., Inventor; Aug. 04, 2004; 19 pp.; In English
Contract(s)/Grant(s): DE-AC0676RLO1830
Patent Info.: Filed Filed 4 Aug 04; US-Patent-Appl-SN-10-911 976
Report No.(s): PB2007-104827; No Copyright; Avail.: CASI: A03, Hardcopy

Novel methods of Fischer-Tropsch synthesis are described. It has been discovered that conducting the Fischer-Tropsch synthesis over a catalyst with a catalytically active surface layer of 35 microns or less results in a liquid hydrocarbon product with a high ratio of C(sub 5-)C(sub 20):C(sub 20+). Descriptions of novel Fischer-Tropsch catalysts and reactors are also provided. Novel hydrocarbon compositions with a high ratio of C(sub 5-)C(sub 20):C(sub 20+) are also described.
NTIS
Fischer-Tropsch Process; Catalytic Activity; Surfactants

20080018001 Traskbritt, P.C., Salt Lake City, UT, USA
Method for the Production of Alpha-Alane
Lund, G. K., Inventor; Hanks, J. M., Inventor; Johnston, H. E., Inventor; 22 Sep 04; 8 pp.; In English
Contract(s)/Grant(s): N00014-02-C-0282
Patent Info.: Filed Filed 22 Sep 04; US-Patent-Appl-SN-10 947 078
Report No.(s): PB2007-105320; No Copyright; Avail.: CASI: A02, Hardcopy

The method includes reacting aluminum trichloride and an alkali metal hydride to form an alane-ether complex solution.

An aqueous ether solution is optionally added to the alane-ether complex solution to form a partially hydrolyzed ether/alane-ether complex solution. A solution of a crystallization additive is added to the alane-ether complex solution or to the aqueous ether/alane-ether complex solution to form a crystallization solution. The crystallization additive is selected from the group consisting of squalene, cyclododecatriene, norbomylene, norbomadiene, a phenyl terminated polybutadiene, 2,4-dimethyl anisole, 3,5-dimethyl anisole, 2,6-dimethyl anisole, polydimethyl siloxane, and mixtures thereof. Ether is removed from the crystallization solution to crystallize the alpha-alane.
NTIS
Ethers; Patent Applications; Alkali Metals; Aluminum Compounds

20080018002 Gifford, Krass, Groh, Sprinkle & Citkowski, P.C., Troy, MI, USA
Catalyst and Method for its Manufacture
Renock, D., Inventor; Bae, I. T., Inventor; Zhang, P., Inventor; Sendek, T. K., Inventor; Mueller, E., Inventor; 13 Jan 05; 6 pp.; In English
Contract(s)/Grant(s): NSF DMI 011 04419; NIST 70-NANB 1H3055
Patent Info.: Filed Filed 13 Jan 05; US-Patent-Appl-SN-11 035 172
Report No.(s): PB2007-105360; No Copyright; Avail.: CASI: A02, Hardcopy

A catalyst is synthesized by a method in which a catalytic metal such as platinum or another noble metal is dispersed onto a support member. A transition metal macrocycle is also adsorbed onto the support, and the support is heat treated so as to at least partially pyrolyze the macrocycle and anchor the transition metal to the support. The catalytic metal is alloyed with the transition metal either during the pyrolysis step, or in a separate step. The catalyst has significant utility in a variety of applications including use as an oxygen reduction catalyst in fuel cells.
NTIS
Catalysts; Patent Applications; Noble Metals; Platinum; Heat Treatment

20080018005 Lawrence Livermore National Lab., Livermore, CA USA
Studies of Hydrogen Getter Material Self-decomposition and Reaction Capacity
Saab, A. P.; Dinh, L. N.; Mar. 24, 2007; 26 pp.; In English
Report No.(s): DE2007-908101; UCRL-TR-229374; No Copyright; Avail.: National Technical Information Service (NTIS)

Diacetylene based hydrogen getters are examined in order to gauge their self decomposition products, as well as to determine possible origins for observed losses in getter capacity. Simple long term (several months) thermal aging tests were conducted, with periodic solid-phase micro-extraction (SPME) sampling followed by GC/MS analysis. The results suggest that bis(diphenylethynyl)benzene tends to decompose to give phenyl contaminants more readily than diphenylbutadiyne. Transmission electron microscopy (TEM) and electron diffraction studies of the palladium catalyst following varying extents of reaction with hydrogen show that there is no change to the catalyst particles, indicating that any change in capacity originates from other causes. These causes are suggested by Sieverts-type experiments on the reaction of the getter with a low pressure (about 10 Torr) hydrogen atmosphere. The reaction data indicate that the getter capacity depends on the pressure of hydrogen to which the material is exposed, and also its thermal history.
NTIS
Alcohols; Butanes; Decomposition; Getters; Hydrogen

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METALS AND METALLIC MATERIALS

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

20080016771 Lockheed Martin Corp., Denver, CO, USA
Oxidative Dissolution of Nickel Metal in Hydrogenated Hydrothermal Solutions
Ziemniak, S. E.; Guilmette, P. A.; Turcotte, R. A.; Tunison, H. M.; Mar. 27, 2007; 43 pp.; In English
Report No.(s): DE2007-903203; LM-07K020; No Copyright; Avail.: Department of Energy Information Bridge

A platinum-lined, flowing autoclave facility is used to investigate the solubility behavior of metallic nickel in hydrogenated ammonia and sodium hydroxide solutions between 175 and 315oC. The solubility measurements were interpreted by means of an oxidative dissolution reaction followed by a sequence of Ni(II) ion hydrolysis reactions: Ni(s) + 2H+(aq) = Ni2+(aq) + H2(g) and Ni2+(aq) + nH2O = Ni(OH)n 2-n(aq) + nH+(aq). where n = 1 and 2. Gibbs energies

associated with these reaction equilibria were determined from a least-squares analysis of the data.
NTIS
Ammonia; Dissolving; Hydrogenation; Nickel; Sodium Hydroxides; Solubility

20080016772 Lockheed Martin Corp., Schenectady, NY, USA
Nickel Alloy Primary Water Bulk Surface and SCC Corrosion Film Analytical Characterization and SCC Mechanistic Implications
Morton, D.; Lewis, N.; Hanson, M.; Rice, S.; Sanders, P.; Apr. 18, 2007; 32 pp.; In English
Report No.(s): DE2007-903204; LM-07K022; No Copyright; Avail.: National Technical Information Service (NTIS)

Alloy 600 corrosion coupon tests were performed: (1) to quantify the temperature dependency of general corrosion and (2) to characterize the composition and structure of bulk surface corrosion films for comparison with ongoing primary water SCC (PWSCC) crack tip corrosion film analyses. Results suggest that the thermal activation energy of Alloy 600 corrosion is consistent with the thermal activation energy of nickel alloy PWSCC. Analytical investigations of the structure and composition of Alloy 600 bulk surface corrosion oxides revealed a duplex (inner and outer) oxide layer structure. The outer layer is discontinuous and comprised of relatively large (1 to 3 im) nickel ferrite crystals and smaller (approx. 0.1 im) chromium containing nickel ferrite crystals. The inner layer consists of a relatively continuous chromite spinel (major phase) and chromia (Cr2O3 minor phase) which formed through non-selective oxidation. Chromia and dealloyed Alloy 600 (highly Ni enriched metal) were only observed at 337 degrees C (640 degrees F) and only along the boundaries of deformation induced fine grains and subcells. Specimens having deformation free surfaces exhibited continuous uniform inner chromite spinel oxide layers. Specimens with machining induced surface deformation produced non-uniform inner layer oxides.
NTIS
Corrosion; Metal Surfaces; Nickel Alloys; Stress Corrosion Cracking; Water; Films

20080016808 Westinghouse Savannah River Co., Aiken, SC, USA
Literature Survey of Gaseous Hydrogen Effects on the Mechanical Properties of Carbon and Low Alloy Steels
Lam, P. S.; Sindelar, R. L.; Adams, T. M.; Apr. 19, 2007; 18 pp.; In English
Contract(s)/Grant(s): DE-AC09-96SR18500
Report No.(s): DE2007-903095; WSRC-STI-2007-00197; No Copyright; Avail.: National Technical Information Service (NTIS)

Literature survey has been performed for a compendium of mechanical properties of carbon and low alloy steels following hydrogen exposure. The property sets include yield strength, ultimate tensile strength, uniform elongation, reduction of area, threshold stress intensity factor, fracture toughness, and fatigue crack growth. These properties are drawn from literature sources under a variety of test methods and conditions. However, the collection of literature data is by no means complete, but the diversity of data and dependency of results in test method is sufficient to warrant a design and implementation of a thorough test program. The program would be needed to enable a defensible demonstration of structural integrity of a pressurized hydrogen system. It is essential that the environmental variables be well-defined (e.g., the applicable hydrogen gas pressure range and the test strain rate) and the specimen preparation be realistically consistent (such as the techniques to charge hydrogen and to maintain the hydrogen concentration in the specimens).
NTIS
Carbon; Carbon Steels; Crack Propagation; High Strength Steels; Hydrogen; Mechanical Properties; Surveys

20080016935 Army Research Development and Engineering Command, Warren, MI, USA
Automatic Primer Feed Mechanism
Van Dyke-Restifo, S. M., Inventor; Madigan, L. J., Inventor; Olcott, D. F., Inventor; Scalise, D., Inventor; 13 Aug 01; 21 pp.; In English
Patent Info.: Filed Filed 13 Aug 01; US-Patent-Appl-SN-10-501 620
Report No.(s): PB2007-105242; No Copyright; Avail.: CASI: A03, Hardcopy

An automatic primer feed mechanism for use with a carrier assembly of a large caliber artillery piece, which includes mechanical assemblies for automatic primer loading after full breech closure and allows for spent primer cartridges to be extracted before opening of the breech to maximize safety, thereby allowing the gun crew to perform artillery piece misfire, sticker and check fire operations before the breech is opened. The mechanism includes a body member that mounts the automatic feed mechanism to the carrier of the artillery piece so as to interface with the carrier to position the mechanism on one side of the breech of the artillery piece. The body member includes a cam surface member, which provides a path for

movement of an injection arm member. The tray member has guide rails for engagement with the body, which slides in relation thereto. A magazine containing a plurality of primer cartridges, which inserts in a receiver channel located in the tray member. The mechanism provides improved safety wherein live primers stored in a magazine are at a distance from the firing chamber hole that prevents flame from reaching a live charge before a fresh primer is injected therein.
NTIS
Artillery; Patent Applications

20080016986 Calderon Energy Company, Bowling Green, OH, USA
Phase II Calderon Process to Produce Direct Reduced Iron Research and Development Project. Quaterly Technical Progress Report Reporting Period: 01-01-07 to 03-31-07
Apr. 30, 2007; 17 pp.; In English
Report No.(s): DE2007-903220; No Copyright; Avail.: Department of Energy Information Bridge

This project was initially targeted to the making of coke for blast furnaces by using proprietary technology of Calderon in a phased approach, and Phase 1 was successfully completed. The project was then re-directed to the making of iron units. In 2000, U.S. Steel teamed up with Calderon for a joint effort to produce directly reduced iron with the potential of converting it into molten iron or steel consistent with the Roadmap recommendations of 1998 prepared by the Steel Industry in cooperation with the Department of Energy by using iron ore concentrate and coal as raw materials, both materials being appreciably lower in cost than using iron pellets, briquettes, sinter and coke.
NTIS
Furnaces; Industries; Iron; Steels

20080017053 Iowa State Univ. of Science and Technology, Ames, IA USA; Pratt and Whitney Aircraft Group, East Hartford, CT, USA; General Electric Aircraft Engines, Cincinnati, OH, USA; Honeywell Engines, Systems and Services, Phoenix, AZ, USA
Inspection Development for Titanium Forgings
Margetan, F. J.; Umbach, J.; Roberts, R.; Friedl, J.; Degtyar, A.; May 01, 2007; 179 pp.; In English
Report No.(s): PB2007-111127; No Copyright; Avail.: National Technical Information Service (NTIS)

The Forging Inspection Development task started in June 1999 with the primary objective of advancing the state of the art in ultrasonic forging inspection sensitivity from no. 1 flat-bottom hole (FBH) (1/64 diameter) to no. 1/2 FBH (1/128 diameter), increasing in sensitivity by a factor of four. The improvement was achieved and demonstrated with the use of a phased array inspection system at the Iowa State University phased array test bed. Significant development work was performed to establish the ultrasonic beam parameters that would do the high-sensitivity inspection in forged titanium rotors. Attempts were made at using both fixed-focus, single-element transducers and a phased array approach for the desired focus at various zone depths. After it was determined that the fixed-focus transducers could not be manufactured using existing manufacturing technology at the required diameters and frequency, the team concentrated on the phased array approach using a segmented annular array. Based on the noise characteristics that were observed for the various Ti-6-4 samples, it was determined that a 10-MHz beam with a focused spot diameter of 0.045 inches and 60% bandwidth would be required to reach the no. 1/2 sensitivity. The improved sensitivity was demonstrated by inspecting samples of Ti-6-4 forgings with no. 1/2 FBHs drilled to the depths of the inspection zones and by scanning several forgings with the high-sensitivity setting to determine if the ultrasonic noise caused unacceptable false calls. Feasibility was demonstrated with this transducer. Besides the development required to establish the necessary ultrasonic beam characteristics, other technical aspects were studied during the program.
NTIS
Forging; Titanium; Nondestructive Tests; Ultrasonic Tests

20080017054 General Electric Co., Cincinnati, OH, USA; Pratt and Whitney Aircraft Group, East Hartford, CT, USA; Iowa State Univ. of Science and Technology, Ames, IA USA
Inspection Development for Large-Diameter Titanium Billet - Engine Titanium Consortium Phase 2
Keller, M.; Degtyar, A.; Umbach, J.; Brasche, L.; May 01, 2007; 48 pp.; In English
Report No.(s): PB2007-111128; No Copyright; Avail.: National Technical Information Service (NTIS)

The Engine Titanium Consortium Phase I program comprised of Iowa State University; General Electric; Honeywell Engines, Systems & Services; and Pratt & Whitney began in 1993 with a focus on improved inspection of titanium billet used in the production of jet engines. The Phase II program began in 1999 and focused on further sensitivity improvements to

titanium billet using the multizone approach. The goal of the Phase II effort was to achieve a no. 1 flat-bottom hole sensitivity for a 10 diameter billet and assess the impact of attenuation compensation procedures. A supplemental task was later added to the Phase II effort that focused on titanium billet larger than 10 in diameter. This report documents the results for 13 and 14 diameter billets in laboratory and factory settings.
NTIS
Billets; Inspection; Jet Engines; Titanium

20080017063 NASA Langley Research Center, Hampton, VA, USA
Multiscale Modeling of Damage Processes in fcc Aluminum: From Atoms to Grains
Glaessgen, E. H.; Saether, E.; Yamakov, V.; April 21, 2008; 17 pp.; In English; 11th Joint NASA/FAA/DoD Conference on Aging Aircraft, 21-24 Apr. 2008, Phoenix, AZ, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): NCC1-02043; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080017063

Molecular dynamics (MD) methods are opening new opportunities for simulating the fundamental processes of material behavior at the atomistic level. However, current analysis is limited to small domains and increasing the size of the MD domain quickly presents intractable computational demands. A preferred approach to surmount this computational limitation has been to combine continuum mechanics-based modeling procedures, such as the finite element method (FEM), with MD analyses thereby reducing the region of atomic scale refinement. Such multiscale modeling strategies can be divided into two broad classifications: concurrent multiscale methods that directly incorporate an atomistic domain within a continuum domain and sequential multiscale methods that extract an averaged response from the atomistic simulation for later use as a constitutive model in a continuum analysis.
Author
Multiscale Models; Continuum Mechanics; Continuum Modeling; Molecular Dynamics; Fracture Mechanics; Aluminum; Morphology; Crack Propagation

20080017103 UT-Battelle, LLC, Oak Ridge, TN, USA
Method and Apparatus for Semi-Solid Material Processing
Han, Q., Inventor; Jian, X., Inventor; Xu, H., Inventor; Meek, T. T., Inventor; 17 Jun 04; 13 pp.; In English
Contract(s)/Grant(s): DE-AC05-00OR22725
Patent Info.: Filed Filed 17 Jun 04; US-Patent-Appl-SN-10-871-180
Report No.(s): PB2007-109426; No Copyright; Avail.: CASI: A03, Hardcopy

A method of forming a material includes the steps of: vibrating a molten material at an ultrasonic frequency while cooling the material to a semi-solid state to form non-dendritic grains therein; forming the semi-solid material into a desired shape; and cooling the material to a solid state. The method makes semi-solid castings directly from molten materials (usually a metal), produces grain size usually in the range of smaller than 50 mu m, and can be easily retrofitted into existing conventional forming machine.
NTIS
Castings; Solid State; Metals

20080017200 Cornell Univ., Ithaca, NY, USA; NASA Langley Research Center, Hampton, VA, USA
Multiscale Modeling of Damage Processes in Aluminum Alloys: Grain-Scale Mechanisms
Hochhalter, J. D.; Veilleux, M. G.; Bozek, J. E.; Glaessgen, E. H.; Ingraffea, A. R.; April 21, 2008; 18 pp.; In English; 11th Joint NASA/FAA/DoD Conference on Aging Aircraft, 21-24 Apr. 2008, Phoenix, AZ, USA; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

This paper has two goals related to the development of a physically-grounded methodology for modeling the initial stages of fatigue crack growth in an aluminum alloy. The aluminum alloy, AA 7075-T651, is susceptible to fatigue cracking that nucleates from cracked second phase iron-bearing particles. Thus, the first goal of the paper is to validate an existing framework for the prediction of the conditions under which the particles crack. The observed statistics of particle cracking (defined as incubation for this alloy) must be accurately predicted to simulate the stochastic nature of microstructurally small fatigue crack (MSFC) formation. Also, only by simulating incubation of damage in a statistically accurate manner can subsequent stages of crack growth be accurately predicted. To maintain fidelity and computational efficiency, a filtering procedure was developed to eliminate particles that were unlikely to crack. The particle filter considers the distributions of particle sizes and shapes, grain texture, and the configuration of the surrounding grains. This filter helps substantially reduce

the number of particles that need to be included in the microstructural models and forms the basis of the future work on the subsequent stages of MSFC, crack nucleation and microstructurally small crack propagation. A physics-based approach to simulating fracture should ultimately begin at nanometer length scale, in which atomistic simulation is used to predict the fundamental damage mechanisms of MSFC. These mechanisms include dislocation formation and interaction, interstitial void formation, and atomic diffusion. However, atomistic simulations quickly become computationally intractable as the system size increases, especially when directly linking to the already large microstructural models. Therefore, the second goal of this paper is to propose a method that will incorporate atomistic simulation and small-scale experimental characterization into the existing multiscale framework. At the microscale, the nanoscale mechanics are represented within cohesive zones where appropriate, i.e. where the mechanics observed at the nanoscale can be represented as occurring on a plane such as at grain boundaries or slip planes at a crack front. Important advancements that are yet to be made include: 1. an increased fidelity in cohesive zone modeling; 2. a means to understand how atomistic simulation scales with time; 3. a new experimental methodology for generating empirical models for CZMs and emerging materials; and 4. a validation of simulations of the damage processes at the nano-micro scale. With ever-increasing computer power, the long-term ability to employ atomistic simulation for the prognosis of structural components will not be limited by computation power, but by our lack of knowledge in incorporating atomistic models into simulations of MSFC into a multiscale framework.
Derived from text
Aluminum Alloys; Crack Propagation; Damage; Microstructure; Simulation; Crack Initiation; Fatigue (Materials); Particles; Mathematical Models

20080017477 Lawrence Livermore National Lab., Livermore, CA USA
Electronic Transitions in f-electron Metals at High Pressures
Yoo, C. S.; Maddox, B.; Lazicki, A.; Iota, V.; Klepeis, J. P.; Feb. 13, 2007; 11 pp.; In English
Report No.(s): DE2007-902239; UCRL-TR-228003; No Copyright; Avail.: Department of Energy Information Bridge
This study was to investigate unusual phase transitions driven by electron correlation effects that occur in many f-band transition metals and are often accompanied by large volume changes: approx. 20% at the sigma-a transition in Pu and 5-15% for analogous transitions in Ce, Pr, and Gd. The exact nature of these transitions has not been well understood, including the short-range correlation effects themselves, their relation to long-range crystalline order, the possible existence of remnants of the transitions in the liquid, the role of magnetic moments and order, the critical behavior, and dynamics of the transitions, among other issues. Many of these questions represent forefront physics challenges central to Stockpile materials and are also important in understanding the high-pressure behavior of other f- and d-band transition metal compounds including 3d-magnetic transition monoxide (TMO, TM=Mn, Fe, Co, Ni).
NTIS
Electron Transitions; High Pressure; Metals; Transition Metals

20080017829 Louisiana State Univ., Baton Rouge, LA, USA
Idle Iron in the Gulf of Mexico
Kaiser, M. J.; Pulsipher, A. G.; May 01, 2007; 203 pp.; In English
Contract(s)/Grant(s): 1435-01-04-CA-32806-36184
Report No.(s): PB2007-111647; No Copyright; Avail.: National Technical Information Service (NTIS)
Offshore structures are installed to produce hydrocarbons, but at some point in time during the life cycle of the field, when the cost to operate a structure exceeds the income from production, the structure will exist as a liability instead of an asset. Federal regulations require that an offshore oil and gas lease be cleared of all structures within one year after production on the lease ceases. In recent years, the Minerals Management Service has begun to encourage operators to remove structures on producing leases that are no longer 'economically viable'. The purpose of this paper is to quantify the amount of idle iron that exists in the Gulf of Mexico and to describe its geographic distribution and ownership patterns. The basic question of what idle iron is and why it exists is addressed, followed by a discussion of the policy implications involved in the interpretation of federal regulations. Summary statistics that quantify and define the idle iron inventory is then presented.
NTIS
Iron; Marine Technology; Offshore Platforms; Crude Oil; Life (Durability); Policies

20080017946 Dykema Gossett, PLLC, Bloomfield Hills, MI, USA
Apparatus and Method for Detecting Surface Defects on a Workpiece Such as a Rolled/Drawn Metal Bar
Chang, T. S., Inventor; Gutchess, D., Inventor; Huang, H. H., Inventor; Aug. 02, 2005; 18 pp.; In English
Contract(s)/Grant(s): NIST-70NANBDH3014

Patent Info.: Filed Filed 2 Aug 05; US-Patent-Appl-SN-11-194 985
Report No.(s): PB2007-109476; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention is directed to solving the problems associated with the detection of surface defects on metal bars as well as the problems associated with applying metal flat inspection systems to metal bars for non-destructive surface defects detection. A specially designed imaging system, which is comprised of a computing unit, line lights and high data rate line scan cameras, is developed for the aforementioned purpose. The target application is the metal bars (1) that have a circumference/cross-section-area ratio equal to or smaller than 4.25 when the cross section area is unity for the given shape, (2) whose cross-sections are round, oval, or in the shape of a polygon, and (3) are manufactured by mechanically cross-section reduction processes. The said metal can be steel, stainless steel, aluminum, copper, bronze, titanium, nickel, and so forth, and/or their alloys. The said metal bars can be at the temperature when they are being manufactured.
NTIS
Detection; Metals; Surface Defects; Surface Properties

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*.

20080016637 Los Alamos National Lab., NM USA
Dual Ion Beam Assisted Deposition of Biaxially Textured Template Layers
Groves, J. R., Inventor; Arendt, P. N., Inventor; Hammond, R. H., Inventor; Mar. 29, 2005; 8 pp.; In English
Contract(s)/Grant(s): W-7405-ENG-36
Patent Info.: Filed Filed 29 Mar 05; US-Patent-Appl-SN-11-093 926
Report No.(s): PB2007-104798; No Copyright; Avail.: CASI: A02, Hardcopy

The present invention is directed towards a process and apparatus for epitaxial deposition of a material, e.g., a layer of MgO, onto a substrate such as a flexible metal substrate, using dual ion beams for the ion beam assisted deposition whereby thick layers can be deposited without degradation of the desired properties by the material. The ability to deposit thicker layers without loss of properties provides a significantly broader deposition window for the process.
NTIS
Deposition; Epitaxy; Ion Beams; Patent Applications; Templates

20080016640 Greenlee Winner and Sullivan, P.C., Boulder, CA, USA
Methods for Purifying Carbon Materials
Dailly, A., Inventor; Ahn, C., Inventor; Yazami, R., Inventor; Fultz, B. T., Inventor; Mar. 16, 2005; 29 pp.; In English
Contract(s)/Grant(s): DE-FC36-01GO11090
Patent Info.: Filed Filed 16 Mar 05; US-Patent-Appl-SN-11-081 841
Report No.(s): PB2007-104789; No Copyright; Avail.: CASI: A03, Hardcopy

Methods of purifying samples are provided that are capable of removing carbonaceous and noncarbonaceous impurities from a sample containing a carbon material having a selected structure. Purification methods are provided for removing residual metal catalyst particles enclosed in multilayer carbonaceous impurities in samples generate by catalytic synthesis methods. Purification methods are provided wherein carbonaceous impurities in a sample are at least partially exfoliated, thereby facilitating subsequent removal of carbonaceous and noncarbonaceous impurities from the sample. Methods of purifying carbon nanotube-containing samples are provided wherein an intercalant is added to the sample and subsequently reacted with an exfoliation initiator to achieve exfoliation of carbonaceous impurities.
NTIS
Carbon; Purification

20080016685 Lawrence Livermore National Lab., Livermore, CA USA
Smart Surfaces: New Coatings and Paints with Radiation Detection Functionality
Farmer, J. C.; Choi, J. S.; Mar. 12, 2007; 22 pp.; In English
Report No.(s): DE2007-902620; UCRL-TR-228914; No Copyright; Avail.: National Technical Information Service (NTIS)

Paints are being developed and tested that might ultimately be able to detect radiological agents in the environment by incorporating special pigments into an organic polymeric binder that can be applied as a paint or coatings. These paints detect

radioactive sources and contaminants with inorganic or organic scintillation or thermo-luminescent pigments, which are selected based upon the radiation (alpha, beta, gamma or n) to be detected.
NTIS
Paints; Radiology; Radiation Detectors

20080016749 Lawrence Livermore National Lab., Livermore, CA USA
Thermal Stability and Mechanical Behavior of Ultra-Fine BBC TA and V Coatings
Jankowski, A. F.; Go, J.; Hayes, J. P.; Nov. 03, 2006; 16 pp.; In English
Report No.(s): DE2007-907855; UCRL-PROC-225853; No Copyright; Avail.: Department of Energy Information Bridge

Ultra-refined microstructures of both tantalum (Ta) and vanadium (V) are produced using electron-beam evaporation and magnetron sputtering deposition. The thermal stability of the micron-to-submicron grain size foils is examined to quantify the kinetics and activation energy of diffusion, as well as identify the temperature transition in dominant mechanism from grain boundary to lattice diffusion. The activation energies for boundary diffusion in Ta and V determined from grain growth are 0.3 and 0.2 eV-atom-1, respectively, versus lattice diffusion values of 4.3 and 3.2 eV-atom-1, respectively. The mechanical behavior, as characterized by strength and hardness, is found to inversely scale with square-root grain size according to the Hall-Petch relationship. The strength of Ta and V increases two-fold from 400 MPa, as the grain size decreases from 2 to 0.75 micrometer.
NTIS
Mechanical Properties; Tantalum; Thermal Stability; Vanadium

20080016775 Pacific Northwest National Lab., Richland, WA, USA
Investigation of Tc Migration Mechanism During Bulk Vitrification Process Using Re Surrogate
Kim, D. S.; Bagaasen, L. M.; Crum, J. V.; Fluegel, A.; Gallegos, A.; Dec. 01, 2006; 119 pp.; In English
Report No.(s): DE2007-903263; PNNL-16267; No Copyright; Avail.: National Technical Information Service (NTIS)

As a part of Bulk vitrification (BV) performance enhancement tasks, Laboratory scoping tests were performed in FY 2004-2005 to explore possible ways to reduce the amount of soluble Tc in the BV waste package. Theses scoping tests helped identify which mechanisms play an important role in the migration of Tc in the BV process (Hrma et al. 2005 and Kim et al. 2005). Based on the results from these scoping tests, additional tests were identified that will improve the understanding of Tc migration and to clearly identify the dominant mechanisms. The additional activities identified from previous studies were evaluated and prioritized for planning for Tasks 29 and 30 conducted in FY2006. Task 29 focused on the improved understanding of Tc migration mechanisms, and Task 30 focused on identifying the potential process changes that might reduce Tc/Re migration into the castable refractory block (CRB). This report summarizes the results from the laboratory- and crucible-scale tests in the lab for improved Tc migration mechanism understanding utilizing Re as a surrogate performed in Task 29.
NTIS
Migration; Vitrification

20080016794 Wolf Greenfield and Sacks, P.C., Boston, MA, USA; Vermont Univ., Burlington, VT, USA
Protein Based Wood Finishes and Methods for Producing the Same
Guo, M., Inventor; Wright, N., Inventor; Li, J., Inventor; Jan. 18, 2005; 18 pp.; In English
Contract(s)/Grant(s): VT-NS-029SG; VT-NS-033SG
Patent Info.: Filed Filed 18 Jan 05; US-Patent-Appl-SN-11-037 817
Report No.(s): PB2007-104826; No Copyright; Avail.: CASI: A03, Hardcopy

Wood finishes and methods of production and application of wood finishes are provided. The finishes may contain biologically produced components, such as proteins, and specifically may include whey proteins derived from dairy processing. The wood finishes are environmentally friendly as they use reduced levels of solvents and provide a safe and protective coating for wood and wood products.
NTIS
Finishes; Patent Applications; Proteins; Wood

20080016917 Roth and Goldman, Torrance, CA, USA
Dual Composition Ceramic Substrate for Microelectronic Applications
Bennett, K. A., Inventor; Coyle, R. T., Inventor; May 11, 2005; 7 pp.; In English
Contract(s)/Grant(s): 083290

Patent Info.: Filed Filed 11 May 05; US-Patent-Appl-SN-11-127 373
Report No.(s): PB2007-104795; No Copyright; Avail.: CASI: A02, Hardcopy

Ceramic substrates for microelectronic modules are formed in multiple layers fused into a unitary one-piece assembly. The layers contain the same ceramic material but in different purity so that one outer layer is optimal in composition for bonding to a thick film conductor and the other outer layer is optimal in composition for bonding to a thin film conductor. In a dual composition substrate embodiment one layer is formed of a 96% alumina composition and the second layer is formed of a 99.6% alumina composition.

NTIS

Ceramics; Microelectronics; Micromodules; Substrates

20080016924 World Trade Center West Patent Group, Boston, MA, USA

Polyelectrolyte Multilayers that Influence Cell Growth Methods of Applying Them, and Articles Coated with Them

Rubner, M. F., Inventor; Mendelsohn, J. D., Inventor; Yang, S. Y., Inventor; Oct. 13, 2004; 39 pp.; In English
Patent Info.: Filed Filed 13 Oct 04; US-Patent-Appl-SN-10-964 568
Report No.(s): PB2007-108834; No Copyright; Avail.: CASI: A03, Hardcopy

One aspect of the present invention relates to a method of coating a surface, comprising sequentially depositing on a surface, under pH-controlled conditions, alternating layers of polymers to provide a coated surface, wherein a first polymer is selected from the group consisting of pH dependent cationic polyelectrolytes and neutral polymers, and a second polymer is selected from the group consisting of anionic polyelectrolytes, thereby permitting or preventing cell adhesion to said coated surface. In certain embodiments, the aforementioned method provides a coated surface to which cell adhesion is permitted. In certain embodiments, the aforementioned method provides a coated surface to which cell adhesion is prevented. Another aspect of the present invention relates to a method of rendering a surface cytophilic, comprising the step of coating a surface with a polyelectrolyte multilayer film, which film swells to less than or equal to about 150% of its original thickness when exposed to an aqueous medium. Another aspect of the present invention relates to a method of rendering a surface cytophobic, comprising the step of coating a surface with a polyelectrolyte multilayer film, which film swells to greater than or equal to about 200% of its original thickness when exposed to an aqueous medium.

NTIS

Cell Division; Coatings

20080017465 Lawrence Livermore National Lab., Livermore, CA USA

Modeling and the Sputter Deposition of Coatings onto Spherical Capsules

Jankowski, A. F.; Hayes, J. P.; Sep. 21, 2006; 15 pp.; In English
Report No.(s): DE2007-907861; UCRL-CONF-224597; No Copyright; Avail.: Department of Energy Information Bridge

The sputter deposition of coatings onto capsules of polymer and oxide shells as well as solid metal spheres is accomplished using a chambered substrate platform. Oxides and metal coatings are sputter deposited through a screen-aperture array onto a 0.3-1.2 mm diameter, solid spheres and hollow shells. Each shell is contained within its own individual chamber within a larger array. Ultrasonic vibration is the method used to produce a random bounce of each capsule within each chamber, in order to produce a coating with uniform thickness. Characterization of thin aluminum-oxide coated, platinum solid spheres and thicker copper-gold layer coated, hollow capsules (of both glass and polymer) show that uniform coatings can be produced using a screen-aperture chambered, substrate platform. Potential advantages of this approach compared to open-bounce pans include improved sample yield and reduced surface roughness from debris minimization. A process model for the coating growth on the capsules is developed to assess selection of the screen aperture based on the effects of sputter deposition parameters and the coating materials.

NTIS

Sputtering; Coatings

20080017834 Energy Research Co., Staten Island, NY, USA

Measurement and Control of Glass Feedstocks. Final Report

Weisberg, A.; Craparo, J.; De Saro, R.; Apr. 15, 2007; 31 pp.; In English
Report No.(s): DE2007-902660; No Copyright; Avail.: National Technical Information Service (NTIS)

ERCo has developed a laser-based technology for rapid compositional measurements of batch, real-time sorting of cullet, and in-situ measurements of molten glass. This technology, termed LIBS (Laser Induced Breakdown Spectroscopy) can determine whether or not the batch was formulated accurately in order to control glass quality. It can also be used to determine

if individual batch ingredients are within specifications. In the case of cullet feedstocks, the sensor can serve as part of a system to sort cullet by color and ensure that it is free of contaminants. In-situ compositional measurements of molten glass are achieved through immersing a LIBS probe directly into the melt in a glass furnace. This technology has been successfully demonstrated in ERCos LIBS laboratory for batch analysis, cullet sorting, and glass melt measurements. A commercial batch analyzer has been operating in a PPG fiberglass plant since August 2004. LIBS utilizes a highly concentrated laser pulse to rapidly vaporize and ionize nanograms of the material being studied. As this vapor cools, it radiates light at specific wavelengths corresponding to the elemental constituents (e.g. silicon, aluminum, iron) of the material. The strengths of the emissions correlate to the concentrations of each of the elemental constituents. By collecting the radiated light with a spectrometer capable of resolving and measuring these wavelengths, the elemental composition of the sample is found.
NTIS
Glass; Glass Fibers; Lasers

20080017859 Lane (Philip Douglas), Potomac Falls, VA, USA
Method of Increasing Carbon Foam Yield
Lucas, R. D., Inventor; Matviya, T. M., Inventor; Mar. 17, 2005; 7 pp.; In English
Contract(s)/Grant(s): AFRL-F-29601-03-C-0078
Patent Info.: Filed Filed 17 Mar 05; US-Patent-Appl-SN-11-082 342
Report No.(s): PB2007-105166; No Copyright; Avail.: CASI: A02, Hardcopy

A method for increasing the yield of carbon foam is described. The method includes placing a foaming sheet over the top surface of the material to be foamed. In certain embodiments, the foaming sheet is placed over the top surface of particulate coal prior to and during the foaming process. In some embodiments the foaming sheet is a smooth, continuous sheet, such as aluminum foil or the like. The resulting carbon product includes an increased amount of usable carbon foam.
NTIS
Carbon; Foams; Foaming; Methodology

20080017941
Elastomeric Bearing Pads Under Combined Loading
Mtenga, P. V.; Aug. 01, 2006; 110 pp.; In English
Report No.(s): PB2007-111608; FSU-PRJ-NO-00944; No Copyright; Avail.: National Technical Information Service (NTIS)

The purpose of this study was to study the behavior of steel reinforced elastomeric bearing pads under combined loading in order to develop a new design formula. Specific study objectives included the following: (1) conduct combined loading tests on steel reinforced elastomeric bearing pads; (2) conduct analytical modeling of steel reinforced elastomeric bearing pads under combined axial and rotational loading; and (3) use the results of the experimental and analytical studies to develop a new design formula. In this study, researchers subjected a number of bearing pads to axial loading combined with cyclic rotational loading, of up to a million cycles. The shear modulus, G, of the material plays an important role in determining the bearing capacity. Researchers developed and applied a nondestructive technique to determine the G value for the pads. They also utilized ANSYS, a commercially available finite element analysis software package, to create analytical models of the pads.
NTIS
Elastomers; Highways; Steels

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*.

20080016687 Westinghouse Savannah River Co., Aiken, SC, USA
Safety Instrumented Functions as Criticality Defenses
Hearn, W. H.; Suttinger, L. T.; Jan. 01, 2007; 10 pp.; In English
Report No.(s): DE2007-902847; LOW-RSS-2007-00025; No Copyright; Avail.: Department of Energy Information Bridge

The objective of this paper is to share the SRS methodology for identifying the reliability requirements and documenting the expected performance of Safety Instrumented Functions (SIFs) used as criticality defenses. Nuclear Criticality SIFs are

comprised of sensors, logic solvers, and final control elements, which may be either automatic or manual, to detect a process hazard and respond to prevent a criticality. The Savannah River Site (SRS) has invoked the chemical process industry safety standard (ANSI/ISA 84.00.01)1 for the design of safety significant instrumented systems. The ISA standard provides a graded approach to design based on the amount of risk reduction that is required of an SIF. SRS is embarking on application of this standard to nuclear criticality defenses, thus integrating criticality safety requirements with verifiable design methodology. Per the DOE G 421.1-12 discussion of the double contingency principle, guidance for a single contingency barrier includes, The estimated probability that the control will fail (when called upon for protection) is not greater than 1 in 100 demands. The application of this standard to nuclear criticality SIFs will provide clear requirements in terms of safety availability and testing to assure that the instrumented criticality system as designed, installed, and maintained will meet is performance requirements. The paper identifies the numerous challenges presented by this initiative and the benefits of this approach.
NTIS
Industrial Safety; Safety Management; Materials Handling; Risk Assessment; Fissionable Materials; Nuclear Power Plants; Process Control (Industry)

20080016787 National Renewable Energy Lab., Golden, CO USA
Using GPS Travel Data to Assess the Real World Driving Energy Use of Plug-In Hybrid Electric Vehicles (PHEVs)
Gonder, J.; Markel, T.; Simpson, A.; Thornton, M.; May 01, 2007; 13 pp.; In English
Report No.(s): DE2007-903383; NREL/CP-540-40858; No Copyright; Avail.: National Technical Information Service (NTIS)

Highlights opportunities using GPS travel survey techniques and systems simulation tools for plug-in hybrid vehicle design improvements, which maximize the benefits of energy efficiency technologies.
NTIS
Electric Motor Vehicles; Energy Consumption; Global Positioning System

20080017104 Netherlands Organization for Applied Scientific Research TNO, The Hague, Netherlands
Final Report 'Integrated Topside Design', V049
vanEwijk, L. J.; May 2006; 46 pp.; In Dutch; Original contains color and black and white illustrations
Report No.(s): TNO-DV1-2005-A188; Copyright; Avail.: Other Sources

A total overview of all activities and results of the 'Integrated Topside Design' V049 program cannot be summarized in a single report. With the text in front of you an attempt is made to complete a part of it. The results of the research are discussed relative to the stated research questions and the defense needs. The applicability of the performed work in future developments and new build projects is discussed.
Transl. by Schreiber
Design Analysis; Sensors; Ships; Signatures; Defense Program

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*.

20080016649 Swedish Defence Research Establishment, Linkoeping, Sweden
Determination of Gain and Phase for a Standard Gain Antenna
Pettersson, L.; Aug. 01, 2006; 34 pp.; In English
Report No.(s): PB2007-106506; FOI-R-2046-SE; No Copyright; Avail.: National Technical Information Service (NTIS)

Gain and phase of a ridge waveguide antenna have been determined in the boresight direction for frequencies in the range 2-18 GHz. The measurement procedure used to determine the antenna characteristics is a variant of the three-antenna method. The content of the report is divided into three sections. In the first section we define antenna concepts, derive some relations and summarize the results of the measurements. In section two the measurement procedure and its error sources are described. The third section consists of five appendices containing derivations to relations in the report.
NTIS
Antenna Gain; Waveguide Antennas

20080016726 Savannah River National Lab., Aiken, SC, USA
Wireless for a Nuclear Facility
Shull, D.; Cordaro, J.; Mar. 28, 2007; 11 pp.; In English
Report No.(s): DE2007-901919; WSRC-STI-2007-00155; No Copyright; Avail.: Department of Energy Information Bridge

The introduction of wireless technology into a government site where nuclear material is processed and stored brings new meaning to the term harsh environment. At SRNL, we are attempting to address not only the harsh RF and harsh physical environment common to industrial facilities, but also the harsh regulatory environment necessitated by the nature of the business at our site. We will discuss our concepts, processes, and expected outcomes in our attempts to surmount the roadblocks and reap the benefits of wireless in our factory.

NTIS
Radio Frequencies; Wireless Communication; Nuclear Power Plants; Nuclear Fuels; Nuclear Reactors; Reactor Materials

20080016820 Federal Communications Commission, Washington, DC USA
Lands of Opportunity: Bringing Telecommunications Services to Rural Communities
Jan. 01, 2007; 22 pp.; In English
Report No.(s): PB2007-111308; No Copyright; Avail.: CASI: A03, Hardcopy

This publication is intended to serve as a resource for local, state, and tribal government leaders, community planners, educators and health care professionals on: Programs and incentives available to assist in the development of telecommunications services; Assistance in developing infrastructure or basic and advanced telecommunications services; and Potential for advanced telecommunications services to promote economic growth in rural communities.

NTIS
Telecommunication; Economics

20080016923 Defence Research Agency, Linkoping, Sweden
Security in Wireless Sensor Networks with Focus on Energy
Farman, L.; Sterner, U.; Westerdahl, L.; Zeijlon, P.; Jan. 01, 2006; 52 pp.; In Swedish
Report No.(s): PB2007-107371; FOI-R-1912-SE; No Copyright; Avail.: National Technical Information Service (NTIS)

An important challenge for wireless networks are the nodes limited energy-and-calculation resources. Further, another important challenge for security is the distributed routing. When designing the security for the sensor network it is therefore important to consider these aspects and that someone may use them to destroy the functions in the sensor network. Authentication, i.e. a well known security solution, or handle the security at the routing layer with multiple routes (multipath) are the two methods that are studied to improve the security in the sensor network. Further, the energy consumption for the respectived method is also considered. The studied routing attack is called a black hole. One evaluation parameter is for example the effect of the datafusion in the network when a black hole is introduced. The results show that authentication is an effective protection against a black hole, but gives increased energy consumption. To use multipath on the other hand is not effective.

NTIS
Communication Networks; Security; Multipath Transmission

20080016926 Straub and Pokotylo, Trenton, NJ, USA
Maintaining Packet Sequence Using Cell Flow Control
Park, J., Inventor; Chao, H. H. J., Inventor; Dec. 3, 2004; 30 pp.; In English
Contract(s)/Grant(s): NSF-ANI-9906673
Patent Info.: Filed Filed 3 Dec 04; US-Patent-Appl-SN-11-004 260
Report No.(s): PB2007-104744; No Copyright; Avail.: CASI: A03, Hardcopy

Packets out-of-sequence problem can be solved by using a window flow control scheme that can dispatch traffic at the cell level, in a round robin fashion, as evenly as possible. Each VOQ at the input port has a sequence head pointer that is used to assign sequence numbers (SN) to the cells. Also a sequence tail pointer is available at each VOQ that is used to acknowledge and limit the amount of cells that can be sent to the output ports based on the window size of the scheme. Each VIQ at the output port has a sequence pointer or sequence number (SN) pointer that indicates to the VIQ which cell to wait for. Once the VIQ receives the cell that the SN pointer indicated, the output port sends an ACK packet back to the input port. By using

sequence numbers and the relevant pointers, the packet out-of-sequence problem is solved.
NTIS
Packets (Communication); Packet Switching; Sequential Control

20080016931 Steubing, McGuiness and Manaras, LLP, Acton, MA, USA
Burst Switching in a High Capacity Network
Beshai, M. E., Inventor; Vickers, R., Inventor; May 9, 2005; 36 pp.; In English
Contract(s)/Grant(s): TIA F30602-98-2-0194
Patent Info.: Filed Filed 9 May 05; US-Patent-Appl-SN-11-124 656
Report No.(s): PB2007-105196; No Copyright; Avail.: CASI: A03, Hardcopy

At a master controller of a space switch in a node in a data network, a request is received from a source node that requests a connection to be established through the space switch. This request is compared to other such requests so that a schedule may be established for access to the space switch. The schedule is then sent to the source nodes as well as to a slave controller of the space switch. The source nodes send data bursts which are received at the space switch during a short guard time between successive reconfigurations of the space switch. Data bursts are received at the space switch at a precisely determined instant of time that ensures that the space switch has already reconfigured to provide requested paths for the individual bursts. The scheduling is pipelined and performed in a manner that attempts to reduce mismatch intervals of the occupancy states of input and output ports of the space switch. The method thus allows efficient utilization of the data network resources while ensuring virtually no data loss.
NTIS
Computer Networks; Controllers; Switches; Switching

20080017003 Daly, Crowley and Mofford, LLP, Canton, MA, USA
Method and Apparatus for Signal Code Carrier Coherency for Wide Area Augmentation System
Hsu, P. H., Inventor; Jun. 07, 2005; 14 pp.; In English
Contract(s)/Grant(s): DR145 940
Patent Info.: Filed Filed 7 Jun 05; US-Patent-Appl-SN-11-146-696
Report No.(s): PB2007-105274; No Copyright; Avail.: CASI: A03, Hardcopy

In a wide area augmentation system (WAAS), L5 signal code carrier coherency is maintained during GUST initialization and after switchover.
NTIS
Air Navigation; Augmentation; Patent Applications; Signal Transmission

20080017022 Aerospace Corp., El Segundo, CA, USA
Binary Offset Carrier M-Code Envelope Detector
Lillo, W. E., Inventor; Ward, P. W., Inventor; Abbott, A. S., Inventor; Jun. 22, 2004; 20 pp.; In English
Contract(s)/Grant(s): F04701-00-C-0009
Patent Info.: Filed Filed 22 Jun 04; US-Patent-Appl-SN-10-874 965
Report No.(s): PB2007-109355; No Copyright; Avail.: CASI: A03, Hardcopy

An M code envelope detector receives an incoming binary offset carrier (BOC) signal, such as the M code signal, and generates inphase BOC and quadraphase BOC signals, separated by an offset, that have respective ambiguous correlation envelopes, that when combined, provide a near unimodal correlation function with respect to code phase error of the BOC signal having an inherent multimodal autocorrelation function, with the near unimodal correlation envelope being tracked by early and late code replicas at broad one chip phases for providing unambiguous but nonlinear code phase error tracking, which detector is then further improved with the use of code replicas having narrow partial chip phases, such as 1/8 chip phases, for providing near linear code phase error tracking for unambiguous and accurate code tracking of the BOC signal.
NTIS
Binary Codes; Spread Spectrum Transmission

20080017034 Johns Hopkins Univ., Laurel, MD, USA
Method and Construction for Space-Time Codes for AM-PSK Constellations
Hammons, A. R., Inventor; Mar. 30, 2005; 17 pp.; In English
Contract(s)/Grant(s): CCR-0325781

Patent Info.: Filed Filed 30 Mar 05; US-Patent-Appl-SN-11-094-661
Report No.(s): PB2007-105271; No Copyright; Avail.: CASI: A03, Hardcopy

Space-time codes are developed for multi-radii AM-PSK constellations. Further, a 'super-unified' space-time code construction is developed that incorporates multi-radii AM-PSK codes with the Lu-Kumar unified codes. The multi-radii space-time codes achieve the rate-diversity tradeoff--that is, the codes transmit information at the maximum rate possible for the given signaling constellation and the achieved transmit diversity level.

NTIS

Coding; Constellations; Construction; Patent Applications; Phase Shift Keying; Radii

20080017035 Shumaker and Sieffert, P.A., Saint Paul, MN, USA

Bandwidth and Power Efficient Multicarrier Multiple Access

Glannakis, G. B., Inventor; Zhou, S., Inventor; Xia, P., Inventor; Mar. 02, 2005; 24 pp.; In English
Contract(s)/Grant(s): 0105612; DAAD-19-01-2-011
Patent Info.: Filed Filed 2 Mar 05; US-Patent-Appl-SN-11-070-855
Report No.(s): PB2007-105270; No Copyright; Avail.: CASI: A03, Hardcopy

Techniques are described for multicarrier multiple access wireless transmission, e.g. orthogonal frequency-division multiple access (OFDMA) transmissions, over frequency selective fading channels. The techniques are designed to maintain constant modulus transmissions for uplink while effectively mitigating intersymbol interference. Specifically, the techniques utilize non-redundant unitary precoding across OFDMA subcarriers to maintain constant modulus transmissions for uplink communications. For example, the techniques involve precoding a block of information symbols and assigning a different subcarrier for each symbol of the block. The subcarriers are selected to be equi-spaced and may be selected, for example, from a phase-shift keying constellation. The number of symbols per block is equal to the number of subcarriers assigned per user. Importantly, even with multiple subcarriers per user, the techniques enable constant modulus transmissions for uplink. Consequently, the techniques may achieve high power and bandwidth efficiency as well as improved performance over conventional OFDMA and GMC-CDMA transmissions.

NTIS

Bandwidth; Frequency Division Multiple Access; Multiple Access; Code Division Multiple Access; Intersymbolic Interference; Uplinking

20080017293 Federal Emergency Management Agency, Washington, DC USA

Expanding and Using Knowledge to Reduce Earthquake Losses: The National Earthquake Hazards Reduction Program Strategic Plan, 2001-2005

Mar. 2003; 76 pp.; In English
Report No.(s): PB2007-111480; FEMA-383; No Copyright; Avail.: CASI: A05, Hardcopy

The development and use of this strategic plan will result in a new era of coordination and advancement for the National Earthquake Hazards Reduction Program. It will serve as a mechanism to improve coordination among the agencies, and provide the broad vision that NEHRP will use to move forward boldly into the 21st century. This NEHRP Strategic Plan, respectfully submitted, represents the consensus view of the Policy Coordination Council (PCC).

NTIS

Earthquakes; Hazards; Project Planning

20080017402 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, The Hague, Netherlands

Discriminating Sea Spikes in Incoherent Radar Measurements of Sea Clutter

DeWit, J. J. M.; Schouten, M. W.; March 2008; 2 pp.; In English; Original contains color and black and white illustrations
Report No.(s): TD2008-0023; TNO-DV 2008 A067; Copyright; Avail.: Other Sources

In this report, the results of an inventory of sea spike characteristics is given. Furthermore, the possibility to detect sea spikes with standard ship navigation radars is explored. In literature it was found that the most distinct properties of sea spikes are the sudden increase in polarization ratio HW/VV and Doppler velocity. These properties cannot be measured with current navigation radars, but future navigation radars will be coherent. It is therefore worthwhile to investigate the added value of using coherent sea clutter data in the sea spike detection and classification process.

Author

Radar Measurement; Navigation; Ships; Clutter; Classifications

20080017442 Federal Trade Commission, Washington, DC, USA
FTC (Federal Trade Commission) in 2007: A Champion for Consumers and Competition
Apr. 1, 2007; 63 pp.; In English
Report No.(s): PB2007-111736; No Copyright; Avail.: CASI: A04, Hardcopy

The Federal Trade Commission (FTC or Commission), the only federal agency with both consumer protection and competition jurisdiction in broad sectors of the economy, is committed to ensuring that American consumers are protected from deceptive, unfair, and anticompetitive trade practices that harm consumer welfare. To accomplish this goal, the agency embraces its dual, but complementary, missions. First, the FTC aggressively enforces the nations antitrust laws to protect consumers from anticompetitive mergers and business conduct. Second, the Commission actively engages in enforcement efforts to protect consumers from fraudulent, deceptive, and unfair business conduct, and to safeguard consumers privacy and personal information. While the FTCs competition and consumer protection missions focus on different types of conduct, they share the same overall goal: that consumers obtain truthful information about products and services that they can then use to make purchase decisions in a competitive marketplace in which their personal information is safeguarded. This purpose has assumed even greater importance in this dynamic, digital, and global marketplace. To accomplish these goals, the FTC leverages its limited resources by focusing its efforts on industries and practices that most directly affect consumers; by buttressing its enforcement and advocacy work through coordination with other federal and state agencies, criminal authorities, and international partners; by utilizing its broad array of databases and other resources to support its enforcement work; by informing itself of consumers concerns and business conduct through hearings, workshops, and public comments; by promoting its pro-consumer agenda through speeches, reports, advocacy comments, amicus briefs, and testimony; and by educating consumers and businesses with practical guidance on a wide range of marketplace issues on paper and online, in English and in Spanish. The FTC efficiently and effectively utilizes all of these tools to protect competition and consumers. In the past year, the FTC accomplished a great deal in a broad spectrum of industries, while making improvements to its organization and processes.

NTIS
Competition; Consumers; Procedures

20080017872 Harness Dickey and Pierce, PLC, Bloomfield Hills, MI, USA
Antenna Apparatus and Method
Heisen, P. T., Inventor; Navarro, J. A., Inventor; Chen, M., Inventor; May 31, 2005; 26 pp.; In English
Contract(s)/Grant(s): N00014-02-C-0068
Patent Info.: Filed Filed 31 May 05; US-Patent-Appl-SN-11-140-758
Report No.(s): PB2007-105273; No Copyright; Avail.: CASI: A03, Hardcopy

A phased array antenna module for use in the gigahertz bandwidth. The module includes a metallic core with a pair of chip carrier assemblies secured to opposite sides of the core. The core has an internal waveguide with a signal splitter for directing electromagnetic wave energy evenly to the two chip carrier assemblies. A flexible, cylindrical connector assembly electrically couples the chip carrier assemblies to an aperture board. The aperture board includes a plurality of dipole antenna radiating elements. The module core is coupled directly to a cold plate. A direct thermal path is created between the chip carrier assemblies, the module core and the cold plate for highly efficient cooling of the electronic components on the chip carrier assemblies.

NTIS
Antenna Arrays; Modules; Phased Arrays; Antennas

20080017919 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Mass and Mean Size Dual-frequency Radar Relations for Frozen Hydrometeors
Meagher, Jonathan P.; Haddad, Ziad S.; September 20, 2004; 3 pp.; In English; International Geoscience and Remote Sensing Symposium, IGARSS '04, 20-24 Sep. 2004, Anchorage, AK, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40769

Airborne in-situ frozen Particle Size Distribution data from the TRMM field campaigns in used to develop mass and mean size dual-frequency radar relations.

Author
Particle Size Distribution; TRMM Satellite; Radar Measurement; Multispectral Radar; Discrete Functions; Probability Distribution Functions; Method of Moments

20080017922 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Prototype Development of a Geostationary Synthetic Thinned Aperture Radiometer, GeoSTAR

Tanner, Alan B.; Wilson, William J.; Kangaslahti, Pekka P.; Lambrigsten, Bjorn H.; Dinardo, Steven J.; Piepmeier, Jeffrey R.; Ruf, Christopher S.; Rogacki, Steven; Gross, S. M.; Musko, Steve; June 22, 2004; 6 pp.; In English; Earth Science and Technology Conference (ESTC), 22-24 Jun. 2004, Palto Alto, CA, USA; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/40754

Preliminary details of a 2-D synthetic aperture radiometer prototype operating from 50 to 58 GHz will be presented. The instrument is being developed as a laboratory testbed, and the goal of this work is to demonstrate the technologies needed to do atmospheric soundings with high spatial resolution from Geostationary orbit. The concept is to deploy a large sparse aperture Y-array from a geostationary satellite, and to use aperture synthesis to obtain images of the earth without the need for a large mechanically scanned antenna. The laboratory prototype consists of a Y-array of 24 horn antennas, MMIC receivers, and a digital cross-correlation sub-system. System studies are discussed, including an error budget which has been derived from numerical simulations. The error budget defines key requirements, such as null offsets, phase calibration, and antenna pattern knowledge. Details of the instrument design are discussed in the context of these requirements.

Author

Synthetic Apertures; Atmospheric Sounding; Geosynchronous Orbits; High Resolution; Spatial Resolution; Antenna Radiation Patterns; Cross Correlation

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*.

20080016644 Swedish Defence Research Establishment, Linkoeping, Sweden

Flexibla TeleKrigkomponenter Slutrapport (Flexible Electronic Warfare Components - Final Report)

Eklund, D.; Frostemark, T.; Gustafsson, K.; Hillerstroem, G.; Dec. 01, 2005; 40 pp.; In Swedish

Report No.(s): PB2007-105535; FOI-R-1822-SE; No Copyright; Avail.: CASI: A03, Hardcopy

The rapid development of programmable logic devices, FPGAs, offers new potential in the field of digital signal processing. The project Flexible Electronic Warfare Components has been concerned with how this can be used to speed up the development process of electronic warfare (EW) systems and obtain higher reliability demonstrators. This report describes the work done, and the conclusions drawn, in the project. The aim has been to set up guidelines for a methology for how to go from model description to a specific warfare component. The flexibility in FPGA techniques supports the desirable evolutionary development scheme that has been successfully applied in several EW projects. The methodology offers the possibility to integrate several functions and, importantly, to upgrade EW systems in the field.

NTIS

Electronic Warfare; Field-Programmable Gate Arrays; Flexibility

20080016652 Budapest Univ. of Technology and Economics, Budapest, Hungary

Periodica Polytechnica Electrical Engineering, Volume 50, Nos. 1-2, 2006

Benyo, Z.; May 09, 2005; 172 pp.; In English

Report No.(s): PB2007-109544; No Copyright; Avail.: CASI: A08, Hardcopy

This third volume of the special issue of Periodica Politechnica presents the latest results of the Biomedical Engineering research group at the Department of Control Engineering and Information Technology. The high interest research areas are: A Multi-Channel Vital Signal Processing Method for Detection of Respiration Disorders; Extension of the Bergman minimal model for the glucose-insulin interaction; Application of Computer Algebra to Glucose-Insulin Control in H2/Hoo space using Mathematica; Future Prospects in Medicine of the Application of the Infant Cry; Expansion of sample-space for ANN based classification of CBF signals; Medical Image Processing for Virtual Endoscopy; Simulation and Recognition of Various Events from 3-D Heart Model; DNA-chips in practice and their clinical relevance; Investigation of myocardial short-scan SPECT methods using a real inhomogeous attenuating medium; A Novel Computer Aided Neurolinguistic Approach to the Treatment of Aphasia; SVM Classifier for Biomedical Signals using WaveletDeep Structure Analysis; Modeling via Block Random

Feedback Systems. The papers published in this volume are seeking answers to actual questions of today's Biomedical Engineering problems and most of them represents future PhD thesis topics of the authors.
NTIS
Bioengineering; Electrical Engineering

20080016655 Weingarten, Schurgin, Gagnebin and Lebovici. LLP, Boston, MA, USA
Tunable Current-Mode Integrator for Low-Frequency Filters
Yang, Z., Inventor; Hinck, T. A., Inventor; Cohen, H. L., Inventor; Hubbard, A., Inventor; Dec. 19, 2004; 10 pp.; In English
Contract(s)/Grant(s): N00014-01-1-0178; N00014-00-C-0314
Patent Info.: Filed Filed 19 Dec 04; US-Patent-Appl-SN-11-009 377
Report No.(s): PB2007-109321; No Copyright; Avail.: CASI: A02, Hardcopy

A tunable current mode integrator for low-frequency continuous-time filters that requires a reduced amount of area when implemented in an integrated circuit (IC). The integrator includes input and output transistors, and cross-coupled current mirrors, integration capacitors, and operational transconductance amplifiers (OTAs) that form a feedback structure with the input transistors. Input currents are converted to small current swings within the OTAs, and are subsequently integrated by the capacitors. Resulting integrated voltages are converted to output currents by the output transistors.
NTIS
Integrated Circuits; Integrators; Low Frequencies; Patent Applications

20080016698 Christie, Parker and Hale, LLP, Pasadena, CA, USA
Polymer Matrix Electroluminescent Materials and Devices
Marrocco, M. L., Inventor; Motamedi, F. J., Inventor; Abdelrazzaq, F. B., Inventor; Dec. 16, 2003; 46 pp.; In English
Contract(s)/Grant(s): DE-FG02-03ER83850
Patent Info.: Filed Filed 16 Dec 03; US-Patent-Appl-SN-10-738 143
Report No.(s): PB2007-108787; No Copyright; Avail.: CASI: A03, Hardcopy

Photoluminescent and electroluminescent compositions are provided which comprise a matrix comprising aromatic repeat units covalently coordinated to a phosphorescent or luminescent metal ion or metal ion complexes. Methods for producing such compositions, and the electroluminescent devices formed therefrom, are also disclosed.
NTIS
Electroluminescence; Matrix Materials

20080016756 Lawrence Livermore National Lab., Livermore, CA USA; California Univ., San Francisco, CA, USA
Phasing Surface Emitting Diode Laser Outputs into a Coherent Laser Beam
Holzrichter, J. F., Inventor; Mar. 18, 2004; 11 pp.; In English
Contract(s)/Grant(s): W-7405-ENG-48
Patent Info.: Filed Filed 18 Mar 04; US-Patent-Appl-SN-10-804 282
Report No.(s): PB2007-105195; No Copyright; Avail.: CASI: A03, Hardcopy

A system for generating a powerful laser beam. A laser element array includes a first laser element and at least one additional laser element. The first laser element and the at least one additional laser element have a rear laser mirror, an output mirror, and laser material between the rear laser mirror and the output mirror. An injector directs a part of the injection laser signal into the first laser element and directs an additional part of the injection laser signal into the at least one additional laser element. The laser element array transforms the first injection laser signal and the at least one additional injection laser signal into a first circulating laser beam in the first laser element and an additional circulating laser beam in the at least one additional laser element. A reference laser beam source directs a first part of a reference laser beam into the first laser element to mix with the first circulating laser beam and directs an additional part of the reference laser beam into the at least one additional laser element to mix with the at least one additional circulating laser beam. An amplifier and phase conjugater amplifies and phase conjugates the first part of the reference laser beam and the additional part of the reference laser beam and produces a first amplified output laser beam emanating from the first laser element and an additional amplified output laser beam emanating from the at least one additional laser element. A combiner combines the first amplified output laser beam and the at least one additional amplified output laser beam into a powerful laser beam.
NTIS
Diodes; Laser Arrays; Laser Beams; Laser Outputs; Surface Emitting Lasers

20080016757 Quine Intellectual Property Law Group, P. C., Alameda, CA, USA; California Univ., San Francisco, CA, USA
Situ Patterning of Electrolyte for Molecular Information Storage Devices
Bocian, D. F., Inventor; Kuhr, W. G., Inventor; Lindsey, J. S., Inventor; Misra, V., Inventor; Apr. 30, 2004; 34 pp.; In English
Contract(s)/Grant(s): MDA972-01-C-0072
Patent Info.: Filed Filed 30 Apr 04; US-Patent-Appl-SN-10-837 028
Report No.(s): PB2007-105197; No Copyright; Avail.: CASI: A03, Hardcopy

This invention pertains to methods assembly of organic molecules and electrolytes in hybrid electronic. In one embodiment, a is provided that involves contacting a surface/electrode with a compound if formula: R-L(sup 2)-M-L(sup 1)-Z(sup 1) where Z(sup 1) is a surface attachment group; L(sup 1) and L(sup 2) are independently linker or covalent bonds; M is an information storage molecule; and R is a protected or unprotected reactive site or group; where the contacting results in attachment of the redox-active moiety to the surface via the surface attachment group; and contacting the surface-attached information storage molecule with an electrolyte having the formula: J-Q where J is a charged moiety (e.g., an electrolyte); and Q is a reactive group that is reactive with the reactive group (R) and attaches J to the information storage molecule thereby patterning the electrolyte on the surface.

NTIS
Data Storage; Electrolytes

20080016760 Kushman (Brooks), P.C., Southfield, MI, USA
High-Q Micromechanical Resonator Devices and Filters Utilizing Same
Nguyen, C. T. C., Inventor; Li, S. S., Inventor; Jan. 21, 2005; 21 pp.; In English
Contract(s)/Grant(s): NSF-9986866
Patent Info.: Filed Filed 21 Jan 05; US-Patent-Appl-SN-11-040 766
Report No.(s): PB2007-104782; No Copyright; Avail.: CASI: A03, Hardcopy

High-Q micromechanical resonator devices and filters utilizing same are provided. The devices and filters include a vibrating polysilicon micromechanical 'hollow-disk' ring resonators obtained by removing quadrants of material from solid disk resonators, but purposely leaving intact beams or spokes of material with quarter-wavelength dimensions to non-intrusively support the resonators. The use of notched support attachments closer to actual extensional ring nodal points further raises the Q. Vibrating micromechanical hollow-disk ring filters including mechanically coupled resonators with resonator Q's greater than 10,000 achieve filter Q's on the order of thousands via a low-velocity coupling scheme. A longitudinally mechanical spring is utilized to attach the notched-type, low-velocity coupling locations of the resonators in order to achieve a extremely narrow passband.

NTIS
Micromechanics; Q Devices; Q Factors; Resonators; Resonant Vibration

20080016809 Knolls Atomic Power Lab., Niskayuna, NY, USA
Spectral Control for Thermophotovoltaic Energy Conversion
Fourspring, P. M.; DePoy, D. M.; Mar. 19, 2007; 33 pp.; In English
Contract(s)/Grant(s): DE-AC12-00SN39357
Report No.(s): DE2007-903184; LM-07K001A; No Copyright; Avail.: National Technical Information Service (NTIS)

The energy source for thermophotovoltaic energy conversion is a net flux of photons between two surfaces at different temperatures.

NTIS
Energy Conversion; Spectra; Thermophotovoltaic Conversion

20080016918 Hitt Gaines, P.C., Richardson, TX, USA; Lucent Technologies, Murray Hill, NJ, USA
P-Type OFET with Fluorinated Channels
Bao, Z., Inventor; Borkent, E. J., Inventor; Mar. 17, 2004; 13 pp.; In English
Contract(s)/Grant(s): NIST-70NANB2H3032
Patent Info.: Filed Filed 17 Mar 04; US-Patent-Appl-SN-10-802 973
Report No.(s): PB2007-104788; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention provides an organic field-effect transistor (OFET) and a method of fabricating the OFET. The OFET, configured to function as a p-type semiconductor, includes a substrate having a top surface and a semiconductor layer located over the top surface. The semiconductor layer comprises organic semiconductor molecules. Each of the organic

semiconductor molecules includes a core having conjugated pi bonds, a fluorinated alkyl group, and an alkyl spacer group having a chain of two or more carbon atoms. One end of the chain is bonded to the fluorinated alkyl group and another end of the chain is bonded to the core. Substituents coupled to the carbon atoms have an electronegativity of less than about 4.
NTIS
Field Effect Transistors; P-Type Semiconductors; Organic Semiconductors; Fluorination; Fabrication

20080016930
Transmit Power Adaptation for CDMA Communication Systems Using Successive Interference Cancellation
Bar-Ness, Y., Inventor; Lee, Y. H., Inventor; Mar. 10, 2005; 19 pp.; In English
Contract(s)/Grant(s): CCR-0085846
Patent Info.: Filed Filed 10 Mar 05; US-Patent-Appl-SN-11-076 751
Report No.(s): PB2007-105194; No Copyright; Avail.: CASI: A03, Hardcopy

Transmit power adaptation for DS/CDMA systems is disclosed for a CDMA system that utilizes a successive interference cancellation receiver on fading channels. The transmission power is adapted in response to channel variations to achieve an arbitrary power profile for received signal powers at the system base station. That is, the received signal powers are distributed with some factor x(sub i)'s given as: S(sub R)(sup i)=S(sub R)(sup (l))x(sub i), (i=2,3, . . . , K and x(sub l)=1) where K is the number of users and S(sub R)(sup (i)) is the received signal power of the user having the i.sup.th strength, and wherein user strengths are ranked in the order of estimated channel gains. The factor x(sub i) gives a measure of the disparity between the received power levels. The channel is estimated at both the transmitter and receiver. In one embodiment, the factors, x(sub i), for distributing the signal powers are selected such that the average BER for each user is minimized. In another embodiment, the factors, x(sub i), for distributing the signal powers are selected such that, after successive interference cancellation, an instantaneous BER for all users is equal.
NTIS
Cancellation; Code Division Multiple Access; Telecommunication

20080016938 NanoSystems, Inc., Palo Alto, CA, USA
Nanostructure and Nanocomposite Based Compositions and Photovoltaic Devices
Scher, E., Inventor; Buretea, M. A., Inventor; Chow, C., Inventor; Empedocles, S., Inventor; Meisel, A., Inventor; 9 Dec 04; 39 pp.; In English
Contract(s)/Grant(s): NRO-03-C-0042
Patent Info.: Filed Filed 9 Dec 04; US-Patent-Appl-SN-11-008 315
Report No.(s): PB2007-105231; No Copyright; Avail.: CASI: A03, Hardcopy

Nanocomposite photovoltaic devices are provided that generally include semiconductor nanocrystals as at least a portion of a photoactive layer. Photovoltaic devices and other layered devices that comprise core-shell nanostructures and/or two populations of nanostructures, where the nanostructures are not necessarily part of a nanocomposite, are also features of the invention. Varied architectures for such devices are also provided including flexible and rigid architectures, planar and non-planar architectures and the like, as are systems incorporating such devices, and methods and systems for fabricating such devices. Compositions comprising two populations of nanostructures of different materials are also a feature of the invention.
NTIS
Nanocomposites; Nanostructure (Characteristics); Nanostructures (Devices); Patent Applications; Semiconductor Devices

20080016999 Quine Intellectual Property Law Group, P. C., Alameda, CA, USA; California Univ., Berkeley, CA, USA; North Carolina State Univ., Raleigh, NC USA
Attachment of Organic Molecules to Group III, IV or V Substrates
Bocian, D. F., Inventor; Lindsey, J. S., Inventor; Liu, Z., Inventor; Yasseri, A. A., Inventor; Loewe, R. S., Inventor; May 26, 2005; 22 pp.; In English
Contract(s)/Grant(s): MDA972-01-C-0072
Patent Info.: Filed Filed 26 May 05; US-Patent-Appl-SN-11-140 011
Report No.(s): PB2007-105241; No Copyright; Avail.: CASI: A03, Hardcopy

This invention provides a new procedure for attaching molecules to semiconductor surfaces, in particular silicon. The molecules, which include, but are not limited to porphyrins and ferrocenes, have been previously shown to be attractive candidates for molecular-based information storage. The new attachment procedure is simple, can be completed in short times, requires minimal amounts of material, is compatible with diverse molecular functional groups, and in some instances affords

unprecedented attachment motifs. These features greatly enhance the integration of the molecular materials into the processing steps that are needed to create hybrid molecular/semiconductor information storage devices.
NTIS
Data Storage; Molecules; Semiconductors (Materials); Silicon; Substrates

20080017008 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Assessing and Mitigating Radiation Effects in Xilinx FPGAs
Adell, Philippe; Allen, Greg; February 02, 2008; 37 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAS7-03001; WBS: 939904.01.11.30; JPL Project No. 102197; Task Number: 3.18.4
Report No.(s): JPL Publication 08-9; Copyright; Avail.: CASI: A03, Hardcopy

This document provides an understanding of Single-Event Effects (SEEs) in Field-Programmable Gate Array (FPGA) components with a specific interest on Xilinx Static Random Access Memory (SRAM) FPGAs. It also provides help to designers to identify appropriate testing and mitigation strategies to qualify these parts for space application.
Author
Field-Programmable Gate Arrays; Radiation Effects; Random Access Memory

20080017010 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Scaled CMOS Technology Reliability Users Guide
White, Mark; Chen, Yuan; March 2008; 28 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAS7-03001; WBS 939904.01.11.10; Project No. 102197; Task No.1.18.5
Report No.(s): JPL Publication 08-14; Copyright; Avail.: CASI: A03, Hardcopy

This users guide provides an overview of technology scaling, technology scaling impact on circuits, technology scaling impact on parts reliability, and guidelines for infusing advanced CMOS technologies in space applications.
Author
CMOS; Technology Utilization; Scalers

20080017011 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
The Impact of Hydrogen Contamination on the Total Dose Response of Linear Bipolar Microcircuits
Adell, Philippe C.; McClure, Steve S.; April 2008; 25 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAS7-03001; WBS 939904.01.11-30; JPL Project No. 102197-3.33.7; Task No. 102683
Report No.(s): JPL Publication 08-15; Copyright; Avail.: CASI: A03, Hardcopy

Recent enhanced low dose rate sensitivity (ELDRS) investigations carried out by RLP Research, Crane, Arizona State University (ASU), and Jet Propulsion Laboratory (JPL) have shown significant differences in the degradation of bipolar microcircuits with total dose in the presence of molecular hydrogen (H2) in packages. This has a significant impact on radiation hardness assurance and opens up opportunity to improve device performance. The objectives of this program are 1) to investigate and confirm the causal relationship between packaging recipes, hydrogen contamination, and total dose response of linear bipolar microcircuits; and 2) to develop a guideline that will take into account these effects at the radiation level for future NASA space missions. This program is geared to benefit all future NASA space missions using bipolar or BiCMOS linear devices. A close collaboration between JPL, ASU, Crane, and RLP Research led to the following set of investigations: 1. JPL tasks included investigations into the source of hydrogen in common packages, low dose rate and high dose rate testing of vendor packaged devices and residual gas analysis (RGA) to identify the correlation between their packaging recipes, hydrogen contamination and total dose response. 2. JPL funded ASU to develop physical models that take into account the participation of hydrogen into the mechanism of creation of interface traps (i.e., enhanced the degradation of linear bipolar microcircuits). 3. JPL and Crane collaborated to obtain data from high dose rate and low dose rate testing in a hydrogen environment.
Author
Bipolarity; Contamination; Degradation; Hydrogen; Microelectronics; Hydrogen Atoms; Linear Circuits

20080017015 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
TID Effects in Space-Like Variable Dose Rates
Harris, Richard D.; April 2008; 15 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): NAS7-03001; WBS 939904.01.11.30; JPL Project No. 102197; Task No. 3.31.7
Report No.(s): JPL-Publ-08-17; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2014/40770

The degradation of the LM193 dual voltage comparator has been studied with different types of total ionizing dose (TID)

dose rates. These include several different constant dose rates and a variable dose rate that simulates the behavior of a solar flare. The varying dose rate of a solar flare is the type of real total dose exposure that a space mission might see in lunar or Martian orbit. A comparison of these types of dose rates is made to explore how well the constant dose rates used for typical part testing predicts the performance during a simulated space-like mission.
Author
Solar Flares; Radiation Dosage; Degradation; Cobalt 60; Electronic Equipment

20080017018 National Inst. of Standards and Technology, Boulder, CO, USA
Numerical Comparison of Currents Induced on an Object in Free-Space and in a TEM Cell
Fornberg, P. E.; Holloway, C. L.; Wilson, P. F.; Jul. 01, 2006; 50 pp.; In English
Report No.(s): PB2007-107301; NIST/TN-1527; No Copyright; Avail.: National Technical Information Service (NTIS)

The finite-difference time-domain (FDTD) method is used to investigate whether the currents induced on equipment under test (EUT) in a transverse electromagnetic (TEM) cell are similar to those induced in a free-space environment. The approach is to simulate an identical EUT in both environments and determine a correlation based on the respective current distributions. The effect of the ratio of EUT to TEM cell size on the correlation to free space is also investigated.
NTIS
Electromagnetic Fields; Finite Difference Time Domain Method; Current Distribution; Time Domain Analysis; Finite Difference Theory

20080017023 Plevy, Howard, and Dracy, P.C., Fort Washington, PA, USA
Semiconductor Based Broad Area Optical Amplifier
Kwakernaak, M. H., Inventor; Jun. 16, 2005; 12 pp.; In English
Contract(s)/Grant(s): MDA972-03-C-0043
Patent Info.: Filed Filed 16 Jun 05; US-Patent-Appl-SN-11-154 354
Report No.(s): PB2007-109356; No Copyright; Avail.: CASI: A03, Hardcopy

An optical amplifier including: a photonic gain element; and, a transistor electromagnetically coupled to the gain element to inject current into the gain element responsively to the internal optical intensity of the gain element.
NTIS
Light Amplifiers; Semiconductor Devices; Semiconductors (Materials)

20080017026 Park, Vaughan and Fleming, LLP, Davis, CA, USA
Method and Apparatus for Routing Differential Signals Across a Semiconductor Chip
Proebsting, R. J., Inventor; Ho, R., Inventor; Drost, R. J., Inventor; Mar. 26, 2004; 17 pp.; In English
Contract(s)/Grant(s): NBCH020055
Patent Info.: Filed Filed 26 Mar 04; US-Patent-Appl-SN-10-810 284
Report No.(s): PB2007-105246; No Copyright; Avail.: CASI: A03, Hardcopy

One embodiment of the present invention provides an arrangement of differential pairs of wires that carry differential signals across a semiconductor chip. In this arrangement, differential pairs of wires are organized within a set of parallel tracks on the semiconductor chip. Furthermore, differential pairs of wires are organized to be non-adjacent within the tracks. This means that each true wire is separated from its corresponding complement wire by at least one intervening wire in the set of parallel tracks, thereby reducing coupling capacitance between corresponding true and complement wires. Moreover, this arrangement may include one or more twisting structures, wherein a twisting structure twists a differential pair of wires so that the corresponding true and complement wires are interchanged within the set of parallel tracks.
NTIS
Chips; Semiconductors (Materials); Wire

20080017050 National Inst. of Standards and Technology, Gaithersburg, MD, USA
Quantum Electrical Metrology Division Programs, Activities, and Accomplishments, January 2007
Jan. 01, 2007; 76 pp.; In English
Report No.(s): PB2007-110784; NISTIR 7370; No Copyright; Avail.: CASI: A05, Hardcopy

The Quantum Electrical Metrology Division unites fundamental electrical metrology and leading-edge quantum-based metrology research to create a dynamic organization poised to lead quantum metrology into the future. The Division consists of three groups: Fundamental Electrical Measurements, Applied Electrical Metrology, and Quantum Devices. The first two

groups are located in Gaithersburg, MD and boast of a proud 100-year history of precision electrical metrology. The Quantum Devices Group located in Boulder, CO brings a 35-year history of creating world-leading quantum-based standards and measurements. The Division works to provide the worlds best electrically-based measurements and standards. This document is organized into two main sections, Quantum Standards, and Quantum Measurements. Within those sections each Division project is described without reference to its geographical location. Appendix A describes the organizational location of all the research projects in the Division. Appendix B lists all of the measurement services offered by the Division, and Appendix C is a Division staff list for readers wishing to phone or e-mail us to learn more about a topic. We are always interested in new post-doctoral associates, and Appendix D describes many research opportunities in the Quantum Electrical Metrology Division.
NTIS
Metrology; Electrical Measurement; Leading Edges

20080017083 Oak Ridge National Lab., TN USA
Annual Technical Progress Report of Radioisotope Power System Materials Production and Technical Program Tasks for October 1, 2005 through September 30, 2006
Apr. 01, 2007; 55 pp.; In English
Contract(s)/Grant(s): DE-AC05-00OR22725
Report No.(s): DE2007-902178; ORNL/TM-2007/044; No Copyright; Avail.: Department of Energy Information Bridge

The Office of Space and Defense Power Systems of the Department of Energy (DOE) provides Radioisotope Power Systems (RPS) for applications where conventional power systems are not feasible. For example, radioisotope thermoelectric generators were supplied by the DOE to the National Aeronautics and Space Administration for deep space missions including the Cassini Mission launched in October of 1997 to study the planet Saturn. For the Cassini Mission, ORNL produced carbon-bonded carbon fiber (CBCF) insulator sets, iridium alloy blanks and foil, and clad vent sets (CVS) used in the generators. The Oak Ridge National Laboratory (ORNL) has been involved in developing materials and technology and producing components for the DOE for more than three decades. This report reflects program guidance from the Office of Space and Defense Power Systems for fiscal year (FY) 2006. Production activities for prime quality (prime) CBCF insulator sets, iridium alloy blanks and foil, and CVS are summarized in this report. Technology activities are also reported that were conducted to improve the manufacturing processes, characterize materials, or to develop information for new radioisotope power systems.
NTIS
Production Planning; Radioisotope Batteries

20080017102 Pietragallo, Bosic and Gordon, Pittsburgh, PA, USA
Transducer for Heat Assisted Magnetic Recording
Challener, W. A., Inventor; 23 Jun 04; 19 pp.; In English
Contract(s)/Grant(s): NIST-70NANB1H3056
Patent Info.: Filed Filed 23 Jun 04; US-Patent-Appl-SN-10-874-457
Report No.(s): PB2007-109425; No Copyright; Avail.: CASI: A03, Hardcopy

An apparatus for concentrating electromagnetic energy comprises a metallic transducer including a first section and a second section, wherein the first section is wider than the second section and has a width to length aspect ratio greater than or equal to a width to length aspect ratio of the second section, and a condenser for directing electromagnetic radiation onto the transducer. A magnetic storage device that includes the apparatus is also provided.
NTIS
Magnetic Recording; Magnetic Storage; Patent Applications; Transducers

20080017371 Loughborough Univ., Leicesterschire, UK
Characterisation
El-Fatatry, Ayman; Nanotechnology Aerospace Applications; March 2007, pp. 4-1 - 4-8; In English; See also 20080017367; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A04, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This lecture will focus on the techniques currently in use or being developed for measuring nano-particles and nanotechnology-based products from all aspects including, geometries, forms and conformity as well as functional characteristics such as absorption, charge or porosity. The lecture will also aim to address the systems/response based

measurements of such materials and novel nano-composites. In this context, the lecture s content will be as follows; Challenges in Characterisation of nano-materials, Tools and equipment for in-process assessment (Scanning Electron Microscopes / Scanning Probe Microscopes etc), Tools and equipment for product characterisation (Optical / laser diffraction etc), Techniques for functional characterisation (chemical analysis, surface assessment / mapping etc) and Future directions Author

Characterization; Nanotechnology; Metrology

20080017375 Loughborough Univ., Leicesterschire, UK; Loughborough Univ., Leicesterschire, UK

Defence Applications

Nanotechnology Aerospace Applications; March 2007, pp. 6-1 - 6-6; In English; See also 20080017367; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The potential opportunities promised by nanotechnology for enabling advances in defence technologies are staggering. Although these opportunities are likely to be realised over a few decades, many advantages are currently being secured, particularly for defence applications. This lecture will provide an insight into the capabilities offered by nanotechnology which will enable new defence capabilities, including; smart materials, harder/lighter platforms, new fuel sources and storage as well as novel medical applications. More specifically, the lecture will address the following topics: The vision and the challenges (overview) Novel material characteristics, properties and functionalities for enhanced capabilities (mass storage, nanomagnetics, quantum computing etc) Novel platforms (smart dust, self-assembly etc) Medical and biomedical advances (biomimetics etc)

Author

Nanotechnology; Smart Materials; Nanostructures (Devices); Defense Program

20080017479 Lawrence Livermore National Lab., Livermore, CA USA

High Brightness, Laser-Driven X-ray Source for Nanoscale Metrology and Femtosecond Dynamics

Siders, C. W.; Crane, J. K.; Semenov, V.; Betts, S.; Kozioziemski, B.; Feb. 27, 2007; 14 pp.; In English

Report No.(s): DE2007-902319; UCRL-TR-228409; No Copyright; Avail.: National Technical Information Service (NTIS)

This project developed and demonstrated a new, bright, ultrafast x-ray source based upon laser-driven K-alpha generation, which can produce an x-ray flux 10 to 100 times greater than current microfocus x-ray tubes. The short-pulse (sub-picosecond) duration of this x-ray source also makes it ideal for observing time-resolved dynamics of atomic motion in solids and thin films.

NTIS

Brightness; Laser Outputs; Measuring Instruments; Metrology; Nanotechnology; X Ray Sources

20080017484 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Microelectronics Reliability: Physics-of-Failure Based Modeling and Lifetime Evaluation

White, Mark; Bernstein, Joseph B.; February 2008; 219 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NAS7-03001; WBS: 939904.01.11.10; JPL Project No. 102197; Task No. 1.18.5

Report No.(s): JPL Publication 08-5; Copyright; Avail.: CASI: A10, Hardcopy

This handbook presents a physics-of-failure approach to microelectronics reliability modeling and assessment. Knowledge of the root cause and physical behavior of key failure mechanisms in microelectronic devices has improved dramatically over recent years and has led to the development of more sophisticated reliability modeling tools and techniques. Some of these tools are summarized here. Chapter 1 provides an overview of traditional reliability prediction approaches, i.e., MIL-HDBK-217 compared with some of the more recent reliability modeling and prediction approaches, including Reliability Aware MicroProcessor (RAMP) Model, Failure Rate Based SPICE (FaRBS) reliability simulation, and Maryland Circuit-Reliability Oriented (MaCRO) simulation. Chapter 2 describes the intrinsic wearout mechanisms of the electron device, including physics processes, mechanisms and models of electromigration (EM), hot carrier degradation (HCD), time-dependent dielectric breakdown (TDDB), and negative bias temperature instability (NBTI). In Chapter 3, the modules and processes of FaRBS reliability simulation, model parameter extraction, and derating of voltage and temperature for reliability are described. Sensitivity analysis and SPICE simulation of the wearout models are also discussed. To account for the effect of wearout mechanisms on circuit functionality and reliability, the device-level accelerated lifetime models are extended to microelectronic circuit-level applications and an analog-to-digital converter reliability simulation using the FaRBS application

is provided. Lifetime and failure equivalent circuit models for Hot Carrier Injection (HCI), TDDB, and NBTI are presented in Chapter 4, Microelectronic Circuit Reliability Analysis and MaCRO. This chapter includes an illustrative case study for the purpose of demonstrating how to apply MaCRO models and algorithms to circuit reliability simulation, analysis, and improvement. The most common circuit structures used in reliability simulations are the ring oscillator, the differential amplifier, and the SRAM. The SRAM is selected as a case study vehicle to show the applicability of MaCRO models and algorithms in circuit reliability simulation and analysis. Chapter 5, in conclusion, describes the microelectronic system aspect of reliability, including impact to the system of individual failure mechanism lifetime models, voltage and temperature acceleration, and qualification based on failure mechanism and application. A failure-mechanism-based qualification methodology using specifically designed stress conditions over traditional approaches (i.e., one voltage and one temperature) can lead to improved reliability predictions for targeted applications and optimized burn-in, screening, and qualification test plans.
Author
Circuit Reliability; Failure; Microelectronics; Performance Prediction; Performance Tests; Reliability; Reliability Analysis; Simulation

20080017489 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Guideline for Ground Radiation Testing of Microprocessors in the Space Radiation Environment
Irom, Farokh; April 2008; 51 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAS7-03001; WBS 939904.01.11.30; JPL Project No. 102197; Task No. 3.34.7
Report No.(s): JPL Publication 08-13; Copyright; Avail.: CASI: A04, Hardcopy

This document is intended to be a guideline for radiation tests of microprocessors, in particular advanced commercial microprocessors, which have been the subject of several studies during the last 20 years. The main emphasis is on single-event upset testing, first because microprocessors are highly sensitive to single-event upset effects and, second, because there are many technical challenges in performing such tests on modern microprocessors. Total dose testing is addressed only briefly, noting that most microprocessors are relatively immune to total dose damage because of the inherent effects of scaling on device design and radiation response.
Author
Aerospace Environments; Extraterrestrial Radiation; Microprocessors; Single Event Upsets; Chips (Electronics); Commercial Off-the-Shelf Products; Radiation Dosage

20080017496 NASA Goddard Space Flight Center, Greenbelt, MD, USA
A Comparative Study of Inspection Techniques for Array Packages
Mohammed, Jelila; Green, Christopher; April 28, 2008; 23 pp.; In English; Military, Aerospace, Space and Homeland Security (MASH): Packaging Issues and Applications, 29-30 Apr. 2008, Linthicum Heights, MD, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080017496

This viewgraph presentation reviews the inspection techniques for Column Grid Array (CGA) packages. The CGA is a method of chip scale packaging using high temperature solder columns to attach part to board. It is becoming more popular over other techniques (i.e. quad flat pack (QFP) or ball grid array (BGA)). However there are environmental stresses and workmanship challenges that require good inspection techniques for these packages.
CASI
Inspection; Quality Control; Solders; Chips (Electronics); Chips; Electronic Packaging

20080017502 Molecular Imprints, Inc., Austin, TX, USA
Apparatus to Vary Dimensions of a Substrate During Nano-Scale Manufacturing
Cherala, A., Inventor; Choi, B. J., Inventor; Nimmakayala, P. K., Inventor; Meissi, M. J., Inventor; Sreenivasan, S. V., Inventor; Jun. 01, 2005; 28 pp.; In English
Contract(s)/Grant(s): DARPA-N66001-01-1-8964; DARPA-N66001-02-C-8011
Patent Info.: Filed Filed 1 Jun 05; US-Patent-Appl-SN-11-142-839
Report No.(s): PB2007-109422; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention is directed toward a system to vary dimensions of a substrate, such as a template having a patterned mold. To that end, the system includes a substrate chuck adapted to position the substrate in a region; a pliant member; and an actuator sub-assembly elastically coupled to the substrate chuck through the pliant member. The actuator assembly includes

a plurality of lever sub-assemblies, one of which includes a body lying in the region and spaced-apart from an opposing body associated with one of the remaining lever sub-assemblies of the plurality of lever sub-assemblies. One of the plurality of lever assemblies is adapted to vary a distance between the body and the opposing body. In this manner, compressive forces may be applied to the template to remove unwanted magnification or other distortions in the pattern on the mold. The pliant member is configured to attenuate a magnitude of resulting forces sensed by the substrate chuck generated in response to the compressive forces.
NTIS
Manufacturing; Patent Applications; Semiconductor Devices; Substrates

20080017832 Department of Energy, Washington, DC USA
Basic Research Needs for Solid-State Lighting Report of the Basic Energy Sciences Workshop on Solid-State Lighting. Held on May 22-24, 2006
Jan. 01, 2006; 228 pp.; In English
Report No.(s): DE2007-899126; No Copyright; Avail.: National Technical Information Service (NTIS)
The workshop participants enthusiastically concluded that the time is ripe for new fundamental science to beget a revolution in lighting technology. SSL sources based on organic and inorganic materials have reached a level of efficiency where it is possible to envision their use for general illumination. The research areas articulated in this report are targeted to enable disruptive advances in SSL performance and realization of this dream. Broad penetration of SSL technology into the mass lighting market, accompanied by vast savings in energy usage, requires nothing less. These new 'good ideas' will be represented not by light bulbs, but by an entirely new lighting technology for the 21st century and a bright, energy-efficient future indeed.
NTIS
Illuminating; Light Emitting Diodes; Research; Solid State

20080017846 Sandia National Labs., Albuquerque, NM USA
Failure Analysis for the Dual Input Quad NAND Gate CD4011 Under Dormant Storage Conditions
Sorensen, N. R.; May 01, 2007; 25 pp.; In English
Report No.(s): DE2007-908064; SAND2007-2345; No Copyright; Avail.: National Technical Information Service (NTIS)
Several groups of plastic molded CD4011s were electrically tested as part of an Army dormant storage program. These parts had been in storage in missile containers for 4.5 years, and were electrically tested annually. Eight of the parts (out of 1200) failed the electrical tests and were subsequently analyzed to determine the cause of the failures. The root cause was found to be corrosion of the unpassivated Al bondpads. No significant attack of the passivated Al traces was found. Seven of the eight failures occurred in parts stored on a pre-position ship (the Jeb Stuart), suggesting a link between the external environment and observed corrosion.
NTIS
Degradation; Failure Analysis; Gates (Circuits); Hibernation; Logic Circuits

20080017847 Sandia National Labs., Albuquerque, NM USA
Model for Resonant Plasma Probe
Warne, L. K.; Johnson, W. A.; Coats, R. S.; Jorgenson, R. E.; Hebner, G. A.; Apr. 01, 2007; 91 pp.; In English
Report No.(s): DE2007-908076; SAND2007-2513; No Copyright; Avail.: National Technical Information Service (NTIS)
This report constructs simple circuit models for a hairpin shaped resonant plasma probe. Effects of the plasma sheath region surrounding the wires making up the probe are determined. Electromagnetic simulations of the probe are compared to the circuit model results. The perturbing effects of the disc cavity in which the probe operates are also found.
NTIS
Circuits; Electromagnetic Radiation; Plasma Probes

20080017848 Sandia National Labs., Albuquerque, NM USA
Measurement and Modeling of Transfer Functions for LIghtning Coupling into the Sago Mine
Higgins, M. B.; Morris, M. E.; Apr. 01, 2007; 110 pp.; In English
Report No.(s): DE2007-908077; SAND2006-7976; No Copyright; Avail.: National Technical Information Service (NTIS)
This report documents measurements and analytical modeling of electromagnetic transfer functions to quantify the ability of cloud-to-ground lightning strokes (including horizontal arc-channel components) to couple electromagnetic energy into the

Sago mine located near Buckhannon, WV. Two coupling mechanisms were measured: direct and indirect drive. These transfer functions are then used to predict electric fields within the mine and induced voltages on conductors that were left abandoned in the sealed area of the Sago mine.
NTIS
Lightning; Transfer Functions

20080017856 BBWI, Idaho Falls, ID, USA
Wireless Sensor Systems and Method, and Methods of Monitoring Structures
Kunerth, D. C., Inventor; Svoboda, J. M., Inventor; Johnson, J. T., Inventor; Harding, L. D., Inventor; Klingler, K. M., Inventor; Mar. 17, 2004; 11 pp.; In English
Contract(s)/Grant(s): DE-AC07-99ID13727
Patent Info.: Filed Filed 17 Mar 04; US-Patent-Appl-SN-10-803 517
Report No.(s): PB2007-105163; No Copyright; Avail.: CASI: A03, Hardcopy

A wireless sensor system includes a passive sensor apparatus configured to be embedded within a concrete structure to monitor infiltration of contaminants into the structure. The sensor apparatus includes charging circuitry and a plurality of sensors respectively configured to measure environmental parameters of the structure which include information related to the infiltration of contaminants into the structure. A reader apparatus is communicatively coupled to the sensor apparatus, the reader apparatus being configured to provide power to the charging circuitry during measurements of the environmental parameters by the sensors. The reader apparatus is configured to independently interrogate individual ones of the sensors to obtain information measured by the individual sensors. The reader apparatus is configured to generate an induction field to energize the sensor apparatus. Information measured by the sensor apparatus is transmitted to the reader apparatus via a response signal that is superimposed on a return induction field generated by the sensor apparatus. Methods of monitoring structural integrity of the structure are also provided.
NTIS
Detectors; Structural Analysis; Hazards

20080017857 BBWI, Idaho Falls, ID, USA
Ultrasonic Pulser-Receiver
Taylor, S. C., Inventor; Mar. 17, 2004; 10 pp.; In English
Contract(s)/Grant(s): DE-A07-99ID-13727
Patent Info.: Filed Filed 17 Mar 04; US-Patent-Appl-SN-10-803 518
Report No.(s): PB2007-105164; No Copyright; Avail.: CASI: A02, Hardcopy

Ultrasonic pulser-receiver circuitry, for use with an ultrasonic transducer, the circuitry comprising a circuit board; ultrasonic pulser circuitry supported by the circuit board and configured to be coupled to an ultrasonic transducer and to cause the ultrasonic transducer to emit an ultrasonic output pulse; receiver circuitry supported by the circuit board, coupled to the pulser circuitry, including protection circuitry configured to protect against the ultrasonic pulse and including amplifier circuitry configured to amplify an echo, received back by the transducer, of the output pulse; and a connector configured to couple the ultrasonic transducer directly to the circuit board, to the pulser circuitry and receiver circuitry, wherein impedance mismatches that would result if the transducer was coupled to the circuit board via a cable can be avoided.
NTIS
Circuits; Pulse Generators; Receivers; Ultrasonic Tests; Ultrasonics

20080017864 Boyle Fredrickson Newholm Stein and Gratz, SC, USA
Micro Device Incorporating Programmable Element
Jiang, H., Inventor; Beebe, D. J., Inventor; Agarwal, A. K., Inventor; Atencia-Fernandez, F. J., Inventor; May 20, 2005; 13 pp.; In English
Patent Info.: Filed Filed 20 May 05; US-Patent-Appl-SN-11-133 901
Report No.(s): PB2007-109477; No Copyright; Avail.: CASI: A03, Hardcopy

A micro device is provided that includes a body defining a chamber for receiving fluid. A rotational element is disposed in the chamber for acting on the fluid. The rotational element is rotatable about an axis in response to a rotating magnetic field. The micro device further includes a clutch mechanism having a first disengaged configuration and a second engaged

configuration wherein the clutch mechanism engages the rotational element and prevents rotation of the same.
NTIS
Microelectronics; Rotation; Programmable Logic Devices

20080017868 Akerman Senterfit, West Palm Beach, FL, USA
Method to Contact Patterned Electrodes on Porous Substrates and Devices Thereby
Reynold, J. R., Inventor; Argun, A. A., Inventor; Aubert, P. H., Inventor; Berard, M., Inventor; Nov. 19, 2004; 21 pp.; In English
Contract(s)/Grant(s): 0160-G-AC859; F49620-00-1-0047
Patent Info.: Filed Filed 19 Nov 04; US-Patent-Appl-SN-10-992 827
Report No.(s): PB2007-105204; No Copyright; Avail.: CASI: A03, Hardcopy

A method for contacting patterned electrode devices includes the steps of providing a porous substrate, depositing electrically conductive material to form at least one electrode on a front-side of the porous substrate and depositing at least one electrically conductive back-side contact trace on the back-side of the substrate. A portion of the electrically conductive material penetrates into the substrate. A device is formed including the electrode on the front side of the substrate, wherein the electrode is electrically coupled by a conducting channel including the electrically conductive material through the substrate to the back-side contact trace.
NTIS
Electrodes; Patent Applications; Porosity; Substrates

20080017870 Lamina Ceramics, Inc., Roseland, NJ, USA
High Performance Embedded RF Filters
Geller, B. D., Inventor; Fathy, A. E., Inventor; Liberatdore, M. J., Inventor; Sreeram, N., Inventor; Thaler, B. J., Inventor; May 24, 2005; 5 pp.; In English
Contract(s)/Grant(s): F33615-96-2-5105
Patent Info.: Filed Filed 24 May 05; US-Patent-Appl-SN-11-135-764
Report No.(s): PB2007-105278; No Copyright; Avail.: CASI: A01, Hardcopy

Embedded, coupled, shaped waveguide resonators having conductive walls sandwiched between two fired green tape stacks, said conductive walls having apertures therein whose size and location determine the degree of coupling. These waveguides are made by forming openings in a first green tape stack, defining walls and apertures therein, mounting a second green tape stack having a conductive layer thereon thereover and firing the assembly. E-plane probes are inserted in openings in the second green tape stack and connected to microstrip transmission lines on an external surface pf this green tape stack.
NTIS
Circuit Boards; Embedding; Patent Applications; Printed Circuits; Radio Frequencies; Resonators; Waveguides

20080017923 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Solid-state Terahertz Sources for Space Applications
Maiwald, Frank; Pearson, John C.; Ward, John S.; Schlecht, Erich; Chattopadhyay, Goutam; Gill, John J.; Ferber, R.; Tsang, Raymond; Lin, Robert H.; Peralta, Alejandro; Finamore, B.; Chun, William W.; Baker, John J.; Dengler, Robert J.; Javadi, Hamid H.; Siegel, Peter H.; Mehdi, Imran; September 29, 2004; 2 pp.; In English; International Journal of Infrared and Millimeter Waves Conference, 29 Sept. - 1 Oct. 2004, Karlsrue, Germany; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40755

This paper discusses the construction of solid-state frequency multiplier chains utilized far teraherz receiver applications such as the Herschel Space Observatory . Emphasis will he placed on the specific requirements to be met and challenges that were encountered. The availability of high power amplifiers at 100 GHz makes it possible to cascade frequency doublers and triplers with sufficient RF power to pump heterodyne receivers at THz frequencies. The environmental and mechanical constraints will be addressed as well as reliability issues.
Author
Frequency Multipliers; Power Amplifiers; Solid State; Radio Frequencies; Receivers; Heterodyning

20080017950 Staggs, Michael C., Livermore, CA, USA
High Resistivity Aluminum Antimonide Radiation Detector
Sherohman, J. W., Inventor; Coombs, A. W., Inventor; Yee, J. H., Inventor; Jan. 21, 2005; 20 pp.; In English
Contract(s)/Grant(s): DE-CN-W-740-ENG-48

Patent Info.: Filed Filed 21 Jan 05; US-Patent-Appl-SN-11-040 573
Report No.(s): PB2007-105161; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention relates generally to the tailoring of bulk materials to be suitable for semiconductor applications, and more particularly, to a method of forming a single crystal of AlSb as a material for high-energy radiation detection.
NTIS
Aluminum Antimonides; Electrical Resistivity; Radiation Detectors; Radiation Measuring Instruments

20080018004 Maine and Asmus, Nashua, NH, USA; BAE Systems and Technology, Nashua, NH, USA
Lithographic Semiconductor Manufacturing using a Multi-Layered Process
Lamarre, P. A., Inventor; 14 Jun 04; 21 pp.; In English
Contract(s)/Grant(s): DAAB07-00-D-D329
Patent Info.: Filed Filed 14 Jun 04; US-Patent-Appl-SN-10 710 023
Report No.(s): PB2007-109390; No Copyright; Avail.: CASI: A03, Hardcopy

Multilayer resist systems and techniques used for liftoff or planarizing topography wherein the dimensions and thicknesses of the layers are independently controlled. The undercut may also be independently controlled for precision structures.
NTIS
Lithography; Patent Applications; Semiconductors (Materials)

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*.

20080016643 Lawrence Livermore National Lab., Livermore, CA USA; California Univ., Berkeley, CA USA
Apparatus and Method for Reducing Drag of a Bluff Body in Ground Effect Using Counter-Rotating Vortex Pairs
Ortega, J. M., Inventor; Sabari, K., Inventor; Apr. 05, 2005; 9 pp.; In English
Contract(s)/Grant(s): W-7405-ENG-48
Patent Info.: Filed Filed 5 Apr 05; US-Patent-Appl-SN-11-100 201
Report No.(s): PB2007-104785; No Copyright; Avail.: CASI: A02, Hardcopy

An aerodynamic base drag reduction apparatus and method for bluff bodies, such as tractor-trailer trucks, utilizing a pair of lift surfaces extending to lift surface tips and located alongside the bluff body such as on opposing left and right side surfaces. In a flowstream substantially parallel to the longitudinal centerline of the bluff body, the pair of lift surfaces generate a pair of counter-rotating trailing vortices which confluence together in the wake of the bluff body in a direction orthogonal to the flowstream. The confluence draws or otherwise turns the flowstream, such as the flowstream passing over a top surface of the bluff body, in and around behind a trailing end of the bluff body to raise the pressure on a base surface at the trailing end and thereby reduce the aerodynamic base drag.
NTIS
Aerodynamic Drag; Bluff Bodies; Counter Rotation; Drag Reduction; Ground Effect (Aerodynamics); Vortices

20080016703 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA; California Univ., Berkeley, CA, USA
Partial Equilibrium Theory for Drops and Capillary Liquids
Searcy, A. W.; Beruto, D. T.; Barberis, F.; Jan. 01, 2006; 4 pp.; In English
Report No.(s): DE2007-902449; No Copyright; Avail.: National Technical Information Service (NTIS)

The two-century old theory of Young and Laplace retains apowerful influence on surface and interface studies because it quantitatively predicts the height of rise of capillary liquids from the contact angles of drops. But the classical theory does not acknowledge that equilibrium requires separate minimization of partial free energies of one-component liquids bonded to immiscible solids. We generalize a theorem of Gibbs and Curie to obtain a partial equilibrium (PE) theory that does so and that also predicts the height of capillary rise from contact angles of drops. Published observations and our own measurements of contact angles of water bonded to glass and Teflon surfaces support the conclusion of PE theory that contact angles of meniscuses and of drops are different dependent variables. PE theory provides thermodynamic and kinetic guidance to

nanoscale processes that the classical theory obscures, as illustrated by examples in our concluding section.
NTIS
Capillary Flow; Drops (Liquids); Liquids

20080016725 Savannah River National Lab., Aiken, SC, USA; Westinghouse Savannah River Co., Aiken, SC, USA
Applications of CDF Method to Gas Mixing Analysis in a Large Scaled Tank
Lee, S. Y.; Dimenna, R. A.; Mar. 19, 2007; 16 pp.; In English
Report No.(s): DE2007-901918; WSRC-STI-2007-00009; No Copyright; Avail.: National Technical Information Service (NTIS)

The computational fluid dynamics (CFD) modeling technique was applied to the estimation of maximum benzene concentration for the vapor space inside a large-scaled and high-level radioactive waste tank at Savannah River site (SRS). The objective of the work was to perform the calculations for the benzene mixing behavior in the vapor space of Tank 48 and its impact on the local concentration of benzene. The calculations were used to evaluate the degree to which purge air mixes with benzene evolving from the liquid surface and its ability to prevent an unacceptable concentration of benzene from forming. The analysis was focused on changing the tank operating conditions to establish internal recirculation and changing the benzene evolution rate from the liquid surface. The model used a three-dimensional momentum coupled with multi-species transport. The calculations included potential operating conditions for air inlet and exhaust flows, recirculation flow rate, and benzene evolution rate with prototypic tank geometry. The flow conditions are assumed to be fully turbulent since Reynolds numbers for typical operating conditions are in the range of 20,000 to 70,000 based on the inlet conditions of the air purge system. A standard two-equation turbulence model was used. The modeling results for the typical gas mixing problems available in the literature were compared and verified through comparisons with the test results. The benchmarking results showed that the predictions are in good agreement with the analytical solutions and literature data.
NTIS
Computational Fluid Dynamics; Mixing; Benzene; Gas Mixtures; Tanks (Containers)

20080016742 Conte (Francis L.), Swampscott, MA, USA
Cascade Impingement Cooled Airfoil
Lee, C. P., Inventor; Wadia, A. R., Inventor; Cherry, D. G., Inventor; Apr. 08, 2004; 11 pp.; In English
Contract(s)/Grant(s): F33615-02-C-2212
Patent Info.: Filed Filed 8 Apr 04; US-Patent-Appl-SN-10-820 325
Report No.(s): PB2007-105897; No Copyright; Avail.: CASI: A03, Hardcopy

A turbine blade includes an airfoil having opposite pressure and suction sidewalls joined together at opposite leading and trailing edges and extending longitudinally from root to tip. A plurality of independent cooling circuits are disposed inside the airfoil correspondingly along the pressure and suction sidewalls thereof. Each circuit includes an inlet channel extending through the dovetail. One of the circuits includes multiple longitudinal channels separated by corresponding perforate partitions each including a row of impingement holes for cascade impingement cooling the inner surface of the airfoil.
NTIS
Airfoils; Impingement; Suction; Cooling; Turbine Blades; Rotor Blades (Turbomachinery)

20080017016 Naval Surface Warfare Center, Dahlgren, VA, USA
Device to Detect and Measure the Concentration and Characterization of Airborne Conductive or Dielectric Particles
Richardson, R. E., Inventor; Lopez, A. M., Inventor; Mar. 31, 2004; 16 pp.; In English
Patent Info.: Filed Filed 31 Mar 04; US-Patent-Appl-SN-10-817-415
Report No.(s): PB2007-105277; No Copyright; Avail.: CASI: A03, Hardcopy

A measuring system is disclosed which detects and measures the volume concentration and mass flow of the airborne conductive particles, such as carbon-absorptive chaff particles. The measuring system can be used to estimate the effective conductivity of the detected airborne conductive particles. Further, if particles are not airborne, but are lying on a surface they may be made to become airborne by the vacuum source of the present invention and then detected by the measuring system of the present invention.
NTIS
Air Pollution; Dielectrics; Particles; Patent Applications; Pollution Monitoring

20080017089 Sandia National Labs., Albuquerque, NM USA

Nanostructured Surfaces for Microfluidics and Sensing Applications

Bell, N. S.; Yang, D.; Piech, M.; Gust, D.; Vail, S.; Jan. 01, 2007; 27 pp.; In English

Contract(s)/Grant(s): DE-AC04-94AL85000

Report No.(s): DE2007-902205; SAND2006-7632; No Copyright; Avail.: Department of Energy Information Bridge

The present work demonstrates the use of light to move liquids on a photoresponsive monolayer, providing a new method for delivering analyses in lab-on-chip environments for microfluidic systems. The light-driven motion of liquids was achieved on photoresponsive azobenzene modified surfaces. The surface energy components of azobenzene modified surfaces were calculated by Van Oss theory. The motion of the liquid was achieved by generation of a surface tension gradient by isomerization of azobenzene monolayers using UV and Visible light, thereby establishing a surface energy heterogeneity on the edge of the droplet. Contact angle measurements of various solvents were used to demonstrate the requirement for fluid motion.

NTIS

Detection; Microfluidic Devices; Nanostructure (Characteristics)

20080017392 NASA Langley Research Center, Hampton, VA, USA

Use of HART-II Measured Motion in CFD

Boyd, D. Douglas, Jr.; April 28, 2008; 36 pp.; In English; 5th International HART-II Workshop at the 64th American Helicopter Society Annual Forum and Technology Display, 29 Apr.?1 May, 2008, Montreal, Canada; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080017392

This presentation examines the use of HART-II measured rotor blade motion in computational fluid dynamics (CFD). Historically, comprehensive analyses were used for input to acoustic calculations. These analyses focused on lifting line aerodynamics and beam models. However, there is a a need to evolve lifting line aerodynamics to first principles, notably the use of CFD instead of lifting line. The current analysis focuses on CFD and computational structural dynamics (CSD) coupling. Beam models are still very good (CSD is typically from comprehensive analysis), but generally CFD replaced aerodynamics in comprehensive analysis. This presentation examines both CFD and CSD individually and includes predictions using measured motion as well as predictions using measured motion versus coupled motion and calculations of 'correct' airloads, noise and vibration.

Derived from text

Computational Fluid Dynamics; Rotor Blades; Motion; Helicopters; Dynamic Structural Analysis

20080017473 Lawrence Livermore National Lab., Livermore, CA USA

Aluminum Rayleigh Taylor Strength Measurements and Calculations

Lundquist, M. J.; Cavallo, R. M.; Lorenz, K. T.; Pollaine, S. M.; Remington, B. A.; Jan. 18, 2007; 8 pp.; In English

Report No.(s): DE2007-902231; UCRL-PROC-227311; No Copyright; Avail.: National Technical Information Service (NTIS)

A traditional approach to the study of material strength has been revitalized at the Russian Federal Nuclear Center (VNIIEF). Rayleigh Taylor strength experiments have long been utilized to measure the material response of metals at high pressure and strain rates. A modulated (sinusoidal or sawtooth perturbation) surface is shocklessly (quasi-isentropically) accelerated by a high explosive (HE) driver, and radiography is used to measure the perturbation amplitude as a function of time. The Aluminum T-6061 targets are designed with several sets of two-dimensional sawtooth perturbations machined on the loading surface. The HE driver was designed to reach peak pressures in the range of 200 to 300 kbar and strain rates in the range of 104 - 106 s-1. The standard constitutive strength models, Steinberg- Guinan (SG) (1), Steinberg-Lund (SL) (2), Preston-Tonks-Wallace (PTW) (3), Johnson-Cooke (JC) (4), and Mechanical Threshold Stress (MTS) (5), have been calibrated by traditional techniques: (Hopkinson-Bar, Taylor impact, flyer plate/shock-driven experiments). The VNIIEF experimental series accesses a strain rate regime not attainable using traditional methods. We have performed a detailed numerical study with a two-dimensional Arbitrary Lagrangian Eulerian hydrodynamics computer code containing several constitutive strength models to predict the perturbation growth. Results show that the capabilities of the computational methodology predict the amplitude growth to within 5 percent of the measured data, thus validating both the code and the strength models under the given conditions and setting the stage for credible future design work using different materials.

NTIS

Aluminum; Mechanical Properties

20080017483 Lawrence Livermore National Lab., Livermore, CA USA

Artificial Fluid Properties for Large-Eddy Simulation of Compressible Turbulent Mixing

Cook, A. W.; Jan. 10, 2007; 33 pp.; In English

Report No.(s): DE2007-902334; UCRL-CONF-227155; No Copyright; Avail.: National Technical Information Service (NTIS)

An alternative methodology is described for Large-Eddy Simulation of flows involving shocks, turbulence and mixing. In lieu of altering the governing equations, it is postulated that the large-scale behavior of an LES fluid, i.e., a fluid with artificial properties, will be similar to that of a real fluid, provided the artificial properties obey certain constraints. The artificial properties consist of modifications to the shear viscosity, bulk viscosity, thermal conductivity and species diversivity of a fluid. The modfiied transport coefficients are designed to damp out high wave number modes, close to the resolution limit, without corrupting lower modes. Requisite behavior of the articial properties is discussed and results are shown for a variety of test problems, each designed to exercise different aspects of the models. When combined with a 10th-order compact scheme, the overall method exhibits excellent resolution characteristics for turbulent mixing, while capturing shocks and material interfaces in crisp fashion.

NTIS

Compressible Flow; Large Eddy Simulation; Mixing Layers (Fluids); Turbulent Mixing

20080017499 Lockheed Martin Corp., Bethesda, MD, USA

Friction Factor Measurements in an Equally Spaced Triangular Tube Array

Vassallo, P.; Symolon, P.; Mar. 19, 2007; 17 pp.; In English

Report No.(s): DE2007-903201; LM-07K012; No Copyright; Avail.: National Technical Information Service (NTIS)

Friction factor data for adiabatic cross-flow of water in a staggered tube array was obtained over a Reynolds number range (based on hydraulic diameter and gap velocity) of about 10,000 to 250,000. The tubes were 12.7mm (0.5 inch) outer diameter, in a uniformly spaced triangular arrangement with a pitch-to-diameter ratio of 1.5. The friction factor was compared to several literature correlations, and was found to be best matched by the Idelchik correlation. Other correlations were found to vary significantly from the test data. Based on the test data, a new correlation is proposed for this tube bundle geometry which covers the entire Reynolds number range tested.

NTIS

Cross Flow; Friction Factor

20080017936 Harvard Univ., Cambridge, MA, USA

Method and Apparatus for Gradient Generation

Jeon, N. J., Inventor; Dertinger, S. K. W., Inventor; Chiu, D. T., Inventor; Choi, I. S., Inventor; Whitesides, G. M., Inventor; Jan. 18, 2005; 28 pp.; In English

Contract(s)/Grant(s): ECS9739405

Patent Info.: Filed Filed 18 Jan 05; US-Patent-Appl-SN-11-037-459

Report No.(s): PB2007-105280; No Copyright; Avail.: CASI: A03, Hardcopy

A method and apparatus for treating a fluid. A method for treating a fluid may include combining two or more separate streams into a common stream and then splitting the common stream into a new set of separate streams wherein the separate streams may possess different properties. The separate streams may be combined to produce a gradient, such as a concentration gradient or shear gradient. The apparatus of the invention may provide a network of fluidic channels that may be used to manipulate a fluid to produce, for example, a gradient or a series of solutions containing a substance at varying concentrations.

NTIS

Gradients; Fluidics

20080017952 NASA Johnson Space Center, Houston, TX, USA

Testing, Modeling and System Impact of Metabolic Heat Regenerated Temperature Swing Adsorption

Lacomini, Christine S.; Powers, Aaron; Lewis, Matthew; Linrud, Christopher; Waguespack, Glenn; Conger, Bruce; Paul, Heather L.; [2008]; 14 pp.; In English; 38th International Conference on Environmental Systems, 29 Jun. - 3 Jul. 2008, San Francisco, CA, USA; Original contains color illustrations

Contract(s)/Grant(s): NNJ06HA98C; 831288.03.04

Report No.(s): 081CES-0124; Copyright; Avail.: CASI: A03, Hardcopy

Metabolic heat regenerated temperature swing adsorption (MTSA) technology is being developed for removal and

rejection of carbon dioxide (CO2) and heat from a portable life support system (PLSS) to the Martian environment. Previously, hardware was built and tested to demonstrate using heat from simulated, dry ventilation loop gas to affect the temperature swing required to regenerate an adsorbent used for CO2 removal. New testing has been performed using a moist, simulated ventilation loop gas to demonstrate the effects of water condensing and freezing in the heat exchanger during adsorbent regeneration. In addition, thermal models of the adsorbent during regeneration were modified and calibrated with test data to capture the effect of the CO2 heat of desorption. Finally, MTSA impact on PLSS design was evaluated by performing thermal balances assuming a specific PLSS architecture. Results using NASA s Extravehicular Activity System Sizing Analysis Tool (EVAS_SAT), a PLSS system evaluation tool, are presented.
Author
Adsorption; Metabolism; Heat Exchangers; Temperature Effects; Temperature Distribution; Carbon Dioxide Removal; Portable Life Support Systems; Extravehicular Activity

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*.

20080016639 Department of the Army, Washington, DC, USA
Method and Apparatus for Multi-Spectral Photodetection
Almeida, L. A., Inventor; Mar. 19, 2004; 6 pp.; In English
Patent Info.: Filed Filed 19 Mar 04; US-Patent-Appl-SN-10-804 005
Report No.(s): PB2007-104791; No Copyright; Avail.: CASI: A02, Hardcopy

A multispectral photodetector array includes a two-dimensional array of photodetectors, either photodiodes or photoconductors, are coupled to a read out integrated circuit. The integrated circuit collects electrical signals from individual pixels of the array. Such an array differs from a conventional array in that each row or group of rows in the array has a distinct spectral response.
NTIS
Photometers; Optical Measurement; Spectral Sensitivity

20080016692 Lockheed Martin Corp., Denver, CO, USA
Liquid Metal Flow Meter Final Report
Andersen, C.; Hoogendoorn, S.; Hudson, B.; Prince, J.; Teichert, K.; Jan. 30, 2007; 132 pp.; In English
Report No.(s): DE2007-903080; LM-06K103; No Copyright; Avail.: National Technical Information Service (NTIS)

Measuring the flow of liquid metal presents serious challenges. Current commercially available flow meters use ultrasonic, electromagnetic, and other technologies to measure flow, but are inadequate for liquid metal flow measurement because of the high temperatures required by most liquid metals. As a result of the reactivity and high temperatures of most liquid metals, corrosion and leakage become very serious safety concerns. The purpose of this project is to develop a flow meter for Lockheed Martin that measures the flow rate of molten metal in a conduit.
NTIS
Flowmeters; Liquid Metals; Liquid Flow

20080016736 Jew, C.H., Millbrae, CA, USA
Reticle Stage Based Linear Dosimeter
Berger, K. W., Inventor; 23 Mar 05; 7 pp.; In English
Contract(s)/Grant(s): DE-AC04-94AL85000
Patent Info.: Filed Filed 23 Mar 05; US-Patent-Appl-SN-11-087 996
Report No.(s): PB2007-105198; No Copyright; Avail.: CASI: A02, Hardcopy

A detector to measure EUV intensity employs a linear array of photodiodes. The detector is particularly suited for photolithography systems that includes: (1) a ringfield camera; (2) a source of radiation; (3) a condenser for processing radiation from the source of radiation to produce a ringfield illumination field for illuminating a mask; (4) a reticle that is positioned at the ringfield camera's object plane and from which a reticle image in the form of an intensity profile is reflected into the entrance pupil of the ringfield camera, wherein the reticle moves in a direction that is transverse to the length of the

ringfield illumination field that illuminates the reticle; (5) detector for measuring the entire intensity along the length of the ringfield illumination field that is projected onto the reticle; and (6) a wafer onto which the reticle imaged is projected from the ringfield camera.
NTIS
Dosimeters; Extreme Ultraviolet Radiation; Reticles

20080017326 NASA Dryden Flight Research Center, Edwards, CA, USA
2007 Ikhana Western States and Southern California Emergency UAS Fire Missions
Cobleigh, Brent; April 30, 2008; 29 pp.; In English; Unmanned Aircraft Systems (UAS) Safety Forum, 29-30 Apr. 2008, Washington, DC, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080017326

Four demonstration and four emergency fire imaging missions completed: a) Thermal infrared imagery delivered in near real-time (5 to 15 minutes) to: 1) SoCal Emergency: FEMA, NIFC, NorthCom, California EOC; 2) Demo Flights: NIFC, Individual Fire Incident Commands. Imagery used for tactical and strategic decision making. Air Traffic Control gave excellent support. Mission plans flown in reverse. Real time requests for revisits of active fires. Added new fire during mission. Moved fire loiter points as fires moved. Real-time reroute around thunderstorm activity. Pre & Post flight telecons with FAA were held to review mission and discuss operational improvements. No issues with air traffic control during the 8 fire missions flown. Derived from text
Thermal Mapping; Fires; Infrared Imagery; Decision Making; Emergencies; Air Traffic Control; Pilotless Aircraft

20080017486 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Commercial Sensor Survey Status Report
Becker, Heidi N.; Alexander, James W.; Thorbourn, Dennis O.; Konefat, Edward H.; February 2008; 12 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): NAS7-03001; WBS 939904.01.11.30; JPL Project No. 102197; Task No. 3.21.4
Report No.(s): JPL Publication 08-8; Copyright; Avail.: CASI: A03, Hardcopy

The NEPP FY07 Sensor Technology Commercial Sensor Survey task is geared toward benefiting future NASA space missions with low-cost, short duty-cycle, visible imaging needs. Such applications could include imaging for educational outreach purposes or short surveys of spacecraft, planetary or lunar surfaces. Under the task, inexpensive commercial grade sensors (e.g., CMOS-based 'camera on a chip' systems) have been surveyed and selected for ionizing dose and displacement damage tolerance testing. Only inexpensive, commercial imagers with potential for use in low-duty-cycle space exploration applications have been considered; the task does not address high-cost science grade imagers or hardened technologies. The selected sensors had to meet selection criteria geared toward supporting small, low mass cameras that produce good resolution color images. This document discusses the selection process.
Author
CMOS; Imaging Techniques; NASA Space Programs; Sensors; Commercial Off-the-Shelf Products

20080017953 NASA Goddard Space Flight Center, Greenbelt, MD, USA
A CMOS Imager with Focal Plane Compression using Predictive Coding
Leon-Salas, Walter D.; Balkir, Sina; Sayood, Khalid; Schemm, Nathan; Hoffman, Michael W.; November 2007; 18 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NNG06GH64G; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1109/JSSC.2007.907191

This paper presents a CMOS image sensor with focal-plane compression. The design has a column-level architecture and it is based on predictive coding techniques for image decorrelation. The prediction operations are performed in the analog domain to avoid quantization noise and to decrease the area complexity of the circuit, The prediction residuals are quantized and encoded by a joint quantizer/coder circuit. To save area resources, the joint quantizerlcoder circuit exploits common circuitry between a single-slope analog-to-digital converter (ADC) and a Golomb-Rice entropy coder. This combination of ADC and encoder allows the integration of the entropy coder at the column level. A prototype chip was fabricated in a 0.35 pm CMOS process. The output of the chip is a compressed bit stream. The test chip occupies a silicon area of 2.60 mm x 5.96 mm which includes an 80 X 44 APS array. Tests of the fabricated chip demonstrate the validity of the design.
Author
Chips; Circuits; CMOS; Coders; Imagery

20080017998 Lawrence Livermore National Lab., Livermore, CA USA

Demonstration of Key Elements of a Dual Phase Argon Detection System Suitable for Measurement of Coherent Neutrino-Nucleus Scattering

Adam, B.; Celeste, W.; Christian, H.; Wolfgang, S.; Norman, M.; May 02, 2007; 7 pp.; In English

Report No.(s): DE2007-908090; UCRL-TR-230663; No Copyright; Avail.: Department of Energy Information Bridge

This feasibility study sought to demonstrate several necessary steps in a research program whose ultimate goal is to detect coherent scattering of reactor antineutrinos in dual-phase noble liquid detectors. By constructing and operating a Argon gas-phase drift and scintillation test-bed, the study confirmed important expectations about sensitivity of these detectors, and thereby met the goals set forth in the original proposal. This work has resulted in a successful Lab-Wide LDRD for design and deployment of a coherent scatter detector at a nuclear reactor, and strong interest by DOE Office of Science. In recent years, researchers at Lawrence Livermore National Laboratory (LLNL) and elsewhere have converged on a design approach for a new generation of very low noise, low background particle detectors known as two-phase noble liquid/noble gas.

NTIS

Argon; Coherent Scattering; Neutrinos; Gas Detectors; Radiation Counters

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*.

20080016695 Lawrence Livermore National Lab., Livermore, CA USA; California Univ., Berkeley, CA, USA

Calibration System for Laser Peening

Claudet, A., Inventor; Mar. 21, 2005; 6 pp.; In English

Contract(s)/Grant(s): W-7405-ENG-48

Patent Info.: Filed Filed 21 Mar 05; US-Patent-Appl-SN-11-086 201

Report No.(s): PB2007-104792; No Copyright; Avail.: CASI: A02, Hardcopy

A system for laser peening a workpiece. The system comprises a world coordinate frame, a robot operatively connected to the world coordinate frame for moving the workpiece relative, a calibration tool operatively connected to the robot for determining a multiplicity of data points of the workpiece, a computer for storing and using the multiplicity of data points of the workpiece, and a laser system for laser peening the workpiece using the multiplicity of data points.

NTIS

Calibrating; Lasers; Peening; Metals; Hardening (Materials); Tools

20080016731 Sandia National Labs., Albuquerque, NM USA

LENS Repair and Modification of Metal NW Components: Materials and Applications Guide

Gill, D.; Smugerresky, J.; VanCamp, C.; Adams, T.; Oberhaus, J.; Nov. 01, 2006; 79 pp.; In English

Report No.(s): DE2007-902564; SNL-R-2006-6430; No Copyright; Avail.: National Technical Information Service (NTIS)

This report gives a background of the Laser Engineered Net Shaping (LENS) process including materials analysis addressing the requirements of a number of different applications. Suggestions are given to aid both the product engineer and the process engineer in the successful utilization of LENS for their applications. The results of testing on interface strength, machinability, weldability, corrosion resistance, geometric effects, heat treatment, and repair strategy testing are all included. Finally, the qualification of the LENS process is briefly discussed to give the user confidence in selecting LENS as the process of choice for high rigor applications.

NTIS

Lasers; Metals; Materials Science

20080017862 California Inst. of Tech., Pasadena, CA USA; Office of Naval Research, Arlington, VA USA

Fiber-Coupled Microsphere Raman Laser

Vahala, K. L., Inventor; Spillane, S. M., Inventor; Kippenberg, T. J., Inventor; Oct. 18, 2004; 15 pp.; In English

Contract(s)/Grant(s): N00014-99-1-0661

Patent Info.: Filed Filed 18 Oct 04; US-Patent-Appl-SN-10-967 515
Report No.(s): PB2007-109421; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention is a Raman laser and methods related thereto. In the preferred embodiments, the Raman laser comprises a laser pump signal in a fiber waveguide which is optically coupled to a micro-resonator through a fiber taper. The micro-resonator is constructed from a material that has a high Q when it is formed into a micro-resonator and is phase matched to the waveguide. The lasing frequency can be determined based upon the pump input or the micro-resonator material. In the preferred embodiments, the micro-resonator is constructed from a fused silica material. The present invention provides a compact laser with improved emissions and coupling efficiencies and the ability to use stimulated Raman scattering effects to create lasers having frequencies that are otherwise difficult to obtain. Alternative configurations include multiple micro-resonators on a single fiber waveguide and/or utilizing multiple waveguides attached to one or more micro-resonators. The Raman laser can be made to operate in a continuous-wave as opposed to self-pulsing mode.
NTIS
Microparticles; Raman Lasers; Raman Spectra; Optical Fibers

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*.

20080016723 National Renewable Energy Lab., Golden, CO USA
Advance Petroleum Based Fuels - Diesel Emissions Control Project (APBF-DEC)
Mar. 01, 2007; 149 pp.; In English
Contract(s)/Grant(s): DOE/GO-102007-2377
Report No.(s): DE2007-901862; No Copyright; Avail.: National Technical Information Service (NTIS)

Presents the results of a 2,000-hour test of an emissions control system consisting of a nitrogen oxides adsorber catalyst in combination with a diesel particle filter, advanced fuels, and advanced engine controls in an SUV/pick-up truck vehicle platform.
NTIS
Air Pollution; Combustion Products; Crude Oil; Diesel Engines; Diesel Fuels; Exhaust Emission; Exhaust Gases; Fuels; Pollution Control

20080016825
Methods of Producing Cermet Materials and Methods of Utilizing Same
Kong, P. C., Inventor; 25 Feb 05; 21 pp.; In English
Contract(s)/Grant(s): DE-AC07-991D13727; DE-AC07-051D14517
Patent Info.: Filed Filed 25 Feb 05; US-Patent-Appl-SN-11-667 395
Report No.(s): PB2007-106060; No Copyright; Avail.: CASI: A03, Hardcopy

Methods of fabricating cermet materials and methods of utilizing the same such as in filtering particulate and gaseous pollutants from internal combustion engines having intermetallic and ceramic phases. The cermet material may be made from a transition metal aluminide phase and an alumina phase. The mixture may be pressed to form a green compact body and then heated in a nitrogen-containing atmosphere so as to melt aluminum particles and form the cermet. Filler materials may be added to increase the porosity or tailor the catalytic properties of the cermet material. Additionally, the cermet material may be reinforced with fibers or screens. The cermet material may also be formed so as to pass an electrical current there through to heat the material during use.
NTIS
Cermets; Fabrication; Patent Applications

20080017145 General Electric Co., Niskayuna, NY, USA
Folded Detonation Initiator for Constant Volume Combustion Device
McManus, K. R., Inventor; Dean, A. J., Inventor; Tangirala, V. E., Inventor; 18 Jun 04; 13 pp.; In English
Contract(s)/Grant(s): DABT63-00-C-0001

Patent Info.: Filed Filed 18 Jun 04; US-Patent-Appl-SN-10-870-877
Report No.(s): PB2007-109432; No Copyright; Avail.: CASI: A03, Hardcopy

In the present invention, at least one detonation initiator is positioned downstream of a main combustion chamber, with the initiator oriented such that it projects a detonation initiation wave forward into the main combustion chamber. The main combustion chamber contains a wave reflection surface. The detonation initiation wave is directed into the main combustion chamber and at the wave reflector surface and is used to initiate, or assist in the initiation of, a fuel and gas mixture in the main combustion chamber. The fuel and gas mixture is detonated, creating a high temperature and high pressure wave that is directed out of the main combustion chamber.

NTIS

Combustion; Detonation; Initiators (Explosives); Pulse Detonation Engines; Combustion Chambers; Propellant Explosions; Air Breathing Engines

20080017146 General Electric Co., Niskayuna, NY, USA

Multiple Detonation Initiator for Frequency Multiplied Pulsed Detonation Combustion

Dean, A. J., Inventor; McManus, K. R., Inventor; Tangirala, V. E., Inventor; 18 Jun 04; 9 pp.; In English
Contract(s)/Grant(s): DABT63-00-C-0001
Patent Info.: Filed Filed 18 Jun 04; US-Patent-Appl-SN-10-870-898
Report No.(s): PB2007-109433; No Copyright; Avail.: CASI: A02, Hardcopy

The present invention is a pulse detonation combustion system, having a plurality of detonation initiation devices coupled to a main combustion chamber, where each of the detonation initiation devices is operating out-of-phase with each other. Each of the detonation initiation devices assists in the initiation of a detonation in the main combustion chamber, out-of-phase from each other such that the operational frequency of the pulse detonation combustion system is related to the number of detonation initiation devices multiplied by the operational frequency of a single detonation initiation device.

NTIS

Combustion; Detonation; Frequencies; Initiators (Explosives); Patent Applications; Pulse Detonation Engines

38
QUALITY ASSURANCE AND RELIABILITY

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

20080017084 Westinghouse Savannah River Co., Aiken, SC, USA; Washington Group International, Savannah River Site, Aiken, SC, USA

Safeguards and Security Integration with Safety Analysis

Hearn, J. H.; Lightner, J. W.; Apr. 13, 2007; 9 pp.; In English
Contract(s)/Grant(s): DE-AC09-96SR18500
Report No.(s): DE2007-902184; WSRC-STI-2007-00179; No Copyright; Avail.: Department of Energy Information Bridge

The objective of this paper is to share the Savannah River Site lessons learned on Safeguards and Security (S&S) program integration with K-Area Complex (KAC) safety basis. The KAC Documented Safety Analysis (DSA), is managed by the Washington Savannah River Company (WSRC), and the S&S program, managed by Wackenhut Services, Incorporated Savannah River Site (WSI-SRS). WSRC and WSI-SRS developed a contractual arrangement to recognize WSI-SRS requirements in the KAC safety analysis. Design Basis Threat 2003 (DBT03) security upgrades required physical modifications and operational changes which included the availability of weapons which could potentially impact the facility safety analysis. The KAC DSA did not previously require explicit linkage to the S&S program to satisfy the safety analysis. WSI-SRS have contractual requirements with the Department of Energy (DOE) which are separate from WSRC contract requirements. The lessons learned will include a discussion on planning, analysis, approval of the controls and implementation issues.

NTIS

Grasslands; Nuclear Power Plants; Rivers; Safety; Security

20080017085 Westinghouse Savannah River Co., Aiken, SC, USA

Disciplined Approach to Accident Analysis Development and Control Selection

Ortner, T. L.; Gupta, M. K.; Apr. 13, 2007; 10 pp.; In English
Contract(s)/Grant(s): DE-AC09-96SR18500
Report No.(s): DE2007-902185; WSRC-MS-2007-00004; No Copyright; Avail.: Department of Energy Information Bridge

The development and use of a Safety Input Review Committee (SIRC) process promotes consistent and disciplined

Accident Analysis (AA) development to ensure that it accurately reflects facility design and operation; and that the credited controls are effective and implementable. Lessons learned from past efforts were reviewed and factored into the development of this new process. The implementation of the SIRC process has eliminated many of the problems previously encountered during Safety Basis (SB) document development. This process has been subsequently adopted for use by several Savannah River Site (SRS) facilities with similar results and expanded to support other analysis activities.
NTIS
Accident Investigation; Grasslands; Rivers; Safety

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*.

20080016688 Savannah River National Lab., Aiken, SC, USA
Development and Application of Materials Properties for Flaw Stability Analysis in Extreme Environment Service
Sindelar, R. L.; Lam, P. S.; Duncan, A. J.; Wiersman, B. J.; Subramanian, K. H.; Jan. 01, 2007; 11 pp.; In English
Report No.(s): DE2007-902856; WSRC-STI-2007-00200; No Copyright; Avail.: National Technical Information Service (NTIS)

Discovery of aging phenomena in the materials of a structure may arise after its design and construction that impact its structural integrity. This condition can be addressed through a demonstration of integrity with the material-specific degraded conditions. Two case studies of development of fracture and crack growth property data, and their application in development of in-service inspection programs for nuclear structures in the defense complex are presented. The first case study covers the development of fracture toughness properties in the form of J-R curves for rolled plate Type 304 stainless steel with Type 308 stainless steel filler in the application to demonstrate the integrity of the reactor tanks of the heavy water production reactors at the Savannah River Site. The fracture properties for the base, weld, and heat-affected zone of the weldments irradiated at low temperatures (110 degrees-150 degrees C) up to 6.4 dpaNRT and 275 appm helium were developed. An expert group provided consensus for application of the irradiated properties for material input to acceptance criteria for ultrasonic examination of the reactor tanks. Dr. Spencer H. Bush played a lead advisory role in this work. The second case study covers the development of fracture toughness for A285 carbon steel in high level radioactive waste tanks.
NTIS
Defects; Fracture Strength; Pressure Vessels; Radiation Effects; Structural Stability; Structural Analysis

20080016709 Savannah River National Lab., Aiken, SC, USA
Evaluation of the Failure of Radioactive Waste Transfer Line Jacket
Wiersma, B. J.; Subramanian, K. H.; Plummer, A. S.; Jenkins, C. F.; Hinz, W. R.; Jul. 01, 2007; 10 pp.; In English
Report No.(s): DE2007-903091; PVP2007-26362; No Copyright; Avail.: National Technical Information Service (NTIS)

Radioactive wastes are confined in 49 underground storage tanks at the Savannah River Site. The waste is transported between tanks primarily via an underground transfer piping system. Due to the hazardous nature of the waste, the inner core stainless steel pipe is typically surrounded by a carbon steel pipe jacket, which provides secondary containment. Recently several through-wall penetrations were discovered on a segment of one of the jackets. An evaluation was performed to verify the failure mechanism and to estimate the degree of damage that occurred to the pipe segment. Failure analysis of a section of the jacket confirmed that pitting corrosion on the exterior of the pipe led to the through-wall penetration. Ultrasonic measurements on sections of the pipe were utilized to determine the remaining wall thickness in adjacent areas of the pipe. Based on these measurements, the degree of pitting and general corrosion was determined. Pit growth rate models were then developed to estimate the life expectancy of sections of the pipe that had not been excavated. The calculations estimated that the occurrence of through-wall failures in this jacket will begin to increase substantially in 12 years. Given that this pipe segment will be utilized beyond this time, shortterm and long-term solutions to this failure were proposed. The short-term solutions focused on the repair or replace decisions that must be made to return the jacket to service as soon as practical. The long-term solutions focused on a broader strategy to address jacket integrity issues in the entire tank farm facility. These

solutions included the evaluation of innovative remote inspection and repair techniques.
NTIS
Jackets; Radioactive Wastes; Underground Storage; Waste Management; Failure Analysis; Structural Failure; Tanks (Containers)

20080016780 Sandia National Labs., Albuquerque, NM USA
Structural Integrity Analysis of the Degraded Drywell Containment at the Oyster Creek Nuclear Generating Station
Petti, J. P.; Jan. 01, 2007; 102 pp.; In English
Report No.(s): DE2007-903434; SAND2007-0055; No Copyright; Avail.: National Technical Information Service (NTIS)

This study examines the effects of the degradation experienced in the steel drywell containment at the Oyster Creek Nuclear Generating Station. Specifically, the structural integrity of the containment shell is examined in terms of the stress limits using the ASME Boiler and Pressure Vessel (B&PV) Code, Section III, Division I, Subsection NE, and examined in terms of buckling (stability) using the ASME B&PV Code Case N-284. Degradation of the steel containment shell (drywell) at Oyster Creek was first observed during an outage in the mid-1980s. Subsequent inspections discovered reductions in the shell thickness due to corrosion throughout the containment. Specifically, significant corrosion occurred in the sandbed region of the lower sphere. Since the presence of the wet sand provided an environment which supported corrosion, a series of analyses were conducted by GE Nuclear Energy in the early 1990s. These analyses examined the effects of the degradation on the structural integrity. The current study adopts many of the same assumptions and data used in the previous GE study. However, the additional computational recourses available today enable the construction of a larger and more sophisticated structural model.
NTIS
Containment; Degradation; Nuclear Power Plants; Steels; Structural Failure; Structural Analysis

20080017013 NASA Langley Research Center, Hampton, VA, USA
A Computational Approach for Model Update of an LS-DYNA Energy Absorbing Cell
Horta, Lucas G.; Jackson, Karen E.; Kellas, Sotiris; April 29, 2008; 11 pp.; In English; AHS 64th Annual Forum and Technology Display, 29 Apr. - 1 May 2008, Montreal, Canada; Original contains color illustrations
Contract(s)/Grant(s): WBS 877868.02.07.07.05.02; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080017013

NASA and its contractors are working on structural concepts for absorbing impact energy of aerospace vehicles. Recently, concepts in the form of multi-cell honeycomb-like structures designed to crush under load have been investigated for both space and aeronautics applications. Efforts to understand these concepts are progressing from tests of individual cells to tests of systems with hundreds of cells. Because of fabrication irregularities, geometry irregularities, and material properties uncertainties, the problem of reconciling analytical models, in particular LS-DYNA models, with experimental data is a challenge. A first look at the correlation results between single cell load/deflection data with LS-DYNA predictions showed problems which prompted additional work in this area. This paper describes a computational approach that uses analysis of variance, deterministic sampling techniques, response surface modeling, and genetic optimization to reconcile test with analysis results. Analysis of variance provides a screening technique for selection of critical parameters used when reconciling test with analysis. In this study, complete ignorance of the parameter distribution is assumed and, therefore, the value of any parameter within the range that is computed using the optimization procedure is considered to be equally likely. Mean values from tests are matched against LS-DYNA solutions by minimizing the square error using a genetic optimization. The paper presents the computational methodology along with results obtained using this approach.
Author
Computer Programs; Structural Design; Impact Tolerances; Aerospace Vehicles; Statistical Analysis

20080017095 NASA Langley Research Center, Hampton, VA, USA
Multi-terrain Vertical Drop Tests of a Composite Fuselage Section
Sotirios, Kellas; Jackson, Karen E.; April 29, 2008; 9 pp.; In English; AHS 64th annual forum and technology meeting, 29 Apr. - 1 May 2008, Quebec, Canada; Original contains color illustrations
Contract(s)/Grant(s): WBS 87868.02.07.07.05.02; Copyright; Avail.: Other Sources

A 5-ft-diameter composite fuselage section was retrofitted with four identical blocks of deployable honeycomb energy absorber and crash tested on two different surfaces: soft soil, and water. The drop tests were conducted at the 70-ft. drop tower at the Landing and Impact Research (LandIR) Facility of NASA Langley. Water drop tests were performed into a

15-ft-diameter pool of water that was approximately 42-in. deep. For the soft soil impact, a 15-ft-square container filled with fine-sifted, unpacked sand was located beneath the drop tower. All drop tests were vertical with a nominally flat attitude with respect to the impact surface. The measured impact velocities were 37.4, and 24.7-fps for soft soil and water, respectively. A fuselage section without energy absorbers was also drop tested onto water to provide a datum for comparison with the test, which included energy absorbers. In order to facilitate this type of comparison and to ensure fuselage survivability for the no-energy-absorber case, the velocity of the water impact tests was restricted to 25-fps nominal. While all tests described in this paper were limited to vertical impact velocities, the implications and design challenges of utilizing external energy absorbers during combined forward and vertical impact velocities are discussed. The design, testing and selection of a honeycomb cover, which was required in soft surface and water impacts to transmit the load into the honeycomb cell walls, is also presented.

Author

Drop Tests; Fuselages; Impact Tolerances; Crashworthiness; Structural Reliability; Honeycomb Structures; Structural Design; Dynamic Structural Analysis

20080017466 Lawrence Livermore National Lab., Livermore, CA USA

Calculated Concrete Target Damage by Multiple Rod Impact and Penetration

Pincosy, P. A.; Murphy, M. J.; Jan. 03, 2007; 10 pp.; In English

Report No.(s): DE2007-907864; UCRL-CONF-227036; No Copyright; Avail.: National Technical Information Service (NTIS)

The effect of enhanced crater formation has been demonstrated experimentally when multiple and delayed shaped charge jets impact and penetrate concrete. The concept for enhancement utilizes a single follow-on jet at the centerline of holes produced by multiple precursor jets penetrating the surrounding the region. Calculations of the 3D crater enhancement phenomena have been conducted with multiple rods to simulate the steady state portion of the multiple jet penetration process. It is expected that this analysis methodology will be beneficial for optimization of the multiple jet crater enhancement application. We present calculated results using ALE3D where the model uses the standard Gruneisen equation of state combined with a rate dependent strength model including material damage parameters. This study focuses on the concrete material damage model as a representation of the portion of the target that would eventually be ejected creating a large bore-hole. The calculations are compared with the experimental evidence and limitations of the modeling approach are discussed.

NTIS

Concretes; Impact Damage; Penetration; Rods; Targets

42
GEOSCIENCES (GENERAL)

Includes general research topics related to the Earth sciences, and the specific areas of petrology, mineralogy, and general geology. For other specific topics in geosciences see *categories 42 through 48*.

20080017060 Geological Survey, Menlo Park, CA, USA

Descriptive and Grade-Tonnage Models and Database for Iron Oxide Cu-Au Deposits

Cox, D. P.; Singer, D. A.; Jan. 01, 2007; 14 pp.; In English

Report No.(s): PB2007-112137; USGS-OFR-2007-1155; No Copyright; Avail.: National Technical Information Service (NTIS)

Iron oxide Cu-Au deposits are veins and breccia-hosted bodies of hematite and/or magnetite with disseminated Cu + Au (+ or -) Ag (+ or -) Pd (+ or -) Pt (+ or -) Ni (+ or -) U (+ or -) LREE minerals formed in sedimentary or volcano-sedimentary basins intruded by igneous rocks. Deposits are associated with broad redox boundaries and feature sodic alteration of source rocks and potassic alteration of host rocks.

NTIS

Copper Alloys; Gold Alloys; Iron Oxides; Geology; Breccia; Rock Intrusions

20080017062 Geological Survey, Reston, VA USA

Log ASCII Standard (LAS) Files for Geophysical Wireline Well Logs and Their Application to Geologic Cross Sections through the Central Appalachian Basin

Crangle, R. D.; Jan. 01, 2007; 14 pp.; In English

Report No.(s): PB2007-112149; USGS-OFR-2007-1142; No Copyright; Avail.: National Technical Information Service (NTIS)

The U.S. Geological Survey (USGS) uses geophysical wireline well logs for a variety of purposes, including stratigraphic correlation (Hettinger, 2001, Ryder, 2002), petroleum reservoir analyses (Nelson and Bird, 2005), aquifer studies (Balch, 1988), and synthetic seismic profiles (Kulander and Ryder, 2005). Commonly, well logs are easier to visualize, manipulate, and interpret when available in a digital format. In recent geologic cross sections EE' and DD', constructed through the central Appalachian basin (Ryder, Swezey, and others, in press; Ryder, Crangle, and others, in press), gamma ray well log traces and lithologic logs were used to correlate key stratigraphic intervals (Fig. 1). The stratigraphy and structure of the cross sections are illustrated through the use of graphical software applications (e.g., Adobe Illustrator). The gamma ray traces were digitized in Neuralog (proprietary software) from paper well logs and converted to a Log ASCII Standard (LAS) format. Once converted, the LAS files were transformed to images through an LASreader application (e.g., GeoGraphix Prizm) and then overlain in positions adjacent to well locations, used for stratigraphic control, on each cross section. This report summarizes the procedures used to convert paper logs to a digital LAS format using a third-party software application, Neuralog. Included in this report are LAS files for sixteen wells used in geologic cross section EE' and thirteen wells used in geologic cross section DD'.

NTIS

Geological Surveys; Geophysics; Wells

43
EARTH RESOURCES AND REMOTE SENSING

Includes remote sensing of earth features, phenomena and resources by aircraft, balloon, rocket, and spacecraft; analysis of remote sensing data and imagery; development of remote sensing products; photogrammetry; and aerial photography. For related instrumentation see *35 Instrumentation and Photography*.

20080017094 American Inst. of Aeronautics and Astronautics, Reston, VA, USA

Searching for Sources and Sinks

Iannotta, Ben; Aerospace America; April 2008; Volume 46, No. 4, pp. 38-42; In English; Original contains color illustrations; Copyright; Avail.: Other Sources

With efforts to reduce greenhouse gas emissions recently earning a nod from former skeptics in the Bush administration, two new spacecraft could give the world its first bird's-eye view of the sources of atmospheric carbon dioxide. The satellites, already under construction-one in the U.S. and one in Japan-may also reveal the geographic features that naturally remove CO2 from the air If these spacecraft work, they could keep polluter nations honest about their emissions while solving a global warming mystery: Where does all the CO2 from fossil fuels go?

Derived from text

Carbon Dioxide; Carbon Dioxide Concentration; Global Warming; Greenhouse Effect; Carbon Dioxide Removal; Global Air Pollution; Satellite Observation

20080017107 Michigan State Univ., East Lansing, MI, USA

Family Life Cycle and Deforestation in Amazonia: Combining Remotely Sensed Information with Primary Data

Caldas, M.; Walker, R. T.; Shirota, R.; Perz, S.; Skole, D.; Revista Brasleira de Economia [Brazilian Economy Review]; [2003]; Volume 54, No. 4, pp. 683-711; In Portuguese; Copyright; Avail.: Other Sources; Abstract Only

This paper examines the relationships between the socio-demographic characteristics of small settlers in the Brazilian Amazon and the life cycle hypothesis in the process of deforestation. The analysis was conducted combining remote sensing and geographic data with primary data of 153 small settlers along the TransAmazon Highway. Regression analyses and spatial autocorrelation tests were conducted. The results from the empirical model indicate that socio-demographic characteristics of households as well as institutional and market factors, affect the land use decision. Although remotely sensed information is not very popular among Brazilian social scientists, these results confirm that they can be very useful for this kind of study. Furthermore, the research presented by this paper strongly indicates that family and socio-demographic data, as well as market

data, may result in misspecification problems. The same applies to models that do not incorporate spatial analysis.
Author
Land Use; Regression Analysis; Amazon Region (South America); Deforestation; Remote Sensing; Life (Durability); Autocorrelation

20080017203 NASA Langley Research Center, Hampton, VA, USA
Expected Characteristics of Global Wind Profile Measurements with a Scanning, Hybrid, Doppler Lidar System
Kavaya, Michael J.; April 14, 2008; 8 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080017203

Over 20 years of investigation by NASA and NOAA scientists and Doppler lidar technologists into a global wind profiling mission from earth orbit have led to the current favored concept of an instrument with both coherent- and direct-detection pulsed Doppler lidars (i.e., a hybrid Doppler lidar) and a stepstare beam scanning approach covering several azimuth angles with a fixed nadir angle. The nominal lidar wavelengths are 2 microns for coherent detection, and 0.355 microns for direct detection. The two agencies have also generated two sets of sophisticated wind measurement requirements for a space mission: science demonstration requirements and operational requirements. The requirements contain the necessary details to permit mission design and optimization by lidar technologists. Simulations have been developed that connect the science requirements to the wind measurement requirements, and that connect the wind measurement requirements to the Doppler lidar parameters. The simulations also permit trade studies within the multi-parameter space. These tools, combined with knowledge of the state of the Doppler lidar technology, have been used to conduct space instrument and mission design activities to validate the feasibility of the chosen mission and lidar parameters. Recently, the NRC Earth Science Decadal Survey recommended the wind mission to NASA as one of 15 recommended missions. A full description of the wind measurement product from these notional missions and the possible trades available are presented in this paper.
Author
Doppler Radar; Optical Radar; Wind Measurement; Wind Profiles; Wind Velocity Measurement; Earth Orbits

20080017494 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
QuikSCAT Follow-on Concept Study
Gaston, Robert; Rodriguez, Ernesto; April 2008; 69 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAS7-03001; Task Order NMO715499
Report No.(s): JPL Publication 08-18; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080017494

Global, real-time observations of the speed and direction of winds over the oceans (ocean surface vector winds [OSVW]) are high priority measurements for National Oceanic and Atmospheric Administration s (NOAA s) weather forecasting, prediction, and hazard warning communities. At present, these data are provided by the experimental National Aeronautics and Space Administration (NASA) QuikSCAT satellite sensor, which is operating well beyond its design lifetime. To continue to meet the Nation s need for operational OSVW observations beyond QuikSCAT, NOAA tasked the Jet Propulsion Laboratory (JPL) to design and provide costs for a set of QuikSCAT Follow-On mission options. Three scenarios were examined: 1) a QuikSCAT Replacement mission with capabilities commensurate to QuikSCAT, 2) a next-generation Extended Ocean Vector Winds Mission (XOVWM), as recommended in the National Research Council s decadal survey to provide significantly improved all-weather, allwind, high spatial resolution measurements, and 3) an XOVWM Constellation consisting of two XOVWM observatories to provide improved temporal resolution. In parallel, NOAA asked its users to provide a quantitative assessment of each option s benefit to NOAA. This report presents the JPL design, risk assessment, and cost for each of three options, together with a summary of the NOAA users benefit assessment. The report concludes that though all options are technically feasible for immediate implementation and have a risk posture consistent with a NOAA operational mission, the XOVWM options provide significant observational benefits. While a QuikSCAT Replacement option would continue current operational measurement capabilities, there is a strong and clearly defined operational need for improved capabilities in high winds (e.g., hurricanes or extra-tropical cyclones), heavy precipitation, and near coasts to enable significantly improved severe storm and coastal hazard forecasts, which are provided only by the XOVWM options.
Author
Mission Planning; Quikscat Satellite; Remote Sensing; Ocean Surface; Wind Measurement

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*.

20080016638 MacMillan, Sobanski and Todd, LLC, Toledo, OH, USA; Toledo Univ., OH, USA
Integrated Photoelectrochemical Cell and System Having a Solid Polymer Electrolyte
Deng, X., Inventor; Xu, L., Inventor; May 23, 2005; 16 pp.; In English
Contract(s)/Grant(s): NREL-NDJ-1-30630-08; ARL-WPAFB
Patent Info.: Filed Filed 23 May 05; US-Patent-Appl-SN-11-134 928
Report No.(s): PB2007-104796; No Copyright; Avail.: CASI: A03, Hardcopy

A photoelectrochemical (PEC) cell includes a photovoltaic electrode that generates voltage under radiation; a solid membrane electrode assembly that includes at least one solid polymer electrolyte and first and second electrodes; a mechanism that collect gases from oxidation and reduction reactions; and an electrical connection between the photovoltaic electrode and the solid membrane electrode assembly. A PEC system and a method of making such PEC cell and PEC system are also disclosed.
NTIS
Patent Applications; Photoelectrochemical Devices; Photoelectrochemistry; Solid Electrolytes; Systems Integration

20080016700 New Orleans Univ., LA, USA; California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
TEM Studies of Carbon Coated LiFePO4 after Charge Discharge Cycling
Gabrisch, H.; Wilcox, J.; Doeff, M.; Jan. 01, 2007; 8 pp.; In English
Report No.(s): DE2007-902456; No Copyright; Avail.: Department of Energy Information Bridge

Carbon coating has proven to be a successful approach to improve the rate capability of LiFePO4 used in rechargeable Li-ion batteries. Investigations of the microstructure of carbon coated LiFePO4 after charge discharge cycling shows that the carbon surface layer remains intact over 100 cycles. We find micro cracks in the cycled material that extend parallel to low indexed lattice planes. Our observations differ from observations made by other authors. However the differences between the orientations of crack surfaces in both studies can be reconciled considering the location of weak bonds in the unit cell and specimen geometry as well as elastic stress fields of dislocation.
NTIS
Carbon; Coatings; Cycles; Lithium Batteries

20080016712 Lockheed Martin Corp., Schenectady, NY, USA
Tandem Filer Development for Thermophotovoltaic Energy Conversion from January 2003 to February 2006
Fourspring, P. M.; Mar. 19, 2007; 76 pp.; In English
Report No.(s): DE2007-903185; LM-07K001B; No Copyright; Avail.: National Technical Information Service (NTIS)

The intent of this report is to summarize the tandem filter development for spectral control of thermophotovoltaic energy conversion from January 2003 to the termination of the program in February 2006 and to closeout tandem filter development in order to capture the knowledge gained from the development effort. Over the last three years, the goals of the tandem filter development have been the following: (1) Study the limits of the design of the interference optical coatings component of a tandem filter in order to develop higher performance designs; (2) Enhance the fabrication process of the optical interference coatings to increase the fidelity with the intended design and allow more complex, higher performing designs; (3) Support TPV module testing by providing tandem filters and assembly assistance; (4) Identify and develop materials for optical interference coatings that are stable at higher temperatures than current materials; and (5) Improve the understanding of the directional and spectral reflectance and transmittance characterization of the completed tandem filters to insure the veracity of the characterization data and to provide useful feedback to the tandem filter development process.
NTIS
Energy Conversion; Thermophotovoltaic Conversion; Filters; Product Development; Thermal Energy

20080016718
Jobs and Renewable Energy Project. Final Technical Report
Sterzinger, G.; Dec. 01, 2006; 18 pp.; In English
Report No.(s): DE2007-899887; No Copyright; Avail.: Department of Energy Information Bridge

Early in 2002, REPP developed the Jobs Calculator, a tool that calculates the number of direct jobs resulting from

renewable energy development under RPS (Renewable Portfolio Standard) legislation or other programs to accelerate renewable energy development. The calculator is based on a survey of current industry practices to assess the number and type of jobs that will result from the enactment of a RPS. This project built upon and significantly enhanced the initial Jobs Calculator model by (1) expanding the survey to include other renewable technologies (the original model was limited to wind, solar PV and biomass co-firing technologies); (2) more precisely calculating the economic development benefits related to renewable energy development; (3) completing and regularly updating the survey of the commercially active renewable energy firms to determine kinds and number of jobs directly created; and (4) developing and implementing a technology to locate where the economic activity related to each type of renewable technology is likely to occur. REPP worked directly with groups in the State of Nevada to interpret the results and develop policies to capture as much of the economic benefits as possible for the state through technology selection, training program options, and outreach to manufacturing groups.
NTIS
Calculators; Renewable Energy; Solar Energy; Tasks

20080016987 Dexter Magnetic Technologies, Inc., Elk Grove, IL, USA
Development of a High-Pressure/High-Temperature Downhole Turbine Generator. Phase 1 Final Report October 1, 2005 - February 1, 2007
Price, T. F.; Mar. 27, 2007; 23 pp.; In English
Contract(s)/Grant(s): DE-FC26-05NT42655
Report No.(s): DE2007-903397; No Copyright; Avail.: Department of Energy Information Bridge

The objective of this project as originally outlined has been to achieve a viable downhole direct current (DC) power source for extreme high pressure, high temperature (HPHT) environments of >25,000 psi and >250DG C. The Phase I investigation posed and answered specific questions about the power requirements, mode of delivery and form factor the industry would like to see for HPHT downhole DC power. Phase I also investigated the viability of modifying a commercial downhole turbine generator tool for the HPHT environment, and noted specific components, materials and design features of that commercial system that will require upgrading to meet the HPHT project goals. During the course of Phase I investigation the scope of the project was expanded, without additional cost expected to the project, to include the addition of HT batteries to the power supply platform.
NTIS
Drills; High Pressure; High Temperature; Turbines

20080017101 General Electric Corp. and Development, Niskayuna, NY, USA
High Temperature Battery System for Hybrid Locomotive and Offhighway Vehicles
Salasoo, L., Inventor; King, R. D., Inventor; Kumar, A. K., Inventor; 2 Jul 04; 23 pp.; In English
Contract(s)/Grant(s): DE-FC04-2002AL68284
Patent Info.: Filed Filed 2 Jul 04; US-Patent-Appl-SN-10-884-501
Report No.(s): PB2007-109423; No Copyright; Avail.: CASI: A03, Hardcopy

An electric storage battery system carried on a hybrid energy off-highway vehicle including wheels for supporting and moving the vehicle, an electrical power generator, and traction motors for driving the wheels, with electrical power generated on the vehicle being stored at selected times in the electric storage battery system and discharged from the electric storage battery system for transmission to the traction motors to propel the vehicle, with the vehicle and battery system being exposed to a range of environmental conditions is provided. The storage battery system includes at least one battery for storing and releasing electrical power, wherein the at least one battery generates an internal battery operating temperature that is independent of and exceeds the highest environmental temperature of the vehicle and the at least one battery.
NTIS
Electric Batteries; Electric Motor Vehicles; High Temperature; Locomotives; Patent Applications

20080017289 Department of Energy, Washington, DC, USA
Basic Research Needs for Solar Energy Utilization: Report of the Basic Energy Sciences Workshop on Solar Energy Utilization. Held on April 18-21, 2005
Apr. 2005; 276 pp.; In English
Report No.(s): PB2007-111449; No Copyright; Avail.: National Technical Information Service (NTIS)

World demand for energy is projected to more than double by 2050 and to more than triple by the end of the century. Incremental improvements in existing energy networks will not be adequate to supply this demand in a sustainable way.

Finding sufficient supplies of clean energy for the future is one of societys most daunting challenges. Sunlight provides by far the largest of all carbon-neutral energy sources. More energy from sunlight strikes the Earth in one hour (4.3 OE 1020 J) than all the energy consumed on the planet in a year (4.1 OE 1020 J). We currently exploit this solar resource through solar electricity a $7.5 billion industry growing at a rate of 3540% per annum and solar-derived fuel from biomass, which provides the primary energy source for over a billion people. Yet, in 2001, solar electricity provided less than 0.1% of the world's electricity, and solar fuel from modern (sustainable) biomass provided less than 1.5% of the world's energy. The huge gap between our present use of solar energy and its enormous undeveloped potential defines a grand challenge in energy research. Sunlight is a compelling solution to our need for clean, abundant sources of energy in the future. It is readily available, secure from geopolitical tension, and poses no threat to our environment through pollution or to our climate through greenhouse gases. This report of the Basic Energy Sciences Workshop on Solar Energy Utilization identifies the key scientific challenges and research directions that will enable efficient and economic use of the solar resource to provide a significant fraction of global primary energy by the mid 21st century. The report reflects the collective output of the workshop attendees, which included 200 scientists representing academia, national laboratories, and industry in the USA and abroad, and the U.S. Department of Energys Office of Basic Energy Sciences and Office of Energy Efficiency and Renewable Energy. Solar energy conversion systems fall into three categories according to their primary energy product: solar electricity, solar fuels, and solar thermal systems. Each of the three generic approaches to exploiting the solar resource has untapped capability well beyond its present usage. Workshop participants considered the potential of all three approaches, as well as the potential of hybrid systems that integrate key components of individual technologies into novel cross-disciplinary paradigms.
NTIS
Energy Technology; Research; Solar Energy; Solar Energy Conversion

45
ENVIRONMENT POLLUTION

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

20080016631 California Univ., Riverside, CA, USA
Evaluation of Mechanisms of Exhaust Intrusion into School Buses and Feasible Mitigation Measures
Fitz, D. R.; Winer, A. M.; Jan. 01, 2006; 102 pp.; In English
Contract(s)/Grant(s): ARB-03-343
Report No.(s): PB2007-107341; No Copyright; Avail.: CASI: A06, Hardcopy

Self-pollution, the intrusion of a bus's own exhaust into the bus cabin, leads under some conditions to very high exposures. This study attempted to elucidate how and where self- pollution occurs, and to test various methods to mitigate this phenomenon. The mechanism of self-pollution was investigated by evaluating the magnitude of exhaust system leaks, searching for exhaust entry points using a tracer gas, and determining the overall leak rate of the bus cabin. Comprehensive detection of leaks in the exhaust system using SO2 from the exhaust as a tracer gas and a survey of leak potential using back pressure measurements showed that exhaust system leaks in a well-maintained system were insignificant. However, identifying specific exhaust entry points into the passenger compartment using tracer gas was found to be infeasible due to the large number of potential entry points. To quantify overall air tightness of cabins, the leak rate of 17 buses was evaluated by pressurizing them with an air blower with a constant flow rate and measuring the pressure differential between the inside and outside of the bus (blower door method). Pressure differentials ranged over a factor of five, but in general, newer buses showed lower leak rates.
NTIS
Air Pollution; Exhaust Emission; Intrusion; Pollution Control; Schools

20080016661 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Accuracy of CO2 Sensors in Commercials Buildings: A Pilot Study
Fisk, W. J.; Faulkner, D.; Sullivan, D. P.; Oct. 01, 2006; 11 pp.; In English
Contract(s)/Grant(s): DE-AC02-05CH11231
Report No.(s): DE2007-902450; LBNL-61862; No Copyright; Avail.: Department of Energy Information Bridge

Carbon dioxide (CO(2)) sensors are often deployed in commercial buildings to obtain CO(2) data that are used to automatically modulate rates of outdoor air supply. The goal is to keep ventilation rates at or above code requirements, but to also to save energy by avoiding over-ventilation relative to code requirements. However, there have been many anecdotal reports of poor CO(2) sensor performance in actual commercial building applications. This study evaluated the accuracy of

44 CO(2) sensors located in nine commercial buildings to determine if CO(2) sensor performance, in practice, is generally acceptable or problematic. CO(2) measurement errors varied widely and were sometimes hundreds of parts per million. Despite its small size, this study provides a strong indication that the accuracy of CO(2) sensors used in commercial buildings is frequently less than is needed to measure peak indoor-outdoor CO(2) concentration differences with less than a 20% error. Thus, we conclude that there is a need for more accurate CO(2) sensors and/or better sensor maintenance or calibration procedures.
NTIS
Accuracy; Buildings; Carbon Dioxide

20080016691 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Evaluation of a Combined Ultraviolet Photocatalytic Oxidation (UVPCO)/Chemisorbent Air Cleaner for Indoor Air Applications
Hodgson, A. T.; Destaillats, H.; Hotchi, T.; Fisk, W. J.; Jan. 27, 2007; 74 pp.; In English
Report No.(s): DE2007-903045; LBNL-62202; No Copyright; Avail.: National Technical Information Service (NTIS)

We previously reported that gas-phase byproducts of incomplete oxidation were generated when a prototype ultraviolet photocatalytic oxidation (UVPCO) air cleaner was operated in the laboratory with indoor-relevant mixtures of VOCs at realistic concentrations. Under these conditions, there was net production of formaldehyde and acetaldehyde, two important indoor air toxicants. Here, we further explore the issue of byproduct generation. Using the same UVPCO air cleaner, we conducted experiments to identify common VOCs that lead to the production of formaldehyde and acetaldehyde and to quantify their production rates. We sought to reduce the production of formaldehyde and acetaldehyde to acceptable levels by employing different chemisorbent scrubbers downstream of the UVPCO device. Additionally, we made preliminary measurements to estimate the capacity and expected lifetime of the chemisorbent media. For most experiments, the system was operated at 680-780 m3/h (400-460 cfm). A set of experiments was conducted with common VOCs introduced into the UVPCO device individually and in mixture. Compound conversion efficiencies and the production of formaldehyde and acetaldehyde were determined by comparison of compound concentrations upstream and downstream of the reactor. There was general agreement between compound conversions efficiencies determined individually and in the mixture. This suggests that competition among compounds for active sites on the photocatalyst surface will not limit the performance of the UVPCO device when the total VOC concentration is low. A possible exception was the very volatile alcohols, for which there were some indications of competitive adsorption. The results also showed that formaldehyde was produced from many commonly encountered VOCs, while acetaldehyde was generated by specific VOCs, particularly ethanol. The implication is that formaldehyde concentrations are likely to increase when an effective UVPCO air cleaner is used in buildings containing typical VOC sources. The magnitude of the expected increase will depend upon a number of interrelated factors.
NTIS
Air Filters; Air Pollution; Air Purification; Air Quality; Indoor Air Pollution; Organic Compounds; Oxidation; Pollution Control

20080016701 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA; Harvard School of Public Health, Boston, MA, USA; Helsinki Univ. of Technology, Espoo, Finland; Environmental Protection Agency, Washington, DC USA
Risk Factors in Heating, Ventilating, and Air-Conditioning Systems for Occupant Symptoms in U.S. Office Buildings; the EPA Base Study
Mendell, M. J.; Lei-Gomez, Q.; Mirer, A.; Seppanen, O.; Brunner, G.; Oct.. 01, 2006; 31 pp.; In English
Contract(s)/Grant(s): DE-AC02-05CH11231
Report No.(s): DE2007-902452; LBNL-61870; No Copyright; Avail.: Department of Energy Information Bridge

Nonspecific building-related symptoms among occupants of modern office buildings worldwide are common and may be associated with important reductions in work performance, but their etiology remains uncertain. Characteristics of heating, ventilating, and air-conditioning (HVAC) systems in office buildings that increase risk of indoor contaminants or reduce effectiveness of ventilation may cause adverse exposures and subsequent increase in these symptoms among occupants. We analyzed data collected by the U.S. EPA from a representative sample of 100 large U.S. office buildings--the Building Assessment and Survey Evaluation (BASE) study--using multivariate logistic regression models with generalized estimating equations adjusted for potential personal and building confounders. We estimated odds ratios (ORs) and 95% confidence intervals (CIs) for associations between seven building-related symptom outcomes and selected HVAC system characteristics.
NTIS
Air Conditioning; Air Conditioning Equipment; Air Pollution; Buildings; Environmental Quality; Heating; Indoor Air Pollution; Risk; Signs and Symptoms; Surveys; Ventilation

20080016724 Fluor Daniel Hanford, Inc., Richland, WA, USA

Technical Evaluation of the Safe Transportation of Waste Containers Coated with Polyurea

Vail, T. S.; Mar. 30, 2007; 66 pp.; In English

Report No.(s): DE2007-901915; HNF-32146; No Copyright; Avail.: Department of Energy Information Bridge

This technical report is to evaluate and establish that the transportation of waste containers (e.g. drums, wooden boxes, fiberglass-reinforced plywood (FRP) or metal boxes, tanks, casks, or other containers) that have an external application of polyurea coating between facilities on the Hanford Site can be achieved with a level of onsite safety equivalent to that achieved offsite. Utilizing the parameters, requirements, limitations, and controls described in the DOE/RL-2001-36, Hanford Sitewide Transportation Safety Document (TSD) and the Department of Energy Richland Operations (DOE-RL) approved package specific authorizations (e.g. Package Specific Safety Documents (PSSDs), One-Time Requests for Shipment (OTRSs), and Special Packaging Authorizations (SPAS)) this evaluation concludes that polyurea coatings on packages does not impose an undue hazard for normal and accident conditions. This technical report reviews the transportation of waste packages coated with polyurea and does not credit the polyurea with enhancing the structural, thermal, containment, shielding, criticality, or gas generating posture of a package.

NTIS

Coatings; Radioactive Wastes; Safety; Transportation

20080016739 EC/R, Inc., Durham, NC, USA

National Standards for Hazardous Air Pollutants (NESHAP) for the Chlorine Production Industry: Summary of Public Comments and Responses

Aug. 01, 2003; 36 pp.; In English

Report No.(s): PB2007-111097; EPA/453/R-03-011; No Copyright; Avail.: CASI: A03, Hardcopy

On July 3,2002, the U.S. Environmental Protection Agency (EPA) proposed their decision not to regulate chlorine and hydrochloric acid emissions from chlorine production (67 FR 44713) under the authority of section 112(d)(4) of the Clean Air Act (CAA). Public comments were requested on the proposed decision in the Federal Register. Eight letters were received from industry representatives, governmental entities, and environmental groups during the public comment period. The report presents a list of the commenters, their affiliations, and the EPA docket number assigned to their correspondence. The written comments that were submitted, along with responses to these comments, are summarized in section 2..0 of this document. The summary of comments and responses serves as the basis for the final decision not to regulate chlorine and hydrochloric acid emissions from the chlorine production source category.

NTIS

Air Pollution; Chlorine; Hydrochloric Acid; Standards

20080016740 California Dept. of Health Services, Richmond, CA, USA

Determination of Asbestos Content of Current Automotive Dry Friction Materials, and the Potential Contribution of Asbestos to Particulate Matter Derived From Brake Wear

Wall, S.; Apr. 01, 2007; 148 pp.; In English

Contract(s)/Grant(s): ARB-01-333

Report No.(s): PB2007-109545; No Copyright; Avail.: CASI: A07, Hardcopy

Motor vehicle brake dust emission rates and brake friction material inventories of asbestos, a known carcinogen, are currently largely unknown. Assessment of the potential health effect consequences from asbestos brake friction materials (BFM) requires the identification of the asbestos fiber type and classification of fiber size, as well as, the determination of the asbestos concentration in brake dust emissions. Field collection of used brake shoes from likely target vehicles indicates that very high levels of chrysotile asbestos (20-60% by mass) are still present in brake friction material (BFM) for some models, primarily in rear drum brakes. Similar to deposited dust collected from the braking system surfaces of these target vehicles, air emissions for a test vehicle operating over standard dynamometer emission cycles contained chrysotile fibers < 10 micron length. Due to apparent frictional heating effects, less than 1% of the asbestos mass originally present in the BFM can be identified in both the deposited brake dust, and the airborne brake dust emission during test vehicle chassis dynamometer driving cycles. However, health effects concerns associated with the measurable level of small asbestos fibers in the air emissions may warrant early brake replacement, before warranted by wear, with the now widely available non-asbestos BFM, for a group of target vehicles, with brake shoes installed before calendar year 2000.

NTIS

Air Pollution; Asbestos; Automobiles; Friction; Particulates; Wear; Braking

20080016782 National Renewable Energy Lab., Golden, CO USA

Costs and Emissions Associated with Plug-In Hybrid Electric Vehicle Charging in the Xcel Energy Colorado Service Territory

Parks, K.; Denholm, P.; Markel, T.; May 01, 2007; 29 pp.; In English

Contract(s)/Grant(s): DE-AC36-99-GO10337

Report No.(s): DE2007-903293; NREL/TP-640-41410; No Copyright; Avail.: National Technical Information Service (NTIS)

The combination of high oil costs, concerns about oil security and availability, and air quality issues related to vehicle emissions are driving interest in plug-in hybrid electric vehicles (PHEVs). PHEVs are similar to conventional hybrid electric vehicles, but feature a larger battery and plug-in charger that allows electricity from the grid to replace a portion of the petroleum-fueled drive energy. PHEVs may derive a substantial fraction of their miles from grid-derived electricity, but without the range restrictions of pure battery electric vehicles. As of early 2007, production of PHEVs is essentially limited to demonstration vehicles and prototypes. However, the technology has received considerable attention from the media, national security interests, environmental organizations, and the electric power industry. The use of PHEVs would represent a significant potential shift in the use of electricity and the operation of electric power systems. Electrification of the transportation sector could increase generation capacity and transmission and distribution (T&D) requirements, especially if vehicles are charged during periods of high demand. This study is designed to evaluate several of these PHEV-charging impacts on utility system operations within the Xcel Energy Colorado service territory.

NTIS

Air Pollution; Costs; Electric Motor Vehicles; Pollution Control

20080016788 Westinghouse Savannah River Co., Aiken, SC, USA

Preliminary Nuclear Criticality Safety Evaluation for the Container Surveillance and Storage Capability (CSSC) Project

Miller, M. L.; Reilly, T. A.; Low, J. M.; Jan. 01, 2007; 10 pp.; In English

Report No.(s): DE2007-903400; WSRC-STI-2007-00228; No Copyright; Avail.: Department of Energy Information Bridge

Washington Safety Management Solutions (WSMS) provides criticality safety services to Washington Savannah River Company (WSRC) at the Savannah River Site. One activity at SRS is the Container Surveillance and Storage Capability (CSSC) Project, which will perform surveillances on 3013 containers (hereafter referred to as 3013s) to verify that they meet the Department of Energy (DOE) Standard (STD) 3013(1) for plutonium storage. The project will handle quantities of material that are greater than ANS/ANSI-8.1(2) single parameter mass limits, and thus required a Nuclear Criticality Safety Evaluation (NCSE). The WSMS methodology for conducting an NCSE is outlined in the WSMS methods manual(3). The WSMS methods manual currently follows the requirements of DOE-O-420.1B(4), DOE-STD-3007-2007(5), and the Washington Savannah River Company (WSRC) SCD-3(6) manual. DOESTD-3007-2007 describes how a NCSE should be performed, while DOE-O-420.1B outlines the requirements for a Criticality Safety Program (CSP). The WSRC SCD-3 manual implements DOE requirements and ANS standards. NCSEs do not address the Nuclear Criticality Safety (NCS) of non-reactor nuclear facilities that may be affected by overt or covert activities of sabotage, espionage, terrorism or other security malevolence. Events which are beyond the Design Basis Accidents (DBAs) are outside the scope of a double contingency analysis.

NTIS

Radiation Protection; Radioactive Wastes; Safety; Surveillance

20080016789 Westinghouse Savannah River Co., Aiken, SC, USA

Aging Performance of Viton (Trade Name) GLT O-Rings in Radioactive Material Packages

Skidmore, T. E.; Counts, K. M.; Fox, E. B.; Hoffman, E. N.; Dunn, K. A.; Jan. 01, 2007; 6 pp.; In English

Report No.(s): DE2007-903405; WSRC-STI-2007-00199; No Copyright; Avail.: National Technical Information Service (NTIS)

Radioactive material packages used for transportation of plutonium-bearing materials often contain multiple O-ring seals for containment. Packages such as the Model 9975 are also being used for interim storage of Pu-bearing materials at the Savannah River Site (SRS). One of the seal materials used in such packages is Viton GLT fluoroelastomer. The aging behavior of containment vessel O-rings based on Viton GLT at long-term containment term storage conditions is being characterized to assess its performance in such applications. This paper summarizes the program and test results to date.

NTIS

O Ring Seals; Radioactive Materials; Seals (Stoppers); Viton Rubber (Trademark)

20080016799 Nature Conservancy, Arlington, VA, USA

Application and Development of Appropriate Tools and Technologies for Cost-Effective Carbon Sequestration

Stanley, B.; Brown, S.; Gonzalez, P.; Sohngen, B.; Sampson, N.; Apr. 01, 2007; 39 pp.; In English

Contract(s)/Grant(s): DE-FC-26-01NT41151

Report No.(s): DE2007-902894; No Copyright; Avail.: National Technical Information Service (NTIS)

The Nature Conservancy is participating in a Cooperative Agreement with the Department of Energy (DOE) National Energy Technology Laboratory (NETL) to explore the compatibility of carbon sequestration in terrestrial ecosystems and the conservation of biodiversity. The title of the research project is Application and Development of Appropriate Tools and Technologies for Cost-Effective Carbon Sequestration. The objectives of the project are to: (1) improve carbon offset estimates produced in both the planning and implementation phases of projects; (2) build valid and standardized approaches to estimate project carbon benefits at a reasonable cost; and (3) lay the groundwork for implementing cost-effective projects, providing new testing ground for biodiversity protection and restoration projects that store additional atmospheric carbon. This Technical Progress Report discusses preliminary results of the six specific tasks that The Nature Conservancy is undertaking to answer research needs while facilitating the development of real projects with measurable greenhouse gas reductions. The research described in this report occurred between January 1st and March 31st 2007. The specific tasks discussed include: Task 1: carbon inventory advancements; Task 2: emerging technologies for remote sensing of terrestrial carbon; Task 3: baseline method development; Task 4: third-party technical advisory panel meetings; Task 5: new project feasibility studies; and Task 6: development of new project software screening tool.

NTIS

Carbon; Cost Effectiveness; Carbon Dioxide Removal

20080016812 Sandia National Labs., Albuquerque, NM USA

Verification and Validation Benchmarks

Oberkampf, W. L.; Trucano, T. G.; Feb. 01, 2007; 67 pp.; In English

Contract(s)/Grant(s): DE-AC04-94AL85000

Report No.(s): DE2007-901974; SAND2007-0853; No Copyright; Avail.: Department of Energy Information Bridge

Verification and validation (V&V) are the primary means to assess the accuracy and reliability of computational simulations. V&V methods and procedures have fundamentally improved the credibility of simulations in several high-consequence fields, such as nuclear reactor safety, underground nuclear waste storage, and nuclear weapon safety. Although the terminology is not uniform across engineering disciplines, code verification deals with assessing the reliability of the software coding, and solution verification deals with assessing the numerical accuracy of the solution to a computational model. Validation addresses the physics modeling accuracy of a computational simulation by comparing the computational results with experimental data. Code verification benchmarks and validation benchmarks have been constructed for a number of years in every field of computational simulation. However, no comprehensive guidelines have been proposed for the construction and use of V&V benchmarks. For example, the field of nuclear reactor safety has not focused on code verification benchmarks, but it has placed great emphasis on developing validation benchmarks. Many of these validation benchmarks are closely related to the operations of actual reactors at near-safety-critical conditions, as opposed to being more fundamental-physics benchmarks. This paper presents recommendations for the effective design and use of code verification benchmarks based on manufactured solutions, classical analytical solutions, and highly accurate numerical solutions.

NTIS

Radioactive Wastes; Waste Disposal

20080016988 Western Kentucky Univ., Bowling Green, KY, USA

Establishment of an Environmental Control Technology Laboratory with a Circulating Fluidized-Bed Combustion System. Quarterly Technical Progress Report. January 1-March 31, 2007

Pan, W. P.; Cao, Y.; Smith, J.; Apr. 01, 2007; 25 pp.; In English

Contract(s)/Grant(s): DE-FC26-03NT41840

Report No.(s): DE2007-902975; No Copyright; Avail.: National Technical Information Service (NTIS)

This report is to present the progress made on the project entitled Establishment of an Environmental Control Technology Laboratory (ECTL) with a Circulating Fluidized-Bed Combustion (CFBC) System during the period January 1, 2007 through March 31, 2007. The effort in this quarter has concentrated on installing the CFBC Facility and for conducting cold fluidization operations tests in the CFBC facility. The assembly of the ash recirculation pipe duct from the cyclones back to the bed area of the combustor, including the upper and lower loop seals was completed. The electric bed pre-heater was installed to heat the fluidizing air as it enters the wind box. The induced draft fan along with its machine base and power supply was received

and installed. The flue gas duct from secondary cyclone outlet to induced draft fan inlet was received and installed, as well as the induced fan flue gas discharge duct. Pressure testing from the forced draft fan to the outlet of the induced fan was completed.
NTIS
Circulation; Combustion; Environmental Control

20080016991 Great River Energy, Underwood, ND, USA
Lignite Fuel Enhancement
Bullinger, C.; Apr. 05, 2007; 10 pp.; In English
Contract(s)/Grant(s): DE-FC26-04NT41763
Report No.(s): DE2007-902087; No Copyright; Avail.: Department of Energy Information Bridge
This 11th quarterly Technical Progress Report for the Lignite Fuel Enhancement Project summarizes activities from January 1st through March 31st of 2007. It summarizes the completion of the Prototype testing activity and initial full-scale dryer design, Budget Period 2 activity during that time period.
NTIS
Augmentation; Coal; Drying Apparatus; Lignite

20080017069 ENVIRON International Corp., Novato, CA USA
Speed Enhancements for CAMx Probing Tools
Emery, C.; Wilson, G.; Yarwood, G.; Jun. 07, 2007; 20 pp.; In English
Contract(s)/Grant(s): A-63
Report No.(s): PB2007-112253; CRC-A-63; No Copyright; Avail.: CASI: A03, Hardcopy
The objective of this project was to continue to revise the Comprehensive Air Quality Model with extensions (CAMx) so that multiple computer processors can be used to increase the speed of model simulations that involve Probing Tools. The multi-processor capability implemented in this revision uses the Message Passing Interface (MPI) protocol that allows multiple networked computers to share the load in integrating the model solution. Past support by the Midwest Ozone Group (MOG) and the U.S. Environmental Protection Agency (EPA) allowed us to incorporate multi-processing into the core model. This work sponsored by the CRC extended multi-processing to the source apportionment (SA) and decoupled direct method (DDM) components of the model. The work was arranged according to the following three tasks: (1) initial MPI implementation in the Probing Tools; (2) MPI refinements and optimization; and (3) guidance and documentation. The product of this task is this final report and the delivery of the next generation of the CAMx/MPI beta version.
NTIS
Air Pollution; Air Quality; Atmospheric Models; Augmentation; Diffusion; Environment Models; Pollution Monitoring; Mathematical Models

20080017070 Atmospheric and Environmental Research, Inc., Lexington, MA, USA
Feasibility of Using Satellite Data in Air Quality Modeling
Vijayaraghavan, K.; Snell, H. E.; Seigneur, C.; Jun. 01, 2007; 62 pp.; In English
Contract(s)/Grant(s): A-61
Report No.(s): PB2007-112254; CRC-A-61; No Copyright; Avail.: CASI: A04, Hardcopy
The results of computer simulations of air pollution are usually evaluated by comparison with measurements near the ground and, occasionally, from aircraft and balloons. Over the past decade, several satellites have been launched that measure atmospheric constituents over the Earth using remote sensing devices. This report investigates the feasibility of using such data to evaluate air quality modeling results and to improve the quality of future simulations.
NTIS
Air Quality; Cloud Cover; Environment Models; Satellite Observation; Spatial Distribution; Atmospheric Models; Remote Sensing; Earth Orbits

20080017077 Lawrence Livermore National Lab., Livermore, CA USA
LLNL NESHAPs 2005 Annual Report
Jan. 01, 2007; 46 pp.; In English
Report No.(s): DE2007-898472; UCRL-TR-113867-06; No Copyright; Avail.: Department of Energy Information Bridge
This annual report is prepared pursuant to the National Emission Standards for Hazardous Air Pollutants (NESHAPs; Title

40 Code of Federal Regulations (CFR) Part 61, Subpart H). Subpart H governs radionuclide emissions to air from Department of Energy (DOE) facilities. NESHAPs limits the emission of radionuclides to the ambient air from DOE facilities to levels resulting in an annual effective dose equivalent (EDE) of 10 mrem (100 (micro)Sv) to any member of the public. The EDEs for the Lawrence Livermore National Laboratory (LLNL) site-wide maximally exposed members of the public from operations in 2005 are summarized here. Livermore site: 0.0065 mrem (0.065 (micro)Sv) (41% from point source emissions, 59% from diffuse source emissions). The point source emissions include gaseous tritium modeled as tritiated water vapor as directed by EPA Region IX; the resulting dose is used for compliance purposes. Site 300: 0.018 mrem (0.18 (micro)Sv) (48% from point source emissions, 52% from diffuse source emissions). The EDEs were calculated using the EPA-approved CAP88-PC air dispersion/dose-assessment model, except for doses for two diffuse sources that were estimated using measured radionuclide concentrations and dose coefficients. Specific inputs to CAP88-PC for the modeled sources included site-specific meteorological data and source emissions data, the latter variously based on continuous stack effluent monitoring data, stack flow or other release-rate information, ambient air monitoring data, and facility knowledge.
NTIS
Air Pollution; Exhaust Emission; Exhaust Gases; Pollution Control; Standards; Research Facilities

20080017288 California Univ., Riverside, CA USA
Polycyclic Aromatic Hydrocarbons (PAHs): Sources of Ambient Quinones
Arey, J.; Atkinson, R.; May 2007; 148 pp.; In English
Contract(s)/Grant(s): CARB-03-314
Report No.(s): PB2007-111439; No Copyright; Avail.: CASI: A07, Hardcopy

It has been hypothesized that much of the high morbidity and mortality associated with fine particulate matter is due to quinones, such as 9,10-phenanthrenequinone, which have the ability to form reactive oxygen species (ROS) and cause oxidative stress. During this experimental program, we used the facilities and expertise available at the Air Pollution Research Center, University of California, Riverside, to investigate atmospheric reactions of alkylnaphthalenes and phenanthrene and to assess their potential to contribute to the ambient PAH-quinone burden. Based on our measured yields, calculations suggest that daytime OH radical-initiated and nighttime NO3 radical-initiated reactions of gas-phase phenanthrene will be significant sources of 9,10-phenanthrenequinone in ambient atmospheres. In contrast, the ozone reaction with phenanthrene is unlikely to contribute significantly to ambient 9,10- phenanthrenequinone. The high yield (>30%) of 9,10-phenanthrenequinone from the NO3 radical-initiated reaction implies the potential for high concentrations of this quionone to be formed in areas where nighttime NO3 radical chemistry is important, such as Southern California.Hydroxyl radical-initiated reactions of naphthalene, naphthalene-d8, 1- and 2- methylnaphthalene (1- and 2-MN), 1- and 2-ethylnaphthalene (1- and 2-EN) and the 10 isomeric dimethylnaphthalenes (DMNs) were conducted in a large volume Teflon chamber with analysis by atmospheric pressure ionization mass spectrometry (API-MS). Quinone products were very minor, but the major products were ring-opened dicarbonyls that are 32 mass units higher in molecular weight than the parent compound, one or more ring-opened dicarbonyls of lower molecular weight resulting from loss of two a-carbons and associated alkyl groups, and ringcontaining compounds that may be epoxides. The isomer-specific identifications and, importantly, the genotoxicity of these novel oxygenated species should be determined as well as their presence in ambient atmospheres. Gas-phase NO3 radical-initiated reactions of naphthalene, the MNs, ENs and DMNs were conducted, and for the first time, the dimethylnitronaphthalene and ethylnitronaphthalene isomers formed were identified and their yields measured. Radicalinitiated reactions of a mixture of ENs/DMNs proportioned to mimic ambient concentrations gave profiles of the ENNs and DMNNs expected to be formed from OH and NO3 radicalinitiated reactions. Comparing these ENN/DMNN profiles with those from ambient samples collected in Mexico City, Mexico, Riverside, CA and Redlands, CA, it is apparent that the nitro- PAH formation in Mexico City was dominated by OH radical reaction, while the ENN/DMNN profiles from Southern California could only be explained by the occurrence of nighttime NO3 radical chemistry. This research suggests that nighttime NO3 chemistry can be a significant source of toxic nitro-PAHs and PAH-quinones in ambient atmospheres.
NTIS
Hydrocarbons; Particulates; Polycyclic Aromatic Hydrocarbons; Quinones

20080017296 Environmental Protection Agency, Research Triangle Park, NC USA
MARKAL Scenario Analyses of Technology Options for the Electric Sector: The Impact on Air Quality
Johnson, T. L.; DeCarolis, J. F.; Shay, C. L.; Loughlin, D. H.; Gage, C. L.; Sep. 2006; 110 pp.; In English
Report No.(s): PB2007-111672; EPA/600/R-06/114; No Copyright; Avail.: National Technical Information Service (NTIS)

The report first provides a general overview of EPA's national MARKAL database and energy systems model (EPANMD) and presents results for the business as usual (BAU) baseline scenario. Under baseline assumptions, total electricity use

increases 1.3% annually from 13,378 PJ in 2000 to 19,622 PJ in 2030. Annual growth in electricity demand varies between 1.0% in the residential sector, to 2.1% in the commercial and 1.5% in the industrial sectors of the U.S. economy. A total of 293 GW of new electric generation capacity is added between 2000 and 2030 to meet this growth. More than 76% of the new capacity is natural gas technologies, with 61% being natural gas combined cycle and 15% being natural gas combustion turbines. New conventional coal-fired power plants are not added until 2020, though a small amount of integrated gasification combined cycle generation comes on-line in 2015. Renewables add 34 GW of capacity, with 61% coming from wind power generation, 15% from biomass combined cycle, and 14% from geothermal.
NTIS
Air Quality; Electric Generators

20080017297 Environmental Quality Management, Inc., Durham, NC, USA
Guidance for Evaluating Landfill Gas Emissions from Closed or Abandoned Facilities
Robertson, T.; Dunbar, J.; Sep. 2005; 306 pp.; In English
Report No.(s): PB2007-111680; No Copyright; Avail.: National Technical Information Service (NTIS)

The purpose of this guidance document is to provide the remedial project manager (RPM), the on-scene coordinator (OSC), and potentially responsible parties (PRPs) with a set of procedures and tools for evaluating the health and safety impacts of landfill gas (LFG) emissions from closed or abandoned co-disposal landfills under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); the Superfund Amendments and Reauthorization Act (SARA); and the Resource Conservation of Recovery Act (RCRA).
NTIS
Exhaust Emission; Exhaust Gases; Health; Landfills; Safety

20080017434 Conoco, Inc., Ponca City, OK, USA
Blends of Synthetic Distillate and Biodiesel for Low Nitrogen Oxide Emissions from Diesel Engines
Esen, E., Inventor; Boehman, A. L., Inventor; Morris, D. P., Inventor; Mar. 9, 2005; 22 pp.; In English
Contract(s)/Grant(s): DE-FC26-01NT41098
Patent Info.: Filed Filed 9 Mar 05; US-Patent-Appl-SN-11-076 178
Report No.(s): PB2007-105203; No Copyright; Avail.: CASI: A03, Hardcopy

This invention shows how to make and use a biodiesel-based fuel in diesel engines without incurring the NO(sub x) penalty. Embodiments primarily relate to an optimum range of bulk modulus of compressibility for biodiesel blends, which results in generating 'NO(sub x) neutral' biodiesel blends or to formulate biodiesel blends with lower NOx emissions than conventional petroleum diesel fuel. These biodiesel blends preferably comprise synthetic paraffinic middle distillate derived from a hydrocarbon synthesis to generate synthetic environmentally-friendly diesel fuels.
NTIS
Air Pollution; Diesel Engines; Distillation; Exhaust Emission; Fuels; Mixtures; Nitrogen Oxides; Nitrous Oxides; Patent Applications; Pollution Control

20080017485 North Carolina Univ., Chapel Hill, NC, USA; National Energy Technology Lab., Morgantown, WV, USA
April-October 2006 Semiannual Report: Modeling the Transport and Chemical Evaluation of Onshore and Offshore Emissions and Their Impact on Local and Regional Air Quality Using a Variable-Grid Resolution Air Quality Model
Alapaty, K.; Hanna, A.; Jan. 01, 2006; 6 pp.; In English
Report No.(s): DE2007-902509; No Copyright; Avail.: Department of Energy Information Bridge

This research project has two primary objectives: (1) to further develop and refine the Multiscale Air Quality Simulation Platform - Variable Grid Resolution (MAQSIP-VGR) model, an advanced variable-grid-resolution air quality model, to provide detailed, accurate representation of the dynamical and chemical processes governing the fate of anthropogenic emissions in coastal environments; and (2) to improve current understanding of the potential impact of onshore and offshore oil and gas exploration and production (E&P) emissions on O3 and particulate matter non-attainment in the Gulf of Mexico and surrounding states.
NTIS
Air Pollution; Air Quality; Environment Models

20080017493 Massachusetts Inst. of Tech., Cambridge, MA, USA

International Collaboration on CO2 Sequestration. (Final Report, August 23, 2004-December 31, 2006)

Jan. 01, 2007; 126 pp.; In English

Contract(s)/Grant(s): DE-FG26-98FT40334

Report No.(s): DE2007-902749; No Copyright; Avail.: National Technical Information Service (NTIS)

This report summarizes results of a two-year sub-task to update an environmental assessment of acute marine impacts resulting from direct ocean sequestration. The approach is based on the work of Auerbach et al. (1997) and Caulfield et al. (1997) to assess mortality to zooplankton, but uses updated information concerning bioassays and three modified injection scenarios: a point release of negatively buoyant solid CO2 hydrate particles from a moving ship, a long, bottom-mounted diffuser discharging buoyant liquid CO2 droplets, and a stationary point release of hydrate particles forming a sinking plume. Results suggest that each of these discharge modes could be successfully designed to avoid zooplankton mortality. Sub-lethal and ecosystem effects are discussed qualitatively, but not analyzed quantitatively.

NTIS

Carbon Dioxide; Oceans

20080017503 Texas Southern Univ., Houston, TX, USA

Testing and Modeling of Truck Emissions While Idling

Yu, L.; Qiao, F.; Soltani, F.; Sep. 01, 2006; 68 pp.; In English

Report No.(s): PB2007-111613; REPT-167650-1; No Copyright; Avail.: National Technical Information Service (NTIS)

Air pollutant emissions and fuel consumption are the most important problems associated with vehicle idling. Truck idling in particular is more problematic than other vehicles mainly because of the duration of idling and the high amount of emissions produced. This report is intended to identify the characteristics of truck idling emissions by collecting data using an advanced portable emission measurement system (PEMS), in which the attempt is made to measure actual idling emissions from truck tailpipes and to relate measured emissions to altered pre-testing driving conditions. Employed for the testing is.the On-Board Emission Monitoring system OEM-2100(sup TM), an advanced PEMS. This equipment can determine the second-by-second emissions of HC, CO, CO(sub 2), O(sub 2), and NOx in the exhaust gas by a functional equivalent of a repair-grade dual five-gas analyzer subsystem. Altered driving circumstances considered during truck idling tests include cold starts and hot starts, different distances and durations of driving before the tests, different roadway facility types used while driving, different durations of idling tests, etc. Measured emissions under all the different pre-testing driving conditions are then analyzed and compared. In addition, the measured idling emissions are compared with emissions estimated by the emission factor model MOBILE6 for the particular tested truck.

NTIS

Exhaust Emission; Trucks; Pollution Monitoring

20080017830 Geological Survey, Reston, VA USA

Sulfur Dioxide Emission Rates from Kilauea Volcano, Hawaii, an Update: 2002-2006

Elias, T.; Sutton, A. J.; Jan. 01, 2007; 37 pp.; In English

Report No.(s): PB2007-112132; USGS-OFR-2007-1114; No Copyright; Avail.: National Technical Information Service (NTIS)

Sulfur dioxide (SO2) emission rates from Kilauea Volcano were first measured by Stoiber and Malone (1975) and have been measured on a regular basis since 1979 (Greenland and others, 1985; Casadevall and others, 1987; Elias and others, 1998; Sutton and others, 2001, Elias and Sutton, 2002, Sutton and others, 2003). Compilations of SO2 emission-rate and wind-vector data from 1979 through 2001 are available on the web. (Elias and others, 1998 and 2002). This report updates the database through 2006, and documents the changes in data collection and processing that have occurred during the interval 2002-2006. During the period covered by this report, Kilauea continued to release SO2 gas predominantly from its summit caldera and east rift zone (ERZ) (Elias and others, 1998; Sutton and others, 2001, Elias and others, 2002, Sutton and others, 2003). These two distinct sources are always measured independently. Sulphur Banks is a minor source of SO2 and does not contribute significantly to the total emissions for Kilauea (Stoiber and Malone, 1975).

NTIS

Air Pollution; Pollution Monitoring; Sulfur Dioxides; Volcanoes

20080017841 Regina Univ., Saskatchewan, Canada
CO(2) Capture by Absorption with Potassium Carbonate First Quarterly Report 2007. January 1 - March 31, 2007
Sexton, A.; Davis, J.; Hilliard, M.; Xu, Q.; Van Wagener, D.; Apr. 27, 2007; 110 pp.; In English
Report No.(s): DE2007-907880; No Copyright; Avail.: National Technical Information Service (NTIS)

The objective of this work is to improve the process for CO2 capture by alkanolamine absorption/stripping by developing an alternative solvent, aqueous K2CO3 promoted by piperazine. The best K+/PZ solvent, 4.5 m K+/4.5 m PZ, requires equivalent work of 31.8 mole CO2 when used with a double matrix stripper and an intercooled absorber. The oxidative degradation of piperazine or organic acids is reduced significantly by inhibitor A, but the production of ethylenediamine is unaffected. The oxidative degradation of piperazine in 7 m MEA/2 m PZ is catalyzed by Cu++. The thermal degradation of MEA becomes significant at 120 degrees C. The solubility of potassium sulfate in MEA/PZ solvents is increased at greater CO2 loading.
NTIS
Carbon Dioxide; Carbonates; Potassium

20080017842 Fluor Daniel Hanford, Inc., Richland, WA, USA
Methodology for the Number of Filters Needed in a Waste Box
Marusich, R. M.; May 01, 2007; 37 pp.; In English
Report No.(s): DE2007-907889; HNF-33512; No Copyright; Avail.: Department of Energy Information Bridge

This report provides a model in which the user inputs the free volume of the waste box, sample concentration (ppm of total VOC or volume fraction hydrogen) along with the number of filters to be placed into the waste box lid. Using this information, the model provides an estimate of concentration vs. time or the number of filters needed to reduce the concentration by a specified fraction. If the equations from this report are placed into spreadsheets which are then used to demonstrate TSR compliance, the spreadsheets must come under the Software QA Plan for such documents.
NTIS
Radioactive Wastes; Hydrogen; Air Filters

20080017843 Minnesota Univ., Minneapolis, MN, USA
Yield Improvement and Energy Savings Using Phosphonates as Additives in Kraft Pulp
Tschirner, U.; Smith, T.; Mar. 31, 2007; 59 pp.; In English
Report No.(s): DE2007-907946; No Copyright; Avail.: National Technical Information Service (NTIS)

Develop a commercially viable modification to the Kraft process resulting in energy savings, increased yield and improved bleachability. Evaluate the feasibility of this technology across a spectrum of wood species used in North America. Develop detailed fundamental understanding of the mechanism by which phosphonates improve KAPPA number and yield. Evaluate the North American market potential for the use of phosphonates in the Kraft pulping process. Examine determinants of customer perceived value and explore organizational and operational factors influencing attitudes and behaviors. Provide an economic feasibility assessment for the supply chain, both suppliers (chemical supply companies) and buyers (Kraft mills). Provide background to most effectively transfer this new technology to commercial mills.
NTIS
Additives; Bleaching; Energy Conservation; Industries; Kraft Process (Woodpulp); North America

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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*.

20080017100 Geological Survey, Reston, VA USA
Preliminary Earthquake Hazard Map of Afghanistan
Boyd, O. S.; Mueller, C. S.; Rukstales, K. S.; January 2007; 29 pp.; In English
Report No.(s): PB2007-112129; USGS-OFR-2007-1137; No Copyright; Avail.: National Technical Information Service (NTIS)

The history of destructive earthquakes in Afghanistan spans more than four thousand years. Earthquakes have killed more than 7,000 Afghans in the last 10 years, including the Nahrin earthquake in May 1998 that killed an estimated 4,000 people. We expect that future large earthquakes, driven by ongoing active geologic processes in the region, will occur close to

population centers and lifelines, with a consequent risk for greater casualties and damage. The seismic hazard must be considered in the siting, construction, and restoration of communities and facilities in Afghanistan.Large earthquakes can devastate unreinforced brick and stone buildings and trigger large landslides in mountainous terrain. In 2005, the M7.6 Kashmir earthquake in Pakistan killed more than 85,000 people, injured more than 69,000, and destroyed entire towns and villages; reconstruction efforts are ongoing as we write this report. This earthquake serves as a cautionary analog for what could happen in Afghanistan in terms of magnitude, strong ground shaking, damage to structures, and landslides. Improved construction standards and techniques, guided by scientific estimates of the seismic hazard, could significantly reduce the loss of life and property.
NTIS
Afghanistan; Earthquakes; Hazards

20080017292 Wiss, Janney, Elstner and Associates, Inc., Northbrook, IL, USA
Reducing the Risks of Nonstructural Earthquake Damage: A Practical Guide. Third Edition
Sep. 1994; 25 pp.; In English
Contract(s)/Grant(s): EMW-92-C-3852
Report No.(s): PB2007-111478; No Copyright; Avail.: CASI: A03, Hardcopy

This guide was developed to fulfill several different objectives and address a wide audience with varying needs. The primary intent is to explain the sources of nonstructural earthquakedamage in simple terms and to provide information on effective methods of reducing the potential risks. The recommendations contained in this guide are intended to reduce the potential hazards but cannot completely eliminate them.
NTIS
Damage; Earthquakes; Hazards

20080017835 Nevada Univ., Las Vegas, NV, USA
Earthquakes in Southern Nevada - Uncovering Hazards and Mitigating Risk: A Research Study by the University of Nevada, Las Vegas. Final Technical Report August 1, 2004 - January 31, 2007
Wiedemann, J.; Apr. 25, 2007; 14 pp.; In English
Report No.(s): DE2007-902758; No Copyright; Avail.: National Technical Information Service (NTIS)

Improve understanding of the earthquake hazard in the Las Vegas Valley and to assess the state of preparedness of the area's population and structures for the next big earthquake. 1. Enhance the seismic monitoring network in the Las Vegas Valley 2. Improve understanding of deep basin structure through active-source seismic refraction and reflection testing 3. Improve understanding of dynamic response of shallow sediments through seismic testing and correlations with lithology 4. Develop credible earthquake scenarios by laboratory and field studies, literature review and analyses 5. Refine ground motion expectations around the Las Vegas Valley through simulations 6. Assess current building standards in light of improved understanding of hazards 7. Perform risk assessment for structures and infrastructures, with emphasis on lifelines and critical structures 8. Encourage and facilitate broad and open technical interchange regarding earthquake safety in southern Nevada and efforts to inform citizens of earthquake hazards and mitigation opportunities.
NTIS
Earthquakes; Geology; Geophysics; Hazards; Nevada; Risk

20080017925 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Status of a UAV SAR Designed for Repeat Pass Interferometry for Deformation Measurements
Hensley, Scott; Wheeler, Kevin; Hoffman, Jim; Miller, Tim; Lou, Yunling; Muellerschoen, Ron; Zebker, Howard; Madsen, Soren; Rosen, Paul; June 22, 2004; 18 pp.; In English; Earth Science Technology Conference, 22 Jun. 2004, Palto Alto, CA, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40738

Under the NASA ESTO sponsored Instrument Incubator Program we have designed a lightweight, reconfigurable polarimetric L-band SAR designed for repeat pass deformation measurements of rapidly deforming surfaces of geophysical interest such as volcanoes or earthquakes. This radar will be installed on an unmanned airborne vehicle (UAV) or a lightweight, high-altitude, and long endurance platform such as the Proteus. After a study of suitable available platforms we selected the Proteus for initial development and testing of the system. We want to control the repeat track capability of the aircraft to be within a 10 m tube to support the repeat deformation capability. We conducted tests with the Proteus using real-time GPS with sub-meter accuracy to see if pilots could fly the aircraft within the desired tube. Our results show that pilots

are unable to fly the aircraft with the desired accuracy and therefore an augmented autopilot will be required to meet these objectives. Based on the Proteus flying altitude of 13.7 km (45,000 ft), we are designing a fully polarimetric L-band radar with 80 MHz bandwidth and 16 km range swath. This radar will have an active electronic beam steering antenna to achieve Doppler centroid stability that is necessary for repeat-pass interferometry (RPI). This paper will present are design criteria, current design and expected science applications.
Author
Synthetic Aperture Radar; Design Analysis; Interferometry; Deformation; Earthquakes; Volcanoes; Real Time Operation; Geophysics

20080017926 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
The HYDROS Radiometer/Radar Instrument
Spencer, Michael W.; Njoku, Eni; Entekhabi, Dara; Doiron, Terence; Piepmeier, Jeffrey; Girard, Ralph; September 20, 2004; 4 pp.; In English; IEEE International Geoscience and Remote Sensing Symposium, 20-24 Sept. 2004, Anchorage, Ak, USA; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40736

The science objectives of the HYDROS mission are to provide frequent, global measurements of surface soil moisture and surface freeze/thaw state. In order to adequately measure these geophysical quantities, the key instrument requirements were determined by the HYDROS science team to be: 1) Dual-polarization L-Band passive radiometer measurements at 40 km resolution, 2) Dual-polarization L-Band active radar measurements at 3 km resolution, and 3) A wide swath to insure global three day refresh time for these measurements (1000 km swath at the selected orbit altitude of 670 km). As a solution to this challenging set of instrument requirements, a relatively large, 6 meter, conically-scanning reflector antenna architecture was selected for the instrument design. The deployable mesh antenna is shared by both the radiometer and radar electronics by employing a single L-Band feed.
Author
Radar Measurement; Radiometers; Reflector Antennas; Geophysics; Soil Moisture; Swath Width

47
METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification.

20080016632 National Center for Atmospheric Research, Boulder, CO USA
Delta-Eddington Multiple Scattering Parameterization for Solar Radiation in the Sea Ice Component of the Community Climate System Model
Briegleb, B. P.; Light, B.; Feb. 01, 2007; 108 pp.; In English
Report No.(s): PB2007-107343; NCAR/TN-472-STR; No Copyright; Avail.: CASI: A06, Hardcopy

In this report, the authors first review the solar radiation parameterization in the sea ice component of the present version of CCSM. This gives the rationale for presenting an alternative solar radiation parameterization. An overview of the alternative Delta-Eddington solar radiation parameterization for sea ice is then presented, then the specifies of the theory, data, comparisons with other calculations, and finally a summary. The appendices present the Delta-Eddington multiple scattering solution for a single layer, the solution for inter-layer scattering, a summary of the polar atmospheric radiation model used for various calculations in this work, some issues relevant to varying the number of snow and sea ice layers, and a glossary of acronyms.
NTIS
Climate Models; Parameterization; Scattering; Sea Ice; Solar Radiation

20080016801 Fluor Daniel Hanford, Inc., Richland, WA, USA
Weather-Related Variability of Calorimeter Performance in a Poorly-Controlled Environment
Cameron, M. A.; Apr. 16, 2007; 11 pp.; In English
Contract(s)/Grant(s): DE-AC06-96RL13200
Report No.(s): DE2007-902902; HNF-33219-FP-REV0; No Copyright; Avail.: Department of Energy Information Bridge

Four Antech airbath calorimeters at the Hanford site were studied for three summers and two winters in a location not well-shielded from outside temperature changes. All calorimeters showed significant increases in variability of standard measurements during hot weather. The increased variability is postulated to be due to a low setting of the Peltier cold face

temperature, which doesn't allow the instrument to drain heat fast enough in a hot environment. A higher setting of the Peltier cold face might lead to better performance in environments subjected to a broad range of temperatures.
NTIS
Calorimeters; Variability

20080017042 Westinghouse Savannah River Co., Aiken, SC, USA
Comparison of Consequence Analysis Results from Two Methods of Processing Site Meteorological Data
Thoman, D. C.; Weber, A. H.; OKula, K. R.; Apr. 25, 2007; 11 pp.; In English
Report No.(s): DE2007-902857; WSRC-STI-00221; No Copyright; Avail.: National Technical Information Service (NTIS)

Consequence analysis to support documented safety analysis requires the use of one or more years of representative meteorological data for atmospheric transport and dispersion calculations. At minimum, the needed meteorological data for most atmospheric transport and dispersion models consist of hourly samples of wind speed and atmospheric stability class. Atmospheric stability is inferred from measured and/or observed meteorological data. Several methods exist to convert measured and observed meteorological data into atmospheric stability class data. In this paper, one year of meteorological data from a western Department of Energy (DOE) site is processed to determine atmospheric stability class using two methods. The method that is prescribed by the U.S. Nuclear Regulatory Commission (NRC) for supporting licensing of nuclear power plants makes use of measurements of vertical temperature difference to determine atmospheric stability. Another method that is preferred by the U.S. Environmental Protection Agency (EPA) relies upon measurements of incoming solar radiation, vertical temperature gradient, and wind speed. Consequences are calculated and compared using the two sets of processed meteorological data from these two methods as input data into the MELCOR Accident Consequence Code System 2 (MACCS2) code.
NTIS
Meteorological Parameters; Safety

20080017290 National Oceanic and Atmospheric Administration, Washington, DC, USA
Southwest Pacific Ocean Circulation and Climate Experiment (SPICE). Part I. Scientific Background
Ganachaud, A.; Kessler, W.; Wijffels, S.; Ridgway, K.; Cai, W.; May 2007; 46 pp.; In English
Report No.(s): PB2007-111469; CLIVAR/PUB-111; No Copyright; Avail.: National Technical Information Service (NTIS)

The goal of SPICE is to observe, simulate, and understand the role of the southwest Pacific Ocean circulation in (a) the large-scale, low-frequency modulation of climate from the Tasman Sea to the equator, and (b) the generation of local climate signatures whose diagnosis will aid regional sustainable development. This goal will be realized through four specific efforts, which are discussed in detail in this Scientific Plan: (1) Analysis of the southwest Pacific role in global coupled models; (2) Development of an observational program to survey air-sea fluxes and currents in the Coral, Solomon, and Tasman Seas, and their in-flows and outflows, with special attention to the strong boundary currents and jets; (3) Combination of these observations with focused modeling efforts to devise a sustained monitoring program to adequately sample the time-variability of the currents and their heat and mass transports; (4) Using remotely and locally sampled meteorological fields, and the ocean analysis, determination of the air-sea heat and freshwater fluxes and water mass transformations that occur in the region, and their effects on the local and global climate. A focus here may be the design of a process study to observe, model, and understand the South Pacific Convergence Zone. The simultaneous large-scale and regional approach allows applications ranging from ENSO forecast improvement, to coral bleaching, cyclone trajectory, or projection of local ocean and climate conditions.
NTIS
Climate; Ocean Currents; Pacific Ocean

20080017294 Environmental Protection Agency, Washington, DC, USA
EPA's Ocean Survey Vessel Bold, 2006 Annual Report
January 2007; 28 pp.; In English
Report No.(s): PB2007-111640; EPA/842/R-07-004; No Copyright; Avail.: CASI: A03, Hardcopy

This report highlights oceanographic surveys from the initiation of the Bold as EPAs oceans and coastal monitoring vessel in August 2005 through December of 2006. Over this year and a half, the Bold completed a total of 32 oceanographic surveys involving hundreds of sampling locations, spending over 250 days at sea in U.S. waters.
NTIS
Environment Protection; Oceanography; Oceans; Position (Location)

20080017295 Government Accountability Office, Washington, DC, USA

Weather Forecasting: National Weather Service's Operations Prototype Needs More Rigorous Planning

Jun. 2007; 37 pp.; In English

Report No.(s): PB2007-111670; GAO-07-650; No Copyright; Avail.: CASI: A03, Hardcopy

Using advanced systems and trained specialists located in 122 weather forecast offices throughout the country, the National Weather Service (NWS) provides storm and flood warnings and weather forecasts to protect life and property and to enhance the national economy. To improve the efficiency of its operations, in November 2006, NWS approved an effort to develop a prototype of an alternative way of operating. Under this prototype, weather forecasting offices would share selected responsibilities. GAO (1) determined the status of and plans for the prototype, (2) evaluated whether the prototype's justification was sufficient, (3) determined whether NWS's plans to evaluate the prototype are adequate, (4) evaluated whether NWS is sufficiently involving stakeholders in its prototype plans, and (5) determined how NWS plans to ensure that there will be no degradation of service during and after the prototype. To do so, GAO analyzed agency documentation and interviewed program officials and stakeholders.

NTIS

Forecasting; Prototypes; Weather Forecasting

20080017299 Colorado Univ., Boulder, CO, USA

National Operational Hydrologic Remote Sensing Center SNOw Data Assimilation System (SNODAS) Products at NSIDC (National Snow and Ice Data Center)

Barrett, A. P.; Nov. 12, 2003; 19 pp.; In English

Report No.(s): PB2007-111719; No Copyright; Avail.: National Technical Information Service (NTIS)

The National Snow and Ice Data Center (NSIDC) has an agreement with the NOAA National Weather Service's National Operational Hydrologic Remote Sensing Center (NOHRSC) to archive output from their SNOw Data Assimilation System (SNODAS) beginning 1 October 2003. This report gives a brief description of SNODAS and the output archived at NSIDC, identifies a set of potential users of this data and discusses these users needs. The format of archived output is also discussed. This report is current as of its publication date. Details of the SNODAS products and the archive at NSIDC may change with time.

NTIS

Assimilation; Data Systems; Hydrology; Ice; Remote Sensing; Snow

20080017405 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Do Global Models Properly Represent the Feedback Between Land and Atmosphere?

Dirmeyer, Paul A.; Koster, Randal D.; Guo, Zhichang; December 09, 2005; 54 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NAG5-11579; Copyright; Avail.: Other Sources

The GEWEX/CLIVAR Global Land-Atmosphere Coupling Experiment (GLACE) has provided an estimate of the global distribution of land-atmosphere coupling strength during boreal summer based on the results from a dozen weather and climate models. However, there is a great deal of variation among models, attributable to a range of sensitivities in the simulation of both the terrestrial and atmospheric branches of the hydrologic cycle. It remains an open question whether any of the models, or the multi-model estimate, reflect the actual pattern and strength of land-atmosphere coupling in the earth's hydrologic cycle. We attempt to diagnose this by examining the local co-variability of key atmospheric and land surface variables both in models and in those few locations where comparable, relatively complete, long term measurements exist. We find that most models do not encompass well the observed relationships between surface and atmospheric state variables and fluxes, suggesting that these models do not represent land-atmosphere coupling correctly. Specifically, there is evidence that systematic biases in near surface temperature and humidity among all models may lead to incorrect surface flux sensitivities. However, the multi-model mean generally validates better than most or all of the individual models. We also compare regional precipitation behavior (lagged autocorrelation and predisposition toward maintenance of extremes) between models and observations. Again we find a great deal of variation among the participating models, but remarkably accurate behavior of the multi-model mean.

Author

Air Land Interactions; Earth Atmosphere; Atmospheric General Circulation Models; Climate Models; Weather

20080018003 Armstrong Teasdale, LLP, Saint Louis, MO, USA
Methods and Apparatus for Rotor Blade Ice Detection
LeMieux, D. L., Inventor; 10 Jun 04; 19 pp.; In English
Contract(s)/Grant(s): DE-ZAM-7-13320-26
Patent Info.: Filed Filed 10 Jun 04; US-Patent-Appl-SN-10-865-376
Report No.(s): PB2007-109359; No Copyright; Avail.: CASI: A03, Hardcopy

A method for detecting ice on a wind turbine having a rotor and one or more rotor blades each having blade roots includes monitoring meteorological conditions relating to icing conditions and monitoring one or more physical characteristics of the wind turbine in operation that vary in accordance with at least one of the mass of the one or more rotor blades or a mass imbalance between the rotor blades. The method also includes using the one or more monitored physical characteristics to determine whether a blade mass anomaly exists, determining whether the monitored meteorological conditions are consistent with blade icing; and signaling an icing-related blade mass anomaly when a blade mass anomaly is determined to exist and the monitored meteorological conditions are determined to be consistent with icing.
NTIS
Detection; Ice; Ice Formation; Patent Applications; Turbine Blades; Wind Turbines

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*.

20080016741 Knobbe, Martens, Olson and Bear, LLP, Irvine, CA, USA
Method of Inhibiting Choroidal Neovascularization
Wen, R., Inventor; Luo, Z., Inventor; Laties, A. M., Inventor; Sep. 18, 2003; 12 pp.; In English
Contract(s)/Grant(s): NIH-Y12727
Patent Info.: Filed Filed 18 Sep 03; US-Patent-Appl-SN-10-665 203
Report No.(s): PB2007-108819; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention relates to compositions and methods for inhibiting unwanted angiogenesis, particularly those of ocular tissues. The treatment, inhibition, and/or prevention of choroidal neovasculature (CNV) is provided, along with an animal model for CNV and imaging techniques that permit the screening of potential agents as anti-angiogenesis and anti-CNV agents.
NTIS
Angiogenesis; Eye (Anatomy); Eye Diseases

20080016915 Darby and Darby, P.C., New York, NY, USA
Structure-Based Design and Synthesis of FGF Inhibitors and FGF Modulator Compounds
Mohammadi, M., Inventor; Green, D. L., Inventor; Robert, L. J., Inventor; Oct. 31, 2002; 28 pp.; In English
Contract(s)/Grant(s): NIH-1R01-DE13686-01; NIH-1R01-HL52622
Patent Info.: Filed Filed 31 Oct 02; US-Patent-Appl-SN-10-285 405
Report No.(s): PB2007-108807; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention provides methods and compositions for modulating FGF-signaling and activities associated therewith, such as mitogenesis and angiogenesis. In particular, the invention provides crystal structure coordinates for a ternary complex of an FGF receptor, and FGF ligand, and a third compound, sucrose octasulfate, that binds to the FGF receptor and ligand to promote formation and dimerization of the ternary complex. Screening methods are provided by which novel agonists and antagonist for FGF-mediating signaling and activities may be identified using these crystal structure coordinates. Exemplary compounds are also provided that have novel utilities as agonists or antagonists of FGF-mediated signaling and activities.
NTIS
Ligands; Modulators; Crystal Structure; Fibroblasts; Synthesis

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*.

20080016916 Sheldon Mack Rose and Anderson, P.C., Pasadena, CA, USA
Method of Delaying the Onset of Diabetes
Escher, A. P., Inventor; Liu, J., Inventor; Apr. 17, 2001; 8 pp.; In English
Contract(s)/Grant(s): ARMY-DAMD17-97-2-7016
Patent Info.: Filed Filed 17 Apr 01; US-Patent-Appl-SN-10 257 221
Report No.(s): PB2007-108812; No Copyright; Avail.: CASI: A02, Hardcopy

A method for preventing, delaying the onset of or treating diabetes in a patient comprising selecting a patient who is susceptible to developing diabetes, who is developing diabetes or who is diabetic and administering to the patient one or more than one dose of a pharmaceutical agent comprising a polynucleotide encoding a secreted exogenous protein, such as a secreted luciferase or a secreted form of human glutamic acid decarboxylase.
NTIS
Metabolic Diseases; Diabetes Mellitus; Polynucleotides; Pharmacology; Prevention

53
BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

20080017139 National Inst. of Information and Communications Technology, Japan
Interaction Analysis at the Dialog by Nonverbal Behavior
Yoshimoto, Jun; Mizukami, Etsuo; Yamashita, Koji; Yano, Hiroyuki; Review of the National Institute of Information and Communications Technology, Volume 53, No. 3; September 2007, pp. 91-98; In Chinese; See also 20080017128; Copyright; Avail.: Other Sources

We much know nonverbal behaviors that coexist with our communicative history may tell us important information and regulate our verbal dialogue when we have face to face conversed. Researches for nonverbal behaviors in human interaction were begun by scientific ways, however, quite recently. In order to measure the activity of conversation by the computer with video cameras, it is necessary to detect regulators that called turn-maintaining cues or turn-yielding cues. This paper presents a method of automatic segmentation and classification of nonverbal behaviors in dialogues captured on video from two subjects by cluster analysis. As an example for evaluating a classification, we discuss the specific group of behaviors had suggested turn-maintenance cue.
Author
Verbal Communication; Regulators; Classifications; Conversation; Cluster Analysis; Cameras

20080017142 National Inst. of Information and Communications Technology, Japan
Basic Study for Cognition and Manipulation of the Body Image
Maekawa, Satoshi; Review of the National Institute of Information and Communications Technology, Volume 53, No. 3; September 2007, pp. 73-81; In Chinese; See also 20080017128; Copyright; Avail.: Other Sources

In recent years, it becomes clear that the body image is not inherent, but have plasticity. This fact suggests that the body image can be manipulated. With the progress of the computer, virtual external world can be built with reality, but the ability of the body image manipulation suggests virtual self with reality. Although the cognitive ability of human is limited, the world of virtual self with reality, which means freedom from physical body, may be very vast. However, the comprehension level about virtual self is just low so far, and a basic study of it is conducted as before. In this paper, estimation methods of amputee's motor intention from surface electromyography measured noninvasively, are proposed, and the results of psychological experiments about body image are shown.
Author
Cognition; Mental Performance; Electromyography

20080017409 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Soesterberg, Netherlands
Models and Methods in SCOPE: A Status Report
Ubink, E. M.; Lotens, W. A.; Aldershoff, R. F.; April 2008; 2 pp.; In English; Original contains color and black and white illustrations
Report No.(s): TD2008-0050; TNO-DV 2008 A126; Copyright; Avail.: Other Sources

SCOPE is a simulation of dismounted soldier operations developed by TNO. SCOPE is used for research in the field of operational performance. Operational performance depends on many factors, varying from climate and terrain characteristics to group dynamics and equipment. SCOPE contains models and variables representing many of these factors. This report is a status overview of the models and variables that are currently implemented in SCOPE.
Author
Human Performance; Situational Awareness; Simulation; Group Dynamics

54
MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human factors engineering, bionics, man-machine systems, life support, space suits and protective clothing. For related information see also *16 Space Transportation and Safety* and *52 Aerospace Medicine*.

20080016811 Sandia National Labs., Albuquerque, NM USA
Policy Implications of Technologies for Cognitive Enhancement
Sarewitz, D.; Karas, T. H.; Feb. 01, 2007; 33 pp.; In English
Contract(s)/Grant(s): DE-AC04-94AL85000
Report No.(s): DE2007-901973; SAND2006-7909; No Copyright; Avail.: Department of Energy Information Bridge

The Advanced Concepts Group at Sandia National Laboratory and the Consortium for Science, Policy and Outcomes at Arizona State University convened a workshop in May 2006 to explore the potential policy implications of technologies that might enhance human cognitive abilities. The groups deliberations sought to identify core values and concerns raised by the prospect of cognitive enhancement. The workshop focused on the policy implications of various prospective cognitive enhancements and on the technologies--nanotechnology, biotechnology, information technology, and cognitive science--that enable them. The prospect of rapidly emerging technological capabilities to enhance human cognition makes urgent a daunting array of questions, tensions, ambitions, and concerns. The workshop elicited dilemmas and concerns in ten overlapping areas: science and democracy; equity and justice; freedom and control; intergenerational issues; ethics and competition; individual and community rights; speed and deliberations; ethical uncertainty; humanness; and sociocultural risk.
NTIS
Augmentation; Cognition; Policies; Technology Assessment

20080017286 Helsinki Univ. of Technology, Espoo, Finland; Lawrence Livermore National Lab., Livermore, CA, USA
Effect of Temperature on Task Performance in Office Environment
Seppaenen, O.; Fisk, W. J.; Lei, Q. H.; Jul. 2006; 11 pp.; In English
Report No.(s): DE2007-903490; LBNL-60946; No Copyright; Avail.: Department of Energy Information Bridge

Indoor temperature is one of the fundamental characteristics of the indoor environment. It can be controlled with a degree of accuracy dependent on the building and its HVAC system. The indoor temperature affects several human responses, including thermal comfort, perceived air quality, sick building syndrome symptoms and performance at work. In this study, we focused on the effects of temperature on performance at office work. We included those studies that had used objective indicators of performance that are likely to be relevant in office type work, such as text processing, simple calculations (addition, multiplication), length of telephone customer service time, and total handling time per customer for call-center workers. We excluded data from studies of industrial work performance. We calculated from all studies the percentage of performance change per degree increase in temperature, and statistically analyzed measured work performance with temperature. The results show that performance increases with temperature up to 21-22 degrees C, and decreases with temperature above 23-24 degrees C. The highest productivity is at temperature of around 22 degrees C. For example, at the temperature of 30 degrees C the performance is only 91.1% of the maximum i.e. the reduction in performance is 8.9%.
NTIS
Human Performance; Tasks; Temperature Effects; Work Capacity

20080017505 Texas A&M Univ., College Station, TX USA

Assessing Driver Distraction Due to In-Vehicle Video Systems through Field Testing at the Pecos Research and Testing Center

Funkhouser, D.; Chrysler, S. T.; Mar. 01, 2007; 55 pp.; In English

Report No.(s): PB2007-111615; REPT-473700-00082-1; No Copyright; Avail.: CASI: A04, Hardcopy

Nine drivers drove 5 laps in an instrumented vehicle around a 10.1 mile closed course containing numerous curves. Two laps were designated as controls, with each participant also driving one lap while watching a DVD program, one lap while listening to a DVD program and one lap while operating the DVD player. Participants watching and operating the DVD player were less likely to notice outside events like a lead vehicle applying its brake, or a light being illuminated in their periphery. During the laps involving the DVD player, they also reacted slower to the events presented in their periphery. Participants watching or operating the DVD player were also more likely to use their brake and take turns at higher lateral accelerations when negotiating the many curves throughout the test-track. Finally, participants drove significantly slower when watching the DVD player and marginally slower when operating it.

NTIS

Field Tests; Performance Tests; Human Performance

20080017937 University of South Florida, Tampa, FL, USA

Repair Time Standards for Transit Vehicle. Phase III

Centeno, G.; Chaudhary, R.; Rojas, D.; Jul. 1, 2006; 38 pp.; In English

Report No.(s): PB2007-110791; No Copyright; Avail.: CASI: A03, Hardcopy

This project is the continuation of the successful Repair Time Standards research initiative started two years ago to establish accurate repair time standards for vehicles in public transit systems. During this third phase the engine removal and replacement system were studied and evaluated. Standards that optimize the time required to perform tasks, continually improve reliability of services and conserve resources at a minimum cost will be established. One of the tasks during phase III was to benchmark the proposed methodology and preliminary results with current practices from other transit agencies nationwide including the Metropolitan Transit Authority in New York City, New York; the Metropolitan Atlanta Rapid Transit Authorization in Atlanta, Georgia; the San Francisco Municipal Railway in San Francisco, California; and the Metropolitan Bus Authority in San Juan, Puerto Rico. This report summarizes the results of the visits to these facilities. In addition, during this research we explored another technique used for developing standards namely MODular Arrangement of Predetermined Time Standard (MODAPTS). This tool was used to validate the observations taken at the various transit facilities in central Florida, and to develop reliable standards which resulted on improved productivity.

NTIS

Maintenance; Time Measurement

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*.

20080016648 National Inst. of Standards and Technology, Gaithersburg, MD, USA

Test Results for Hardware Write Block Device: Tableau Forensic SATA Bridge T3u (USB Interface)

Jan. 01, 2007; 19 pp.; In English

Report No.(s): PB2007-110430; No Copyright; Avail.: CASI: A03, Hardcopy

The Computer Forensics Tool Testing (CFTT) program is a joint project of the National Institute of Justice (NIJ), the research and development organization of the U.S. Department of Justice, and the National Institute of Science and Technologys (NISTs) Office of Law Enforcement Standards (OLES) and Information Technology Laboratory (ITL). CFTT is supported by other organizations, including the Federal Bureau of Investigation, the U.S. Department of Defense Cyber Crime Center, Internal Revenue Service Criminal Investigations Electronic Crimes Program, and the U.S. Department of Homeland Securitys Bureau of U.S. Immigration and Customs Enforcement and U.S. Secret Service. The objective of the CFTT program is to provide measurable assurance to practitioners, researchers, and other applicable users that the tools used in computer forensics investigations provide accurate results. Accomplishing this requires the development of specifications and test methods for computer forensics tools and subsequent testing of specific tools against those specifications. Test results provide the information necessary for developers to improve tools, users to make informed choices, and the legal community and

others to understand the tools capabilities. This approach to testing computer forensics tools is based on well-recognized methodologies for conformance and quality testing. This document reports the results from testing the Tableau Forensic SATA Bridge T3u (USB Interface) write blocker against the Hardware Write Blocker (HWB) Assertions and Test Plan Version 1.0. NTIS

Crime; Law (Jurisprudence); Organizations; Computer Techniques

20080016650 Swedish Defence Research Establishment, Linkoeping, Sweden

Mixed Reality for Technical Maintenance Techniques, Applications and Gaze Interactions

Gustafsson, T.; Carleberg, P.; Feb. 01, 2006; 40 pp.; In English

Report No.(s): PB2007-106504; FOI-R-1946-SE; No Copyright; Avail.: National Technical Information Service (NTIS)

In a world of increasingly complicated technical systems connected in complex structures there will be a need of a flexible, easy-to-use and intuitive support system. The approach described in this report is to base this support system on Mixed Reality ideas and techniques. Mixed Reality can be described as a technical information system that allows human-machine interaction where real and virtually generated image objects are mixed (merged) in varying degrees and presented in the field of view of a user. The purpose of the project is to generate knowledge about how a future support system, based on Mixed Reality, should be designed concerning technical solutions, aspects of Human-Machine-Interaction and logistics. The report describes the work performed in phase 3 and regards technical solutions and design. The report is in the main divided into the following parts: A short introduction to Mixed Reality; studies of project test case examples; and a thorough description of emerging technologies developed in the project. Mixed Reality seems to be useful not only in the area of technical support systems but also in other areas where this type of visualization can give the user quite a new ability. NTIS

Maintenance; Man Machine Systems; Support Systems; Logistics; Information Systems

20080016662 Research and Technology Organization, Neuilly-sur-Seine, France

Information for Fusion for Command Support

December 2006; In English; See also 20080016663 - 20080016680

Report No.(s): RTO-MP-IST-055; AC/323(IST-055)TP/38; Copyright; Avail.: CASI: C01, CD-ROM

Topics covered include: Technical Evaluation Report; A Model for Situation and Threat Assessment; Service-Oriented Architectures, Network-Centric Warfare, and Agile, Self-Synchronized C2: Impacts to Data Fusion Process Design; Intelligence Base: Strategic Instrument of an Organization; Formatted Message Exchange in a Multinational Environment; Cognitive Situation Awareness for Information Superiority; High-Level Fusion using Bayesian Networks: Applications in Command and Control; A Bayesian Methodology for Effects Based Planning; Decision Support for Asymmetric Urban Warfare; Logical Traps in High-Level Knowledge and Information Fusion; Application of the Semantics Enrichment Concept in the Information Fusion for Command Support; Extraction of Relations between Entities from Texts by Learning Methods; Structuring and Fusing Text; Towards Automatic Threat Recognition; A Speech Classification System; Nexus - Middleware for Decentralized Service-Oriented Information Fusion; Network Enabled Capability: Decentralized Coordination of Autonomous Agents to Achieve Operational Goals; and A Generic Fusion Tool on Command Control of C4ISR Simulations. Derived from text

Applications Programs (Computers); Service Oriented Architecture; Multisensor Fusion; Command and Control; Bayes Theorem; Classifications; Asymmetry

20080016663 Encompass Consulting, Honeoye Falls, NY, USA

Technical Evaluation Report

Rogova, Galina L.; Information for Fusion for Command Support; December 2006, pp. T-1 - T-8; In English; See also 20080016662; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Maintaining coherent situation awareness is essential for military decision makers. Given knowledge of the environment and the threats it presents, the military commander is able to take informed decisions and assess the impact of those decisions more effectively. Situation awareness requires contextual understanding and interpretation of the events and behaviors of interest, which can be achieved by utilizing higher level fusion processes (situation assessment and impact prediction). Higher level fusion processes employ information about objects, intelligence information, historical databases, and domain knowledge to recognize relations between these objects and dynamics of these relations. Contextual information is particularly critical in current asymmetric threat environments, in which the Level 0 and 1 signal/feature and platform identification and

tracking - are far less important than characterizing the composition, activity, capability and intent of insurgent organizations. At the same time, with recent advances in the ability to gather, store, and analyze a wide variety of data from multiple geographically distributed heterogeneous sources, determining how best to process this information in order to generate an accurate and timely situational picture has become a major challenge. The goal of the NATO/RTO Specialists Meeting on Information Fusion for Command Support, held in The Hague, The Netherlands, on 8 and 9 November 2005, was to confront this challenge by facilitating an exchange of information on the state of the art of the designing situation and threat assessment processes. The NATO/RTO Specialists Meeting is a separate part of the Final Demonstration event of the IST Task Group IST-038/RTG-016 on Information Fusion Demonstration. These activities are the follow-on of the IST Symposium IST-040/RSY-012 on Military Data and Information Fusion (October 2003, in Prague, CZ), which showed the importance of discussions on higher level fusion problems and methods in order to provide necessary support to modern military operations.
Author
Military Operations; Multisensor Fusion; Intelligence; Data Bases; Critical Current; Thermoelectric Generators

20080016664 BAE Systems, UK
High-Level Fusion using Bayesian Networks: Applications in Command and Control
Bladon, P.; Day, P. S.; Hughes, T.; Stanley, P.; Information for Fusion for Command Support; December 2006, pp. 4-1 - 4-18; In English; See also 20080016662; Original contains color illustrations; Copyright; Avail.: CASI: A04, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In this paper, we discuss how Bayesian networks can be used to develop automated situation-assessment tools suitable for use as decision aids in a command and control system. Inevitably, the introduction of a new technology raises a number of validation, systems integration and human-factors questions. Those issues pertinent to Bayesian network decision aids are identified and their implications discussed. We then describe in detail the implementation of such a system capable of providing Combat-ID and Threat Assessment advisories in the naval anti-air warfare role and its assessment within a realistic (synthetic) human-in-the-loop experiment. We discuss the experimental system, the experimental design and protocol and the experimental results. In a controlled experiment using 14 subjects with relevant military experience we found that the Bayes net decision aid system was preferred by the majority of the experimental subjects and led to a number of operator performance improvements which could directly contribute to improved operational effectiveness.
Author
Bayes Theorem; Command and Control; Decision Support Systems; Human Factors Engineering; Systems Integration; System Effectiveness; Operator Performance

20080016665 Tubitak Marmara Research Center, Kocaeli, Turkey
A Generic Fusion Tool on Command Control of C4ISR Simulations
Sari, Faruk; Cengiz, Ramazan; Hocaoglu, Fatih; Sari, Nursen; Pasalioglu, Seref; Firat, Cuneyd; Information for Fusion for Command Support; December 2006, pp. 16-1 - 16-10; In English; See also 20080016662; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We present a generic high-level fusion tool that is a part of a novel C4ISR M&S system based on the HLA being developed by T B TAK MAM BTE. The main objective of our fusion tool is to execute a generic, user-friendly information fusion process via a database using rules, which can be defined during run time.
Author
Multisensor Fusion; Command and Control; Knowledge Representation; Information Systems; Decision Making; Cost Effectiveness; Computer Techniques; Simulation

20080016666 Southampton Univ., UK
Network Enabled Capability: Decentralized Coordination of Autonomous Agents to Achieve Operational Goals
Jennings, Nick; Johnston, Robert; Wright, Andy; Information for Fusion for Command Support; December 2006, pp. 15-1 - 15-12; In English; See also 20080016662; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The move from platform centric planning to network enabled capability poses not only organizational challenges but also challenges to the technology that will be needed to enable networked operations. Within this context, this paper outlines the central role that autonomous software agents, that coordinate their activities in flexible ways, have to play in providing robust system solutions. The major research challenges are addressed in order to take this promising technology forward and to make

it suitable for NEC application. The interactions of the various autonomous agents within the system, that are necessary in order to achieve their individual and collective aims, can be analysed and designed using techniques from Game Theory and Mechanism Design. Game theory is exploited because it has developed powerful tools for analysing decision making in decentralized open systems with multiple autonomous agents. Recently, these tools have been tailored to computational settings to provide a principled foundation for building multiple agent systems. This tailoring gives rise to the field of computational mechanism design. A whole system approach to the requirements and the assessment of the technologies has been adopted. Of prime important for driving this research programme are: a) Information Assurance: Currently in networked systems, security and trust are key issues with no robust solution. Therefore assurance of information over dynamic networks requires tackling dynamic and cross coalition, multi-level security systems. b) Self-management of Sensor Networks: The complexity of future systems means that a degree of sub-system autonomy will be required for self-management of the networks and its assets.
Author
Information Systems; Decision Making; Game Theory; Computer Programming; Computer Systems Programs; Autonomy

20080016667 BT Adastral Park, Ipswich, UK
Nexus - Middleware for Decentralized Service-Oriented Information Fusion
Jakob, Michal; Kaveh, Nima; Ghanea-Hercock, Robert; Information for Fusion for Command Support; December 2006, pp. 14-1 - 14-8; In English; See also 20080016662; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We present Nexus - a robust and scalable middleware for decentralized service-oriented information fusion. As a project in the UK Ministry of Defence Defence Technology Centre, Nexus is driven by the goals of Network Enabled Capability (NEC). It provides support for discovering, structuring and fusing information - key operations enabling the NEC vision. It is built on top of three key concepts - service-oriented computing based on web services, a peer-to-peer architecture and goal-oriented automatic service composition. Combining these three concepts, Nexus delivers agile information fusion capability via a loosely collaborating set of information and fusion services deployed in the service network. Although no strict restrictions are imposed, the fusion services are supposed to provide a higher-level fusion capability on the level 2 and 3 of the JDL data fusion hierarchy [12]. Implementation of peer-topeer service oriented information fusion based on JXTA and web services is described, together with a demonstration application exploiting these fusion capabilities to support an emergency response scenario.
Author
Multisensor Fusion; Information Systems; Applications Programs (Computers); Deployment

20080016668 Thales Research and Technology, Orsay, France
Extraction of Relations between Entities from Texts by Learning Methods
Goujon, Benedicte; Frigiere, Julia; Information for Fusion for Command Support; December 2006, pp. 9-1 - 9-8; In English; See also 20080016662; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The aim of this work is to automatically extract structured information from unstructured texts, permitting their fusion in an intelligence application. In Thales, we have a knowledge management system (Ideliance) that permits us to manage entities and relations between them, but at present the user must manually capture this information. To automate such an extraction, we propose the use of a learning algorithm that we have developed after the study of the existing information extraction methods. We present the Sem+ tool that implements the algorithm, and the evaluation of this tool carried out by us and by the Land Headquarter (S.T.A.T. unit).
Author
Management Systems; Machine Learning; Intelligence; Extraction; Texts

20080016669 Calspan-Buffalo Univ. Research Center, NY, USA
A Model for Situation and Threat Assessment
Steinberg, Alan; Information for Fusion for Command Support; December 2006, pp. KN1-1 - KN1-4; In English; See also 20080016662; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A model is presented for situation and threat assessment, with a goal of advancing the state of the art in representing, recognizing and discovering situations and, in particular, threat situations. The activity relates to levels 2 and 3 of the familiar

JDL data fusion model. Level 2, Situation Assessment , involves such applications as scene understanding, force structure analysis and many other types of situational analysis. Level 3, Impact Assessment includes, besides threat assessment (as level 3 was originally named), course of action analysis and outcome prediction. Data fusion is the process of estimating or predicting some aspect of the world. Specifically, the data fusion process of Situation Assessment has the job of estimating or predicting situations. A situation can be defined very broadly as any structure part of reality (Devlin, 1991). In that structural analysis involves an assessment of the element of an entity in their relation to one another, Situation Assessment involves (a) inferring relationships, (b) inferring the states of elements on the basis of estimates of their relationships, and (c) recognizing or classifying situations on the basis of estimates of constituent elements and their relationships. In that the last of these is a recognition/classification problem, we should expect to have some similarity to target recognition and classification; i.e. the matching of data to prior models (a deductive process). As in target recognition/classification, this dependency on prior models presumes a process for generating, evaluating and selecting such models. These are characteristically abductive (i.e. explanatory) and inductive processes. We take as our starting point the process involved in Scene Understanding as it occurs in machine vision, automatic target recognition (ATR) and remote sensing applications. ATR and machine vision have evolved from straight-forward template matching techniques, in which observed scenes are compared with stored images. Template techniques are obviously constrained by the number of target/context scenes that they can store. Various indexing schemes are used to reduce this burden, by extracting relatively invariant features, but the approach is ultimately restricted to situations in which target signatures are not much affected by contextual factors (occlusion, shadowing, illumination variability, etc.). Far more robust (although more complex) are model-based techniques, in which candidate scene hypotheses are adaptively generated, evaluated, refined and modified. Such techniques can be augmented by adaptive data collection techniques that anticipate the utility of information in resolving present ambiguities and manage sensors or data mining processes to maximize the value of returned data.
Author
Multisensor Fusion; Target Recognition; Scene Analysis; Predictions; Data Acquisition; Damage Assessment; Classifications; Occlusion

20080016670 Cranfield Univ., Cranfield, UK
Decision Support for Asymmetric Urban Warfare
Enderwick, Tracey; McNaught, Ken; Information for Fusion for Command Support; December 2006, pp. 6-1 - 6-12; In English; See also 20080016662; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The deciphering of intelligence is a complex task and if not explained clearly can cause confusion in battle, ultimately increasing the probability of fratricide and loss. Various methods have been tried to simplify the deciphering of intelligence, many of which are simplistic and deterministic in their nature (e.g. fuzzy logic). In this paper, we employ two probabilistic techniques (Bayesian Networks and Influence Diagrams), widely accepted in a variety of industries, to aid decision makers by determining the most probable outcome based on the intelligence known at the time. The methodology described in this paper relates to an asymmetric urban warfare scenario and has proven to be robust and insensitive to reasonable changes in the data. The time taken to develop and understand a Bayesian Network or Influence Diagram makes it improbable for satisfactory use within a high tempo real life scenario. These tools are potentially useful during the intelligence preparation phase and as decision support tools for areas such as troop allocation and operational planning.
Author
Decision Support Systems; Bayes Theorem; Intelligence; Fuzzy Systems; Planning; Operational Problems

20080016671 State Univ. of New York, Buffalo, NY, USA
Service-Oriented Architectures, Network-Centric Warfare, and Agile, Self-Synchronized C2: Impacts to Data Fusion Process Design
Llinas, James; Information for Fusion for Command Support; December 2006, pp. KN2-1 - KN2-6; In English; See also 20080016662; Original contains color illustrations; Copyright; Avail.: CASI: A05, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

One of the primary if not the central motivating rationale for Network-Centric Warfare (NCW) is that NCW provides an enabling mechanism for information sharing and shared understanding and awareness of military situations of interest, that in turn allows the realization of entirely new concepts of C2 that are advertised as providing greatly increased agility, speed of command, and synchronization in C2. In turn, the underlying enabling 'IT' mechanism for NCW is the Service-Oriented Architecture (SOA) concept, within which all functional services, to include Data Fusion Services, will presumably operate. These attractive but as-yet-not-fully-defined concepts represent a challenge to the Data Fusion community in terms of

understanding the implications of the evolving NCW, SOA, and new C2 concepts on the design of Data Fusion Services. Key to this understanding in particular is the need for a close dialog with the C2 research community on exactly what the information needs of new C2 concepts will be and how those needs can best be met by appropriately-designed Data Fusion Services. This talk will address each of these issues and argue for the need for both: (1) a multi-community approach to the architecting of effective and efficient SOA s, and (2) for new initiatives in distributed Data Fusion to address the specific technical challenges of NCW-specific Data Fusion Service design and implementation. (It should be noted that this paper is drawn largely from US literature and so presents a US-based viewpoint developed by the author; the paper does not represent any official US governmental views.) This brief paper is intended to sketch the topical areas that will be addressed in the associated Keynote speech.
Author
Service Oriented Architecture; Multisensor Fusion; Synchronism

20080016672 Universite d'Artois, Lens Cedex, France
Logical Traps in High-Level Knowledge and Information Fusion
Gregoire, Eric; Information for Fusion for Command Support; December 2006, pp. 7-1 - 7-10; In English; See also 20080016662; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In this paper, we are concerned with high-level information fusion, such as it is envisioned in JDL levels 4 and 5. More precisely, the focus is on decision and reasoning systems that must act in a rational and logical way from several knowledge and high-level information sources and databases. Whatever the selected knowledge and information representation languages in the sources are, an automatic reasoning system that is part of decision-support system must obey unquestionable rules and principles pertaining to logic. However, applying those rules that are initially defined for reasoning about a unique view of a situation, which is supposed to be fully described, can lead to serious and unexpected drawbacks in the context of the fusion of several different and partial views. We address three such issues. The first-one is related to the dramatic trivializing effects of logical inconsistency. The second one lies on the implicit transformation of necessary conditions into sufficient ones when fusion is operated. The last one is the implicit loss of more specific and precise information in favour of more general knowledge. Each of these problems is motivated by intuitive examples before practical solutions are discussed.
Author
Information Systems; Decision Support Systems; Data Bases; Languages

20080016673 SPOTI, Issy- les- Moulineaux, France
Application of the Semantics Enrichment Concept in the Information Fusion for Command Support
Bares, Michel; Information for Fusion for Command Support; December 2006, pp. 8-1 - 8-12; In English; See also 20080016662; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In this paper we present the different notions surrounding the concept called semantics enrichment which may significantly contribute facilitating the fusion process. After having introduced the role of the semantics in any command aid support, we show how it is possible to increase the relevance of operational information from its semantics. We propose a way to enrich semantics, firstly by making symbolic fusion, secondly by determining compatibility relations between pre-defined domains of operational knowledge; for that purpose we rely upon the fuzzy logic elements. We finally present applications, in which, all notions referring to the semantics enrichment concept can be applied. A possible way of extending the semantics enrichment process is also presented. Keywords: fusion, semantics, symbolic fusion, compatibility relations, knowledge representation, fuzzy logic.
Author
Fuzzy Systems; Logical Elements; Knowledge Representation; Semantics

20080016674 BAE Systems, UK
A Bayesian Methodology for Effects Based Planning
Bullen, Bert; Information for Fusion for Command Support; December 2006, pp. 5-1 - 5-8; In English; See also 20080016662; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We present a methodology that employs Bayesian Networks in aiding Effects Based Planning. The network models the probabilistic dependencies between elements of the domain of interest in which a mission is being planned, the actions taken

on those elements and the effects resulting from those actions. The model can be interrogated from the perspective of the actions, the elements of the domain or, recursively, the effects.
Author
Bayes Theorem; Mission Planning; Situational Awareness; Command and Control; Control Systems Design; Data Acquisition; Multisensor Fusion; Reconnaissance

20080016675 Assistant Chief of Staff Evaluation-Division Concepts, Raketstraat, Brussels, Belgium
Intelligence Base: Strategic Instrument of an Organisation
Rabaey, Marc; Leclercq, Jean-Marie; Vandijck, Eddy; Hoffman, Ghislain; Timmerman, Martin; Information for Fusion for Command Support; December 2006, pp. 1-1 - 1-14; In English; See also 20080016662; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Not only is the speed of delivery of information increasing in this ever faster changing world, but also the amount of information. Moreover, in the fight against international terrorism a nation has to share intelligence and exchange information with other nations. This requires a secure and performing communication system. This paper introduces the concept of the Intelligence Base, which meets the needs of an efficient and effective intelligence system. The Intelligence Base is composed of a Fact Base (storing information), an Interpreted Information Base (storing intelligence), an Unknown Base (to manage the requested information) and an Intelligence Bus (communication system). The underlying architecture is based on Service-Oriented Architecture, already adopted by the business world to integrate business processes and their applications.
Author
Intelligence; Organizations; Information Systems; Service Oriented Architecture

20080016676 Thales Research and Technology, France
Cognitive Situation Awareness for Information Superiority
Laudy, Claire; Mattioli, Juliette; Museaux, Nicolas; Information for Fusion for Command Support; December 2006, pp. 3-1 - 3-12; In English; See also 20080016662; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We present a summary of the drawbacks and deficiencies that we noticed in the currently available Command Support Systems (CSS) and the methodology we propose to improve them: Situation Awareness support through Cognitive Fusion of Information stemmed out of document analysis. Our approach is divided into two parts: a methodology for situation representation out of document analysis and a methodology for situation analysis and reasoning to support decision-making. The situation representation part is based on the use of conceptual graphs and fusion of nodes in graph structures, whereas the situation analysis part follows Complex Event Processing methodology.
Author
Command Guidance; Information Systems; Decision Making; Perceptual Errors

20080016677 Turkish General Staff Headquarters, Ankara, Turkey
Formatted Message Exchange in a Multinational Environment
Ucuncu, Murat; Demirezen, M. U.; Information for Fusion for Command Support; December 2006, pp. 2-1 - 2-10; In English; See also 20080016662; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

It is important to exchange meaningful and useful data in a multinational environment. However, several nations have different data dictionary and data models. There are also cases where there are different data models in a nation, e.g. The Army data model and the Navy data model could be different for their information systems. In such cases, it is almost impossible to exchange data and utilize these data to obtain a situation display. Several techniques have been developed to take over this problem. One of them is database replication and other is the Formatted Message approach. Each method has its own advantages and disadvantages. Formatted Message Approach is used to exchange data among the different information systems in our study. We have developed an algorithm, which tries to handle this interoperability issue. In the algorithm, core software is developed which checks all the received formatted messages and corrects the possible specific errors according to ADatP-3 rules and inserts or updates the database with this received and corrected data. Software can be thought as a gateway between the GIS application and National information systems that send formatted messages. It converts formatted messages to database entries so that GIS application can use the received data and display them. The software developed was tested during Joint Warrior Interoperability Demonstration 2003 (JWID- 03). During JWID-03, OWNSITREP (Own Situation Report), ENSITREP (Enemy Situation Report), NAVSITSUM, (Naval Situation Summary) and NAVSITREP (Naval Situation

Report) formatted messages prepared and sent by almost 9 different nations, were received, parsed, filtered and recorded in an ORACLE 9i database. ATCCIS (Baseline 11) data model was also implemented in the database side and utilized in our software development. IRIS IMT was used to model both the formatted message and the database. It is also used to record received data via formatted messages. After each database insert or update, unit positions, unit coordinates, battle of order information etc. are displayed on a GIS system (TACCIS). In Conclusion, all the different formatted messages coming from different nations are possible to processed and after the probable errors are corrected. Useful data is recorded to database to obtain a Multinational Common Operational Picture, by the developed software.
Author
Software Engineering; Information Systems; Data Bases; Computer Programs; Messages; Interoperability; Coordinates; Algorithms

20080016678 Research Inst. for Communication, Information Processing and Ergonomics, Wachtberg-Werthhoven, Germany
Towards Automatic Threat Recognition
Schade, Ulrich; Biermann, Joachim; Frey, Miloslaw; Information for Fusion for Command Support; December 2006, pp. 11-1 - 11-10; In English; See also 20080016662; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The current transformation processes aim at robustly networked forces in order to enable them to execute network-centric operations [1]. Obviously, this will provide the forces headquarters with a huge amount of data and information that has to be processed to deduce an appropriate picture of the respective battlespace and evolving threats in a timely and most reliable manner. Some of the data will not be relevant at all, but some other may indicate upcoming threats. This is true especially with respect to reconnaissance reports which will not only include information from own reconnaissance assets but also from civilians and other open sources. Thus, one of the most challenging aspects of data and information processing in military affairs is to find the situation relevant information within the huge amount of irrelevant one. The paper at hand describes a high level information fusion system under development. This system automatically processes the incoming stream of unstructured information in order to support the human operator in intelligence processing. Ideally, analysing the input information based on the so far perceived situation and available background knowledge, the system recognizes that part of information which might indicate new threats (as well as targets) or confirm existing hypotheses. The relevant and preprocessed information then will be presented to the operator for further (interactive) investigation. Our system processes the incoming messages in two steps according to the established intelligence processing procedures. During the first one, the reported events are categorized (or classified), and cross-referenced. In the second one, the resulting information is analysed and combined and integrated into patterns in the course of the production of further intelligence in order to separate the presumable relevant information from the less significant one. For both steps, knowledge about the domain and the information context has to be accessed and exploited. Therefore, the system resorts to an ontology. To point out the system and its functionalities, the paper will describe this ontology as well as the processing steps in general and by example.
Author
Information Systems; Warning Systems; Reconnaissance; Data Processing; Intelligence; Systems Engineering; Targets

20080016679 Evidence Based Research, Inc., Vienna, VA, USA
Structuring and Fusing Text
Noble, David F.; Information for Fusion for Command Support; December 2006, pp. 10-1 - 10-14; In English; See also 20080016662; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Much information important for battlefield assessments is transmitted as unstructured text, including both unclassified documents available to the general public as well as highly classified reports and messages. Text can convey such highly valued information as adversary plans and goals. Unfortunately, valuable text nuggets may be buried in massive amounts of less important information, and may be difficult to find. Once found, different aspects of an entity or activity may be scattered among different text sources, making it difficult to assemble into a coherent picture able to convey context, relationships, and trends. This paper describes a methodology for structuring and fusing open source information so that it may be presented on maps and diagrams. This process employs formal ontologies for the fusion domain and for evidential reasoning, a commercial tool for text extraction and structuring, and tools to help operators review, edit, and augment the fusion products. It features a fusion pedigree to document the audit trail of sources and processes contributing to a fusion product. The fusion steps are: 1) collect structured and unstructured information related to the entity or event of interest; 2) extract and structure free text; 3) create ‘event reports’ from each structured record, whether derived from free text or previously structured sources; 4) create

ontology-based communication reports from these records, 5) associate these reports, 6) cue manual search for additional information, and 7) fuse the information.
Author
Texts; Communicating; Periodicals; Messages; Internets; Extraction; Cues

20080016680 MEDAV G.m.b.H., Uttenreuth, Germany
A Speech Classification System
Uebler, Ulla; Information for Fusion for Command Support; December 2006, pp. 12-1 - 12-10; In English; See also 20080016662; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper presents the technique of speech classification and the usage of this technology in a set of scenarios. Speech classification reduced the amount of labour necessary for the analysis of incoming audio signals by classifying the signals to the spoken language, the speaker etc. Different scenarios are presented showing how speech classification can be used in order to deliver the maximum efficiency and accuracy in the scope of information processing.
Author
Speech; Classifications; Audio Signals; Languages; Data Processing; Classifiers; Algorithms

20080016693 Lockheed Martin Corp., Schenectady, NY, USA; Knolls Atomic Power Lab., Niskayuna, NY, USA
Keff Search Capability in MC21
Morrow, R. E.; Trumbull, T. Y.; Donovan, T. J.; Sutton, T. M.; Jan. 09, 2007; 13 pp.; In English
Report No.(s): DE2007-903082; LM-06K143; No Copyright; Avail.: National Technical Information Service (NTIS)

The MC21 Monte Carlo code is required to permit an individual geometric component or groups of components to be tagged as movable within some permissible range. Typical examples of such movable components would be control devices such as translating rods or rotating drums. Given this geometric information, a target multiplication factor (keff), and a convergence criterion, MC21 will iterate on movable component positions and return a final position that reflects a keff close to the target value. An initial version of this capability is demonstrated through modifications to MC21 that sets the geometry data structures for the movable components, calls the main Fortran-95 solver to compute keff, and converges on the final position. This approach uses an adaptive batching algorithm that continually increases the accuracy of each successive MC21 keff result as the movable geometry approaches the converged position.
NTIS
Monte Carlo Method; Geometry

20080016699 Fenwick and West, LLP, Mountain View, CA, USA
Database Manipulations Using Group Theory
Dixon, H. E., Inventor; Ginsberg, M. L., Inventor; Hofer, D., Inventor; Luke, E. M., Inventor; Feb. 5, 2004; 49 pp.; In English
Contract(s)/Grant(s): DARPA-F30602-00-2-0534; AFRL-F33615-02-C-4032
Patent Info.: Filed Filed 5 Feb 04; US-Patent-Appl-SN-10-773 351
Report No.(s): PB2007-108831; No Copyright; Avail.: CASI: A03, Hardcopy

Data in a database describe an application domain such as a satisfiability problem. The data are represented in a manner that expresses the structure inherent in the data and one such representation uses group theory and represents the data as one or more 'augmented clauses,' where each clause has a pair (c,G) including a database element c and a group G of group elements g acting on it. A query is encoded in a group theory representation and is executed on the group theory representation of the data to identify database elements and associated group elements satisfying the query. If desired, the satisfying database elements are converted from the group theory representation to the native representation of the data.
NTIS
Data Bases; Group Theory

20080016721 Department of Energy, Washington, DC USA
Sixth International PCaPAC (Personal Computers and Particle Accelerator Controls) held on October 24-27, 2006 at Jefferson Lab, Newport News, VA
Jan. 01, 2006; 179 pp.; In English
Report No.(s): DE2007-901544; No Copyright; Avail.: National Technical Information Service (NTIS)

The 6th International PCaPAC (Personal Computers and Particle Accelerator Controls) workshop was held at Jefferson

Lab, Newport News, Virginia, from October 24-27, 2006. The main objectives of the conference were to discuss the most important issues of the use of PCs and modern IT technologies for controls of accelerators and to give scientists, engineers, and technicians a forum to exchange the ideas on control problems and their solutions. The workshop consisted of plenary sessions and poster sessions. No parallel sessions were held. Totally, more than seventy oral and poster presentations as well as tutorials were made during the conference, on the basis of which about fifty papers were submitted by the authors and included in this publication. This printed version of the PCaPAC 2006 Proceedings is published at Jefferson Lab according to the decision of the PCaPAC International Program Committee of October 26, 2006.
NTIS
Particle Accelerators; Personal Computers

20080016755 Verizon Corporate Services Group, Inc., Irving, TX, USA
Packet-Based and Pseudo-Packet-Based Cryptographic Synchronization Systems and Methods
Milliken, W. C., Inventor; Troxel, G. D., Inventor; Mar. 09, 2005; 34 pp.; In English
Contract(s)/Grant(s): MDA904-03-C-0969
Patent Info.: Filed Filed 9 Mar 05; US-Patent-Appl-SN-11-076 216
Report No.(s): PB2007-105193; No Copyright; Avail.: CASI: A03, Hardcopy

The disclosed technology provides a system and method of synchronizing cryptographic operation between a transmitter and a receiver. A transmitter can communicate encrypted data to a receiver according to a first communications protocol, and communicate a transmitter number and a portion of the encrypted data to the receiver according to a second communications protocol. The receiver can be in communication with a memory space containing locations that are each associated with an encrypted data and that can contain a previous receiver number. The receiver can receive transmitted encrypted data and an associated transmitter number and can search the memory space to find a location wherein the encrypted data associated with the location is entirely, or in part, the same as the transmitted encrypted data. When such a location is found, the receiver can compare the transmitter number with the previous receiver number stored in the location.
NTIS
Cryptography; Receivers; Synchronism; Transmitters

20080016759 Naval Undersea Warfare Center, Newport, RI, USA
Chain Rule Processor
Baggenstoss, P. M., Inventor; Feb. 27, 2004; 12 pp.; In English
Patent Info.: Filed Filed 27 Feb 04; US-Patent-Appl-SN-10-789 050
Report No.(s): PB2007-105177; No Copyright; Avail.: CASI: A03, Hardcopy

A modularized classifier is provided which includes a plurality of class specific modules. Each module has a feature calculation section, and a correction section. The modules can be arranged in chains of modules where each chain is associated with a class. The first module in the chain receives raw input data and subsequent modules act on the features provided by the previous module. The correction section acts on the previously computed correction. Each chain is terminated by a probability density function evaluation module. The output of the evaluation module is combined with the correction value of the last module in the chain. This combined output is provided to a compare module that indicates the class of the raw input data.
NTIS
Classifiers; Modules; Probability Theory

20080016762 Air Force Research Lab., Rome, NY, USA
Method for Automatic Community Model Generation Based on Uni-Parity Data
Zhang, Z., Inventor; Salerno, J. J., Inventor; Mar. 15, 2004; 13 pp.; In English
Patent Info.: Filed Filed 15 Mar 04; US-Patent-Appl-SN-10-800 489
Report No.(s): PB2007-105178; No Copyright; Avail.: CASI: A03, Hardcopy

Method for automatic community model generation based on uni-parity data. Correlation analysis is employed to identify links within the community. Method may be particularized for solving specific problems such as determining the activities between individuals within a money laundering ring.
NTIS
Parity; Correlation

20080016763 Center for Mathematics and Computer Science, Amsterdam, Netherlands

AmbientDB: Relational Query Processing in a P2P Network

Jun. 30, 2003; 22 pp.; In English

Report No.(s): PB2007-111352; INS-R0306; Copyright; Avail.: National Technical Information Service (NTIS)

A new generation of applications running on a network of nodes, that share data on an ad-hoc basis, will benefit from data management services including powerful querying facilities. In this paper, we introduce the goals, assumptions and architecture of AmbientDB, a new peer-to-peer (P2P) DBMS prototype developed at CWI. Our focus is on the query processing facilities of AmbientDB, that are based on a tree-level translation of a global query algebra into multi-wave stream processing plans, distributed over an ad-hoc P2P network. We illustrate the usefulness of our system by outlining how it eases construction of a music player that generates intelligent playlists with collaborative filtering over distributed music logs. Finally, we show how the use of Distributed Hash Tables (DHT) at the basis of AmbientDB to provide global indexing support allows applications like the P2P music player to scale to large amounts of nodes.

NTIS

Data Processing; Data Management; Algebra

20080016765 Center for Mathematics and Computer Science, Amsterdam, Netherlands

That Obscure Object of Desire: Multimedia Metadata on the Web (Part II)

van Ossenbruggen, J. R.; Nack, F. M.; Hardman, L.; Dec. 03, 2003; 16 pp.; In English

Report No.(s): PB2007-111356; INS-E0309; Copyright; Avail.: National Technical Information Service (NTIS)

This article discusses the state of the art in metadata for audio-visual media in large semantic networks, such as the Semantic Web. Our discussion is predominantly motivated by the two most widely known approaches towards machine-processable and semantic-based content description, namely the Semantic Web activity of the W3C and ISO's efforts in the direction of complex media content modeling, in particular the Multimedia Content Description Interface (MPEG-7). We explain that the conceptual ideas and technologies discussed in both approaches are essential for the next step in multimedia development. Unfortunately, there are still many practical obstacles that block their widespread use for providing multimedia metadata on the Web. Based on a scenario to explain our vision of a media-aware Semantic Web, we derive in Part I, PB2007-111355, a number of problems regarding the semantic content description of media units. We then discuss the multimedia production chain, in particular emphasizing the role of progressive metadata production. As a result we distill a set of media-based metadata production requirements and show how current media production environments fail to address these. We then introduce those parts of the W3C and ISO standardization works that are relevant to our discussion. In Part II, we analyze their abilities to define structures for describing media semantics, discuss syntactic and semantic problems, ontological problems for media semantics, and the problems of applying the theoretical concepts to real world problems. Part II concludes with implications of the findings for future action with respect to the actions the community should take.This article discusses the state of the art in metadata for audio-visual media in large semantic networks, such as the Semantic Web. Our discussion is predominantly motivated by the two most widely known approaches towards machine-processable and semantic-based content description, namely the Semantic Web activity of the W3C and ISO's efforts in the direction of complex media content modeling, in particular the Multimedia Content Description Interface (MPEG-7). We explain that the conceptual ideas and technologies discussed in both approaches are essential for the next step in multimedia development. Unfortunately, there are still many practical obstacles that block their widespread use for providing multimedia metadata on the Web. Based on a scenario to explain our vision of a media-aware Semantic Web, we derive in Part I a number of problems regarding the semantic content description of media units. We then discuss the multimedia production chain, in particular emphasizing the role of progressive metadata production. As a result we distill a set of media-based metadata production requirements and show how current media production environments fail to address these. We then introduce those parts of the W3C and ISO standardization works that are relevant to our discussion. In Part II, PB2007-111356, we analyze their abilities to define structures for describing media semantics, discuss syntactic and semantic problems, ontological problems for media semantics, and the problems of applying the theoretical concepts to real world problems. Part II concludes with implications of the findings for future action with respect to the actions the community should take.

NTIS

Audio Equipment; Metadata; Multimedia; Visual Aids

20080016766 Center for Mathematics and Computer Science, Amsterdam, Netherlands

Structuring and Presenting Annotated Media Repositories

Rutledge, L. W.; van Ossenbruggen, J. R.; Hardman, L.; Feb. 12, 2004; 14 pp.; In English

Report No.(s): PB2007-111358; INS-E0402; Copyright; Avail.: National Technical Information Service (NTIS)

The Semantic Web envisions a Web that is both human readable and machine processible. In practice, however, there is

still a large conceptual gap between annotated content repositories on the one hand, and coherent, human readable Web pages on the other. To bridge this conceptual gap, one needs to select the appropriate content from the repository, structure and order the material, and design a Web page that effectively conveys the selected content and the chosen structure. In addition to this conceptual gap, there is also a technological gap. On one side of this gap, we find the semantic-oriented technology deployed to build annotated content repositories. This includes RDF, RDF Schema and OWL. On the other side of the gap is the syntax-oriented technology deployed to build Websites. This includes XML, XSLT, CSS, XHTML and SMIL. In this paper, we discuss the conceptual relationships between the world of explicit metadata semantics and the world of Web presentations and their underlying syntactic formats. We also explore to what extent this gap can be bridged automatically, and how current Web technologies can be used to support this process.
NTIS
Annotations; Document Markup Languages; Websites

20080016767 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Multimedia Retrieval Using Multiple Examples
Westerveld, T. H. W.; de Vries, A. P.; Mar. 05, 2004; 12 pp.; In English
Report No.(s): PB2007-111359; INS-E0403; Copyright; Avail.: National Technical Information Service (NTIS)
The paper presents a variant of our generative probabilistic multimedia retrieval model that is suitable for information needs expressed as multiple examples. Results have been evaluated on the TRECVID 2003 collection.
NTIS
Multimedia; Information Retrieval; Probability Theory

20080016768 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Cache-Conscious Radix-Decluster Projections
Manegold, S.; Boncz, P. A.; Nes, N. J.; Kersten, M. L.; Jun. 01, 2004; 26 pp.; In English
Report No.(s): PB2007-111362; INS-E0406; Copyright; Avail.: National Technical Information Service (NTIS)
As CPU's become more powerful with Moore's law and memory latencies staying constant, the impact of the memory access performance bottleneck continues to grow on relational operators like join, which can exhibit random access on a memory region larger than the hardware caches. While cache-conscious variants for various relational algorithms have been described, previous work has mostly ignored (the cost of) projection columns. However, real-life joins almost always come with projections, such that proper projection column manipulation should be an integral part of any generic join algorithm. In this paper, we analyze cache-conscious hash-join algorithms including projections on two storage schemes: N-ary Storage Model (NSM) and Decomposition Storage Model (DSM). It turns out, that the strategy of first executing the join and only afterwards dealing with the projection columns (i.e., post-projection) on DSM, in combination with a new finely tunable algorithm called Radix-Decluster, outperforms all previously reported projection strategies. To make this result generally applicable, we also outline how DSM Radix-Decluster can be integrated in a NSM-based RDBMS using projection indices.
NTIS
Random Access Memory; Decomposition; Costs

20080016790 Savannah River National Lab., Aiken, SC, USA; National Inst. of Standards and Technology, Gaithersburg, MD USA
Validation of Computer Models for Nuclear Material Shipping Packages
Gupta, N. K.; Shine, E. P.; Tuckfield, R. C.; Fong, J. T.; Jan. 01, 2007; 8 pp.; In English
Report No.(s): DE2007-903406; PVP-2007-26751; No Copyright; Avail.: National Technical Information Service (NTIS)
Computer models are abstractions of physical reality and are routinely used for solving practical engineering problems. These models are prepared using large complex computer codes that are widely used in the industry. Patran/Thermal is such a finite element computer code that is used for solving complex heat transfer problems in the industry. Finite element models of complex problems involve making assumptions and simplifications that depend upon the complexity of the problem and upon the judgment of the analysts. The assumptions involve mesh size, solution methods, convergence criteria, material properties, boundary conditions, etc. that could vary from analyst to analyst. All of these assumptions are, in fact, candidates for a purposeful and intended effort to systematically vary each in connection with the others to determine there relative importance or expected overall effect on the modeled outcome. These kinds of models derive from the methods of statistical science and are based on the principles of experimental designs. These, as all computer models, must be validated to make sure that the output from such an abstraction represents reality. A new nuclear material packaging design, called 9977, which

is undergoing a certification design review, is used to assess the capability of the Patran/Thermal computer model to simulate 9977 thermal response. The computer model for the 9977 package is validated by comparing its output with the test data collected from an actual thermal test performed on a full size 9977 package. Inferences are drawn by performing statistical analyses on the residuals.
NTIS
Computerized Simulation; Packaging

20080016818 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Towards Ontology-Driven Discourse: From Semantic Graphs to Multimedia Presentations
Geurts, J. P. T. M.; Bocconi, S.; van Ossenbruggen, J. R.; Hardman, H. L.; May 31, 2003; 18 pp.; In English
Report No.(s): PB2007-111350; INS-R0305; Copyright; Avail.: National Technical Information Service (NTIS)

Traditionally, research in applying Semantic Web technology to multimedia information systems has focused on using annotations and ontologies to improve the retrieval process. This paper concentrates on improving the presentation of the retrieval results. First, our approach uses ontological domain knowledge to select and organize the content relevant to the topic the user is interested in. Domain ontologies are valuable in the presentation generation process, because effective presentations are those that succeed in conveying the relevant domain semantics to the user. Explicit discourse and narrative knowledge allows selection of appropriate presentation genres and creation of narrative structures, which are used for conveying these domain relations. In addition, knowledge of graphic design and media characteristics is essential to transform abstract presentation structures in real multimedia presentations. Design knowledge determines how the semantics and presentation structure are expressed in the multimedia presentation. In traditional Web environments, this type of design knowledge remains implicit, hidden in style sheets and other document transformation code. Our second use of Semantic Web technology is to model design knowledge explicitly, and to let it drive the transformations needed to turn annotated media items into structured presentations.
NTIS
Multimedia; Graphs (Charts); Information Systems; Design Analysis

20080016819 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Cuypers Meets Users: Implementing a User Model Architecture for Multimedia Presentation Generation
Little, S.; Hardman, H.; Nov. 14, 2003; 14 pp.; In English
Report No.(s): PB2007-111351; INS-E0306; Copyright; Avail.: National Technical Information Service (NTIS)

With the rapid growth of interest in the Internet as a means for accessing multimedia presentations for education, entertainment and commerce, comes a corresponding need for systems to supply automatically generated, personalized presentations. Multimedia is a rich and complex genre of resources and the interrelated effects of content, style and structure ensure that automatic presentation generation is in itself a complicated and challenging task. Integrating a model for user personalization adds a further layer of complication and ensuring that the requirements of user, supplier and platform are all met is a demanding undertaking. This project investigates the influence of information about a user in the process of generating a multimedia presentation. As a result an architecture taking into account these trade-offs is proposed. To evaluate this combined architecture, a framework has been implemented which adjusts colour choices based on the different influences involved. This paper describes the integration of a user modelling approach within an existing system architecture, discusses some of the issues involved in applying user modelling to multimedia presentation generation and describes the prototype implementation and how it addresses some of these issues.
NTIS
Multimedia; Architecture (Computers); Commerce; Internets

20080016821 Center for Mathematics and Computer Science, Amsterdam, Netherlands
RAM: Array Processing Over a Relational DBMS (Database Management System)
van Ballegooij, A. R.; de Vries, A. P.; Kersten, M. L.; Mar. 31, 2003; 22 pp.; In English
Report No.(s): PB2007-111342; INS-R0301; Copyright; Avail.: National Technical Information Service (NTIS)

Developing multimedia applications in relational databases is hindered by a mismatch in computational frameworks. Efficient manipulation of multimedia data calls for array-based processing, which at best is available as a database add-on, not supported by the query optimizer. As a result, array-based processing ends up in dedicated programs outside the DBMS: non-reusable black boxes. The goal of our research is to reduce this gap between user-needs and system functionality by developing a seemless integration of array processing in a relational algebra engine. The paper introduces a declarative

language for array-expressions based on the array comprehension, and its mapping to a relational kernel in a prototype implementation. The layered architecture of the resulting array database management system allows the use of structural knowledge available in the array data type. This additional source of information can be exploited for query optimization, which is demonstrated with a case study. The experiments show how the performance of a standard tool for matrix computations can be achieved without sacrificing data independence, highlighting however a critical aspect in the DBMS architecture proposed.
NTIS
Data Base Management Systems; Relational Data Bases

20080016872 Research and Technology Organization, Neuilly-sur-Seine, France
Virtual Media for Military Applications
June 2006; In English; RTO Human Factors and Medicine Panel (HFM) Workshop, 13-15 June 2006, West Point, NY, USA; See also 20080016873 - 20080016905
Report No.(s): RTO-MP-HFM-136; AC/323(HFM-136)TP/68; Copyright; Avail.: CASI: C01, CD-ROM

Topics covered include: Technical Evaluation Report; Some Human Factors Considerations for Designing Mixed Reality Interfaces; A Vision for Future Virtual Training; The Future of Simulation; Applicability of Virtual Environments as C4ISR Displays; Measuring, Monitoring, and Managing Knowledge in Command and Control Organizations; Components of Effective Training; Experimental Studies in a Reconfigurable C4 Test-bed for Network Enabled Capability; Challenges and Potential of Service-Oriented Architectures for Net-Centric Operations; SimNEC: Research Platform for Studying Human Functioning in NCW; Serious Gaming Technologies Support Human Factors Investigations of Advanced Interfaces for Semi-Autonomous Vehicles; Tele-Presence: Bringing the Operator Back in the Loop; Understanding Soldier Robot Teams in Virtual Environments; Teleoperation of Unmanned Vehicles: The Human Factor; Human Automation Integration for Supervisory Control of UAVs; The Direction of Virtual Vehicle Simulations for Military Training; Interaction Methods for Virtual Reality Applications; Evaluating Mission Training Fidelity Requirements: Examining Key Issues in Deployability and Trainability; MSC: Vehicle for Validation of Military Flight Simulation; Applying Simulation to Study Human Performance Impacts of Evolutionary and Revolutionary Changes to Armoured Vehicle Design; Emerging Requirements for Virtual Simulations; Combined Arms Training: Measures and Methods for a Changing World; Current Issues in the Use of Virtual Simulations for Dismounted Soldier Training; Virtual Environment Training for Dismounted Teams - Technical Challenges; Immersive Simulation to Train Urban Infantry Combat; Use of the Dismounted Soldier Simulator to Corroborate NVG Studies in a Field Setting; Mobile Augmented Reality: Applications and Human Factors Evaluations; Cognitive Performance Assessment in Mixed and Virtual Environment Systems; Helicopter Aircrew Training Using Fused Reality; Human Performance Assessments when Using Augmented Reality for Navigation; Augmented Reality: Enabling Component for Effective Live Virtual Constructive Integration; The Lessons Learned in the Application of Augmented Reality; and Towards Determination of Visual Requirements for Augmented Reality Displays and Virtual Environments for the Airport Tower.
Derived from text
Automatic Control; Command and Control; Human Factors Engineering; Service Oriented Architecture; Military Technology; Virtual Reality; Test Stands; Display Devices; Flight Simulation; Lessons Learned

20080016873 Army Research Lab., Fort Huachucha, AZ, USA
Understanding Soldier Robot Teams in Virtual Environments
Barnes, Michael J.; Cosenzo, Keryl A.; Jentsch, Florian; Chen, Jessie Y. C.; McDermott, Patricia; Virtual Media for Military Applications; June 2006, pp. 10-1 - 10-14; In English; See also 20080016872; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The purpose of this paper is to demonstrate how current virtual technologies are being used to answer both very applied and more basic questions concerning how humans and robots interact and form teams to conduct missions in a variety of future combat situations. The general research philosophy is to conduct the research using virtual environments that are comparatively isomorphic to the functional requirements of future battlespaces. We argue that, in some cases, trying to capture the exact conditions of future conflict is self-defeating, because of the unpredictability of future events. Rather, we believe it is more efficient to sample a variety of future battlespaces and vary the functional requirements of both the robotic and the Soldier s tasking. Understanding the richness of possible HRI paradigms should allow us to develop general models of HRI and HR teaming performance in order to predict operational and design requirements before either the robotic systems or the future battle environments are fully articulated.
Derived from text
Functional Design Specifications; Robotics; Robots

20080016874 North Carolina Univ., Chapel Hill, NC, USA

Virtual Environment Training for Dismounted Teams - Technical Challenges

Brooks, Fred; Fuchs, Henry; McMillan, Leonard; Whitton, Mary; Cannon-Bowers, Jan; Virtual Media for Military Applications; June 2006, pp. 22-1 - 22-10; In English; See also 20080016872; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Just as flight simulators enable pilots to safely practice responses to emergencies, the challenge now is to develop virtual environment technology for the training together of small teams on foot--military squads, Coast Guard boarding parties, police, EMTs, emergency room trauma teams, hazmat teams, etc. Such training allows repeated, varied practice. The goal is you are there; you learn by doing with feedback; you jell as a team by doing together. First, we must clearly envision what is wanted. This we will call the Immersive Team Trainer (ITT). The successes of flight and ship bridge simulators encourage us. Their use for training mounted teams is a well understood and trusted accomplishment. Decades of development have brought flight simulators to mature excellence; simulators for training other vehicle crews are rapidly approaching this maturity. Such simulators have been proven to be not only more cost-effective per hour than live vehicle training, but more effective as well, since VEs can provide a higher density of experiences and the chance to practice rare and dangerous scenarios safely. The vision is to extend VEs for training dismounted teams effectively and cost-effectively. This has not been done yet because it is technically much more difficult than immersive training for vehicle crews.

Author

Education; Training Devices; Armed Forces; Training Simulators

20080016875 Army Research Inst. for the Behavioral and Social Sciences, Fort Knox, KY, USA

Components of Effective Training

Lussier, James W.; Shadrick, Scott B.; Virtual Media for Military Applications; June 2006, pp. 3-1 - 3-12; In English; See also 20080016872; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

When acquiring difficult skills it is useful to distinguish between ideal activities performed early in skill acquisition and those performed later. In this paper we distinguish the two as training and practice. Early on, activities ought to be designed to shape the manner in which the behavior is performed in order to insure that it occurs in an expert form. Later, activities are designed to make the behavior more automatic, i.e., less consciously controlled, to make it smoother, faster, or otherwise more effective, and to increase retention. The two types of activity are markedly different in structure, pace, amount and type of coaching required, composition of the training audience, focus of conscious attention, appropriate performance measures and feedback, and a variety of other characteristics. The distinction between training activities is important because a too rapid progression to the later type of activity - or skipping the first type of activity entirely - can be very inefficient with regard to acquisition rate and also tends to limit the level of expertise ultimately attained. The distinction applies not only to overt skilled sensorimotor behavior but also to cognitive behavior such as battle command decision making. Developers of today s high-technology simulation and training delivery systems, particular those characterized as virtual, typically strive to create high-fidelity practice environments which are not always suitable for the early and very important training activities. The paper describes the differences between effective training and practice. It discusses examples of successful applications designed for training complex skill related to battle command, and presents data comparing performance of Army leaders who acquired their skill through training and those who acquired it through experience, in this case, through deployments to Iraq or Afghanistan. Developers of advanced training delivery systems are urged to consider the two forms of skill development activity and provide features to support both.

Author

Education; Feedback; Decision Making; Deployment; Simulation

20080016876 Research Inst. for Communication, Information Processing and Ergonomics, Wachtberg-Werthhoven, Germany

Applicability of Virtual Environments as C4ISR Displays

Alexander, Thomas; Renkewitz, Helge; Conradi, Jessica; Virtual Media for Military Applications; June 2006, pp. 1-1 - 1-12; In English; See also 20080016872; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

New sensors, communication infrastructure, and information systems will make plenty of information about actual mission scenarios available. Innovative concepts like Network Centric Warfare (NCW) describe the consequent availability of this information for each command level at any time, at any place. But the huge amount of information may also lead to

information overload for the human commander: Relevant information may be overseen. This might results into building a wrong mental model of the mission scenario and wrong decisions. Therefore, the development of new display paradigms and technology for information presentation is essential. They should be based on established procedures in military decision making and staff planning and allow the easy transfer of them. This article presents some example approaches of applying Augmented Reality (AR) and Virtual Environment (VE) technology as advanced Tactical Situation Display (TSD) for different military command levels. It is concluded that research on microergonomic (i.e. perceptual, motor capabilities for data visualization and data input) and macroergonomic topics (i.e. workload, situational awareness, decision making performance) is needed for a reasonable application of VE as a display of C4ISR systems.
Author
Situational Awareness; Virtual Reality; Telecommunication; Workloads (Psychophysiology); Scientific Visualization; Information Systems; Decision Making

20080016877 Naval Postgraduate School, Monterey, CA, USA
Combined Arms Training: Measures and Methods for a Changing World
Sadagic, Amela; Darken, Rudolph P.; Virtual Media for Military Applications; June 2006, pp. 20-1 - 20-14; In English; See also 20080016872; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

It is clear that the way the military prepares for combat is rapidly changing. Doctrine and mission objectives are changing at a faster rate than ever before. The operational tempo is faster than it has been in the past. Yet leadership demands a prepared military force no performance drop-off is acceptable. In fact, we will need to discover how to train in novel ways, in novel places, on novel tasks, to meet the requirements. While technology is not the whole answer to the puzzle, it must play a part. Determining how simulation and gaming technologies can be brought to bear on readiness will be key. Measures of effectiveness that equate to readiness are also needed. Much of what is done today is subjective in nature. There needs to be an improved mix of subjective and objective measures that can be used to 'roll up' readiness from the individual on up to an entire force. Identifying opportunities for simulation and gaming that really improve individual and team performance and that are deployable so that they can be used in theatre are essential to success. We have been working with the USA Marine Corps at Twentynine Palms, California this past year on the beginning of a research program designed to (a) determine a baseline measure of how effective current training methods are towards readiness standards, (b) document the training measures and methods of team training used at 29 Palms, and (c) identify how simulation and gaming technologies can be used to enhance current training methods, and how these technologies should be integrated with conventional training. The paper will document our progress to date and will forecast what is happening next towards this important research goal that will have broad applicability beyond the Marine Corps to all NATO military training.
Author
Education; Human Performance; Leadership; Combat; Forecasting

20080016878 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Soesterberg, Netherlands
SimNEC: Research Platform for Studying Human Functioning in NCW
vanVeen, Hendrik-Jan; deGraaf, Bernd; Essens, Peter; Virtual Media for Military Applications; June 2006, pp. 6-1 - 6-10; In English; See also 20080016872; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

SimNEC is TNO s grand scheme for experimentally studying human factors issues related to NEC/NCW. The research platform SimNEC consists of multidisciplinary expert teams, long-term research programmes, and a local network of state-of-the-art simulator modules. SimNEC does not focus on technology, but is purposely designed to study the functioning of humans in future network-centric warfare. This distinguishes SimNEC from typical technology-focused concept demonstration and experimentation approaches. Note, however, that SimNEC is designed with the capability to couple with and involve external parties, simulators, simulation networks, and potentially even life systems. Several individual simulator modules have been created in-house over the past few years as the result of originally separate long-term research programmes, such as ICO, MSC, UMV, and FAC. ICO stands for an Integrated Command environment for the bridge, command centre and engine room of a naval frigate. MSC is a Mission Simulation Centre consisting of four F-16 cockpits (one on the high-end motion platform Desdemona). The UMV is a ground station for Unmanned Military Vehicle operations. FAC is a Forward Air Controller (or dismounted soldier) who communicates with MSC or a helicopter of the air maneuver brigade. C-unit is a RNLA command post for land operations within a NATO Response Force. Cannibal Hector is a joint operational centre for the supreme staff during an operation (hector is an acronym for human in command, and cannibal stands for maximally reduced manning). The network of simulator modules allows for the use of sensors and actors from one unit

in any other unit. This part is currently under construction. The aim of SimNEC is to facilitate experimental studies in each of the domains concerned, and additionally to provide the platform for joint/combined operations with multiple levels involved. We believe that real insight in the human aspects of NEC/NCW requires complex scenarios and a complex interconnected environment. We will discuss the approach taken and the studies that are under way and planned in the coming years.
Author
Human Factors Engineering; Ground Stations; Simulation; Multidisciplinary Research; Modules; Domains; Cockpits

20080016879 Birmingham Univ., UK
Serious Gaming Technologies Support Human Factors Investigations of Advanced Interfaces for Semi-Autonomous Vehicles
Stone, Robert; Guest, Robert; Ch'ng, Eugene; McCririe, Christopher; Collins, Christopher; Mannur, Rama; Rehmi, Imran; Virtual Media for Military Applications; June 2006, pp. 8-1 - 8-20; In English; See also 20080016872; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Since the advent of highly capable uninhabited vehicles, notably in the application domains of offshore oil/gas exploration and defence, attention has increasingly focused on the development of technologies necessary to endow remote systems with complete autonomy. However, this approach has not met with widespread success. Operational experiences frequently point to the fact that the human operator still has a significant role to play in the future of uninhabited vehicles, as part of a control continuum that ranges from direct teleoperation during critical mission phases and recovery modes of control to the high-level supervision of single or multiple platforms. However, few (if any) usable guidelines and/or affordable experimental test beds exist to help ensure that human factors issues are adopted early in the design lifecycle of uninhabited systems. To help redress this situation, research under way within the University of Birmingham and the UK s Human Factors Integration Defence Technology Centre has resulted in the development of an experimental Synthetic Environments technology demonstrator test bed, codenamed Alchemy. The test bed is designed to support the generation of new human factors knowledge relating (initially) to operator display and control requirements for uninhabited vehicles, such as iSTAR UAVs (Intelligence, Surveillance, Target Acquisition & Reconnaissance Uninhabited Air Vehicles), deployed in support of homeland security operations or urban combat. The test bed has evolved from an early PC demonstrator, exploiting the Microsoft DirectX Application Programming Interface and .NET framework, to one that now exploits the power, quality and support of software tools emerging from the serious gaming community. This evolution is also helping to support the exploitation of serious games technologies in other defence applications, from close-range weapons training to military surgery.
Author
Remote Control; Autonomy; Human Factors Engineering; Teleoperators; Surveillance; Target Acquisition; Combat; Deployment; Proving; Application Programming Interface

20080016880 TRADOC Analysis Command, Fort Leavenworth, KS, USA
A Vision for Future Virtual Training
Shufelt, James W.; Virtual Media for Military Applications; June 2006, pp. KN2-1 - KN2-12; In English; See also 20080016872; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Virtual training is not intended to replace live training; it augments and supplements live training to sustain unit proficiency. The many advantages of virtual training are currently limited by lack of full interoperability with other virtual simulations, Live and Constructive training environments and battle command systems. In addition, the synthetic environment replicated in virtual training does not accurately represent the actual area of operations or local training areas. Army programs such as Synthetic Environment Core (SE Core), the Future Combat System (FCS), and the Live, Virtual, Constructive - Integrated Architecture (LVC-IA), along with science and technology initiatives, will greatly increase the capabilities and interoperability of the virtual training environment, resulting in a more accurately replication of the operational environment. The impacts of these programs on virtual training simulations lead to a proposed updated vision for future virtual training.
Author
Virtual Reality; Education; Command Guidance; Combat; Interoperability; Simulation

20080016881 Mymic, LLC, Portsmouth, VA, USA

Emerging Requirements for Virtual Simulations

Jones, Phillip; Virtual Media for Military Applications; June 2006, pp. 19-1 - 19-2; In English; See also 20080016872; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This viewgraph presentation reviews the use of virtual simulation as a training tool for armies. It reviews some of the advantages of using simulation, and some of the user's requirements for the development of these simulations as training tools. CASI

Education; Simulation; Virtual Reality; Computerized Simulation; Training Simulators; Military Technology

20080016882 Naval Research Lab., Washington, DC, USA

Mobile Augmented Reality: Applications and Human Factors Evaluations

Livingston, Mark A.; Brown, Dennis G.; Julier, Simon J.; Schmidt, Greg S.; Virtual Media for Military Applications; June 2006, pp. 25-1 - 25-16; In English; See also 20080016872; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Recent trends in military operations (quick-reaction forces, putting fewer warfighters at risk, and increasing the use of unmanned vehicles) have increased the difficulty in acquiring and maintaining situation awareness (SA). Augmented reality (AR) has the potential to meet some of these new challenges. AR systems integrate computer-generated graphics (or annotations) with the user s view of the real world. These annotations can be cues to establish and maintain SA, or they can provide virtual opposing forces (OPFOR) for training scenarios. However, the design of the user interface of a mobile AR system presents a unique set of technical challenges. The interface must be capable of automatically deciding what annotations need to be shown. Furthermore, it must select the characteristics of those annotations (including appearance, size, and drawing style) to ensure the display is intuitive and unambiguous. In the training applications, the virtual OPFOR must appear and behave realistically. We discuss the development of our augmented reality system and the human factors testing we have performed. We apply the system to two military needs: situation awareness during operations and training.

Author

Human Factors Engineering; Virtual Reality; Risk; Education; Military Operations

20080016883 Defence Research and Development Canada, Toronto, Ontario, Canada

Use of the Dismounted Soldier Simulator to Corroborate NVG Studies in a Field Setting

Ho, Ghee; Frim, John; Virtual Media for Military Applications; June 2006, pp. 24-1 - 24-8; In English; See also 20080016872; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Two virtual reality (VR) laboratory studies were conducted using an immersive Dismounted Soldier Simulator (DSS) to replicate and extend a field study on Night Vision Goggle (NVG) field of view (FOV). The DSS was intended to allow for better control of confounding environmental factors identified in the field experiment. In the first VR laboratory study, experimental procedures of the field study were replicated. Soldiers 'wore' different FOV NVGs and detected randomly selected stationary targets while standing stationary at predetermined locations along the urban lane. In the second or extended laboratory study, soldiers wore NVGs with either 40 , 70 , or 95 FOV and detected a series of dynamic soldier-like targets while navigating and traversing through the virtual urban village. Results from these laboratory studies seem to reveal a trend that soldiers could detect targets better while wearing NVGs with larger than 40 degrees FOV, and performance with 70 degrees FOV NVGs was better than with 95 degrees FOV NVGs. Furthermore, it seemed the wider the FOV, the fewer navigation mistakes the soldiers committed.

Author

Goggles; Night Vision; Simulators; Virtual Reality; Image Intensifiers

20080016885 CAE Professional Services, Ottawa, Ontario, Canada

Applying Simulation to Study Human Performance Impacts of Evolutionary and Revolutionary Changes to Armored Vehicle Design

Espenant, Mark; Virtual Media for Military Applications; June 2006, pp. 17-1 - 17-2; In English; See also 20080016872; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In excess of 5000 hours of experimentation has been conducted, and more is on-going in live, virtual, and constructive

environments. Human and system performance measurements have lead to vastly increased understanding of display requirements, training approaches, human-computer interactions, and use of augmented and mixed environments.
Derived from text
Human Performance; Virtual Reality; Human-Computer Interface; Simulation

20080016886 Old Dominion Univ., Norfolk, VA, USA
Challenges and Potential of Service-Oriented Architectures for Net-Centric Operations
Tolk, Andreas; Gaskins, Ryland C.; Virtual Media for Military Applications; June 2006, pp. 5-1 - 5-14; In English; See also 20080016872; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

NATO is currently moving away from system-centric solutions based on the exchange of messages between individual systems towards information-centric solutions based on service-oriented architectures. The core idea is to share services in a net-enabled environment to bring all the information a military user needs to him, no matter what he does, where he is, or what system he currently uses. Within the US, the Global Information Grid (GIG) is currently in use and first examples have been implemented to evaluate the feasibility of these concepts. Some of these first components and services were successfully used in Operation Iraqi Freedom. However, while service-oriented architectures (SOA) technically have the potential to find every piece of information relevant for an operation no matter where it is, they also challenge the user and the developers to ignore thousands of additionally available pieces of information that are not currently relevant. To what extent virtual and augmented reality technologies can help to cope with such issues is the topic of the current research, but it is obvious that technology and education must be aligned to ensure feasibility and usability. This paper gives a short overview of technical constraints, concepts, and implementations. It contributes to the discussion of where Human Factors expertise is urgently required to make these new concepts a success for the military user.
Author
Human Factors Engineering; Service Oriented Architecture; User Requirements; Virtual Reality; Education; Feasibility

20080016887 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Soesterberg, Netherlands
MSC: Vehicle for Validation of Military Flight Simulation
deGraaf, Bernd; Bles, Wim; Wentink, Mark; Tielemans, Willem; Virtual Media for Military Applications; June 2006, pp. 16-1 - 16-8; In English; See also 20080016872; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The AH-64 Apache helicopter trainer and the F-16 Unit Level Trainer of the Royal Netherlands Air Force (RNLAF) are single unit fixed base simulation facilities, primarily in use to meet procedural training needs. The Black Hawk helicopter trainer in Fort Rucker (US Army), on the other hand, is based on a moving (‘hexapod’) platform, and so is the Cougar helicopter training facility at Marseille, France. At Benson, Willingford (RAF) Chinook helicopter pilots train in a fixed base trainer. We can continue on this list, but the purpose was to name a few. At the end of the list we find the main ground base training facility for the F 35 ‘Joint Strike Fighter’, which is specified to be a configuration of a set of linked fixed base cockpits. For each of these simulators a thorough procurement trajectory was followed, based on an extensive analysis of functional needs weighed against a careful consideration of technological and financial pro s and con s. The question however is whether the policy makers and procurement officers did get enough support from us, the scientific community, to make the proper evidence based decisions on military flight simulation. The answer, at least for the Dutch, is that they did not. For this a research vehicle is built by which we try to define what elements of flight hours can be flown on the ground, or in other words to determine the envelope for replacing flight hours with flight simulation.
Derived from text
AH-64 Helicopter; Training Devices; Flight Simulators; Research Vehicles; Flight Simulation; F-16 Aircraft; Education; Cockpits

20080016888 Army Simulation Training, and Instrumentation Command, Orlando, FL, USA
The Direction of Virtual Vehicle Simulations for Military Training
Riggins, Wil; Virtual Media for Military Applications; June 2006, pp. 13-1 - 13-6; In English; See also 20080016872; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A Live, realistic environment has always been the preferred medium for military training. However, numerous considerations such as safety and constrained resources; along with technical advances, continue to make virtual and

constructive simulations attractive as supplements to live training so long as these alternatives can offer resource-saving benefits. In fact, virtual simulations are currently capable of supporting many individual and an increasing number of collective tasks required for training our armed forces. However, there are significant limitations that reduce the effectiveness of virtual training simulations, and stand as roadblocks to a seamless objective LVC capability. Most virtual simulations focus on training an individual Warfighter on one specific battlefield operating system. They do not enable small unit leaders and commanders to effectively manage the integration of that system into a combined arms fight. While standards of interoperability exist, networking these separate virtual devices together to enable combined arms team training requires a platoon of civilian technicians and weeks of modification. Geographically distributed events present major hurdles. The specificity of virtual terrain databases which are based on the individual requirements of their system, preclude a fair-fight with other databases of the same geographic terrain. Some of these limitations are technical in nature and will be addressed through advances and focused research in the field of virtual simulation. Others are based on current technical architectures, stove-piped requirements, and the lack of common synthetic environment products. This paper examines current capabilities and suggests requirements necessary for future virtual simulations to enable the LVC vision. We may not achieve a 'Star Trek Holodeck' - like training capability for some time. However, future efforts must focus on making the virtual training experience more 'life-like' to the individual and collective audiences that commanders are required to train. Future enhancements to combined arms virtual simulations will help lessen the impact of limited resources, and will help ensure a continued training edge for the core fighting force of the transformed U.S. Army, the Brigade Combat Team.
Author
Virtual Properties; Simulation; Interoperability; Education; Data Bases; Combat; Terrain

20080016889 Army Research Inst. for the Behavioral and Social Sciences, Orlando, FL, USA
Current Issues in the Use of Virtual Simulations for Dismounted Soldier Training
Knerr, Bruce W.; Virtual Media for Military Applications; June 2006, pp. 21-1 - 21-12; In English; See also 20080016872; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Research on the use of virtual simulation to train Soldiers and leaders in small dismounted units has largely focused on the use of specially developed, relatively high-fidelity PC-based simulators. It has been successful in demonstrating that virtual simulation can adequately support the performance of a variety of Soldier activities, and is perceived to be effective for training both individual and collective Soldier skills. However, as computer graphics technology has advanced, the interface devices (head-mounted or projection displays, position trackers, and instrumented mock weapons) required for immersive virtual simulations have become a relatively larger contributor to the cost of simulators than the simulation engine. This raises the question of whether a high-fidelity interface contributes sufficiently to training effectiveness to justify its cost. In addition, the widespread availability and use of video and computer games has raised the question of whether either commercial games or specially designed games can meet some part of the Army s training needs. This paper describes and discusses these issues in detail, presents supporting research evidence, and describes future research needs.
Author
Computer Graphics; Computerized Simulation; Education; Display Devices; Virtual Reality

20080016890 EADS Deutschland G.m.b.H, Unterschleissheim, Germany
Interaction Methods for Virtual Reality Applications
Vogelmeier, Leonhard; Neujahr, Harald; Sandl, Peter; Virtual Media for Military Applications; June 2006, pp. 14-1 - 14-8; In English; See also 20080016872; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Even after several years of development, human machine interfaces applied in Virtual Reality (VR) environments are in many cases not very well adapted to the user and the task to be fulfilled, which often affects the success of VR applications. This observation is made by plenty of experts and it coincides with the experience we have gathered within the past years. On this basis we started to adapt and advance existing HMIs, aiming to improve the handling and to meet the special requirements of dedicated applications. Our first VR application was the cockpit development using virtual prototypes. For this exercise it is essential to ensure, that the deviation of the real human body from its virtual representation is within a defined margin. Another important feature for cockpit development is the provision of haptic feedback. Both requirements could not be satisfied using commercially available tools, so we needed to develop our own methods. In the beginning we concentrated our activities on a precise representation of the human body. For this purpose we designed easy-to-use calibration methods for the measurement of the tracking sensor positions at the human body. In addition we developed a new kinematic model, which was able to compensate for inaccuracies, which arise from differences between the virtual and the real skeleton. In order

to provide haptic feedback we built a flexible Mixed Mock-Up system, parts of which can be adjusted by the user during the VR session. Changing our focus of research to maintainability and training applications in recent years, we began to design appropriate interaction concepts and to investigate the implementation of the concepts using several interaction methods. The paper will provide a survey of our activities and present some interesting results.
Author
Virtual Reality; Human-Computer Interface; Human Performance; Cockpits; Education; Feedback; Human Body; Kinematics

20080016891 Lumir Research Inst., Grayslake, IL, USA
Evaluating Mission Training Fidelity Requirements: Examining Key Issues in Deployability and Trainability
Bennett, Winston; Rickard, Robert; Bell, Jeffry; France, Michael; Greschke, David; Schreiber, Brian T.; Virtual Media for Military Applications; June 2006, pp. 15-1 - 15-8; In English; See also 20080016872; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Due to infrequent training while deployed, warfighters skills can decay, thus creating a training gap. Deployed training has historically been hindered by restrictions to live-fly training opportunities due to factors such as ops-tempo, airspace/range restrictions, security issues, alert requirements, and wartime rules of engagement. In order to maintain high proficiency and readiness levels, changes are needed in standard training programs while warfighters are deployed. The USA Air Force s Distributed Mission Operations (DMO) concept has become critical to warfighter training across all mission areas. Despite an increased reliance on DMO training, a deployable DMO training capability does not exist to provide the critical training opportunities previously unavailable during extended deployments. Moreover, while researchers have discussed and described the tradespace associated with varying levels of physical and functional fidelity, opportunities to conduct controlled studies to examine and quantify 'how much of what kind of fidelity' for skills improvement and maintenance are few and far between. This presentation will describe a series of research studies underway at the Warfighter Readiness Research Division in Mesa Arizona designed to assess within-training and training transfer to live operations for both individual and tactical teams, with varying levels of fidelity in the training environment. These studies are examining a variety of specific parameters associated with achieving and maintaining combat readiness and proficiency. We conclude with discussion of our longer-term plan to demonstrate and quantify the impact of deployed training and rehearsal environment on transfer to the operational environment and to subsequent retraining intervals.
Author
Retraining; Combat; Mission Planning; Deployment; Education; Airspace; Abilities

20080016892 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Soesterberg, Netherlands
Technical Evaluation Report
Werkhoven, Peter; Virtual Media for Military Applications; June 2006, pp. T-1 - T-14; In English; See also 20080016872; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Recent improvements in computer systems and displays have enabled new simulation technologies such as Augmented, Mixed, and Virtual Environments (AMVE). Increased computer power at low cost, wireless networks, miniaturizations of sensor and computer components, and better visual, auditory and tactile display systems are contributing to the maturation of these technologies. Potential applications in military operations, as well as training and system design are providing requirements that have spurred this technology development. Today, most of the attention is focused on the development of the technologies themselves. However, to be effective in military operations, the technologies must evolve into systems that provide the information that their human users need to accomplish military objectives. Compared to research on computer architectures, communication protocols, and display devices there has been relatively little research on the perceptual requirements for displays, human-computer-interaction issues, design of effective training approaches, measurement of human performance and cultural and organizational issues. The fundamental knowledge available today already indicates a large potential of AMVE technology for a broad spectrum of military applications.
Derived from text
Architecture (Computers); Human-Computer Interface; Systems Engineering; Education; Display Devices; Communication Networks; Military Operations; Military Technology

20080016893 Toronto Univ., Ontario, Canada
Some Human Factors Considerations for Designing Mixed Reality Interfaces
Milgram, Paul; Virtual Media for Military Applications; June 2006, pp. KN1-1 - KN1-14; In English; See also 20080016872; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Mixed Reality (MR) refers to the general case of combining images along a continuum which ranges from purely real

(unmodelled) data, such as raw video images, to completely virtual images, based on modelled environments. Depending on where a particular display mode lies on the reality-virtuality continuum, MR encompasses the case of Augmented Reality (AR), as well as the case of Augmented Virtuality (AV). In designing human-machine interfaces for mixed reality applications, a number of considerations are discussed which may potentially impact the effectiveness of the design. In addition to the real-virtual image content (which is closely related to how much knowledge is available about the images being displayed), these include the (visual) perceptual impact of the display technologies used for combining real and virtual images, which manifest themselves in particular when virtual objects must be aligned with real ones, for applications such as AR mediated teleoperation. Other considerations include where the user's particular viewpoint lies along a continuum ranging from ego- to exo-centricity, as well as control-display congruence issues constrained by the other MR factors.
Author
Man Machine Systems; Human Factors Engineering; Human-Computer Interface; Virtual Reality; Teleoperators

20080016894 California Univ., Marina del Rey, CA, USA
Cognitive Performance Assessment in Mixed and Virtual Environment Systems
Pair, Jarrell; Rizzo, Albert; Virtual Media for Military Applications; June 2006, pp. 26-1 - 26-4; In English; See also 20080016872; Original contains color illustrations
Contract(s)/Grant(s): DAAD 19-99-D-0046; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The U.S. Army is currently interested in developing state-of-the-art training methods that leverage technology based on established and emerging immersive mixed and virtual environment systems employing both head mounted and spatially immersive display technologies. A primary motivation for utilizing mixed and virtual environment systems is that they create cost-effective simulations of relevant military challenges while training a variety of skills and processes. However, in a sometimes single-minded effort to directly advance training technology, the area of performance testing and assessment has often been overlooked. There are a number of compelling reasons to address the assessment component concurrently with efforts to build better training tools. It is nearly a given in modern psychology that, before one can begin to focus on training or enhancement of any behavior, one needs to be able to measure and understand the performance that needs to be trained. This requires assessment tools that have demonstrated reliability and validity for measuring criterion performance both pre and post training implementation. Without good assessment metrics, the measurement of training effectiveness is compromised, and as well, the ability to investigate and understand the components of effective performance that are needed to drive the evolution of a training system is not possible. To address this need, we have initiated development of a comprehensive, standardized, norm-based VR cognitive performance assessment test (VRCPAT) battery.
Author
Performance Tests; Mental Performance; Education; Standardization; Psychology; Simulation; Criteria

20080016895 Systems Technology, Inc., Hawthorne, CA, USA
Helicopter Aircrew Training Using Fused Reality
Bachelder, Ed; Virtual Media for Military Applications; June 2006, pp. 27-1 - 27-14; In English; See also 20080016872; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper describes a novel Mixed Reality [1] technique for robust, real-time chromakey processing for training applications using software and off-the-shelf video hardware. This technique has been coined and patented by the author as Fused Reality. Until now chromakeying has been conducted using dedicated hardware, imposing substantial restrictions on the visual environments that will support chromakey. Variations on the traditional chromakey setup, such as using retroreflective screens and light-emitting cameras, can overcome some of the technique s original drawbacks (such as lighting difficulties), but they can introduce new problems as well (i.e., a user s hand can obstructing the light projected from the head-mounted source can create an ill-defined silhouette). The novel chromakey method introduced in this paper is applied to training helicopter aircrew personnel using a prototype simulator, the Prototype Aircrew Virtual Environment Training (PAVET) System. The ultimate goal of the PAVET will be to provide training to Navy aircrewmen in all operational aspects of the MH-60S, including aerial gunnery, search and rescue, and vertical replenishment. A key requirement for these types of tasks is for trainees to see and manipulate physical objects (e.g., a jammed gun) at close range while viewing an interactive flight and shipboard environment. In order to satisfy space and cost constraints, some physical objects that the aircrewmen physically interact with (such as a rescue litter) must be capable of being sent out into the virtual environment and later retrieved. Fused Reality accomplishes this critical feature through contraction and expansion of specific real-world objects as they move away and toward the trainee. Fused Reality s adaptive color recognition allows for realistic set lighting, colors, and

user movement and positioning. It also enables 'lumakey' - preserving only pixels that are above a brightness threshold and rendering all others transparent, allowing for extremely compact and portable training devices. Examples of Fused Reality such as these are demonstrated and discussed.
Author
Training Devices; Helicopters; Flight Crews; Education; Real Time Operation; Simulators

20080016896 Brunel Univ., Uxbridge, UK
Experimental Studies in a Reconfigurable C4 Test-bed for Network Enabled Capability
Stanton, N. A.; Walker, G. H.; Salmon, P. M.; Gulliver, S.; Jenkins, D.; Darshna, Ladva; Rafferty, Laura; Young, M. S.; Watts, S.; Baber, C.; Houghton, R.; McMaster, R.; Virtual Media for Military Applications; June 2006, pp. 4-1 - 4-8; In English; See also 20080016872; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper reports on the development of a command and control environment that enables experimental studies to be conducted into Network Enabled Capability (NEC). The command and control environment comprises a reconfigurable Command Wall, and wireless local area network and reconfigurable wearable computers. The two studies reported in this paper explore communication media (study one) and data source/decay (study two). Study one showed the advantages and disadvantages of the electronic medium for passing data between the field and command room. Study two explored data push versus data pull and the effects of data decay on some aspects of command performance. As an experimental environment the reconfigurable C4 test-bed is now beginning to show some utility. Further studies are being planned and scenarios are being developed.
Author
Command and Control; Reconfigurable Hardware; Local Area Networks; Environmental Tests

20080016897 Texas A&M Univ., Galveston, TX, USA
The Future of Simulation
Loftin, R. Bowen; Virtual Media for Military Applications; June 2006, pp. KN3-1 - KN3-4; In English; See also 20080016872; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A04, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This short paper outlines some of the author s thoughts on the 'future of simulation.' After a brief motivation for the article and a recounting of the history of simulation, four major themes are explored: convergent simulations, serious games and simulation, human-simulator interfaces, and computing technology. The article concludes with a 'vision' of what a future simulation might be.
Author
Simulation; Convergence; Computers; Simulators; Computation

20080016898 QinetiQ Ltd., Hampshire, UK
The Lessons Learned in the Application of Augmented Reality
Franklin, Matthew; Virtual Media for Military Applications; June 2006, pp. 30-1 - 30-8; In English; See also 20080016872; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The purpose of this paper is to provide an overview of the lessons learned from research conducted on behalf of the UK MoD into the application of Augmented Reality (AR) technologies. The lessons learned include technological and procedural aspects discovered during the preliminary research, user field trials and subsequent feedback. The paper is primarily focused on the application of AR in the training domain and in particular the use of AR to support Forward Air Controller training. However, the lessons learned also apply to the use of AR in operational and test and evaluation domains.
Author
System Effectiveness; Lessons Learned; Virtual Reality; Education; Domains; Feedback

20080016900 NASA Ames Research Center, Moffett Field, CA, USA
Towards Determination of Visual Requirements for Augmented Reality Displays and Virtual Environments for the Airport Tower
Ellis, Stephen R.; Virtual Media for Military Applications; June 2006, pp. 31-1 - 31-10; In English; See also 20080016872; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The visual requirements for augmented reality or virtual environments displays that might be used in real or virtual towers

are reviewed with respect to similar displays already used in aircraft. As an example of the type of human performance studies needed to determine the useful specifications of augmented reality displays, an optical see-through display was used in an ATC Tower simulation. Three different binocular fields of view (14deg, 28deg, and 47deg) were examined to determine their effect on subjects ability to detect aircraft maneuvering and landing. The results suggest that binocular fields of view much greater than 47deg are unlikely to dramatically improve search performance and that partial binocular overlap is a feasible display technique for augmented reality Tower applications.
Author
Air Traffic Control; Human Performance; Maneuvers; Virtual Properties; Virtual Reality; Simulation

20080016901 Naval Research Lab., Washington, DC, USA
Immersive Simulation to Train Urban Infantry Combat
Templeman, James N.; Sibert, Linda E.; Page, Robert C.; Denbrook, Patricia S.; Virtual Media for Military Applications; June 2006, pp. 23-1 - 23-16; In English; See also 20080016872; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The key component in developing an effective virtual infantry training simulator is the user interface. Our goal is to develop interfaces that give users close to the same ability to move and coordinate actions as they have in the real world. We have developed two interfaces. Gaiter is a highly realistic body-driven interface in which the user walks in place to walk through the virtual world. With Gaiter, the user can naturally intermix a range of natural and gestural actions. An experiment comparing Gaiter with less realistic interfaces shows that a control technique that mimics a user s natural actions, while beneficial, does not immediately provide all the capabilities of natural motion. These results, along with a Marine Corps interest in lower cost, more deployable systems, have led us to develop a new virtual locomotion control. Pointman is a device-driven interface that uses a conventional dual joystick gamepad. Unlike the control mappings of a conventional gamepad, Pointman allows the user to specify direction of movement independently from the heading of the upper body, allowing the user to execute realistic tactical infantry movements such as pie-ing the corner. Pointman can also be used for teleoperation of remotely piloted vehicles, providing added separation over the vehicle s motion and view. Both interfaces derive from an analysis of action and effect that highlights the importance of providing open loop control.
Author
Training Simulators; Remotely Piloted Vehicles; Teleoperators; Combat; Cost Reduction; Locomotion

20080016902 Army Missile Command, Orlando, FL, USA
Augmented Reality: Enabling Component for Effective Live Virtual Constructive Integration
Dean, Frank; Jaszlics, Sheila; Stilson, Richard; Sanders, Scot; Virtual Media for Military Applications; June 2006, pp. 29-1 - 29-16; In English; See also 20080016872; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper describes the results of a RDECOM research project called the Dismounted Augmented Reality Training System (DARTS). The DARTS prototype that was developed under this effort provides encouraging data and a confidence that the tools and techniques that are necessary to implement this technology, in a live military training environment, are not far off. Ultimately the key to successful implement and use of this emerging technology is for trainers to understand its potential uses and to place command emphasis on further development for specific military uses.
Author
Prototypes; Training Devices; Simulators; Military Technology; Armed Forces

20080016903 Aptima, Inc., Washington , DC, USA
Measuring, Monitoring, and Managing Knowledge in Command and Control Organizations
Freeman, Jared; Weil, Shawn A.; Hess, Kathleen P.; Virtual Media for Military Applications; June 2006, pp. 2-1 - 2-10; In English; See also 20080016872; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Virtual environments for command and control typically represent spatial information about entities, such as the location of friendly and enemy forces. Iconography and interaction standards for such displays are well defined. Less attention has been paid to representing non-geographical information, such as information about the state of knowledge and decision making in a command staff. We report here on two technologies designed to enable commanders to measure, monitor, and manage knowledge and decision making. The IMAGES tool (now under development) exploits communication and language analysis technologies as well as network visualization techniques to help commanders explore the distribution of knowledge in written

communications (e.g., chat and email). The CENTER tool (now implemented) exploits a theory of collaborative critical thinking for representing the state of decision making within distributed teams. Here, we describe challenge, requirements, and two solutions for measuring, monitoring, and managing knowledge using virtual environments in command and control operations.
Author
Virtual Reality; Command and Control; Display Devices; Decision Making; Cognitive Psychology

20080016904 Forschungsgesellschaft fuer Angewandte Naturwissenschaften e.V, Wachtberg-Werthhoven, Germany
Teleoperation of Unmanned Vehicles: The Human Factor
Trouvain, Boris; Virtual Media for Military Applications; June 2006, pp. 11-1 - 11-8; In English; See also 20080016872; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Unmanned vehicles or robots promise to increase the operational range of the armed forces while reducing the exposition of personnel to hazardous conditions. They have traditionally been in use for aerial surveillance and ground based explosive ordnance disposal. Following the ongoing progress in research and technology, unmanned vehicles have the potential to play a much more versatile role in future conflicts. The use of such systems is already expanding into reconnaissance, surveillance and target acquisition scenarios. Virtual and Augmented Reality technologies are utilized across a wide range of relevant areas concerning the development, evaluation and operation of unmanned vehicles. Virtual Reality interfaces are of high value for the development process ranging from the technical design phase to the simulation-based evaluation of the human-machine system. A particularly relevant aspect concerning unmanned vehicles represents the operational performance of the human-machine-team. This performance however, is primarily dependent on how effectively a human operator can supervise and control the unmanned system using a given human-machine interface. In this paper we present a task-centric approach to the command and control of unmanned vehicles that differs significantly from the traditional vehicle-centric teleoperation method as used in todays available systems. We believe that this approach can support the acceptance and use of unmanned vehicles by dismounted soldiers. Our interface implementation features both 2D and virtual scene representation components to allow the task specification by the user.
Author
Robots; Unmanned Ground Vehicles; Reconnaissance; Command and Control; Man Machine Systems; Approach Control; Teleoperators; Virtual Reality; Surveillance; Aerial Reconnaissance

20080016905 Defence Scientific Technology Lab., Farnborough, UK
Human Automation Integration for Supervisory Control of UAVs
Taylor, Robert M.; Virtual Media for Military Applications; June 2006, pp. 12-1 - 12-10; In English; See also 20080016872; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

With the increasing use of uninhabited military vehicles in air, land, naval (surface and underwater) roles, we need to know more about factors affecting operator 'engagement' - cognitive/conative/behavioural task involvement - with systems exploiting virtual media technology, in particular for reach-back, remote supervision of operations involving use of lethal force. UK experience in operating Predator has led to concerns about the operator needing emotional connectivity to 'feel the granularity of the battle-space', about the 'morality of altitude', and the potential for the 'playground bully' to become the mode of control. Research has demonstrated the difficulty of providing sustained levels of cognitive engagement for operators at remote control stations providing supervisory targeting veto. It may be possible to mitigate these risks and to augment human involvement and engagement strategies through operator selection, training and system design. Consideration is needed of the relevance of mission and decision enabling technologies for augmenting engagement. These enabling technologies include advanced human-computer interfaces, virtual media, multi-modal 'immersive' synthetic environments, task and user monitoring and modelling, collaborative technologies and communication techniques such as semantic information/ knowledge web approaches to decision effectiveness.
Author
Automatic Control; Mental Performance; Systems Engineering; Remote Control; Education; Pilotless Aircraft

20080016922 Defence Research Agency, Linkoping, Sweden
Intelligent Physical Protection Systems Methods and Techniques
Jungert, E.; Lantz, F.; May 01, 2006; 38 pp.; In Swedish
Report No.(s): PB2007-107372; FOI-R-1993-SE; No Copyright; Avail.: National Technical Information Service (NTIS)

Intrusions into different types of physical establishments have become more and more common. The purpose of such

intrusions is generally theft, terror attacks and other types of criminal activities. Generally, the establishments subject to such intrusions are equipped with alarms using video cameras, sensors and other types of detectors to determine these activities. However, when the alarm goes off it is often too late to carry out any powerful counter activity to stop the attempts. As in many cases, large values are at stake and as the costs for watching the establishments are high, other means to stop the intruders to diminish the consequences are needed. The solution to this problem is to design and develop a computer system equipped with multiple sensors, algorithms for sensor data analysis and a set of decision support tools. The purpose is to prevent intrusion by observing the activities that occur outside the establishments and to quickly and effectively determine whether they can be considered suspicious or abnormal. Through the detection of such activities it will become possible to prepare for an intrusion in advance either by preventing it or to diminish its consequences.
NTIS
Protection; Decision Support Systems; Warning Systems; Multisensor Fusion

20080016927 Numerica 21 Inc., Angel Fire, Mexico
Netaware Development, Support, and Maintenance Environment for DOE Numerical Libraries
Smith, B. T.; Dec. 01, 2006; 59 pp.; In English
Contract(s)/Grant(s): DE-FG02-04ER84028
Report No.(s): DE2007-896460; No Copyright; Avail.: Department of Energy Information Bridge

A study was performed to identify tools needed to support the maintenance of DOE scientific software and libraries destined to operate over a computational grid. The study quickly identified the need for a harness, called the Test Harness, that could evaluate the numeric results obtained from the same software over a variety of computational platforms. The test harness is installed in the application software or library procedures and monitors the results obtained from porting the application software to new platforms or enhancing the software for whatever reason.
NTIS
Computer Networks; Libraries; Maintenance

20080016929 Shimokaji and Associates P.C., Irvine, CA, USA; Boeing Co., Chicago, IL, USA
Machine Readable Medium and Method for Determining Feature-Relating Tolerance Consumed
Hollingshead, P. C., Inventor; Beike, C. A., Inventor; Mar. 12, 2004; 18 pp.; In English
Contract(s)/Grant(s): FAR 52227-12
Patent Info.: Filed Filed 12 Mar 04; US-Patent-Appl-SN-10-800 383
Report No.(s): PB2007-105179; No Copyright; Avail.: CASI: A03, Hardcopy

A machine readable medium and a method are disclosed that determine whether a pattern of manufactured or simulated features violates a feature relating tolerance and determines acceptability of the pattern. Allowable tolerance may include feature relating tolerances and material conditions. Manufactured centers are drawn relative to a one true position. A circle drawn through or outside the manufactured centers is used to determine if there is feature relating tolerance violation. Material condition may also be used.
NTIS
Circles (Geometry); Acceptability

20080017048 Sonnenschein Nath and Rosenthal. LLP, Chicago, IL, USA
Methods and Systems for Providing Information Network Access to a Host Agent Via a Guardian Agent
Corman, D. E., Inventor; Herm, T. S., Inventor; Dorris, S. A., Inventor; Martens, E. J., Inventor; Jun. 16, 2004; 7 pp.; In English
Contract(s)/Grant(s): F33615-97-D-1155
Patent Info.: Filed Filed 16 Jun 04; US-Patent-Appl-SN-10-869 334
Report No.(s): PB2007-109375; No Copyright; Avail.: CASI: A02, Hardcopy

Methods, systems, and articles of manufacture consistent with the present invention provide a first data processing system access to a network via a second data processing system. An object is sent to the second data processing system, which object when instantiated on the second data processing system implements a network access program that can subscribe to information from the network and publish information to the network. Subscribed to information is received from the second data processing system.
NTIS
Communication Networks; Computer Information Security; Computer Networks; Data Processing

20080017091 Sandia National Labs., Albuquerque, NM USA
Capabilities, Methodologies, and Use of the Cambio File Translation Application
Lasche, G. P.; Mar. 01, 2007; 13 pp.; In English
Contract(s)/Grant(s): DE-AC04-94AL85000
Report No.(s): DE2007-902212; SAND2007-1841; No Copyright; Avail.: National Technical Information Service (NTIS)

This report describes the capabilities, methodologies, and uses of the Cambio computer application, designed to automatically read and display nuclear spectral data files of any known format in the world and to convert spectral data to one of several commonly used analysis formats. To further assist responders, Cambio incorporates an analysis method based on non-linear fitting techniques found in open literature and implemented in openly published source code in the late 1980s. A brief description is provided of how Cambio works, of what basic formats it can currently read, and how it can be used. Cambio was developed at Sandia National Laboratories and is provided as a free service to assist nuclear emergency response analysts anywhere in the world in the fight against nuclear terrorism.
NTIS
Computer Techniques; Emergencies; Industries; Terrorism; Translating

20080017098 Sandia National Labs., Albuquerque, NM USA
Design Tools for Complex Dynamic Security Systems
Groom, K. N.; Byrne, R. H.; Laguna, G. A.; Rohrer, B. R.; Wilson, D. G.; Jan. 01, 2007; 102 pp.; In English
Contract(s)/Grant(s): DE-AC04-94AL85000
Report No.(s): DE2007-902217; SAND2007-0433; No Copyright; Avail.: National Technical Information Service (NTIS)

The development of tools for complex dynamic security systems is not a straight forward engineering task but, rather, a scientific task where discovery of new scientific principles and math is necessary. For years, scientists have observed complex behavior but have had difficulty understanding it. Prominent examples include: insect colony organization, the stock market, molecular interactions, fractals, and emergent behavior. Engineering such systems will be an even greater challenge. This report explores four tools for engineered complex dynamic security systems: Partially Observable Markov Decision Process, Percolation Theory, Graph Theory, and Exergy/Entropy Theory. Additionally, enabling hardware technology for next generation security systems are described: a 100 node wireless sensor network, unmanned ground vehicle and unmanned aerial vehicle.
NTIS
Complex Systems; Security; Telecommunication; Warning Systems; Wireless Communication

20080017118 Research and Technology Organization, Neuilly-sur-Seine, France
Knowledge-Based Radar Signal and Data Processing
June 2007; In English; See also 20080017119 - 20080017126; Original contains color and black and white illustrations
Report No.(s): RTO-EN-SET-063(2006); AC/323(SET-063)TP/70; Copyright; Avail.: CASI: C01, CD-ROM

The following topics are discussed: Introduction to Radar Signal and Data Processing: The Opportunity; Fundamentals of Knowledge-Based Techniques; Knowledge-Based Solutions as They Apply to the General Radar Problem; Expert System Constant False Alarm Rate (CFAR) Processor; Knowledge-Based Control For Space Time Adaptive Processing; Application of Knowledge-Based Techniques to Tracking Function; Impact of Knowledge-Based Techniques on Emerging Technologies; and Integrated End-to-End Radar Signal and Data Processing with Over-Arching Knowledge-Based Control.
Derived from text
Knowledge Based Systems; Radar Data; Signal Processing; Space-Time Adaptive Processing

20080017119 Capraro Technologies, Inc., Utica, NY, USA
Integrated End-to-End Radar Signal and Data Processing with Over-Arching Knowledge-Based Control
Capraro, Gerard T.; Knowledge-Based Radar Signal and Data Processing; June 2007, pp. 8-1 - 8-24; In English; See also 20080017118; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper provides information related to integrating Knowledge Based (KB) techniques within the filtering, detection, tracking and target identification portions of an airborne radar s processing chain. We will present multiple information sources and how they can be used to enhance a radar s performance for end-to-end signal and data processing.
Author
Airborne Radar; Knowledge Based Systems; Tracking (Position); Radar Data; Detection

20080017120 University Coll., London, UK

Impact of Knowledge-Based Techniques on Emerging Technologies

Griffiths, H. D.; Knowledge-Based Radar Signal and Data Processing; June 2007, pp. 7-1 - 7-28; In English; See also 20080017118; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This tutorial provides a discussion of the application of knowledge-based processing techniques to emerging technologies. Following the third of the tutorials in this series we interpret knowledge-based processing as the use of adaptivity and the exploitation of prior knowledge in such a way as to choose the optimum processing method in each case. We interpret emerging technologies as novel applications, such as multifunction phased array radars, waveform diversity, bistatic and multistatic radars, and synthetic aperture radars. Firstly, we consider the potential of electronically-steered phased array antennas and the associated signal processing techniques. This is followed by a description of knowledge-based processing in the task scheduling in a multifunction phased array radar. It is shown that prior information on targets can be used to control parameters such as update rate and dwell time. Next, we consider waveform diversity, which may be considered to be a development of multifunction phased array radar, in which a radar may simultaneously radiate and receive different signals in different directions for different purposes. Such a scheme may entail adaptivity in the angular domain, in the time domain and in the coding domain (and conceivably in other domains as well), and the use of knowledge-based techniques in this processing has obvious attractions. Two examples are discussed: the first is target-matched illumination, which shows that there is an optimum waveform for the detection of a given target in a given environment, and the second is interpolation between two (or more) spectral bands to give the effect of a signal of very high bandwidth, and hence very high range resolution. Next there follows a discussion of the application of knowledge-based techniques to bistatic and multistatic radar, including the use of information on waveform properties in passive coherent location (PCL), tracking in multistatic radar, and spatial denial as a waveform diversity technique to prevent the exploitation by an enemy of a radar as a bistatic illuminator. Finally, an example is given of the use of context in target detection in synthetic aperture radar imagery, exploiting the fact that targets of interest will tend to be parked in groups close to hedges and the edges of woods rather than individually in the middle of open ground. Useful improvements in detection performance are obtained.
Author

Knowledge Based Systems; Tracking Radar; Signal Processing; Target Acquisition; Synthetic Aperture Radar; Antenna Arrays; Multistatic Radar; Detection; Coding; Bandwidth

20080017121 Air Force Research Lab., Rome, NY, USA

Knowledge-Based Control For Space Time Adaptive Processing

Wicks, Michael C.; Knowledge-Based Radar Signal and Data Processing; June 2007, pp. 5-1 - 5-52; In English; See also 20080017118; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A04, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Airborne surveillance radar systems operate in a severe and dynamic interference environment. The interference is a sum of clutter, other moving objects, possible deliberate electronic counter measures (ECM) and noise. The ability to detect weak airborne and ground targets requires the suppression of interference in real time. Space-Time Adaptive Processing (STAP) techniques promise to be the best means to suppress such interference. The processing technique presently employed for GMTI systems is displaced phase center antenna (DPCA). In DPCA the Doppler spectrum of the sidelobe clutter is folded into the mainlobe and centered at zero Doppler, thus minimizing the spread induced by platform motion. In practice, however, there are several factors that limit the performance of DPCA. System errors, such as the channel-to-channel mismatch, are the prime limiting factor. In addition, DPCA processing is heavily dependent on an assumed relationship between platform velocity and the radar PRI. Deviation from this relationship leads to severely degraded performance (Figure 2). Furthermore, at any time only a fraction of the array channels is used, i.e. DPCA uses the antenna aperture inefficiently. In contrast to DPCA, STAP uses the multiple channel receive data vector to determine where to place nulls: spatial nulls for point interference, such as jammers and space-time nulls for extended interference, such as clutter. STAP is therefore effective against all forms of interference, both unintentional and intentional ECM. Furthermore, STAP is much less sensitive (by orders of magnitude) to receiver channel errors.
Author

Space-Time Adaptive Processing; Knowledge Based Systems; Airborne Surveillance Radar; Real Time Operation; Clutter; Errors; Targets

20080017122 Capraro Technologies, Inc., Utica, NY, USA

Fundamentals of Knowledge-Based Techniques

Capraro, Gerard T.; Knowledge-Based Radar Signal and Data Processing; June 2007, pp. 2-1 - 2-18; In English; See also 20080017118; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper provides a brief overview of the fundamentals of Artificial Intelligence (AI) and Knowledge-Based (KB) techniques that we feel are necessary to understand the current research efforts being performed in knowledge base radar signal and data processing. A set of definitions and descriptions of some of the major areas of AI are presented. Examples are provided using radar terminology to illustrate concepts presented. Finally we present a description of those technologies being pursued by the World Wide Web Consortium (W3C) for building the Semantic Web or the next generation Internet. The Semantic Web is perceived by some as being a very large knowledge base.

Author

Knowledge Based Systems; Signal Processing; Internets; Artificial Intelligence; Radar Data

20080017123 Department of the Air Force, Washington, DC, USA

Expert System Constant False Alarm Rate (CFAR) Processor

Wicks, Michael C., Inventor; Baldygo, William J., Jr., Inventor; Brown, Russell D., Inventor; Knowledge-Based Radar Signal and Data Processing; June 2007, pp. 4-1 - 4-24; In English; See also 20080017118

Patent Info.: Filed Mar. 18, 1994; US-Patent-5,499,030; US-Patent-Appl-No- 215073; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

An artificial intelligence system improves radar signal processor performance by increasing target probability of detection and reducing probability of false alarm in a severe radar clutter environment. This utilizes advances in artificial intelligence and expert systems technology for the development of data analysis and information (signal) processors used in conjunction with conventional (deterministic) data analysis algorithms to combine radar measurement data (including observed target tracks and radar clutter returns from terrain, sea, atmospheric effects, etc.) with topographic data, weather information, and similar information to formulate optimum filter coefficients and threshold tests. Present fielded radar systems use one CFAR algorithm for signal processing over the entire surveillance volume. However, radar experiments have shown that certain CFAR algorithms outperform others in different environments. The system intelligently senses the clutter environment, and selects and combines the most appropriate CFAR algorithm(s) to produce detection decisions that will outperform a processor using a single algorithm. The invention provides for improved performance through the application of rule-based and data-based expert system computer software technology to CFAR signal processors, thereby improving target detection by reducing processing losses which result from a mismatch between the single, fixed CFAR processor and dynamically changing environment in which a radar must operate.

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

Expert Systems; False Alarms; Rates (Per Time); Radar Measurement; Target Acquisition; Surveillance; Signal Processing; Artificial Intelligence

20080017124 University Coll., London, UK

Knowledge-Based Solutions as They Apply to the General Radar Problem

Griffiths, H. D.; Knowledge-Based Radar Signal and Data Processing; June 2007, pp. 3-1 - 3-22; In English; See also 20080017118; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This tutorial provides an introduction to the application of knowledge-based processing to the general radar problem. We interpret knowledge-based processing as the use of adaptivity and the exploitation of prior knowledge in such a way as to choose the optimum processing method in each case, and we interpret the general radar problem as the detection, classification and tracking of targets against a background of clutter and interference. As such the tutorial attempts to describe the nature of the general radar problem and the basic processing techniques that are used, and to show why knowledge-based signal processing may be advantageous, setting the scene for the subsequent tutorials covering CFAR detection, space-time adaptive processing, tracking, and emerging technologies. The fundamental concepts of matched filtering, superresolution and adaptive filtering are described, emphasizing the equivalence of time/frequency and aperture/angular domains, and introducing the concept of Space-Time Adaptive Processing. A description is given of some of the statistical clutter models in common use (Rayleigh, Ricean, Lognormal, Weibull and Compound-K), with practical examples of sea clutter and of land clutter which demonstrate that clutter is in general non-Gaussian and non-stationary, both in time and space. Two examples are given of the application of adaptive techniques to the suppression on nonhomogeneous clutter, showing that the performance of the

adaptive Doppler filtering algorithm is severely compromised at clutter edges, due to incorrect estimation of the clutter covariance matrix, and how in Space-Time Adaptive Processing a nonhomogeneity detector can be used in the choice of the most appropriate STAP algorithm, forming the so-called Knowledge-Based STAP (KB-STAP) processor.
Author
Knowledge Based Systems; Tracking (Position); Signal Processing; Background Noise; Adaptive Filters; Detection; Space-Time Adaptive Processing

20080017125 SELEX Sistemi Integrati S.p.A, Rome, Italy
Application of Knowledge-Based Techniques to Tracking Function
Farina, A.; Knowledge-Based Radar Signal and Data Processing; June 2007, pp. 6-1 - 6-34; In English; See also 20080017118; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper describes the application of Knowledge-Based System (KBS) to tracking. Section 2 paves the way to the new technology by discussing the following topics: historical survey of stochastic filtering theory; overview of tracking systems with some details on mono-sensor and multi-sensor tracking, evolution of filtering logics, evolution of correlation logics, and presentation of recent findings on non linear filtering (e.g.: unscented Kalman filter, particle filter) theory which go beyond the classical Kalman filtering. After this introduction to the current state of the art, Section 3 discusses the new technology referred to as 'knowledge-based tracker' : a tracker that exploits a-priori knowledge (e.g.: map data) to gain improved performance. Three applications follow: the first refers to the A-SMGCS (Advanced Surface Movement Guidance and Control System) for traffic control on the surface of an airport (section 4); in this case the target tracker is enhanced by exploiting the knowledge of the aerodrome map with runways, taxiways etc. The sensor is a high resolution surface based radar. The theme of section 5 is the tracking of ground moving or stationary vehicles using an airborne GMTI radar. Here we need to take care of the constraints imposed by the terrain (for which only uncertain data might be available), road networks and regions that could be not-trafficable. These information, also in this case, lead to finite support for the distribution of the target state; the classical Kalman filter doesn t work well and KBS tracker is needed. The last application (section 6) refers to tracking of airborne target masking itself in blind Doppler: these are Doppler frequency bands where the target cannot be detected due to the presence of MTI to reject ground clutter from radar echoes. This is a strategy that the pilot of an aircraft may implement to mask himself to an enemy radar. It is shown that particle filter can fruitfully exploit the a-priori information on blind Doppler thus keeping the probability of target track maintenance at a reasonable level also when the target pursues this masking strategy. An extensive list of references (section 9) is helpful to the Reader for a deeper insight to the many interesting topics of radar.
Author
Knowledge Based Systems; Targets; Airborne Radar; Expert Systems; Multisensor Applications; Kalman Filters

20080017126 SELEX Sistemi Integrati S.p.A, Rome, Italy
Introduction to Radar Signal and Data Processing: The Opportunity
Farina, A.; Knowledge-Based Radar Signal and Data Processing; June 2007, pp. 1-1 - 1-24; In English; See also 20080017118; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper introduces to the lecture series dedicated to the knowledge-based radar signal and data processing. Knowledge-based expert system (KBS) is in the realm of artificial intelligence. KBS consists of a knowledge base containing information specific to a problem domain and an inference engine that employs reasoning to yield decisions. KBS have been built: some are very complex with thousands rules while others, relatively simple, are designed to tackle very specialized tasks. This lecture series shows that KBS can be successfully applied to radar systems. This paper introduces the Reader to the world of radar and, specifically, to the topics tackled in the subsequent lectures of the series. The paper starts with an introduction (Section 2) to radar (radar evolution from the early days up today, taxonomy of radar and radar equation). Subsequently, Section 3 considers the schematic of a modern radar system. The phased-array radar is the theme of Section 4. Signal processing, one of the main building blocks of modern radar, is introduced in Section 5. The section also introduces to the various forms of adaptivity in time, space and space-time domains for natural and intentional interference mitigation. Data processing, mainly target tracking, (Section 6) is the other relevant building block of radar. An extensive list of references (Section 9) is helpful to the Reader for a deeper insight to the many interesting topics of radar
Author
Radar Data; Signal Processing; Tracking (Position); Knowledge Based Systems; Expert Systems; Phased Arrays; Artificial Intelligence; Data Processing

20080017127 Columbia Univ., New York, NY, USA
Apparatus Method and Medium for Detecting Payload Anomaly Using N-Gram Distribution of Normal Data
Stolfo, S. J., Inventor; Wang, K., Inventor; 12 Nov 04; 44 pp.; In English
Contract(s)/Grant(s): DARPA-F30602-02-2-0209
Patent Info.: Filed Filed 12 Nov 04; US-Patent-Appl-SN-10-986-447
Report No.(s): PB2007-109427; No Copyright; Avail.: CASI: A03, Hardcopy

A method, apparatus and medium are provided for detecting anomalous payloads transmitted through a network. The system receives payloads within the network and determines a length for data contained in each payload. A statistical distribution is generated for data contained in each payload received within the network, and compared to a selected model distribution representative of normal payloads transmitted through the network. The model payload can be selected such that it has a predetermined length range that encompasses the length for data contained in the received payload. Anomalous payloads are then identified based on differences detected between the statistical distribution of received payloads and the model distribution. The system can also provide for automatic training and incremental updating of models.
NTIS
Anomalies; Computer Networks; Detection; Patent Applications; Payloads

20080017144 Mercadante, Michael J., Milpitas, CA, USA
Process & Methods for Content Adaptive Learning
Mercadante, M. J., Inventor; Aswadhati, V., Inventor; 26 May 05; 11 pp.; In English
Patent Info.: Filed Filed 26 May 05; US-Patent-Appl-SN-11-138-992
Report No.(s): PB2007-109431; No Copyright; Avail.: CASI: A03, Hardcopy

A Business system for Content Adaptive Learning for assisting teams with continuous improvement of customer service by a 360 degree view (Agent, Customer, & Manager) of their performance against goals and performance measures, enabled by a set of processes and methods which create a Learning Center, a set of processes and methods which enable Real-Time Content Detection, a set of processes and methods which create a set of Proactive Behaviors, a set of processes and methods enabling Learning and a set of processes and methods enabling Behavior Change.
NTIS
Commerce; Goals; Real Time Operation; Performance Tests

20080017298 General Services Administration, Washington, DC, USA
E-Authentication Handbook for Federal Government Agencies. Version 3.0.0
May 04, 2005; 27 pp.; In English
Report No.(s): PB2007-111709; No Copyright; Avail.: CASI: A03, Hardcopy

This handbook is designed to assist Agencies in E-Authentication-enabling AAs, which results in an Agency becoming a member of the E-Authentication Federation. The reader of this handbook is assumed to have a working knowledge of identity management, including SAML and Public Key Infrastructure (PKI). This handbook is written and intended for Agencies that provide online AA services to external facing end users. The ability to rely upon a definitive statement of who is interacting with an online Government AA is a cornerstone of E-Government. This handbook provides helpful guidelines for Agencies to understand the Initiative, the role of the Agency in the Initiative, steps involved in entering the community of trust, and the resources available to assist in that process. A companion Handbook for Credential Service Providers (CSPs) exists and focuses on similar information and guidelines for implementing CSs. These handbooks are living documents and will be periodically updated to incorporate changes as needs of the Initiative and its participants evolve.
NTIS
Computer Information Security; Handbooks; United States

20080017436 Carlson, Gaskey and Olds, P.C., Birmingham, AL, USA
Model Predictive Controller with Life Extending Control
Fuller, J. W., Inventor; Mar. 16, 2004; 5 pp.; In English
Contract(s)/Grant(s): N00421-01-2-0131
Patent Info.: Filed Filed 16 Mar 04; US-Patent-Appl-SN-10-801 235
Report No.(s): PB2007-105207; No Copyright; Avail.: CASI: A01, Hardcopy

An MPC Control system provides a life extending control that includes life-extending goals in the performance index of the MPC controller and limits in the inequality equations. The MPC controller performs the normal functions of a control

system for a physical system, but does so in a manner that extends the life or time-to-next maintenance or reduces the number of parts that need to be replaced. If the life extending functions do not degrade other control functions, they can be always enabled, making the system less expensive to maintain. If the life extending functions degrade some other control functions, they can be adjusted in-the-field or on-the-fly to stretch the time-until-maintenance until it is more convenient, but with some impact on performance.
NTIS
Controllers; Predictions

20080017463 Lawrence Livermore National Lab., Livermore, CA USA
Spectral Predictors
Ibarria, L.; Lindstrom, P.; Rossignac, J.; Nov. 21, 2006; 12 pp.; In English
Report No.(s): DE2007-907839; UCRL-CONF-226261; No Copyright; Avail.: National Technical Information Service (NTIS)

Many scientific, imaging, and geospatial applications produce large high-precision scalar fields sampled on a regular grid. Lossless compression of such data is commonly done using predictive coding, in which weighted combinations of previously coded samples known to both encoder and decoder are used to predict subsequent nearby samples. In hierarchical, incremental, or selective transmission, the spatial pattern of the known neighbors is often irregular and varies from one sample to the next, which precludes prediction based on a single stencil and fixed set of weights. To handle such situations and make the best use of available neighboring samples, we propose a local spectral predictor that offers optimal prediction by tailoring the weights to each configuration of known nearby samples. These weights may be precomputed and stored in a small lookup table. We show that predictive coding using our spectral predictor improves compression for various sources of high-precision data.
NTIS
Predictions; Scalars; Spectra

20080017471 Lawrence Livermore National Lab., Livermore, CA USA
Early Computing and Its Impact on Lawrence Livermore National Laboratory
Likke, W.; Mar. 21, 2007; 42 pp.; In English
Report No.(s): DE2007-902225; UCRL-TR-226840; No Copyright; Avail.: Department of Energy Information Bridge

In November, 1952 some of the first staff members from the newly formed Livermore Laboratory traveled to Philadelphia to get acquainted with their still unshipped 13-ton Univac. What they saw bore scant resemblance to what todays notebook computer buyer places on his or her desk. Besides the extraordinary reduction in size, todays computers come with a variety of data entry and output systems: A keyboard that enters information directly into the billion digits of central memory, a screen that can display a full range of colored images, a mouse to alter text or images, ports to a printer or video device, ports to record or load data previously recorded either on this machine or elsewhere onto compact disks or memory sticks, and network connections to vast resources of information on the internet.
NTIS
Computers; Internets

20080017837 Sandia National Labs., Albuquerque, NM USA
Data Storage Model for Novel Partial Differential Equation Discretizations
Thompson, D.; Pebay, P. P.; Doyle, W. S. K.; Apr. 01, 2007; 94 pp.; In English
Report No.(s): DE2007-907817; SAND2007-0525; No Copyright; Avail.: National Technical Information Service (NTIS)

The purpose of this report is to define a standard interface for storing and retrieving novel, non-traditional partial differential equation (PDE) discretizations. Although it focuses specifically on finite elements where state is associated with edges and faces of volumetric elements rather than nodes and the elements themselves (as implemented in ALEGRA), the proposed interface should be general enough to accomodate most discretizations, including hp-adaptive finite elements and even mimetic techniques that define fields over arbitrary polyhedra. This report reviews the representation of edge and face elements as implemented by ALEGRA. It then specifies a convention for storing these elements in EXODUS files by extending the EXODUS API to include edge and face blocks in addition to element blocks. Finally, it presents several techniques for rendering edge and face elements using VTK and ParaView, including the use of VTKs generic dataset interface for interpolating values interior to edges and faces.
NTIS
Data Storage; Partial Differential Equations

20080017845 Sandia National Labs., Albuquerque, NM USA

Network and Adaptive System of Systems Modeling and Analysis

Eddy, J. P.; Anderson, D. J.; Lawton, C. R.; Campbell, J. E.; May 01, 2007; 54 pp.; In English

Report No.(s): DE2007-908063; SAND2007-2788; No Copyright; Avail.: National Technical Information Service (NTIS)

This report documents the results of an LDRD program entitled Network and Adaptive System of Systems Modeling and Analysis that was conducted during FY 2005 and FY 2006. The purpose of this study was to determine and implement ways to incorporate network communications modeling into existing System of Systems (SoS) modeling capabilities. Current SoS modeling, particularly for the Future Combat Systems (FCS) program, is conducted under the assumption that communication between the various systems is always possible and occurs instantaneously. A more realistic representation of these communications allows for better, more accurate simulation results. The current approach to meeting this objective has been to use existing capabilities to model network hardware reliability and adding capabilities to use that information to model the impact on the sustainment supply chain and operational availability. Future work will extend these capabilities to allow for statistical treatment of non-hardware related network failures.

NTIS

Adaptation; Combat; Network Analysis; Reliability

20080017871 Thorp, Reed and Armstrong, LLP., Pittsburgh, PA, USA

Recognizing Multi-Stroke Symbols

Stahovic, T. F., Inventor; May 26, 2005; 26 pp.; In English

Contract(s)/Grant(s): NSF-DMI 0200262

Patent Info.: Filed Filed 26 May 05; US-Patent-Appl-SN-11-138 577

Report No.(s): PB2007-109353; No Copyright; Avail.: CASI: A03, Hardcopy

A method of analyzing a symbol comprised of one or more drawn strokes is comprised of calculating the speed of drawing along each stroke. A curvature magnitude along each stroke is calculated. An initial set of candidate points defining initial segments is identified using the calculated speed and curvature metric magnitude. The initial segments are classified as a type of primitive. The initial segments are compared to the original stroke. Merging and splitting of certain of the initial segments may be performed in response to the comparison to produce new segments which are classified as a type of primitive. Because of the rules governing abstracts, this abstract should not be used in construing the claims.

NTIS

Machine Learning; Pattern Recognition; Symbols

20080017874 Washington State Transportation Center, Seattle, WA, USA; Washington State Transportation Commission, Olympia, WA, USA

ITS (Intelligent Transportation Systems) Backbone Infrastructure

Dailey, D. J.; Apr. 01, 2003; 21 pp.; In English

Report No.(s): PB2007-111338; No Copyright; Avail.: National Technical Information Service (NTIS)

In this brief report, we provide a description of the activities in each of the areas to which the Backbone contributes, and we provide supporting statistics for each of these contributions. The form of these statistics varies by application area: (1) potential viewers, in the case of TrafficTV, (2) page views, in the case of MyBus, (3) data stream use, in the case of Busview, and (4) number of downloads, in the case of the SDD Toolkit.

NTIS

Real Time Operation; Transportation; Statistics

20080017940 Stanford Linear Accelerator Center, Menlo Park, CA, USA; National Univ. of Science and Technology, Rawalpindi, Pakistan

Quantifying and Mapping the Digital Divide from an Internet Point of View

Cottrell, R. L.; Khan, S.; Williams, J.; Mehdi, A.; Kalim, U.; May 01, 2007; 13 pp.; In English

Report No.(s): DE2007-903296; SLAC-PUB-12510; No Copyright; Avail.: National Technical Information Service (NTIS)

Quantitative knowledge of the magnitude, extent and trends of the Digital Divide are critical to understand and identify the regions most in need of help, to make rational decisions on how to address the problems and to make cases for executives, funding agencies and politicians. We report on a project (PingER) to measure the Digital Divide from the point of view of Internet performance. The PingER project has been measuring Internet performance since 1995 and with the increased emphasis on measuring and tracking the Digital Divide, it now covers over 700 hosts in over 115 countries that between them

contain over 99% of the world's Internet connected population. In this paper we will describe the how PingER works, it deployment, the data analysis, and presentation. We also introduce a new PingER visualization tool (ViPER) that provides a more appealing interactive visualization of the PingER data and also works on mobile PDAs. We will also show results from PingER that illustrate the magnitude, extent and trends for the Digital Divide, and also compare PingER results with some human development and technology indices.
NTIS
Information Systems; Internets

20080017999 Lawrence Livermore National Lab., Livermore, CA USA
Unsupervised Group Discovery and Link Prediction in Relational Datasets: A Nonparametric Bayesian Approach
Koutsourelakis, P. S.; May 07, 2007; 53 pp.; In English
Report No.(s): DE2007-908093; UCRL-TR-230743; No Copyright; Avail.: National Technical Information Service (NTIS)

In this report we address the problem of unsupervised group discovery in relational datasets. A fundamental issue in all clustering problems is that the actual number of clusters is unknown a priori. In most cases this is addressed by running the modelerent number of clusters each time and selecting the value that provides the best at based on some criterion (i.e. Bayes factor in the case of Bayesian techniques). It is easily understood that it would be preferable to develop techniques that are able to number of clusters is essentially learned from that data along with the rest of model parameters. For that purpose, we adopt a nonparametric Bayesian framework which provides a very exible modeling environment in which the size of the model i.e. the number of clusters, can adapt to the available data and readily accommodate outliers. The latter is particularly important since several groups of interest might consist of a small number of members and would most likely be smeared out by traditional modeling techniques. Finally, the proposed framework combines all the advantages of standard Bayesian techniques such as integration of prior knowledge in a principled manner, seamless accommodation of missing data, quantication of condence in the output etc.
NTIS
Bayes Theorem; Data Links; Data Bases; Criteria

60
COMPUTER OPERATIONS AND HARDWARE

Includes hardware for computer graphics, firmware and data processing. For components see *33 Electronics and Electrical Engineering*. For computer vision see *63 Cybernetics, Artificial Intelligence and Robotics*.

20080016779 Sandia National Labs., Albuquerque, NM USA
Supercomputer and Cluster Performance Modeling and Analysis Efforts: 2004-2006
Ang, J.; Barnette, D.; Benner, B.; Goudy, S.; Malins, B.; Feb. 01, 2007; 47 pp.; In English
Report No.(s): DE2007-903425; SAND2007-0601; No Copyright; Avail.: National Technical Information Service (NTIS)

This report describes efforts by the Performance Modeling and Analysis Team to investigate performance characteristics of Sandia's engineering and scientific applications on the ASC capability and advanced architecture supercomputers, and Sandia's capacity Linux clusters. Efforts to model various aspects of these computers are also discussed. The goals of these efforts are to quantify and compare Sandia's supercomputer and cluster performance characteristics; to reveal strengths and weaknesses in such systems; and to predict performance characteristics of, and provide guidelines for, future acquisitions and follow-on systems. Described herein are the results obtained from running benchmarks and applications to extract performance characteristics and comparisons, as well as modeling efforts, obtained during the time period 2004-2006. The format of the report, with hypertext links to numerous additional documents, purposefully minimizes the document size needed to disseminate the extensive results from our research.
NTIS
Cluster Analysis; Performance Prediction; Supercomputers

20080016797 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Disturb Testing in Flash Memories
Sheldon, Douglas; Freie, Michael; April 14, 2008; 27 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAS7-03001; WBS 939904.01.11-10; JPL Project No.: 102197; Task No.1.23.6
Report No.(s): JPL-Publ-08-7; Copyright; Avail.: CASI: A03, Hardcopy

2Gb NAND flash devices were tested for sensitivity to both program and read disturb conditions. This disturb testing is

part of the overall reliability evaluation of these devices for use on NASA missions. Disturb testing is designed to study the robustness of the data storage of the flash cells when the state of a nearby cell is being changed, either through programming or reading. A disturb failure means that the initial (and expected) state of the cell has been changed (disturbed) to the opposite state as a result of programming or reading the nearby cells. Disturb failures are usually soft failures that require additional device commands to repair. Flash manufacturers acknowledge disturb failures can occur on their devices and try to provide users with guidance on how to address them. For the high reliability nature of NASA missions, a quantitative understanding of the possible degree of disturb failures is required. Such quantitative understanding will guide device screening and procurement requirements as well as possible system mitigation implementations. No specific disturb failures were noted on the testing done for this report. However, inconsistent behavior in flash memory bad blocks was observed. Block locations that were initially identified as bad by the manufacturer performed correctly as the device began to be exercised. These locations remained robust even as the device was stressed over time and temperature. Other cells marked as good by the manufacturer began to degrade under this exposure to time and temperature. The associated failure rate with this degradation is 100X higher than predicted by the manufacturer s data. At this time, it is unknown why such a high failure rate was observed. The existence of this much higher failure rate and inconsistency in manufacturer-defined bad and good blocks means that NASA must individually screen, characterize, and qualify any and all NAND flash devices that it intends to use for spacecraft applications. Derived from text

Electronic Equipment; Performance Tests; Computer Storage Devices; Component Reliability; Data Storage

61
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.

20080016690 Lawrence Livermore National Lab., Livermore, CA USA

Keeping an Eye on the Prize

Hazi, A. U.; Feb. 08, 2007; 5 pp.; In English

Report No.(s): DE2007-902885; UCRL-TR-227894; No Copyright; Avail.: National Technical Information Service (NTIS)

Setting performance goals is part of the business plan for almost every company. The same is true in the world of supercomputers. Ten years ago, the Department of Energy (DOE) launched the Accelerated Strategic Computing Initiative (ASCI) to help ensure the safety and reliability of the nations nuclear weapons stockpile without nuclear testing. ASCI, which is now called the Advanced Simulation and Computing (ASC) Program and is managed by DOEs National Nuclear Security Administration (NNSA), set an initial 10-year goal to obtain computers that could process up to 100 trillion floating-point operations per second (teraflops). Many computer experts thought the goal was overly ambitious, but the programs results have proved them wrong.

NTIS

Supercomputers; Computerized Simulation; Nuclear Weapons; Tests

20080016708 Lockheed Martin Corp., Denver, CO, USA

MC21 Monte Carlo Transport Code

Sutton, T. M.; Donovan, T. J.; Trumbull, T. H.; Dobreff, P. S.; Caro, E.; Jan. 09, 2007; 15 pp.; In English

Report No.(s): DE2007-903083; LM-06K144; No Copyright; Avail.: National Technical Information Service (NTIS)

MC21 is a new Monte Carlo neutron and photon transport code currently under joint development at the Knolls Atomic Power Laboratory and the Bettis Atomic Power Laboratory. MC21 is the Monte Carlo transport kernel of the broader Common Monte Carlo Design Tool (CMCDT), which is also currently under development. The vision for CMCDT is to provide an automated, computer-aided modeling and post-processing environment integrated with a Monte Carlo solver that is optimized for reactor analysis. CMCDT represents a strategy to push the Monte Carlo method beyond its traditional role as a benchmarking tool or tool of last resort and into a dominant design role. This paper describes various aspects of the code, including the neutron physics and nuclear data treatments, the geometry representation, and the tally and depletion capabilities.

NTIS

Monte Carlo Method; Neutrons; Photons; Computer Aided Design; Computer Programming

20080017413 NASA Dryden Flight Research Center, Edwards, CA, USA
C3 System Performance Simulation and User Manual. Getting Started: Guidelines for Users
February 08, 2006; 24 pp.; In English; Original contains color illustrations
Report No.(s): DFRC-239; CCC007-Rev2; Copyright; Avail.: CASI: A03, Hardcopy

This document is a User's Manual describing the C3 Simulation capabilities. The subject work was designed to simulate the communications involved in the flight of a Remotely Operated Aircraft (ROA) using the Opnet software. Opnet provides a comprehensive development environment supporting the modeling of communication networks and distributed systems. It has tools for model design, simulation, data collection, and data analysis. Opnet models are hierarchical -- consisting of a project which contains node models which in turn contain process models. Nodes can be fixed, mobile, or satellite. Links between nodes can be physical or wireless. Communications are packet based. The model is very generic in its current form. Attributes such as frequency and bandwidth can easily be modified to better reflect a specific platform. The model is not fully developed at this stage -- there are still more enhancements to be added. Current issues are documented throughout this guide. Author

Mathematical Models; Simulation; User Manuals (Computer Programs); Remotely Piloted Vehicles; Command and Control

62
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.

20080016764 Center for Mathematics and Computer Science, Amsterdam, Netherlands
That Obscure Object of Desire: Multimedia Metadata on the Web (Part I)
van Ossenbruggen, J. R.; Nack, F. M.; Hardman, L.; Dec. 03, 2003; 16 pp.; In English
Report No.(s): PB2007-111355; INS-E0308; Copyright; Avail.: National Technical Information Service (NTIS)

This article discusses the state of the art in metadata for audio-visual media in large semantic networks, such as the Semantic Web. Our discussion is predominantly motivated by the two most widely known approaches towards machine-processable and semantic-based content description, namely the Semantic Web activity of the W3C and ISO's efforts in the direction of complex media content modeling, in particular the Multimedia Content Description Interface (MPEG-7). We explain that the conceptual ideas and technologies discussed in both approaches are essential for the next step in multimedia development. Unfortunately, there are still many practical obstacles that block their widespread use for providing multimedia metadata on the Web. Based on a scenario to explain our vision of a media-aware Semantic Web, we derive in Part I a number of problems regarding the semantic content description of media units. We then discuss the multimedia production chain, in particular emphasizing the role of progressive metadata production. As a result we distill a set of media-based metadata production requirements and show how current media production environments fail to address these. We then introduce those parts of the W3C and ISO standardization works that are relevant to our discussion. In Part II, PB2007-111356, we analyze their abilities to define structures for describing media semantics, discuss syntactic and semantic problems, ontological problems for media semantics, and the problems of applying the theoretical concepts to real world problems. Part II concludes with implications of the findings for future action with respect to the actions the community should take.
NTIS

Audio Equipment; Metadata; Multimedia; Visual Aids; World Wide Web; Data Management

20080016899 University of Central Florida, Orlando, FL, USA
Human Performance Assessments when Using Augmented Reality for Navigation
Goldiez, Brian F.; Saptoka, Nabin; Aedunuthula, Prashanth; Virtual Media for Military Applications; June 2006, pp. 28-1 - 28-10; In English; See also 20080016872; Original contains color illustrations
Contract(s)/Grant(s): N00014-03-1-0677; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Human performance executing search and rescue type of navigation is one area that can benefit from augmented reality technology when the proper computer generated information is added to a real scene. Search and rescue is characterized by the need to completely inspect a space, find an objective, and exit the space. Time is of the essence in completing this type of task and the environment is normally not familiar to the user, and lacks known landmarks. We briefly report on an experiment that demonstrated the benefits of augmented reality in a search and rescue task. Specifically, 120 participants, equally divided by gender, were tested in speed and accuracy using augmented reality in a search and rescue task. Accuracy

performance was improved using augmented reality as compared to the control conditions. Additionally, a user controlled On-Demand display resulted in better performance than a Continuously On display. We report on additional analysis performed on data gathered during the augmented reality experiment. Specifically the data involves whether the sense of presence occurred during the task, how one can measure presence in augmented reality environments, and the extent to which individual differences were factors in performance. While presence was not found in the experiments, new insights and measurement approaches emerged. Individual differences also exhibited some interesting results. Spatial recall and ingress-egress time were the independent variables measured against various factors obtained from demographics. Briefly, when individual treatments are aggregated, individuals between 25-35 years of age took longer to traverse the maze when compared to both older and younger groups. Likewise, females and persons with spatially oriented academic majors took longer to traverse the maze. We conjecture that these increases in times are due to well known gender differences, maturity or existing training in spatially oriented tasks.
Author
Human Performance; Navigation; Display Devices; Imagery; Video Equipment; Situational Awareness

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*.

20080016884 Institute for Human Factors TNO, Soesterberg, Netherlands
Tele-Presence: Bringing the Operator Back in the Loop
vanErp, Jan B. F.; Duistermaat, Maaike; Jansen, Chris; Groen, Eric; Hoedemaeker, Marieka; Virtual Media for Military Applications; June 2006, pp. 9-1 - 9-18; In English; See also 20080016872; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The importance of uninhabited vehicles in military environments has been recognized for many years. Much progress has been made in fields such as robotics and data communications, but not so much on the human factors issues. This is partly due to the trend to strive for ever higher levels of system autonomy, leaving the operator the task of supervising the system. However, by increasing system automation, the cognitive system of operators may become a bottleneck. A recent concept (which we call tele-presence) to tackle this problem is to design man-machine interfaces that allow operators to optimally use their perceptual motor system in order to relieve the cognitive system. Such an interface would enable sheer effortless looking and moving around in the remote environment by bringing the operator back in the front of the loop, resulting in a redistribution of task demands from the cognitive level to the perceptual level. A successful implementation would result in increased situational awareness and reduced cognitive load. This paper starts with describing the theoretical background behind tele-presence concept among others based on Endsley;s Situational Awareness model. In the second part, we describe the design of a telepresence interface for controlling an unmanned ground vehicle and an initial, exploratory study. The findings of this experiment show that we were not able to elicit a robust tele-presence effect yet. We discuss the results in relation to the present state of technology, interface characteristics such as delay between input and feedback, behaviour and motion sickness, and make recommendations on future research directions.
Author
Man Machine Systems; Situational Awareness; Teleoperators; Unmanned Ground Vehicles; Autonomy

20080017004 Lucent Technologies, Shrewsbury, NJ, USA
All-Optical Linear Feedback Shift Register
Bhardwaj, A., Inventor; Jaques, J. J., Inventor; Mar. 19, 2004; 16 pp.; In English
Contract(s)/Grant(s): MDS904-03-C-0413
Patent Info.: Filed Filed 19 Mar 04; US-Patent-Appl-SN-10-804-321
Report No.(s): PB2007-105275; No Copyright; Avail.: CASI: A03, Hardcopy

An all-optical linear feedback circuit for use, for example, as a maximal length pseudo random bit sequence generator includes an all-optical logic circuit that is capable of generating 2(sup N)-1 bit maximal length pseudo random bit sequences on an optical channel at high data rates e.g. 80 Gbit/s. In the pseudo random bit sequence generator of the present invention, intensity-dependent phase modulation of at least one included semiconductor optical amplifier (SOA) is implemented. The maximum data rate is limited by the fast gain recovery time of the carriers in the SOA. An optical logic gate of the pseudo

random bit sequence generator of the present invention may be constructed using various nonlinear elements that provide ultra-fast intensity-dependent phase modulation.
NTIS
Feedback; Feedback Circuits; Linear Circuits; Patent Applications; Shift Registers

20080017138 National Inst. of Information and Communications Technology, Japan
Cognitive Mechanisms of Preverbal Communication
KOZIMA, Hideki; NAKAGAWA, Cocoro; Review of the National Institute of Information and Communications Technology, Volume 53, No. 3; September 2007, pp. 83-90; In Chinese; See also 20080017128; Copyright; Avail.: Other Sources

The goals of 'understanding humanity' and 'humanizing robots' tightly relate to each other. Infanoid Project has related robotics to human sciences in order to understand the underlying mechanism of social communication specific to humans and some species of primates. Early communication between a child and caregiver is mainly embodied through touch and eye contact. By investigating the developmental mechanism of the preverbal interaction, especially through our longitudinal observation of children with communication disorders, we investigated the core human communication capabilities and design principles for future info-communication systems with which we can make symbiotic relationships.
Author
Robotics; Man Machine Systems; Bionics; Communication; Communicating; Conversation

65
STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; time series analysis; and stochastic processes.

20080016636 Government Accountability Office, Washington, DC, USA
Motor Carrier Safety: A Statistical Approach Will Better Identify Commercial Carriers that Pose High Crash Risks than Does the Current Federal Approach
Jun. 01, 2007; 54 pp.; In English
Report No.(s): PB2007-111090; GAO-07-585; No Copyright; Avail.: CASI: A04, Hardcopy

The Federal Motor Carrier Safety Administration (FMCSA) has the primary federal responsibility for reducing crashes involving large trucks and buses that operate in interstate commerce. FMCSA decides which motor carriers to review for compliance with its safety regulations primarily by using an automated, data-driven analysis model called SafeStat. SafeStat uses data on crashes and other data to assign carriers priorities for compliance reviews. GAO assessed (1) the extent to which changes to the SafeStat model could improve its ability to identify carriers that pose high crash risks and (2) how the quality of the data used affects SafeStat's performance. To carry out its work, GAO analyzed how SafeStat identified high-risk carriers in 2004 and compared these results with crash data through 2005. While SafeStat does a better job of identifying motor carriers that pose high crash risks than does a random selection, regression models GAO applied do an even better job. SafeStat works about twice as well as (about 83 percent better than) selecting carriers randomly. SafeStat is built on a number of expert judgments rather than using statistical approaches, such as a regression model. For example, its designers decided to weight more recent motor carrier crashes twice as much as less recent ones on the premise that more recent crashes were stronger indicators of future crashes.
NTIS
Aircraft Carriers; Approach; Crashes; Motor Vehicles; Risk; Safety; Statistical Analysis; Traffic

20080016823 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Taking the Pulse of the Economy
Struzik, Z. R.; Mar. 31, 2003; 14 pp.; In English
Report No.(s): PB2007-111344; INS-R0302; Copyright; Avail.: National Technical Information Service (NTIS)

At a first glance, there seems to be very little linking human heart rate and the stock index level, unless of course one is a trader or has invested a considerable amount of money. There may, however, be a much closer and physically/fundamentally more meaningful link than meets the eye between the heartbeat neuroregulation and market self-regulation. To support this claim, we draw parallels between two complex systems: that of the heart, as observed through the rate of heartbeat; and the economy, measured by the stock index record. As a suggestive illustration, we draw a comparision using particularly sensitive effects, the 'crash' and 'rally'. We argue that even though these effects clearly belong to the dynamical range of the phenomenon, they may, in fact follow a different mechanism than the bulk of the stochastic behaviour. In particular, we

suggest that an economic system under prolonged stress may have it in its nature to plunge to lower performance levels but recover without suffering damage. Similarly, the ultimate stress situation of fetal heartbeat during labor provides a conceptual basis for accommodating heavy crashes. From this perspective we also suggest a different strategy for evaluating crashes and post-crash recovery in order to diagnose, and (ultimately) make a prognosis of, 'economic health', in addition to monitoring the stock index value.
NTIS
Economic Analysis; Market Research; Stochastic Processes

66
SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

Includes mathematical modeling of systems; network analysis; mathematical programming; decision theory; and game theory.

20080017973 Research and Technology Organization, Neuilly-sur-Seine, France
Transforming Training and Experimentation through Modelling and Simulation
September 2006; In English; NATO RTO Modelling and Simulation Conference, 7-8 Oct. 2006, Koblenz, Germany; See also 20080017974 - 20080017996
Report No.(s): RTO-MP-MSG-045; AC/323(MSG-045)TP/30; Copyright; Avail.: CASI: C01, CD-ROM

Topics covered include: Technical Evaluation Report; NATO's Joint Warfare Centre Perspective on CAX Support Tools and Requirements; Australian Defence Simulation - Status; Rapid Prototyping during NATO Experimentation in Support of the Enhanced CIMIC Integrated Capability Team; Using the Multinational Experiment 4 (MNE4) Modeling and Simulation Federation to Support Joint Experimentation; Modeling & Simulation for Experimentation, Test and Evaluation and Training: Alenia Aeronautica Experiences and Perspectives; The Use of a Conceptual Battlespace Architecture to Manage and Exploit Concepts and Doctrine Experimentation; Toward an Integrated Executable Architecture and M and S Based Analysis for Counter Terrorism and Homeland Security; SEDETEP - Transformation of the Spanish Operation Research Simulation Working Environment; The Joint Live Virtual Constructive Data Translator Framework - Interoperability for a Seamless Joint Training Environment; Verification, Validation and Accreditation (VV and A) - Leveraging International Initiatives; Effectiveness of JSAF as an Open Architecture, Open Source Synthetic Environment in Defence Experimentation; The ITSIMBW Environment for Simulation and Decision Support; Battle Management Language Transformations; Towards a European Distributed Experimentation Capability; Interfacing Simulations with Training Content; A Web-Portal Based Approach for Knowledge Networks in Support of the Pathfinder Programme; Instructional Design Consideration and Planning in Transforming Simulation Systems to Platform for Delivery for Instruction; JADE - An Experiment in Distributed Simulation Based Joint Tactical Training; Advancing Fighter Employment Tactics in the Swedish and US Air Forces Using Simulation Environments; J-ROADS Air Defence Simulation Support during the 2006 JPOW IX Missile Defence Exercise; Modelling and Simulation Support to the Effects Based Approach to Operations - Observations from Using GAMMA in MNE 4; and Computer Assisted Exercise Environment for Terrorist Attack Consequence Management.
Derived from text
Computer Techniques; Missile Defense; System Effectiveness; Support Systems; Tactics; Air Defense; Terrorism; Warfare; Education

20080017974 VEGA Group Public Ltd. Co., UK
The Use of a Conceptual Battlespace Architecture to Manage and Exploit Concepts and Doctrine Experimentation
King, Paul; Evans, David; Transforming Training and Experimentation through Modelling and Simulation; September 2006, pp. 6-1 - 6-12; In English; See also 20080017973; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Advanced simulation and modelling technology has provided the military establishment with a new and unprecedented opportunity to experiment with concepts and doctrine in a way that today s constraints on cost and resources have made extremely difficult to realise by any other methods. Simulation and modelling technology enables a greater range of options to be explored, the flexible arrangement of real and the simulated participants and the rapid development and demonstration of new concepts, all leading to a powerful capability for shaping the future of military operations. This technology can be used to underpin experimentation which explores and defines concepts and processes for future doctrine such as the UK (UK)'s Network Enabled Capability (NEC) and Effects Based Operations (EBO). Without some framework for managing the resulting information and to provide a wider scope for interpretation of results, the full benefit of this type of experimentation can remain unfulfilled. Based on work conducted on behalf of the UK Ministry of Defence (MOD) and the UK NITEworks1

programme, this paper shows the benefits which have been gained from an architecture framework based model repository to provide a conceptual architecture for managing and exploiting experimental architectures and observations.
Author
Systems Simulation; Military Operations

20080017975 National Defence Headquarters, Ottawa, Ontario, Canada
Verification, Validation and Accreditation (VV and A) - Leveraging International Initiatives
Masys, A. J.; vanEmmerik, M. L.; Bouc, Pierre; Transforming Training and Experimentation through Modelling and Simulation; September 2006, pp. 10-1 - 10-10; In English; See also 20080017973; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

With the advent of complex coupled systems and the evolutionary introduction of new technology, the application of Modelling and Simulation (M&S) activities has increased throughout industry, academia and military domains. M&S has flourished as an enabling technology facilitating effective training opportunities from procedural training to full mission rehearsal and has been instrumental in helping decision makers take better account of the complexity, dynamics and uncertainties that pervade modern warfare. The application of M&S within the training domain brings with it an inherent risk associated with the danger of using erroneous or unsuitable models and simulation results. Verification and Validation (V&V) of models and simulations are intended to ensure that only correct and suitable results are used thereby facilitating risk management within the training domain. To address the complexities associated with VV&A, a coordinated effort among various international VV&A working groups such as: NATO Modelling and Simulation Group (NMSG) 19; Simulation Interoperability Standards Organization (SISO): Verification, Validation & Accreditation Overlay to Federation Development Product Development Group (PDG); REVVA 2; and SISO Generic Methodology for VV&A in the M&S domain has been formulated. This paper introduces the coordinated effort of these working groups and how they contribute to the understanding, formalization, and evaluation of the quality of training.
Author
Technology Utilization; Interoperability; Complex Systems; Education; Simulation; Risk; Domains

20080017976 MBDA UK Ltd., Herts, UK
Towards a European Distributed Experimentation Capability
Priestley, Mick; Walker, Ben; Spano, Antonella; Monjanel, Francois; Transforming Training and Experimentation through Modelling and Simulation; September 2006, pp. 14-1 - 14-10; In English; See also 20080017973; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Distributed modeling and simulation capabilities have become a key element of experimentation, supporting transformation, Simulation Based Acquisition and Networked Enabled Capability. For some time, MBDA Missile Systems has had experimentation facilities in the UK, France and Italy. In the UK, the company has a Distributed Experimentation Capability consisting of a high bandwidth network linking the Simulation Centre at Stevenage, the System Integration Facility at Bristol and the Trials Facility at Bedford. Over the last two years, a multinational team, part of the Synthetic Environments Centre of Excellence within the company, has been established. Its primary objective is to create a company wide European Distributed Experimentation Capability, linking the facilities in the UK, to Ch tillon in France and La Spezia in Italy. Different link technologies are being evaluated, including internal company networks and the Internet. As part of this evaluation, a Test-Bed infrastructure was established in the UK and distributed to France and Italy for the integration of French and Italian simulations. An interim milestone was a co-located experiment held at the end of 2005. However, the capability continues to be developed to achieve the distributed networking capability. Extensive use is being made of Collaborative Working Environments including: an SE Web on the company s Intranet and an always-on video conferencing. This paper outlines the challenges of creating such a distributed capability covering: working across national boundaries, export controls, distributed teams, the network technologies and the benefits of sharing a common toolset and approach.
Author
Systems Integration; Video Communication; International Trade; Computer Networks; Internets; Video Conferencing; Test Stands; Teleconferencing

20080017977 Norwegian Defence Research Establishment, Kjeller, Norway

JADE - An Experiment in Distributed Simulation Based Joint Tactical Training

Mevassvik, Ole Martin; Brathen, Karsten; Gustavsen, Richard Moe; Transforming Training and Experimentation through Modelling and Simulation; September 2006, pp. 18-1 - 18-10; In English; See also 20080017973; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

JADE, or Joint Air Defence Training Simulation, was an experiment conducted in Norway in March 2006 to explore whether connecting existing training simulators and operational systems is a suitable tool for joint tactical training. The embedded training capability of a Control and Reporting Centre, a naval tactical trainer and game-based fighter simulators located at three different sites were connected over a secure wide area network. Additionally, JADE was a test case for a simulation infrastructure in support of training and experimentation developed by FFI. An overview of the joint tactical training prototype capability established for JADE is given. It consists of three main parts; a distributed simulation system, a command and control system and tactical data links, and a voice communication system. A brief outline of the experimental training event is given, and both operational and technical experiences are discussed.

Author

Air Defense; Education; Command and Control; Training Simulators; Training Devices; Voice Communication; Wide Area Networks

20080017978 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, The Hague, Netherlands

J-ROADS Air Defence Simulation Support during the 2006 JPOW IX Missile Defence Exercise

vanderWiel, Wouter; Transforming Training and Experimentation through Modelling and Simulation; September 2006, pp. 20-1 - 20-12; In English; See also 20080017973; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Joint Research On Air Defence Simulation (J-ROADS) is a simulation environment developed at TNO to support air defence research and CD&E for the Netherlands armed forces. It was designed to support three main uses within air defence research: analysis, exercise support and act as a test bed. These three uses are supported by a single simulation environment using modular components with interchangeable fidelity levels. During the 2006 JPOW IX air defence exercise, J-ROADS was used to represent the Royal NL Air Force Patriot, the Royal NL Navy Air Defence Command Frigate, the Royal NL Army Future Ground Based Air Defence System, and Opposing Force air defence regiments based on Russian systems. By connecting the J-ROADS operator-in-the-loop simulation models over a Link-16 network to other simulations and to live systems, a very realistic training environment was created for training and experimentation. Next to the JPOW training scenarios, special experiments were carried out by the Netherlands armed forces to assess the operational value of new interceptor capabilities and new procedures for human interaction on different command and control levels. Very useful results were obtained and new insights were developed by all participants directly contributing to operational concepts, materiel acquisition processes and the further development of J-ROADS.

Author

Air Defense; Simulation; Command and Control; Missile Defense; Physical Exercise; Test Stands; Education

20080017979 Air Force Research Lab., Mesa, AZ, USA

Advancing Fighter Employment Tactics in the Swedish and US Air Forces Using Simulation Environments

Crane, Peter; Bennett, Winston; Borgvall, Anders; Waldelof, Claes; Transforming Training and Experimentation through Modelling and Simulation; September 2006, pp. 19-1 - 19-12; In English; See also 20080017973; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In today s fast paced operational environment it is almost impossible to evaluate new approaches and capabilities on operational aircraft in active duty squadrons. Further, obtaining range facilities and other aircraft to provide a tactically rich environment for test and evaluation of new concepts and capabilities is both time consuming and very expensive. Finally, many new weapon system capabilities cannot be evaluated in live fly environments as the actual systems do not exist in hardware form yet. Experimentation by expert fighter pilots using simulation facilities in the US and Sweden has resulted in improved tactical employment and training. We will present results from several controlled comparative studies we have undertaken with operational pilots and controllers examining new weapons characteristics and instrumentation for operational aircraft; live, virtual, and constructive data linking and tactics training; precision engagement tactics and system requirements; and embedding human performance assessment in simulation environments and on live aircraft. We will also highlight research currently underway with the Swedish Air Force which is examining and validating simulation technology and

methods for integrating Swedish Air Force into North Atlantic Treaty Organization (NATO/OTAN) peacekeeping support operations.
Author
Systems Simulation; Performance Prediction; Weapon Systems; Ranges (Facilities); Controllers; Environmental Tests; Human Performance; Tactics; System Effectiveness; Evaluation

20080017980 USA Joint Forces Command, Suffolk, VA, USA
Using the Multinational Experiment 4 (MNE4) Modeling and Simulation Federation to Support Joint Experimentation
Blank, Jim; Snyder, Daniel; Osen, David; Transforming Training and Experimentation through Modelling and Simulation; September 2006, pp. 4-1 - 4-14; In English; See also 20080017973; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Multinational experimentation is a critical element of the USA Joint Forces Command s (USJFCOM) Experimentation Directorate (J9) joint concept development and experimentation program. The Multinational Experiment (MNE) series explores ways to achieve a coalition s political goals by influencing the behaviour of our adversaries by relying on the full weight of the coalition s collective national powers (diplomatic, information, military and economics actions). MNE4, conducted in February - March 2006, was one such experimentation venue that explored new ways to apply the various elements of the coalition s considerable influence, short of direct military conflict. MNE4 required an extensive international modeling and simulation (M&S) development effort with models provided by France, Germany and the USA. France provided the Application Logiciele InterArmees Nationale pour l'entainement Au Commandement d un Engagement militaire (ALLIANCE). Germany provided the Joint Operations Army, Navy, Air Force (JOANA) simulation system. The USA provided the Joint Semi-Automated Forces (JSAF) and the Synthetic Environment for Analysis and Simulation (SEAS) systems. The resultant constructive environment rendered by MNE4 s four simulation components supported the entire range of the effects-based approach to assist in the development of future processes, organizations and technologies. Many M&S challenges were addressed as three countries conducted a series of integration milestone and spiral development events to make their respective models interoperate. M&S components provided the constructive environment at the platform and unit levels, which were displayed via web-enabled Command, Control, Communications, and Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) systems. Several first time successes were necessary to make this international development effort a reality. The significance of this work stemmed from the on-going international cooperation needed to get the simulations to communicate and understand each other s interactions. As the M&S community better learns to work together, it will favorably influence the coordination and cooperation needed to advance other work associated with MNE5. In turn, the MNE5 federation will provide an enabling tool to revolutionize coalition military and inter-agency experimentation. MNE5 will seek to include representative participants from non-military organizations to explore how to integrate international capabilities across the spectrum of international security issues. This paper discusses the technical approach to create a sufficient M&S environment for MNE4, and how this development effort may be leveraged for MNE5. Author
Command and Control; Environment Simulation; International Cooperation; Reconnaissance; Telecommunication; Surveillance; Security; Intelligence

20080017981 Old Dominion Univ., Norfolk, VA, USA
A Web-Portal Based Approach for Knowledge Networks in Support of the Pathfinder Programme
Tolk, Andreas; Turnsita, Charles D.; Ohlund, Gunnar; Sursal, Gokay; Transforming Training and Experimentation through Modelling and Simulation; September 2006, pp. 16-1 - 16-12; In English; See also 20080017973; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

As part of the Pathfinder Programme, the technical activity program MSG-027 Pathfinder Integration Environment has the task of bringing the integration knowledge required to build a federation to whatever organization is charged with that federating task. The knowledge concerning an individual federate is often found to a level of great expertise within a localized organization. In order to effectively have all federates required by an organization forming a federation, that organization must have access to the knowledge required to work with these federates. The knowledge could be shared via training and education programs, however the number of systems that exist will make this sort of universal training program unrealistic. A better goal is to have that necessary information available to all eligible organizations that need access to it. This is a perfect problem for knowledge delivery via the modern internet, and such knowledge delivery will not only bring together information gathered in the past, such as from prior NMSG technical activities, but also from present organizations that are experts on the individual systems and methods, and for the future such knowledge delivery will help to guide not only the building of Federations but

also other related MSG Pathfinder activities, or even NATO activities in general (such as study results from other panels, such as IST or SAS). To satisfy the goals of Pathfinder Integration Environment (facilitate the integration of purpose-built Federations from different National Federates) the knowledge needed for that need to be captured and managed. It also requires the development and presentation of a web portal that will make all specialized information and knowledge required for federation development available. A web portal that can satisfy that description must have a number of different functional pillars. The first, of course, is a community of users that will rely on that portal for knowledge and information. The second is a community of subject matter experts (software manufacturers, national sponsors, etc.) who are willing to prepare their knowledge for presentation by the web portal; these are in many cases the same persons. The third pillar is a small staff to manage the knowledge, keep it manageable and up-to-date, and to ensure that it is presented from the subject matter experts, to the user community, in a very useful format. The Pathfinder Integration Environment activity (MSG-027) has sought to provide a web portal, as well as a series of tools to enable the management of the knowledge captured in the portal, and a proof of concept collection of useful knowledge. This paper will discuss the activities that have accomplished the structuring of such a portal, the means by which all three functional pillars of that portal can be supported, and the future of how such work can assist with other NATO MSG activities. NATO s Modelling and Simulation (M&S) Group (MSG) was established under the NATO Research and Technology Organization (RTO) as a permanent panel/group initialized by recommendations made within the NATO Modelling and Simulation Master Plan (NMSMP) [1]. The process of writing the NMSG was officially started in 1996, when the Conference of National Armament Directors (CNAD) established a Steering Group on Modelling and Simulation (SGMS), consisting of a Governmental Policy Subgroup (GPSG), a Military Policy Subgroup (MPSG), and an Industrial Policy Subgroup (IPSG), and tasked them with writing a plan to align and coordinate the M&S related activities better. The SGMS agreed on the Master Plan in July 1998, which was approved by the North Atlantic Council (NAC) in December 1998. This plan is still valid and the basis for NATO s M&S activities.
Author
Education; Internets; Artificial Intelligence; Simulation; Federations

20080017982 NATO Consultation, Command, and Control Agency, The Hague, Netherlands
Modelling and Simulation Support to the Effects Based Approach to Operations - Observations from Using GAMMA in MNE 4
Dompke, Uwe; Transforming Training and Experimentation through Modelling and Simulation; September 2006, pp. 21-1 - 21-16; In English; See also 20080017973; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

NATO participates in the Multinational Experiment series (MNE) on the Effects Based Approach to Operations (EBAO). These experiments look on a new concept to plan, execute and assess complex crisis response operations. Modelling and Simulation can help in many ways to support the Effects Based Approach to Operations and can help on the other hand to set up the experimentation environment to develop new concepts. NC3A supported MNE 4 with its collaborative planning support system EB-TOPFAS (Effects Based Tools for Operational Planning Force Activation and Simulation) and with the simulation and course of action assessment tool GAMMA (Global Aggregated Model for Military Assessment). The paper is based on the experiences of the author supporting the Combined Task Force with GAMMA in MNE 4. The paper will describe the setup of the experiment and the role of modelling and simulation in MNE 4. The use of GAMMA in the EBAO context will be explained. Major activities and observations will be described. Conclusions and recommendations will conclude the paper.
Author
Support Systems; Operational Problems; Military Operations; Decision Making; Planning; Simulation

20080017983 Spanish Navy Operations Research Laboratory (Gimo), Madrid, Spain
SEDETEP - Transformation of the Spanish Operation Research Simulation Working Environment
Catalan, Nelson Ameyugo; Reif, Bernardo Martinez; San Jose Martin, Angel E.; Aguilar, David Villanueva; Transforming Training and Experimentation through Modelling and Simulation; September 2006, pp. 8-1 - 8-12; In English; See also 20080017973; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Spanish Navy Operations Research Laboratory is developing a project called SEDETEP (‘Synthetic Environments DEvelopment Tools Evaluation Project’). The objective of this project is to create an Operation Research Simulation Working Environment (ORSWE) to perform simulation projects in an optimized manner, allowing analysts to reuse assets, minimize development costs and use more effectively the human resources assigned and the know-how generated.
Author
Operations Research; Environment Simulation; Transformations; Human Resources; Simulation

20080017984 Alenia Aeronautica, Italy

Modeling & Simulation for Experimentation, Test and Evaluation and Training: Alenia Aeronautica Experiences and Perspectives

Guido, Marcella; Montrucchio, Cristiano; Transforming Training and Experimentation through Modelling and Simulation; September 2006, pp. 5-1 - 5-16; In English; See also 20080017973; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The use of Modeling & Simulation to support aircraft development is nowadays common practice within any modern aeronautical industry, and a long term key capability of Alenia Aeronautica. Starting from such crucial role, M&S utilization has progressively expanded to effectively support the aeronautical system s early stages - feasibility and definition, and later stages - in service support and pilots training, becoming an essential element during the entire system s life cycle. The main tool to implement and sustain such capability is the Synthetic Environment, which relies on the following elements: 1) Flight Simulators with engineering and training potential; 2) Simulators networking at both LAN and WAN (Local and Wide Area Network) levels; 3) Tactical scenarios; 4) Image generation; 5) Virtual reality. The paper will focus on the latest major experiences of Alenia Aeronautica with the AMX ACOL, Eurofighter, C-27J and Sky-X UAV Programs, from systems concept, through development and experimentation, to pilots training and mission rehearsal. Moreover, Alenia Aeronautica s approach and perspectives in the field of the simulation of Network Centric Operations will be described: the Network Centric Simulation Environment

Author

Support Systems; Flight Simulators; Fighter Aircraft; Wide Area Networks; Virtual Reality; System Effectiveness; Education; Evaluation

20080017985 Centre de Doctrine d'emploi des Forces (CDEF), Paris, France

Battle Management Language Transformations

Bernard, Frederic; Khimeche, Lionel; Pullen, J. Mark; Powers, Michael W.; Sudnikovich, William P.; Ritchie, Adam; Hieb, Michael; deChamps, Patrick; Transforming Training and Experimentation through Modelling and Simulation; September 2006, pp. 13-1 - 13-14; In English; See also 20080017973; Original contains color illustrations; Copyright; Avail.: CASI: A04, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A critically needed element of transformation is to enable interoperation of alliance and coalition Command and Control (C2) and Modelling and Simulation (M&S) systems. Battlefield Management Language (BML) is being developed as a common representation of military mission suitable for automated processing. Within NATO the task group MSG-048 'Coalition BML' is defining a BML using the Joint Command, Control and Consultation Information Exchange Data Model (JC3IEDM) as a lexicon. BML addresses the capability to initialize Simulations with Operational orders and taskings that has been recognized as a key future capability for both training and experimentation. We describe a limited demonstration where both French and US C2 planning systems were used to prepare a Course of Action (COA) to conduct a coalition coordinated operation which supported approval of the new Technology Assessment Program MSG-048. BML is being explored in US Army, US Joint and Coalition Contexts. With MSG-048, continued research in many dimensions is continuing to broaden the BML concept.

Author

Languages; Translating; Control Simulation; Military Operations; Education; Command and Control

20080017986 Department of Defence, Canberra, Australia

Australian Defence Simulation - Status

McFarlane, D.; Kruzins, E.; Transforming Training and Experimentation through Modelling and Simulation; September 2006, pp. 2-1 - 2-12; In English; See also 20080017973; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A rapidly expanding international role and increasing economic and environmental constraints is forcing the Australian Defence Organisation (ADO) to adopt new technology, such as simulation, in response to the challenges. Australia s small, but highly educated Defence population have been early adopters of simulation (since the 1960 s) and shown a clear appreciation of the benefits of simulation to support training. Australia is continuing this trend but is also adopting other application areas where the benefit of simulation is justified. The Defence Simulation Policy states, 'Defence exploits simulation to develop, train for, prepare for and test military options for Government wherever it can enhance capability, save resources or reduce risk.' The use of simulation has been dramatically increasing in the ADO over the last few years and a significant expenditure of A$2-3 billion1 over 10 years is cited for future simulation development. This investment needs to be well managed, coordinated and we need to take a collaborative approach with our industry partners and international

simulation organisations to ensure each dollar is well spent. This paper describes the simulation governance arrangements in place for the AOD. It also details the current and proposed future simulation activities for the ADO around the two Defence outcomes of Developing the Force and Employing the Force . It also discusses some existing challenges for Australia that will need to be overcome.
Author
Organizations; Policies; Simulation; Defense Industry; Economics; Education

20080017987 NATO Allied Command Transformation, Norfolk, VA, USA
Rapid Prototyping during NATO Experimentation in Support of the Enhanced CIMIC Integrated Capability Team
Buck, Wayne; Transforming Training and Experimentation through Modelling and Simulation; September 2006, pp. 3-1 - 3-10; In English; See also 20080017973; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

As part of its ongoing effort to encourage rapid prototyping within NATO, the Allied Command Transformation Modelling and Simulation Section is actively involved in modelling and simulating at the multinational political/military level. Experimentation with multinational political concepts and at the military strategic level is inherently complicated and sensitive. Simulation can be used to not only rapidly prototype concept changes but also to derisk the cultural sensitivities that may be associated with live experimentation. During the NATO Crisis Management Exercise 06, conducted 1-7 March 2006, the Modelling and Simulation Section provided models and simulations, which aided concept developers conducting experimentation and studies. This paper will describe in detail the Crisis Management Exercise simulation effort and briefly explain the main follow on M&S effort which is different in nature. The primary experiment known as the NATO HQ Crisis Management Fusion Centre had an overall aim to enable decision coherence and included several sub-objectives. Extend(TradeMark) was used to simulate the concept and highlight metrics and areas for improvements. Due to the immediate significant need to provide improvements in the Enhanced CIMIC Transformational Objective Area, several follow on activities have begun including a separate modelling effort that was initiated dealing with information collaboration between NATO elements and Non-Governmental Organisations and International Organisations. This information collaboration is being modelled and simulated at all levels from strategic to tactical and across the policy, planning and operations domains. The goal is to create a synthetic environment in a battle laboratory where new procedures can be developed cooperatively to improve the civilian-military relationship during operations. This follow on effort is quite different from the first rapid prototype development effort but still uses several of the lessons learned to steer its progress.
Author
Rapid Prototyping; Support Systems; Management Methods; Organizations; Simulation; Lessons Learned; Policies

20080017988 Defence Research and Development Canada, Ottawa, Ontario, Canada
Effectiveness of JSAF as an Open Architecture, Open Source Synthetic Environment in Defence Experimentation
Hassaine, F.; Abdellaoui, N.; Yavas, A.; Hubbard, P.; Vallerand, A. L.; Transforming Training and Experimentation through Modelling and Simulation; September 2006, pp. 11-1 - 11-6; In English; See also 20080017973; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Today s operational environment necessitates joint or combined operations at all levels. Modeling and simulation (M&S) is a key element supporting combined or joint forces experimentation, training and decision support needs. M&S has been widely used for many years by NATO nations and a considerable number of Simulation Systems have been developed for specific military needs. However, there are few joint Simulation Environments that can support current and future requirements, and that will range from low to high level of fidelity. Very few tools can support the thus far elusive concept of ‘Scalable Fidelity’. We have thus tested the hypothesis that Joint Forces Command (JFCOM) s Joint Semi Automated Forces (JSAF) has the potential for the integration of models with varying levels of fidelity, therefore making it a suitable Synthetic Environment (SE) with scalable fidelity, which is a highly desirable feature for CD&E activities. We believe this was achievable in part due to JSAF s open architecture,its reliance on open standards and being ‘open source’ or more precisely, ‘government source available’. Results indicate that JSAF s open architecture allows easy internal replacement of both low and high fidelity models. Results also show that JSAF s open architecture brings the flexibility to update the system according to CD&E specific requirements. In terms of reusing M&S developments in spiral CD&E work, JSAF seems to support the concept of ‘Scalable Fidelity’ quite well since it supports designing or composing with the anticipated attributes of the planned future. However, a number of problems were encountered with JSAF. Some inevitable problems were related

to both the lack of documentation in particular for the current version (it is the version used for MNE-4 experiments) and the implementation of the environment. We present data
Author
Support Systems; Education; Flexibility; Simulation; Hypotheses

20080017989 Intelligent Automation Systems, Inc., Rockville, MD, USA
Instructional Design Consideration and Planning in Transforming Simulation Systems to Platform for Delivery for Instruction
Haynes, Jacqueline; Bukai, Ohad; Pokorny, Robert; Ruess, Kevin C.; Transforming Training and Experimentation through Modelling and Simulation; September 2006, pp. 17-1 - 17-20; In English; See also 20080017973; Original contains color illustrations; Copyright; Avail.: CASI: A04, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In this paper we present the view of Intelligent Automation Inc. (IAI) as to the future development of Instructional Systems Design (ISD) when applied to Simulation Based Instruction (SBI). We call for the formalization of the SBI ISD process in a way that will achieve the separation of the ISD process from a specific simulation implementation, and address the complexity and special needs of the process. Additionally we describe a new model for instructional design that can be applied to SBI. Unlike traditional models such as ADDIE that focus on the process, our model focuses on the integration of four design elements: process, ontology, collaboration model and product description. We show how the proposed model integrates with current trends in Simulation-SCORM interoperability, as well as streamlining SBI ISD with the ISD of traditional Web-based training (WBT) used in a similar context. Our suggested approach contains a supporting business model, as well as a new class of automated ISD editors to help instructional designers plan effective simulation instruction interactions.
Author
Systems Engineering; Simulation; Interoperability; Education; Commerce

20080017990 Bulgarian Academy of Sciences, Sofia, Bulgaria
Computer Assisted Exercise Environment for Terrorist Attack Consequence Management
Shalamanov, Velizar Mateev; Transforming Training and Experimentation through Modelling and Simulation; September 2006, pp. 22-1 - 22-18; In English; See also 20080017973; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The paper explores architecture for a Joint Training Simulation and Analysis Center in Civil-Military Emergency Planning / Response (JTSAC-CMEP). The center is developed under NATO s Science for Peace Project, SfP 981149, by the Center of Excellence in Operational Analyses a network of working groups from the Academy of Science, the Defense Staff College, and the Academy of Interior Ministry. The CAX environment is a synthesis of tools for scenario development, simulation, multi-agency / international C4 network, web-based information sharing / collection / fusion and post-exercise lessons learned analysis. JTSAC-CMEP is based on a model for concept development and experimentation in the area of civil security through CAX. This model is a base for managing the process of transformation of the security sector into an integrated, network enabled organization. The goal of the integrated security sector is to enable the state to face the challenges posed by terrorism and other asymmetric threats. The JTSAC-CMEP is considered a test-bed for a new decision-making software and information sharing technologies as well as a tool for adding exercise participants in the loop for experimentation of the concepts and acquisition of new knowledge in the area of CMEP. The focus of the environment is on modules for support of exercise (MOSEX), including planning and management, to achieve a higher effectiveness and efficiency of the experimentation and training process. The Modelling and Simulation Tool (MOSEX) is the main engine of the CAX environment. The MOSEX software is tailored and adapted for the Bulgarian context and will be applied in the 'Terrorist Act Consequences Management in South East Europe' exercise (EU TACOM SEE 2006), which is sponsored by the European Union. A limited budget and manpower for the preparation of software is available for the extremely short duration of the exercise. Low cost, standard basic software was selected, which provides the minimum of required functionality of message handling, display capabilities and simulation tools. (MS-Office, MS-Visual Basic, Map Objects/ArcView, PowerSim). The exercise is supported by a set of tools generated with add-ons to MS-Office, some tailoring of existing display software, and quick prototyping. The objective is to demonstrate the possibility to utilize existing low-cost, off-the-shelf software for command and control and to prototype already useful simulation models without great effort. The real challenge facing the team is to organize an analysis of the results and to draft the lessons learned. Therefore, result oriented / effect based planning and management of the JTSAC-CMEP and exercises was defined as a priority from the very beginning. This element of the CAX environment is considered as important as the conducting of the exercise itself. During the exercise and analysis period, a special package

of modelling and simulation tools will be used to acquire knowledge for the emergency management process and for improvement of previously existing models and software. Although the exercise is currently at the stage of preparation we present the results and lessons learned as an attempt to transform training by new means of communication and the utilization of commercially available products. The JTSAC-CMEP will be fully experimented in the context of the EU TACOM SEE-2006 full-scale exercise, taking place in Sofia, Bulgaria, to include CAX for CPX on national level. The exercise is coordinated by the EU and includes observers from NATO and FX, as well as teams from seven countries. The goal is to further improve the center and integrate it in the network of CoE of the ACT with specialization in CIMIC and CMEP.
Author
Command and Control; Computer Techniques; Computerized Simulation; Decision Making; Military Operations; Training Analysis; Terrorism; Physical Exercise; Lessons Learned

20080017991 Fraunhofer Institut for Intelligent Analysis and Information Systems, Sankt Augustin, Germany
The ITSIMBW Environment for Simulation and Decision Support
Beyer, Uwe; Zoller, Thomas; Hugelmeyer, Philipp; Steffens, Timo; Transforming Training and Experimentation through Modelling and Simulation; September 2006, pp. 12-1 - 12-12; In English; See also 20080017973; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In this contribution, we give an overview on the military multi-agent simulation environment ITSimBw, which is developed at Fraunhofer IAIS/ART under contract for the department A5 of the IT office of the German Armed Forces (ITAmtBw), where the project is overseen by Captain Thomas Doll. Due to the growing importance of network centric capabilities in military operations, one of the main focus points for the development of ITSimBw is the faithful modelling of IT and communication aspects. This goal is achieved essentially by two means: 1. A message format for simulated communication acts between agents is provided which allows the detailed specification of communication channel, medium, and range. 2. A voxel-space representation is used to model the extension of all objects belonging to the simulated environment. This allows for the application of high performance ray tracing algorithms to precisely determine the impact of effects like radio-pockets (e.g. caused by mountains) as well as jamming by opposing forces. These two features in conjunction allow for a detailed and realistic modeling of communication chains for reporting and command both inside and across different echelons. Clearly, the modelling of communication aspects can only reasonably be carried out in an environment which is rich enough to support the simulation of a broad variety of scenarios. ITSimBw addresses this point by strictly adhering to an agent-oriented paradigm which allows for the specification of autonomous, situation-based behaviour for all entities. This extended agent concept includes environment, weather, bridges, obstacles, and the like as active elements. This means that all effects and events are handled as actions of agents. Another important issue for any simulation system is the precise and comprehensive description of the scenarios which are to be examined. To this end, ITSimBw encompasses its own LAMPS description language. Being based on high-level Petri-Nets, it can be represented graphically and by rule-sets. Moreover, due to its generality, it is equally well suited for the description of complete scenarios as for the specification of agent behaviour. An important area of ongoing research and development is the capability of LAMPS to record events. This feature enables the creation of a scenario data-base containing mission graphs from simulation runs as well as real-world maneuvers or even actual military missions. This data-base can then form the core component of a decision support system for the military commander. Like a chess player comparing a current board position with memorized games to determine the next move, a graph-metric can be used to liken the LAMPS graph of an ongoing mission with those in the data-base. We thus envisage LAMPS to be a core factor for the application of data-mining-techniques in mission evaluation
Author
Decision Support Systems; Environment Simulation; Channels (Data Transmission); Military Operations; Data Mining; Data Bases; Armed Forces

20080017992 Boeing Co., Saint Louis, MO, USA
Interfacing Simulations with Training Content
Dargue, Brandt W.; Morse, Katherine L.; Smith, Brent; Frank, Geoffrey; Transforming Training and Experimentation through Modelling and Simulation; September 2006, pp. 15-1 - 15-14; In English; See also 20080017973; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Recent years have seen huge increases both in computing power and the number of people able to access computers and the Internet. This proliferation of information and communication technologies has enabled higher quality learning to be made available through increasingly sophisticated modes of presentation. Traditional or conventional training programs use a variety

of instructional development strategies to support a student s need to master a variety of competencies. Simulations and games are increasingly being deployed as powerful and valuable extensions to these traditional educational initiatives. However, learning is a comprehensive process which does not simply consist of the transmission and learning of content. While simulations offer the opportunity to undergo informative interactive experiences, they do not, by themselves, constitute training or instruction. Assessment, student tracking and feedback are important elements in the teaching and learning process. Recognizing the importance of these requirements, two IEEE standards committees have formed a collaborative study group to investigate the potential of formalizing a standard set of technical specifications to allow simulations and/or games to be launched and managed through SCORM-conformant content and Learning Management Systems. This paper and presentation will focus on discussions, both technical and pedagogical; to address the many issues associated with developing such SCORM-Simulation Interface standards. Discussions will focus on the different use cases for simulations and the key interface points between simulation content and LMS environments such as delivering simulation content to the learner, monitoring key interactions and performance within simulation content and determining what the student should next experience within the continuum of training.
Author
Deployment; Education; Simulation; Management Systems; Computers; Continuums

20080017993 Defence Research and Development Canada, Ottawa, Ontario, Canada
Toward an Integrated Executable Architecture and M and S Based Analysis for Counter Terrorism and Homeland Security
Youssef, R.; Kim, B.; Pagotto, J.; Vallerand, A.; Lam, S.; Pace, P.; Pogue, C.; Greenley, A.; Transforming Training and Experimentation through Modelling and Simulation; September 2006, pp. 7-1 - 7-24; In English; See also 20080017973; Original contains color illustrations; Copyright; Avail.: CASI: A04, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Over the past few years, defence organizations have begun to shift from Threat-Based Planning to Capability-Based Planning, focusing on a System of Systems construct. Executable Architecture, a Capability Management methodology, provides the means to conduct dynamic analysis of a system, and is emerging as a supporting methodology. By applying the rigor of systems engineering analysis and techniques, and incorporating a holistic blend of people, process and materiel, Executable Architectures can ensure that capabilities are properly designed, efficiently developed, and sustained with a specific focus on interoperability across government departments and defence organizations. Empowered by the use of modeling and simulation to validate the capability requirements and architectures, defence agencies are able to evaluate the potential effectiveness of adding new tools to current capabilities, such as a new sensor to the C4ISR capability. The goal of this study was to test the hypothesis that Executable Architecture provides an effective methodology or framework to address and analyze counter-terrorism and homeland security Capability gaps. This hypothesis was tested in a Homeland Security simulation scenario, where terrorists planted a dirty bomb close to Parliament Hill in Downtown Ottawa. The experiment consisted in conducting an Executable Architecture-based analysis using CORE(TradeMark), while looking at multiple capability assets such as ground vehicles and an uninhabited aerial vehicle (UAV) focused to locate the radiological source, and by comparing the performance of these assets in terms of various capability based metrics such as agility, persistence, and range and to effectively measure whether the addition of a military UAV system would increase the effectiveness of the current Counter Terrorism Public Security capability. A validated physics-based Radiological emission and detection model was modeled in STK(TradeMark), and JFCOM's Joint Semi-Autonomous Forces (JSAF) was the synthetic environment used to complement the executable architecture model, simulate the homeland security scenario, and show that a civilian emergency management SE tool can be interfaced with a defense federation. Finally and perhaps most importantly, the M&S was used to verify whether Executable
Author
Interoperability; Systems Engineering; Organizations; Radiology; Security; Autonomy; Simulation

20080017994 Old Dominion Univ., Norfolk, VA, USA
Technical Evaluation Report
Tolk, Andreas; Transforming Training and Experimentation through Modelling and Simulation; September 2006, pp. T-1 - T-16; In English; See also 20080017973; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The importance of Modelling and Simulation (M&S) and the effect it has had on transforming training and experimentation in NATO and national activities has been recognised for a number of years and is reflected in several symposium proceedings. Advances in low cost, high power computers, graphics and telecommunications/networking are some

of the key technologies that have provided opportunities for extensive modelling and use of simulations in the live, virtual and constructive domains in new and exciting ways. Increasing collaboration with related NATO panels such as Information System Technologies (IST) and Systems, Analysis and Studies (SAS) and other related organisations such as the Simulation Interoperability Standards Organization (SISO) and the Command and Control Research Programme (CCRP) contributes to these advancements. As a result, M&S are today powerful tools that can assist in many ways towards the Allied Command for Transformation (ACT) mission and its commitment to the transformation of NATO s military capabilities. This symposium focused on papers that demonstrate how M&S has changed component command, joint training and doctrine development. Additional interest is the influence of M&S in research and technology, experimentation into Net Enabled Capabilities (NEC), effect based operations and interoperability for the effectiveness of NATO and the nations. In addition, the symposium addressed the themes of research, development and the application/adaptation of M&S in the defence and commercial environments. The Call for Papers explicitly requested papers addressing the following topics: the NATO Response Force, Military Exercising, Training and Decision Support, Network Centric Warfare, and Defence against Terrorism. In addition to these topics, the symposium also addressed the more general themes of research, development and M&S-related standards. Invited Papers dealt with the NATO Transformation process and implication for M&S, the NATO Joint Warfare Centre and in particular their current and future applications of M&S, and paper from Australia regarding their use of M & S and the development of Commercial gaming technology and its impact in military applications.
Author
Command and Control; Low Cost; Military Technology; Computers; Telecommunication; Information Systems; Systems Analysis

20080017995 NATO Joint Warfare Centre, Stavanger, Norway
NATO's Joint Warfare Centre Perspective on CAX Support Tools and Requirements
Erdal Cayirci; Transforming Training and Experimentation through Modelling and Simulation; September 2006, pp. 1-1 - 1-14; In English; See also 20080017973; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A computer assisted exercise (CAX) is a type of synthetic exercise (SYNEX) where forces are generated, moved and managed in a simulation environment. Therefore, CAX support is often thought limited to installing and running a military constructive simulation during a command post exercise (CPX). In this perception CAX support is to replace or to help response cells, high level commands (HICON), low level commands (LOCON) by running a set of stochastic processes to find out the possible outcomes of the decisions or requests coming from the training audience (TA).
Derived from text
Computer Techniques; Support Systems; Simulation; Physical Exercise; Education

20080017996 Joint Warfighting Center, Fort Monroe, VA, USA
The Joint Live Virtual Constructive Data Translator Framework - Interoperability for a Seamless Joint Training Environment
Bizub, Warren; Bryan, Derek; Harvey, Edward; Transforming Training and Experimentation through Modelling and Simulation; September 2006, pp. 9-1 - 9-8; In English; See also 20080017973; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

US Joint Forces Command s (USJFCOM) Joint National Training Capability (JNTC) program has been tasked by the Office of the Under Secretary of Defense (OUSD) for Personnel and Readiness (P&R) to develop and integrate a distributed, seamless Joint Training Environment (JTE) consisting of Live, Virtual, and Constructive (LVC) training technologies. Currently, LVC assets within the JNTC architecture are integrated through loosely defined protocols, multiple types and instances of protocol translators, and a collection of distributed messaging tools, most of which are either ill-defined, require technical expertise to use, or do not provide the level of interoperability necessary to meet OUSD P&R requirements. The Joint Training and Education Capability Group (JTECG) is studying future LVC integration concepts and tools that will address these limitations and result in more interoperable LVC systems. One such tool, the Joint LVC Data Translator (JLVCDT) Framework, will reduce the number and variety of protocol translators used to support Joint training, will support rapid development and integration of LVC protocols through the use of a scalable software architecture, and will act as a system and software platform for further research and development of a Common LVC Architecture (CLA). Developed in conjunction with the USA Services, the JLVCDT will reuse software and interfaces from existing Service and Joint tools within a more scalable and extensible application infrastructure. The JLVCDT will be easier to configure, deploy, and control than existing tools and will require less technical expertise to operate. It is anticipated that development of the JLVCDT will continue through 2007 resulting in an initial operating capability that can be used to support JNTC events (including multinational

partners)by late 2007to early 2008. This paper will describe the vision for the JLVCDT, the technical approach to developing the JLVCDT, and how the JLVCDT supports the CLA concept.
Author
Interoperability; Education; Protocol (Computers); Armed Forces

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PHYSICS (GENERAL)

Includes general research topics related to mechanics, kinetics, magnetism, and electrodynamics. For specific areas of physics see *categories 71 through 77*. For related instrumentation see *35 Instrumentation and Photography*; for geophysics, astrophysics, or solar physics see *46 Geophysics, 90 Astrophysics*, or *92 Solar Physics*.

20080016651 Haynes and Boone, LLP, Dallas, TX, USA
MEMS Based Charged Particle Deflector Design
Saini, R., Inventor; Jandric, Z., Inventor; Tuggle, D., Inventor; Nov. 12, 2004; 19 pp.; In English
Contract(s)/Grant(s): CN-DAAH01-03-C-R217
Patent Info.: Filed Filed 12 Nov 04; US-Patent-Appl-SN-10-987 871
Report No.(s): PB2007-104752; No Copyright; Avail.: CASI: A03, Hardcopy

A microcolumn including a plurality of beam modification components coupled to an assembly substrate, wherein the plurality of beam modification components includes: (1) an extractor component; (2) a first focusing electrode component; (3) a first anode component; (4) a first deflector component; (5) a second focusing electrode component; (6) a second deflector component; (7) a third focusing electrode component; (8) a third deflector component; (9) a second anode component; (10) a fourth focusing electrode component; and (11) a third anode component. The beam modification components may be ordered on the substrate in this sequence or other sequences.
NTIS
Charged Particles; Deflectors; Electron Beams; Imaging Techniques; Microelectromechanical Systems; Patent Applications

20080016656 Foley and Lardner, LLP, Washington, DC, USA; Northwestern Univ., Chicago, IL, USA
Nanolithography Methods and Products Therefor and Produced Thereby
Mirkin, C. A., Inventor; Hong, S., Inventor; Dravid, V. P., Inventor; Apr. 07, 2005; 14 pp.; In English
Patent Info.: Filed Filed 7 Apr 05; US-Patent-Appl-SN-11-100 483
Report No.(s): PB2007-108832; No Copyright; Avail.: CASI: A03, Hardcopy

In one aspect, a method of nanolithography is provided using a driving force to control the movement of a deposition compound from a scanning probe microscope tip to a substrate. Another aspect of the invention provides a tip for use in nanolithography having an internal cavity and an aperture restricting movement of a deposition compound from the tip to the substrate. The rate and extent of movement of the deposition compound through the aperture is controlled by a driving force.
NTIS
Lithography; Nanofabrication; Nanotechnology

20080016660 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Recent Improvements to the IMPACT-T Parallel Particle Tracking Code
Qiang, J.; Pogorelov, I. V.; Ryne, R.; January 2007; 3 pp.; In English
Report No.(s): DE2007-902809; No Copyright; Avail.: National Technical Information Service (NTIS)

The IMPACT-T code is a parallel three-dimensional quasi-static beam dynamics code for modeling high brightness beams in photoinjectors and RF linacs. Developed under the US DOE Scientific Discovery through Advanced Computing (SciDAC) program, it includes several key features including a self-consistent calculation of 3D spacecharge forces using a shifted and integrated Green function method, multiple energy bins for beams with large energy spread, and models for treating RF standing wave and traveling wave structures. In this paper, we report on recent improvements to the IMPACT-T code including modeling traveling wave structures, short-range transverse and longitudinal wakefields, and longitudinal coherent synchrotron radiation through bending magnets.
NTIS
Synchrotron Radiation; Standing Waves; Coherent Radiation

20080016683 Stanford Linear Accelerator Center, Menlo Park, CA, USA
Unification and Dark Matter in a Minimal Scalar Extension of the Standard Model
Lisanti, M.; Wacker, J. G.; Apr. 01, 2007; 11 pp.; In English
Report No.(s): DE2007-902727; SLAC-PUB-12480; No Copyright; Avail.: National Technical Information Service (NTIS)
The six Higgs doublet model is a minimal extension of the Standard Model (SM) that addresses dark matter and gauge coupling unification. Another Higgs doublet in the 5 representation of a discrete symmetry group, such as S6, is added to the SM. The lightest components of the 5-Higgs are neutral, stable and serve as dark matter so long as the discrete symmetry is not broken. Direct and indirect detection signals, as well as collider signatures are discussed. The ve-fold multiplicity of the dark matter decreases its mass and typically helps make the dark matter more visible in upcoming experiments.
NTIS
Dark Matter; Scalars

20080016684 Stanford Linear Accelerator Center, Menlo Park, CA, USA
Pair Creation at Large Inherent Angles
Chen, P.; Tauchi, T.; Schroeder, D. V.; Apr. 25, 2007; 6 pp.; In English
Report No.(s): DE2007-902725; SLAC-PUB-12486; No Copyright; Avail.: Department of Energy Information Bridge
In the next-generation linear colliders, the low energy e(sup +)e(sup (minus)) pairs created during the collision of high-energy e(sup +)e(sup (minus)) beams would cause potential deleterious background problems to the detectors. At low collider energies, the pairs are made essentially by the incoherent process, where the pair is created by the interaction of beamstrahlung photons on the individual particles in the oncoming beam. This problem was first identified by Zolotarev, et al.
NTIS
Linear Accelerators; Pair Production

20080016686 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Solenoid Transport of a Heavy Ion Beam for Warm Dense Matter Studies and Inertial Confinement Fusion
Armijo, J.; Jan. 01, 2006; 31 pp.; In English
Report No.(s): DE2007-902805; No Copyright; Avail.: National Technical Information Service (NTIS)
;Contents: Magnet measurements and eddy currents in the end plates of STX 4 (STX: the Solenoid Transport Experiment, Measurement of the eddy currents perturbation to the field, Modeling of the phenomenon, Finite-element calculation with ANSYS and importation of the realistic fields in WARP); WARP simulations of electron leakage due to diagnostics in STX 10 (Motivation: the experimental problem of the electrons leakage, Method for a study using WARP, Results of the simulations, Summary and perspectives); Hydrodynamics of the metallic 2-phase flow in upcoming target experiment (The context: target experiments and hydrodynamic simulations without surface Effects, How can we describe a 2-phase flow, Maximum size of droplets in an expanding flow, Kinetic model for the evaporation of a droplet).
NTIS
Inertial Confinement Fusion; Ion Beams; Solenoids

20080016705 Stanford Linear Accelerator Center, Menlo Park, CA, USA; Tokyo Univ., Japan
Conformal Gauge Mediation
Ibe, M.; Nakayama, Y.; Yanagida, T. T.; Apr. 01, 2007; 17 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-902735; SLAC-PUB-12388; No Copyright; Avail.: Department of Energy Information Bridge
We propose a one-parameter theory for gauge mediation of supersymmetry (SUSY) breaking. The spectrum of SUSY particles such as squarks and sleptons in the SUSY standard-model and the dynamics of SUSY-breaking sector are, in principle, determined only by one parameter in the theory, that is, the mass of messengers. Above the messenger threshold all gauge coupling and Yukawa coupling constants in the SUSY-breaking sector are on the infrared fixed point.
NTIS
Gauge Invariance; Measuring Instruments

20080016706 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
Airborne Tactical Free-Electron Laser
Whitney, R.; Neil, G.; Jan. 01, 2007; 13 pp.; In English
Report No.(s): DE2007-902777; No Copyright; Avail.: National Technical Information Service (NTIS)
The goal of 100 kilowatts (kW) of directed energy from an airborne tactical platform has proved challenging due to the

size and weight of most of the options that have been considered. However, recent advances in Free-Electron Lasers appear to offer a solution along with significant tactical advantages: a nearly unlimited magazine, time structures for periods from milliseconds to hours, radar like functionality, and the choice of the wavelength of light that best meets mission requirements. For an Airborne Tactical Free-Electron Laser (ATFEL) on a platforms such as a Lockheed C-130J-30 and airships, the two most challenging requirements, weight and size, can be met by generating the light at a higher harmonic, aggressively managing magnet weights, managing cryogenic heat loads using recent SRF R&D results, and using FEL super compact design concepts that greatly reduce the number of components. The initial R&D roadmap for achieving an ATFEL is provided in this paper. Performing this R&D is expected to further reduce the weight, size and power requirements for the FELs the Navy is currently developing for shipboard applications, as well as providing performance enhancements for the strategic airborne MW class FELs.
NTIS
Airborne Lasers; Antimissile Defense; Free Electron Lasers

20080016707 Virginia Univ., Charlottesville, VA, USA
Nucleon Elastic Form Factors. Current Status of the Experiment Effort
Day, D.; Mar. 01, 2007; 6 pp.; In English
Report No.(s): DE2007-903060; No Copyright; Avail.: National Technical Information Service (NTIS)

The nucleon form factors are still the subject of active investigation even after an experimental effort spanning 50 years. This is because they are of critical importance to our understanding of the electromagnetic properties of nuclei and provide a unique testing ground for QCD motivated models of nucleon structure. Progress in polarized beams, polarized targets and recoil polarimetry have allowed an important and precise set of data to be collected over the last decade. I will review the experimental status of elastic electron scattering from the nucleon along with an outlook for future progress.
NTIS
Form Factors; Nucleons

20080016717 Jefferson (Thomas) National Accelerator Facility, Newport News, VA, USA; Department of Energy, Washington, DC, USA
Gamma N to Delta Transition in Chiral Effective-Field Theory
Pascalts, B.; Vanderhaeghen, M.; Aug. 27, 2006; 9 pp.; In English
Contract(s)/Grant(s): AC05-06OR23177
Report No.(s): DE2007-898810; JLAB-THY-06-592; DOE/OR/23177-0022,HEP-PH/0611317; No Copyright; Avail.: Department of Energy Information Bridge

We describe the pion electroproduction processes in the delta(1232)-resonance region within the framework of chiral effective-field theory. By studying the observables of pion electroproduction in a next-to-leading order calculation we are able to make predictions and draw conclusions on the properties of the N -> delta electromagnetic form factors.
NTIS
Chirality; Pions

20080016720 Lawrence Livermore National Lab., Livermore, CA USA
LCLS XTOD Attenuator System System Concept Report
Kishiyama, K.; Roeben, M.; Trent, J.; Tyutov, D.; Shen, S.; Apr. 19, 2006; 45 pp.; In English
Report No.(s): DE2007-900460; UCRL-TR-220712; No Copyright; Avail.: National Technical Information Service (NTIS)

The attenuator system for the Linac Coherent Light Source (LCLS) X-ray Transport, Optics and Diagnostics (XTOD) system has been configured and analyzed by the Lawrence Livermore National Laboratory's New Technologies Engineering Division (NTED) as requested by the SLAC/LCLS program. The system layout, performance analyses and selection of the vacuum components are presented in this System Conceptual Review (SCR) report. Also included are the plans for prototype, procurement, mechanical integration, and the cost estimates.
NTIS
Attenuators; Coherent Light; Light Sources; X Rays

20080016730 Fermi National Accelerator Lab., Batavia, IL, USA
Quasi-3D Space Charge Simulation
Yang, X.; Apr. 03, 2007; 8 pp.; In English
Report No.(s): DE2007-902539; FERMILAB-FN-0798-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

The longitudinal space charge effect is simulated by binning the longitudinal beam profile in order to calculate the force on the bins using the binned particle distribution via FFT, and applying momentum kick based upon this space charge force to macro-particles. Usually, the longitudinal space charge kick is calculated once per turn since the longitudinal profile doesn't change much in a single turn. Besides, the longitudinal profile is used as a weighting factor for the transverse space charge force. The transverse space charge effect is simulated by projecting the 3-D beam to a 2-D Gaussian distribution in order to use the complex error function to compute the transverse space charge force, and applying this space charge force to macro-particles. One transverse space charge calculation per scale length of the beam shape variation requires at least ten transverse space charge force calculations per betatron oscillation.
NTIS
Simulation; Space Charge

20080016746 Fermi National Accelerator Lab., Batavia, IL, USA
Rare Decay Searches at the Tevatron
Lin, C. J.; Jan. 01, 2006; 5 pp.; In English
Report No.(s): DE2007-907793; FERMILAB-CONF-06-526-E; No Copyright; Avail.: National Technical Information Service (NTIS)

The flavor-changing-neutral-current (FCNC) transitions are highly suppressed in the Standard Model (SM) and can only occur through higher order diagrams. These processes can provide important tests of the SM at the level of radiative corrections where Glashow-Iliopoulos-Maiani (GIM) cancellations are important. Furthermore, in many new physics scenarios, additional loop diagrams involving new particles, such as Supersymmetric (SUSY) particles, can significantly alter the decay rates and kinematics of the FCNC processes. Therefore precision measurements of these rare processes are powerful probes of new physics and are complementary to direct collider searches.
NTIS
Particle Accelerators; Decay Rates; Precision; Correction

20080016747 Manchester Univ., UK
Indirect Measurement of the Width of the W Boson at the DO Experiment
Telford, P.; Jan. 01, 2006; 179 pp.; In English
Report No.(s): DE2007-907800; No Copyright; Avail.: National Technical Information Service (NTIS)

This thesis presents an indirect measurement of the width of the W boson using data collected at the D0 experiment, a multipurpose particle detector utilizing the Fermilab Tevatron.
NTIS
Bosons; Theses

20080016748 Fermi National Accelerator Lab., Batavia, IL, USA; Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Moscow, Russian Federation
Search for New Physics in Lepton + Photon + X Events with 929 pb(sup -1) of P overbar p Collisions at Square Root of s Equals 1.96 TeV
Loginov, A.; Oct. 10, 2006; 10 pp.; In English
Report No.(s): DE2007-907809; FERMILAB-CONF-06-403-E; No Copyright; Avail.: National Technical Information Service (NTIS)

The CDF II detector is a cylindrically symmetric spectrometer designed to study P overbar p collisions at the Fermilab Tevatron based on the same solenoidal magnet and central calorimeters as the CDF I detector from which it was updgraded. Because the analysis described here is intended to repeat the Run I search as closely as possible, we note especially the differences from the CDF I detector relevant to the detection of leptons, photons, and transverse energy.
NTIS
Collisions; Leptons; Photons

20080016750 Stanford Linear Accelerator Center, Menlo Park, CA, USA; Brunel Univ., Uxbridge, UK
Charm Spectroscopy, Charm Decays and New States at Babar
Saleem, M.; Jan. 01, 2007; 4 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-907956; SLAC-PUB-12527; No Copyright; Avail.: Department of Energy Information Bridge
This document presents the recent studies of Charmed hadrons at BABAR BELLE and CLEO.
NTIS
Hadrons; Mesons; Spectroscopy

20080016758 Baker Botts, LLP, Dallas, TX, USA
Imposing and Recovering Correlithm Objects
Matzke, D. J., Inventor; Lawrence, P. N., Inventor; Mar. 10, 2004; 10 pp.; In English
Contract(s)/Grant(s): F30602-03-C-0051
Patent Info.: Filed Filed 10 Mar 04; US-Patent-Appl-SN-10-796 946
Report No.(s): PB2007-105176; No Copyright; Avail.: CASI: A02, Hardcopy
Manipulating correlithm objects includes establishing correlithm objects of an N-dimensional space, where a correlithm object is a point of the space. The correlithm objects are imposed on the space to yield a combined point. An imposed correlithm object is compared to the combined point. The imposed correlithm object is recovered in accordance with the comparison.
NTIS
Yield Point; Manipulators

20080016769 Fermi National Accelerator Lab., Batavia, IL, USA; Maryland Univ., College Park, MD, USA
Measurement of 1/sigma d/sigma/dy for Z/gamma* to e+e- at square root of S = 1.96 TeV
Yan, M.; Mar. 01, 2007; 140 pp.; In English
Report No.(s): DE2007-907792; FERMILAB-THESIS-2007-04; No Copyright; Avail.: National Technical Information Service (NTIS)
Contents: Z and Drell-Yan Production at Tevatron; D0 Detector; The Events; Electron Efficiencies; Efficiency and Acceptance of Z boson; Systematic Uncertainties; 1/sigma d/sigma/dy Measurement; and Discussions and Conclusions.
NTIS
Electrons; Hadrons; Partons; Theses

20080016773 Lockheed Martin Corp., Schenectady, NY, USA
Behavior of the Diamond Difference and Low-Order Nodal Numerical Transport Methods in the Thick Diffusion Limit for Slab Geometry
Gill, D. F.; Apr. 17, 2007; 130 pp.; In English
Report No.(s): DE2007-903208; LM-07K035; No Copyright; Avail.: Department of Energy Information Bridge
The objective of this work is to investigate the thick diffusion limit of various spatial discretizations of the one-dimensional, steady-state, monoenergetic, discrete-ordinates neutron transport equation. This work specifically addresses the two lowest order nodal methods, AHOT-N0 and AHOT-N1, as well as reconsiders the asymptotic limit of the Diamond Difference method.
NTIS
Diamonds; Diffusion; Neutrons; Numerical Analysis; Slabs; Transport Theory

20080016777 Jefferson (Thomas) National Accelerator Facility, Newport News, VA, USA; South Carolina Univ., Columbia, SC, USA; Massachusetts Univ., Amherst, MA, USA
Search for In-Medium Modifications of the Rho Meson
Weygand, D. P.; Djalali, C.; Nassesripour, R.; Wood, M.; Jan. 01, 2007; 8 pp.; In English
Report No.(s): DE2007-903314; No Copyright; Avail.: National Technical Information Service (NTIS)
The photoproduction of vector mesons on various nuclei has been studied using the CEBAF Large Acceptance Spectrometer (CLAS) at Jefferson Laboratory, and here we present preliminary results. All three vector mesons, rho, omega and phi, are observed via their decay to e+e-, in order to reduce the effects of final state interactions in the nucleus. Of particular interest is possible in-medium effects on the properties of the rho meson. The rho spectral function is extracted from

the data on various nuclei, carbon, iron, and titanium, and compared to the spectrum from liquid deuterium, which is relatively free of nuclear effects. We observe no effects on the mass of the rho meson, however, there is some widening of the resonance in titanium and iron, which is consistent with expected collisional broadening.
NTIS
Photoproduction; Rho-Mesons; Vector Mesons

20080016783 Stanford Linear Accelerator Center, Menlo Park, CA, USA
Supersymmetry in Particle Physics. An Elementary Introduction
Aitchison, I. J. R.; May 01, 2007; 257 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-903298; SLAC-R-865; No Copyright; Avail.: Department of Energy Information Bridge
This book is intended to be an elementary and practical introduction to supersymmetry in particle physics. More precisely, the author aims to provide an accessible, self-contained account of the basic theory required for a working understanding of the 'Minimal Supersymmetric Standard Model' (MSSM), including 'soft' symmetry breaking. Some simple phenomenological applications of the model are also developed in the later chapters.
NTIS
Supersymmetry; Broken Symmetry; Phenomenology

20080016784 Princeton Univ., NJ, USA
Charmless hadronic B Decays at BaBar
Biesiada, J.; May 01, 2007; 5 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-903299; SLAC-PUB-12501; No Copyright; Avail.: Department of Energy Information Bridge
We present recent results on charmless hadronic B decays using data collected by the BABAR detector at the PEP-II asymmetric-energy e(sup +)e(sup -) collider at the Stanford Linear Accelerator Center. We report measurements of branching fractions and charge asymmetries in several charmless two-body, three-body, and quasi-two-body decay modes. We also report measurements of polarization in charmless B decays to exclusive final states with two vector mesons.
NTIS
Hadrons; Particle Decay

20080016785 Stanford Linear Accelerator Center, Menlo Park, CA, USA
CP Violation in B Mesons
Lazzaro, A.; Mar. 01, 2007; 16 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-903304; SLAC-PUB-12440; No Copyright; Avail.: Department of Energy Information Bridge
Symmetries and their conservation laws play a fundamental role in Physics. Among them, the discrete symmetries corresponding to charge (C), parity (P), and time (T) transformations are extensively used in the theory of the elementary particles and their interactions (so called Standard Model (SM)) to give the basis of the fundamental physical description of nature. Eventual discoveries of violations of these symmetries become a crucial test for our understanding of the nature. It was assumed that the three discrete symmetries were not violated until 1956 when it was found that P is violated in the weak interaction. Soon it was understood that also the C is violated in the weak interaction. At that time these two violated symmetries were replaced by their combination, CP, which was considered a new fundamental symmetry. In 1964 also the CP was found violated in the case of the neutral K meson system. Since that year there were many achievements in theories and experiments in order to explain this symmetry violation. In the last five years the main contribution comes from the discovery of the CP violation in B meson system.
NTIS
CP Violation; Invariance; Mesons

20080016786 Stanford Linear Accelerator Center, Menlo Park, CA, USA
Carrier-Density-Dependent Lattice Stability in InSb
Hillyard, P. B.; Gaffney, K. J.; Lindenberg, A. M.; Engemann, S.; Akre, R. A.; Mar. 01, 2007; 4 pp.; In English
Report No.(s): DE2007-903305; SLAC/PUB-12421; No Copyright; Avail.: National Technical Information Service (NTIS)
The ultrafast decay of the x-ray diffraction intensity following laser excitation of an InSb crystal has been utilized to

observe carrier dependent changes in the potential energy surface. For the first time, an abrupt carrier dependent onset for potential energy surface softening and the appearance of accelerated atomic disordering for a very high average carrier density have been observed. Inertial dynamics dominate the early stages of crystal disordering for a wide range of carrier densities between the onset of crystal softening and the appearance of accelerated atomic disordering.
NTIS
Crystal Lattices; Stability; Potential Energy; X Ray Diffraction

20080016792 Sandia National Labs., Albuquerque, NM USA
Convergence Properties of Polynomial Chaos Approximations for L2 Random Variables
Field, R. V.; Srigoriu, M. D.; Mar. 01, 2007; 32 pp.; In English
Report No.(s): DE2007-903430; SAND2007-1262; No Copyright; Avail.: Department of Energy Information Bridge

Polynomial chaos (PC) representations for non-Gaussian random variables are infinite series of Hermite polynomials of standard Gaussian random variables with deterministic coefficients. For calculations, the PC representations are truncated, creating what are herein referred to as PC approximations. We study some convergence properties of PC approximations for L2 random variables. The well-known property of mean-square convergence is reviewed. Mathematical proof is then provided to show that higher-order moments (i.e., greater than two) of PC approximations may or may not converge as the number of terms retained in the series, denoted by n, grows large. In particular, it is shown that the third absolute moment of the PC approximation for a lognormal random variable does converge, while moments of order four and higher of PC approximations for uniform random variables do not converge. It has been previously demonstrated through numerical study that this lack of convergence in the higher-order moments can have a profound effect on the rate of convergence of the tails of the distribution of the PC approximation. As a result, reliability estimates based on PC approximations can exhibit large errors, even when n is large. The purpose of this report is not to criticize the use of polynomial chaos for probabilistic analysis but, rather, to motivate the need for further study of the efficacy of the method.
NTIS
Chaos; Convergence; Polynomials; Quantum Theory; Random Variables

20080016793 Fermi National Accelerator Lab., Batavia, IL, USA; Massachusetts Inst. of Tech., Cambridge, MA, USA
Observations B(sup O sub s) - Overbar B(sup o)(sub s) Oscillations
Belloni, A.; Jan. 01, 2006; 6 pp.; In English
Report No.(s): DE2007-907794; FERMILAB-CONF-06-523-E; No Copyright; Avail.: National Technical Information Service (NTIS)

The Standard Model describes B meson mixing in terms of a unitary, non-diagonal quark mixing matrix. The eigenstates of the Hamiltonian, with definite mass and lifetime, are different from the eigenstates of the strong interaction.
NTIS
Elementary Particles; Oscillations

20080016795 Knolls Atomic Power Lab., Niskayuna, NY, USA
Raman Spectroscopy of n-Type and p-Type GaSb with Multiple Excitation Wavelengths
Maslar, J. E.; Hurst, W. S.; Wang, C. A.; Apr. 05, 2007; 46 pp.; In English
Contract(s)/Grant(s): DE-AC12-00SN39357
Report No.(s): DE2007-903186; LM-07K002; No Copyright; Avail.: Department of Energy Information Bridge

The interpretation of Raman spectra of GaSb can be complicated by the presence of a so-called surface space charge region (SSCR), resulting in an inhomogeneous near-surface Raman scattering environment. To fully interpret Raman spectra, it is important to have an understanding of the SSCR profile relative to the Raman probe depth. However, a priori determination of even the actual SSCR width is not always possible for GaSb under a wide range of doping levels. The primary objective of this report is to provide a convenient reference to aid in the determination of relative contributions to an observed GaSb Raman spectrum of SSCR scattering and bulk scattering for a range of excitation wavelengths, doping levels, and SSCR widths and types. Hence, Raman spectra of both n-type and p-type doped GaSb epilayers were obtained using 488 nm, 514.5 nm, 647.1 nm, and 752.55 nm excitation radiation. Both n-type and p-type doped GaSb epilayers were selected for investigation because these layers exhibit the two different SSCR types that are typically encountered with as-grown GaSb and related materials. A range of doping levels were examined for each doping type so as to examine the effects of a varying SSCR width on the observed spectra. A secondary objective of this report is to demonstrate the performance of a spectroscopic

system based on 752.55 nm excitation that is sensitive to bulk carrier properties in n-type and p-type doped GaSb epilayers over a wide doping range, unlike visible wavelength-based optical systems.
NTIS
Excitation; Gallium Antimonides; Raman Spectroscopy

20080016802 Stanford Linear Accelerator Center, Menlo Park, CA, USA
FERMI and Elettra Accelerator Technical Optimization Final Report
Cornacchai, M.; Craievich, P.; Wang, D.; Warnock, R.; Pogorelov, I.; Jul. 06, 2006; 90 pp.; In English
Report No.(s): DE2007-903010; SLAC-TN-60958; No Copyright; Avail.: National Technical Information Service (NTIS)

This chapter describes the accelerator physics aspects, the engineering considerations and the choice of parameters that led to the accelerator design of the FERMI Free-Electron-Laser. The accelerator (also called the electron beam delivery system) covers the region from the exit of the injector to the entrance of the first FEL undulator. The considerations that led to the proposed configuration were made on the basis of a study that explored various options and performance limits. This work follows previous studies of x-ray FEL facilities (SLAC LCLS (1), DESY XFEL (2), PAL XFEL (3), MIT (4), BESSY FEL(5), LBNL LUX (6), Daresbury 4GLS (7)) and integrates many of the ideas that were developed there. Several issues specific to harmonic cascade FELs, and that had not yet been comprehensively studied, were also encountered and tackled. A particularly difficult issue was the need to meet the requirement for high peak current and small slice energy spread, as the specification for the ratio of these two parameters (that defines the peak brightness of the electron beam) is almost a factor of two higher than that of the LCLS's SASE FEL.
NTIS
Free Electron Lasers; Particle Accelerators; Brightness; High Current

20080016803 Istituto Nazionale di Fisica Nucleare, Genoa, Italy
Measuring Gamma With B0 to D0 K*0 Decays at Babar
Pruvot, S.; Schune, M. H.; Sordini, V.; Stocchi, A.; May 02, 2007; 3 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-903011; SLAC-PUB-12495; No Copyright; Avail.: Department of Energy Information Bridge

This document presents the feasibility study for a new analysis for extracting the angle gamma of the Unitarity Triangle from the study of the neutral B meson decays.
NTIS
Mesons; Particle Decay

20080016805 Rice Univ., Houston, TX USA
Kinematic Fitting of Detached Vertices
Mattione, P.; May 01, 2007; 148 pp.; In English
Report No.(s): DE2007-903056; No Copyright; Avail.: National Technical Information Service (NTIS)

Pentaquark states have the potential to revolutionize hadron spectroscopy. All of the hadrons that have been detected and confirmed so far are either baryons or mesons, containing three quarks for one quark and one antiquark respectively, bound together by the strong force. Pentaquarks contain four quarks and one antiquark, so while they are not forbidden by the standard model they would significantly expand our knowledge of the hadron quark structure. However, several high statistic experiments performed over the past several years conflict with the original supporting experiments, casting significant doubt on the existence of the pentaquarks. The eg3 experiment, at the Jefferson Lab CLAS detector was performed to search for the pentaquark states.
NTIS
Apexes; Fitting; Kinematics; Quarks

20080016806 Istituto Nazionale di Fisica Nucleare, Rome, Italy
Leading and Higher Twists in Proton, Neutron and Deuteron Unpolarized Structure Functions F2
Simula, S.; Mar. 01, 2007; 3 pp.; In English
Report No.(s): DE2007-903059; JLAB-PHY-06-610; DOE/ER/405150-4266; No Copyright; Avail.: National Technical Information Service (NTIS)

We summarize the results of a recent global analysis of proton and deuteron F2 structure function world data performed over a large range of kinematics, including recent measurements done at JLab with the CLAS detector. From these data the

lowest moments (n=10) of the unpolarized structure functions are determined with good statistics and systematics. The Q2 evolution of the extracted moments is analyzed in terms of an OPE-based twist expansion, taking into account soft-gluon effects at large x. A clean separation among the leading- and higher-twist terms is achieved. By combining proton and deuteron measurements the lowest moments of the neutron F2 structure function are determined and its leading-twist term is extracted. Particular attention is paid to nuclear effects in the deuteron, which become increasingly important for the higher moments. Our results for the non-singlet, isovector (p-n) combination of the leading-twist moments are used to test recent lattice simulations. We also determine the lowest few moments of the higher-twist contributions, and find these to be approximately isospin independent, suggesting the possible dominance of ud correlations over uu and dd in the nucleon.
NTIS
Deuterons; Neutrons; Protons

20080016828 Heska Corp., Fort Collins, CO, USA
Three-Dimensional Model of a Fc Region of an IgE Antibody and Uses Thereof
Jardetzky, T. S., Inventor; Wurzburg, B. A., Inventor; 1 Aug 02; 335 pp.; In English
Contract(s)/Grant(s): NIH-RO1-AI38972
Patent Info.: Filed Filed 1 Aug 02; US-Patent-Appl-SN-10-211 948
Report No.(s): PB2007-108829; No Copyright; Avail.: CASI: A15, Hardcopy

The present invention includes three-dimensional models of antibodies, such as Fc-Cepsilon3/Cepsilon4 regions of IgE antibodies, as well as methods to produce such models. The present invention also includes muteins having increased stability and/or antibody receptor binding activity, as well as methods to produce such muteins, preferably using information derived from three-dimensional models of the present invention. Also included are nucleic acid sequences encoding muteins of the present invention and use of those sequences to produce such muteins. Also included is the use of the model to identify compounds that inhibit the binding of an antibody receptor protein to an antibody. The present invention also includes uses of such muteins and inhibitory compounds, for example, in methods to diagnose and protect animals from allergy and other abnormal immune responses.
NTIS
Antibodies; Three Dimensional Models

20080016829 Fermi National Accelerator Lab., Batavia, IL, USA
Operational Aspects of High Power Energy Recovery Linacs
Benson, S.; Douglas, D.; Evtushenko, P.; Jordan, K.; Neil, G.; January 2006; 3 pp.; In English
Report No.(s): DE2007-902840; No Copyright; Avail.: National Technical Information Service (NTIS)

We have been operating a high-power energy-recovery linac (ERL) at Jefferson Lab for several years. In the process we have learned quite a bit about both technical and physics limitations in high power ERLs. Several groups are now considering new ERLs that greatly increase either the energy, the current or both. We will present some of our findings on what to consider when designing, building, and operating a high power ERL. Our remarks for this paper are limited to lattice design and setup, magnets, vacuum chamber design, diagnostics, and beam stability.
NTIS
Linear Accelerators; Diagnosis; Vacuum Chambers

20080016933 Allen, Dyer, Doppelt, Milbrath and Gilchrist, PA, Orlando, FL, USA; Harris Corp., Melbourne, FL, USA
Random Number Source and Associated Methods
Clements, R. P., Inventor; Kurdziel, M. T., Inventor; Mar. 11, 2004; 8 pp.; In English
Contract(s)/Grant(s): MDA904-99-C-6511
Patent Info.: Filed Filed 11 Mar 04; US-Patent-Appl-SN-10-798 808
Report No.(s): PB2007-105174; No Copyright; Avail.: CASI: A02, Hardcopy

A random number source includes a ring oscillator generating an internal clock signal having random phase noise, and a first linear feedback shift register connected to the ring oscillator. A counter is connected to a first tap of the first linear feedback shift register for generating a count signal. A feedback bit controller is connected to a second tap of the first linear feedback shift register for generating a random feedback bit for a time based upon the count signal. A second linear feedback shift register is connected to the feedback bit controller for generating a random number based upon the random feedback bit.
NTIS
Clocks; Oscillators; Random Noise; Random Numbers

20080016936 California Univ., Riverside, CA USA

Search for t-Channel Single Top Quark Production in pp Collisions at 1.96 TeV

Perea, P. M.; Jun. 2006; 225 pp.; In English

Report No.(s): DE2007-892492; No Copyright; Avail.: National Technical Information Service (NTIS)

I have performed a search for t-channel single top quark production in p(bar p) collisions at 1.96 TeV on a 366 pb(sup -1) dataset collected with the D0 detector from 2002-2005. The analysis is restricted to the leptonic decay of the W boson from the top quark to an electron or muon, tq(bar b) (yields) lv(sub l)b q(bar b) (l = e,(mu)). A powerful b-quark tagging algorithm derived from neural networks is used to identify b jets and significantly reduce background. I further use neural networks to discriminate signal from background, and apply a binned likelihood calculation to the neural network output distributions to derive the final limits. No direct observation of single top quark production has been made, and I report expected/measured 95% confidence level limits of 3.5/8.0 pb.

NTIS

Pair Production; Particle Collisions; Quarks

20080016937 Fermi National Accelerator Lab., Batavia, IL, USA

LER-LHC Injector Workshop Summary and Super-Ferric Fast Cycling Injector in the SPS Tunnel

Ambrosio, G.; Hays, S.; Huang, Y.; Johnstone, J.; Kashikhin, V.; Mar. 01, 2007; 19 pp.; In English

Report No.(s): DE2007-901952; FERMILAB-CONF-07-069-AD-TD; No Copyright; Avail.: National Technical Information Service (NTIS)

A Workshop on Low Energy Ring (LER) in the LHC tunnel as main injector was convened at CERN on October 11-12, 2006. We present the outline of the LER based on the presentations, and respond to the raised questions and discussions including the post-workshop studies. We also outline the possibility of using the LER accelerator technologies for the fast cycling injector accelerator in the SPS tunnel (SF-SPS).

NTIS

Cycles; Injectors; Particle Accelerators

20080016994 Stanford Univ., Stanford, CA USA; Stanford Linear Accelerator Center, Menlo Park, CA, USA

Structure Loaded Vacuum Laser-Driven Particle Acceleration Experiments at SLAC

Plettner, T.; Byer, R. L.; Colby, E. R.; Cowan, B. M.; Ischebeck, R.; Apr. 01, 2007; 14 pp.; In English

Contract(s)/Grant(s): DE-AC02-76SF00515

Report No.(s): DE2007-902102; SLAC-PBU-12448; No Copyright; Avail.: National Technical Information Service (NTIS)

We present an overview of the future laser-driven particle acceleration experiments. These will be carried out at the E163 facility at SLAC. Our objectives include a reconfirmation of the proof-of-principle experiment, a staged buncher laser-accelerator experiment, and longer-term future experiments that employ dielectric laser-accelerator microstructures.

NTIS

Particle Accelerators; Vacuum Systems; Lasers; Particle Acceleration; Vacuum

20080016995 Naval Research Lab., Washington, DC, USA; LET Corp., Washington , DC, USA; Argonne National Lab., IL USA; Naval Research Lab., Washington, DC, USA

Development of a 20 MeV Dielectric-Loaded Test Accelerator

Gold, S. H.; Kinkead, A. K.; Gai, W.; Power, J. G.; Konecny, R.; Apr. 01, 2007; 7 pp.; In English

Contract(s)/Grant(s): DE-AC02-76SF00515

Report No.(s): DE2007-902104; SLAC-PUB-12454; No Copyright; Avail.: Department of Energy Information Bridge

This paper presents a progress report on a joint project by the Naval Research Laboratory (NRL) and Argonne National Laboratory (ANL), in collaboration with the Stanford Linear Accelerator Center (SLAC), to develop a dielectric-loaded test accelerator in the magnicon facility at NRL. The accelerator will be powered by an experimental 11.424-GHz magnicon amplifier that presently produces 25 MW of output power in approx. 250-ns pulse at up to 10 Hz. The accelerator will include a 5-MeV electron injector originally developed at the Tsinghua University in Beijing, China, and can incorporate DLA structures up to 0.5 m in length. The DLA structures are being developed by ANL, and shorter test structures fabricated from a variety of dielectric materials have undergone testing at NRL at gradients up to approx. 8 MV/m. SLAC has developed components to distribute the power from the two magnicon output arms to the injector and to the DLA accelerating structure

with separate control of the power ratio and relative phase. RWBruce Associates, Inc., working with NRL, has investigated means to join short ceramic sections into a continuous accelerator tube by a brazing process using an intense 83-GHz beam.
NTIS
Dielectrics; Linear Accelerators

20080016996 Stanford Linear Accelerator Center, Menlo Park, CA, USA
High-Efficiency Resonant Cavity Quadrupole Moment Monitor
Barov, N.; Nantista, C. D.; Miller, R. H.; Kim, J. S.; Apr. 13, 2007; 6 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-902106; SLAC-PUB-12453; No Copyright; Avail.: Department of Energy Information Bridge

Measurement of the beam quadrupole moment at several locations can be used to reconstruct the beam envelope and emittance parameters. The measurements can be performed in a non-intercepting way using a set of quadrupole-mode cavities. We present a cavity design with an optimized quadrupole moment shunt impedance. The cavity properties can be characterized using a wire test method to insure symmetry about the central axis, and alignment to nearby position sensing cavities. The design and characterization of the prototype structure is discussed.
NTIS
Cavity Resonators; Quadrupoles

20080017000 Sandia National Labs., Albuquerque, NM USA
Current Scaling of Axially Radiated Power in Dynamic Hohlraums and Dynamic Hohlraum Load Design for ZR
Nash, T.; Sanford, T.; Mock, R.; Mar. 01, 2007; 35 pp.; In English
Contract(s)/Grant(s): DE-AC04-94AL85000
Report No.(s): DE2007-901969; SAND2007-0992; No Copyright; Avail.: National Technical Information Service (NTIS)

We present designs for dynamic hohlraum z-pinch loads on the 28 MA, 140 ns driver ZR. The scaling of axially radiated power with current in dynamic hohlraums is reviewed. With adequate stability on ZR this scaling indicates that 30 TW of axially radiated power should be possible. The performance of the dynamic hohlraum load on the 20 MA, 100 ns driver Z is extensively reviewed. The baseline z-pinch load on Z is a nested tungsten wire array imploding onto on-axis foam. Data from a variety of x-ray diagnostics fielded on Z are presented. These diagnostics include x-ray diodes, bolometers, fast x-ray imaging cameras, and crystal spectrometers. Analysis of these data indicates that the peak dynamic radiation temperature on Z is between 250 and 300 eV from a diameter less than 1 mm. Radiation from the dynamic hohlraum itself or from a radiatively driven pellet within the dynamic hohlraum has been used to probe a variety of matter associated with the dynamic hohlraum: the tungsten z-pinch itself, tungsten sliding across the end-on apertures, a titanium foil over the end aperture, and a silicon aerogel end cap. Data showing the existence of asymmetry in radiation emanating from the two ends of the dynamic hohlraum is presented, along with data showing load configurations that mitigate this asymmetry. 1D simulations of the dynamic hohlraum implosion are presented and compared to experimental data.
NTIS
Dynamic Loads; Hohlraums; Nuclear Physics; Scaling Laws

20080017001 Sandia National Labs., Albuquerque, NM USA; Lawrence Livermore National Lab., Livermore, CA USA; California Univ., Berkeley, CA USA; Wisconsin State Univ., Eau Claire, WI, USA
Z-Inertial Fusion Energy. Power Plant Final Report FY06
Cook, J. T.; Rochau, G. E.; Cipiti, B. B.; Morrow, C. W.; Rodriguez, S. B.; Oct. 01, 2006; 149 pp.; In English
Report No.(s): DE2007-901970; SAND2006-7148; No Copyright; Avail.: National Technical Information Service (NTIS)

This report summarizes the work conducted for the Z-inertial fusion energy (Z-IFE) late start Laboratory Directed Research Project. A major area of focus was on creating a roadmap to a z-pinch driven fusion power plant. The roadmap ties ZIFE into the Global Nuclear Energy Partnership (GNEP) initiative through the use of high energy fusion neutrons to burn the actinides of spent fuel waste. Transmutation presents a near term use for Z-IFE technology and will aid in paving the path to fusion energy. The work this year continued to develop the science and engineering needed to support the Z-IFE roadmap. This included plant system and driver cost estimates, recyclable transmission line studies, flibe characterization, reaction chamber design, and shock mitigation techniques.
NTIS
Fusion Reactors; Nuclear Fusion

20080017002 Lawrence Livermore National Lab., Livermore, CA USA
Lethality Effects of a High Power Solid State Laser
Boley, C.; Fochs, S.; Rubenchik, A.; Mar. 13, 2007; 15 pp.; In English
Report No.(s): DE2007-902884; UCRL-CONF-229010; No Copyright; Avail.: National Technical Information Service (NTIS)

We study the material interactions of a 25-kW solid-state laser, in experiments characterized by relatively large spot sizes (approx. 3 cm) and the presence of airflow. The targets are 1-cm slabs of iron or aluminum. In the experiments with iron, we show that combustion plays an important role in heating the material. In the experiments with aluminum, there is a narrow range of intensities within which the material interactions vary from no melting at all to complete melt-through. A paint layer serves to increase the absorption. We explain these effects and incorporate them into a comprehensive computational model. NTIS

High Power Lasers; Lethality; Solid State Lasers

20080017030 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA; California Univ., Berkeley, CA, USA
Cylindrical Neutron Generator
Leung, K. N., Inventor; Apr. 19, 2005; 18 pp.; In English
Contract(s)/Grant(s): DE-AC03-75SF00098
Patent Info.: Filed Filed 19 Apr 05; US-Patent-Appl-SN-11-110-310
Report No.(s): PB2007-105269; No Copyright; Avail.: CASI: A03, Hardcopy

A cylindrical neutron generator is formed with a coaxial RF-driven plasma ion source and target. A deuterium (or deuterium and tritium) plasma is produced by RF excitation in a cylindrical plasma ion generator using an RF antenna. A cylindrical neutron generating target is coaxial with the ion generator, separated by plasma and extraction electrodes which contain many slots. The plasma generator emanates ions radially over 360 degrees and the cylindrical target is thus irradiated by ions over its entire circumference. The plasma generator and target may be as long as desired. The plasma generator may be in the center and the neutron target on the outside, or the plasma generator may be on the outside and the target on the inside. In a nested configuration, several concentric targets and plasma generating regions are nested to increase the neutron flux.
NTIS

Cylindrical Bodies; Neutrons; Ion Sources; Targets

20080017044 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA; Lawrence Livermore National Lab., Livermore, CA USA; California Univ., Berkeley, CA USA
Characterization of a Tunable Quasi-Monoenergetic Neutron Beam from Deuteron Breakup
Bleuel, D. L.; McMahan, M. A.; Ahle, L.; Barquest, B. R.; Cerny, J.; Dec. 01, 2006; 9 pp.; In English
Contract(s)/Grant(s): DE-AC02005CH11231
Report No.(s): DE2007-902141; LBNL--62123; No Copyright; Avail.: Department of Energy Information Bridge

A neutron irradiation facility is being developed at the 88-Inch Cyclotron at Lawrence Berkeley National Laboratory for the purposes of measuring neutron reaction cross sections on radioactive targets and for radiation effects testing. Applications are of benefit to stockpile stewardship, nuclear astrophysics, next generation advanced fuel reactors, and cosmic radiation biology and electronics in space. The facility will supply a tunable, quasi-monoenergetic neutron beam in the range of 10-30 MeV or a white neutron source, produced by deuteron breakup reactions on thin and thick targets, respectively. Because the deuteron breakup reaction has not been well studied at intermediate incident deuteron energies, above the target Coulomb barrier and below 56MeV, a detailed characterization was necessary of the neutron spectra produced by thin targets.
NTIS

Deuterons; Neutron Beams

20080017045 Stanford Linear Accelerator Center, Menlo Park, CA, USA
Linac Coherent Light Source Electron Beam Collimation
Emma, P.; Dowell, D.; Limorg, C.; Schmerge, J.; Wu, J.; Apr. 27, 2007; 3 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-902721; SLAC-PUB-12489; No Copyright; Avail.: National Technical Information Service (NTIS)

This paper describes the design and simulation of the electron beam collimation system in the Linac Coherent Light

Source (LCLS). Dark current is expected from the gun and some of the accelerating cavities. Particle tracking of the expected dark current through the entire LCLS linac, from gun through FEL undulator, is used to estimate final particle extent in the undulator as well as expected beam loss at each collimator or aperture restriction. A table of collimators and aperture restrictions is listed along with halo particle loss results, which includes an estimate of average continuous beam power lost. In addition, the transverse wakefield alignment tolerances are calculated for each collimator.
NTIS
Coherent Light; Collimation; Electron Beams; Light Sources; Linear Accelerators

20080017046 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Nb3Sn for Radio Frequency Cavities
Godeke, A.; Dec. 01, 2006; 5 pp.; In English
Contract(s)/Grant(s): DE-AC02-05CH11231
Report No.(s): DE2007-902144; LBNL--62140; No Copyright; Avail.: Department of Energy Information Bridge

In this article, the suitability of Nb3Sn to improve the performance of superconducting Radio-Frequency (RF) cavities is discussed. The use of Nb3Sn in RF cavities is recognized as an enabling technology to retain a very high cavity quality factor (Q0) at 4.2 K and to significantly improve the cavity accelerating efficiency per unit length (Eacc). This potential arises through the fundamental properties ofNb3Sn. The properties that are extensively characterized in the literature are, however, mainly related to improvements in current carrying capacity (Jc) in the vortex state. Much less is available for the Meissner state, which is of key importance to cavities. Relevant data, available for the Meissner state is summarized, and it is shown how this already validates the use of Nb3Sn. In addition, missing knowledge is highlighted and suggestions are given for further Meissner state specific research.
NTIS
Cavities; Niobium Alloys; Radio Frequencies; Tin Alloys

20080017047 Stanford Linear Accelerator Center, Menlo Park, CA, USA
Next-Generation Linear Collider Final Focus System Stability Tolerances
Roy, G.; Irwin, J.; Jan. 01, 2007; 8 pp.; In English
Report No.(s): DE2007-902726; SLAC-PUB-12485; No Copyright; Avail.: Department of Energy Information Bridge

The design of final focus systems for the next generation of linear colliders has evolved largely from the experience gained with the design and operation of the Stanford Linear Collider (SLC) and with the design of the Final Focus Test Beam (FFTB). We will compare the tolerances for two typical designs for a next-generation linear collider final focus system.
NTIS
Linear Systems; Systems Engineering

20080017081 Massachusetts Inst. of Tech., Cambridge, MA, USA
Nuclear Structure and Dynamics in the 3He(e,e'p)d and 3He(e,e'p)pn Reactions
Gilad, S.; Feb. 01, 2007; 8 pp.; In English
Report No.(s): DE2007-902156; JLAB-PHY-07-619; DOE/ER/40150-4257; No Copyright; Avail.: National Technical Information Service (NTIS)

We studied the reactions 3He(e, e'p)d and 3He(e, e'p)pn in quasi-elastic perpendicular, co-planar kinematics. The transferred energy and momentum were fixed at 840 MeV and 1502 MeV/c respectively. The cross sections were measured up to missing momenta above 1000 MeV/c. For the two-body break-up channel, the ATL asymmetry was measured up to missing momentum of 660 MeV/c. The data are compared to several model calculations and demonstrate an intricate interplay between reaction dynamics and nuclear structure.
NTIS
Helium Isotopes; Nuclear Structure; Kinematics; Asymmetry

20080017088 Fermi National Accelerator Lab., Batavia, IL, USA
Mesotron Decays and the Role of Anomalies
Bardeen, W. A.; Mar. 15, 2007; 10 pp.; In English
Report No.(s): DE2007-902198; FERMILAB-CONF-07-48-T; No Copyright; Avail.: Department of Energy Information Bridge

Puzzles associated with Yukawas mesotron theory of nuclear interactions led to the discovery of anomalies in quantum

field theory. I will discuss some of the remarkable consequences of these anomalies in the physics of elementary particles. NTIS

Anomalies; Decay

20080017090 Sandia National Labs., Albuquerque, NM USA

Nanoporous Microbead Supported Bilayers. Stability, Physical Characterization, and Incorporation of Functional Transmembrane Proteins

Davis, R. W.; Flores, A.; Barrick, T. A.; Cox, J. M.; Brozik, S. M.; Mar. 01, 2007; 30 pp.; In English

Contract(s)/Grant(s): DE-AC04-94AL85000

Report No.(s): DE2007-902211; SAND2007-1560; No Copyright; Avail.: National Technical Information Service (NTIS)

The introduction of functional transmembrane proteins into supported bilayer-based biomimetic systems presents a significant challenge for biophysics. Among the various methods for producing supported bilayers, liposomal fusion offers a versatile method for the introduction of membrane proteins into supported bilayers on a variety of substrates. In this study, the properties of protein containing unilamellar phosphocholine lipid bilayers on nanoporous silica microspheres are investigated. The effects of the silica substrate, pore structure, and the substrate curvature on the stability of the membrane and the functionality of the membrane protein are determined. Supported bilayers on porous silica microspheres show a significant increase in surface area on surfaces with structures in excess of 10 nm as well as an overall decrease in stability resulting from increasing pore size and curvature. Comparison of the liposomal and detergent-mediated introduction of purified bacteriorhodopsin (bR) and the human type 3 serotonin receptor (5HT3R) are investigated focusing on the resulting protein function, diffusion, orientation, and incorporation efficiency. In both cases, functional proteins are observed; however, the reconstitution efficiency and orientation selectivity are significantly enhanced through detergent-mediated protein reconstitution. The results of these experiments provide a basis for bulk ionic and fluorescent dye-based compartmentalization assays as well as single-molecule optical and single-channel electrochemical interrogation of transmembrane proteins in a biomimetic platform.

NTIS

Biomimetics; Membranes; Proteins; Stability

20080017097 Sandia National Labs., Albuquerque, NM USA

Fundamental Science Investigations to Develop a 6-MV Laser Triggered Gas Switch for ZR. First Annual Report

Maenchen, J.; Lehr, J.; Warne, L. K.; Anaya, V.; Benwell, A.; Mar. 01, 2007; 412 pp.; In English

Contract(s)/Grant(s): DE-AC04-94AL85000

Report No.(s): DE2007-901968; SAND2007-0217; No Copyright; Avail.: National Technical Information Service (NTIS)

In October 2005, an intensive three-year Laser Triggered Gas Switch (LTGS) development program was initiated to investigate and solve observed performance and reliability issues with the LTGS for ZR. The approach taken has been one of mission-focused research: to revisit and reassess the design, to establish a fundamental understanding of LTGS operation and failure modes, and to test evolving operational hypotheses. This effort is aimed toward deploying an initial switch for ZR in 2007, on supporting rolling upgrades to ZR as the technology can be developed, and to prepare with scientific understanding for the even higher voltage switches anticipated needed for future high-yield accelerators. The ZR LTGS was identified as a potential area of concern quite early, but since initial assessments performed on a simplified Switch Test Bed (STB) at 5 MV showed 300-shot lifetimes on multiple switch builds, this component was judged acceptable. When the Z20 engineering module was brought online in October 2003 frequent flashovers of the plastic switch envelope were observed at the increased stresses required to compensate for the programmatically increased ZR load inductance. As of October 2006, there have been 1423 Z20 shots assessing a variety of LTGS designs. Numerous incremental and fundamental switch design modifications have been investigated. As we continue to investigate the LTGS, the basic science of plastic surface tracking, laser triggering, cascade breakdown, and optics degradation remain high-priority mission-focused research topics.

NTIS

Lasers; Plasmas (Physics); Switches

20080017099 Sandia National Labs., Albuquerque, NM USA

Development of the Doppler Electron Velocimeter-Theory

Reu, P. L.; Mar. 01, 2007; 41 pp.; In English

Contract(s)/Grant(s): DE-AC04-94AL85000

Report No.(s): DE2007-902221; SAND2006-6063; No Copyright; Avail.: Department of Energy Information Bridge

Measurement of dynamic events at the nano-scale is currently impossible. This paper presents the theoretical

underpinnings of a method for making these measurements using electron microscopes. Building on the work of Mollenstedt and Lichte who demonstrated Doppler shifting of an electron beam with a moving electron mirror, further work is proposed to perfect and utilize this concept in dynamic measurements. Specifically, using the concept of fringe-counting with the current principles of transmission electron holography, an extension of these methods to dynamic measurements is proposed. A presentation of the theory of Doppler electron wave shifting is given, starting from the development of the de Broglie wave, up through the equations describing interference effects and Doppler shifting in electron waves. A mathematical demonstration that Doppler shifting is identical to the conceptually easier to understand idea of counting moving fringes is given by analogy to optical interferometry. Finally, potential developmental experiments and uses of a Doppler electron microscope are discussed.
NTIS
Electron Beams; Electron Microscopes; Nanotechnology; Velocity Measurement

20080017291 Rutherford Appleton Lab., Chilton, UK; Department of Health and Human Services, Washington, DC USA
Knowledge Transfer of Microstrip Detectors: From Particle to Medical Physics
Manolopoulos, S.; January 2007; 33 pp.; In English
Report No.(s): PB2007-111472; No Copyright; Avail.: National Technical Information Service (NTIS)

This project is a demonstration of Knowledge Transfer. Knowledge in the fabrication, operation and application of radiation detectors originally developed for particle physics experiments has been exploited in diverse areas of research like medical applications. Microstrip detectors, commonplace in particle physics 'trackers', have been evaluated as dosimeters for radiotherapy modalities. Hospital trails conducted under the supervision of clinical scientists demonstrated the viability of these detectors as dosimeters both in the quality assurance of linear accelerators and potentially in treatment planning verification. Important quantities of interest to the clinical scientist, like depth-dose distributions, output factors, off axis ratios etc. were measured with MV X-Rays from a clinical Linac and compared with the present day standard dosimeters. All results showed the performance of our novel dosimeter to be as good as or even better than that of the hospital dosimeters. Moreover the ability of our system for dose distribution measurements in real time was proven.
NTIS
Radiation Detectors; Particle Theory; Real Time Operation

20080017439 Fermi National Accelerator Lab., Batavia, IL, USA
Implementing Radial Motion to the Booster Simulation
Yang, X.; Apr. 5, 2007; 3 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH03000
Report No.(s): DE2007-902538; FERMILA-FN-0799-AD; No Copyright; Avail.: Department of Energy Information Bridge

It's a puzzle that high intensity beams prefer a particular radial motion during transition in the Booster, and the result of removing such a radial motion is to increase the transition loss. In order to understand this observation, the radial motion should be taken into account in the longitudinal simulation.
NTIS
Motion Simulation; Particle Accelerators; Losses

20080017449 Stanford Linear Accelerator Center, Menlo Park, CA, USA; Centre National de la Recherche Scientifique, Paris, France
Charm and Charmonium Spectroscopy at B-Factories (May 2007)
Grenier, P.; May 01, 2007; 4 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-907706; SLAC-PUB-12518; No Copyright; Avail.: Department of Energy Information Bridge

Since a few years, charm and charmonium spectroscopy has revived, both from experimental and theoretical point of views. Many new states have been discovered triggering numerous theoretical publications. The B-factories with their large enriched charm sample have played a leading role on the experimental side with the observation and study of most of the new states. Other experiments such as CLEO and CDF have also contributed. Classical hadron spectroscopy predicted some of these new states, but not all of them. Therefore a lot of effort have been spent in order to understand the nature of the later.

We are summarizing here the most recent and important results in hadron spectroscopy, including strange-charm mesons, charm baryons and charmonium and charmonium-like states.
NTIS
Charm (Particle Physics); Mesons; Spectroscopy

20080017450 Pisa Univ., Italy; European Organization for Nuclear Research, Geneva, Switzerland; Stanford Linear Accelerator Center, Menlo Park, CA, USA
Beam-Beam Simulations for a Single Pass Superb-Factory
Biagini, M. E.; Paoloni, E.; Raimondi, P.; Seeman, J.; Jan. 01, 2006; 3 pp.; In English
Report No.(s): DE2007-907711; SLAC-PUB-12520; No Copyright; Avail.: National Technical Information Service (NTIS)
A study of beam-beam collisions for an asymmetric single pass SuperB-Factory is presented (1). In this scheme an e- and an e+ beam are first stored and damped in two Damping Rings (DR), then extracted, compressed and focused to the IP. After collision the two beams are re-injected in the DR to be damped and extracted for collision again. The explored beam parameters are similar to those used in the design of the International Linear Collider, except for the beam energies. Flat beams and round beams were compared in the simulations in order to optimize both luminosity performances and beam blowup after collision. With such approach a luminosity of the order of 1036 cm-2 s-1 can be achieved.
NTIS
Beam Interactions; Industrial Plants; Simulation

20080017451 Stanford Linear Accelerator Center, Menlo Park, CA, USA
Luminosity Variations Along Bunch Trains in Pep-II
Decker, F. J.; Boyes, M.; Colochop, W.; Novokhatski, A.; Sullivan, M.; Jan. 01, 2006; 3 pp.; In English
Report No.(s): DE2007-907712; SLAC-PUB-12521; No Copyright; Avail.: National Technical Information Service (NTIS)
In the spring of 2005 after a long shut-down, the luminosity of the B-Factory PEP-II decreased along the bunch trains by about 25-30%. There were many reasons studied which could have caused this performance degradation, like a bigger phase transient due to an additional RF station in the Low-Energy-Ring (LER), bad initial vacuum, electron cloud, chromaticity, steering, dispersion in cavities, beam optics, etc. The initial specific luminosity of 4.2 sloped down to 3.2 and even 2.8 for a long train (typical: 130 of 144), later in the run with higher currents and shorter trains (65 of 72) the numbers were more like 3.2 down to 2.6. Finally after steering the interaction region for an unrelated reason (overheated BPM buttons) and the consequential lower luminosity for two weeks, the luminosity slope problem was mysteriously gone. Several parameters got changed and there is still some discussion about which one finally fixed the problem. Among others, likely candidates are: the LER betatron function in x at the interaction point got reduced, making the LER x stronger, dispersion reduction in the cavities, and finding and fixing a partially shorted magnet.
NTIS
Mesons; Storage Rings (Particle Accelerators)

20080017452 Stanford Linear Accelerator Center, Menlo Park, CA, USA
BETA-BEAT Correction Using Strong Sextupole Bumps in PEP-II
Yocky, G.; Jan. 01, 2006; 3 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-907714; SLAC/PUB-12523; No Copyright; Avail.: Department of Energy Information Bridge
A method for correcting lattice beta mismatches has been developed for the PEP-II collider using orbit offsets in strong sextupoles. The solution is first predicted in the MAD program by modelling closed orbit bumps in the plane of correction at the sextupoles strongest in that plane. The derived solution is then tested in the machine to confirm prediction, and finally dialled into the machine under high-current conditions.
NTIS
Synchronism; Particle Accelerators; High Current

20080017453 Stanford Linear Accelerator Center, Menlo Park, CA, USA
Tracking Down a Fast Instability in the PEP-II-LER
Wienands, U.; Akre, R.; Cury, S.; DeBarger, S.; Decker, F. J.; Jan. 01, 2006; 3 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-907713; SLAC-PUB-12522; No Copyright; Avail.: National Technical Information Service (NTIS)
During Run 5, the beam in the PEP-II Low Energy Ring (LER) became affected by a predominantly vertical instability

with very fast growth rate of 10.60/ms and varying threshold. The coherent amplitude of the oscillation was limited to approx. 1 mm peak and would damp down over a few tens of turns, however, beam loss set in even as the amplitude signal damped, causing a beam abort. This led to the conclusion that the bunches were actually blowing up. The appearance of a 2is line in the spectrum suggested a possible head-tail nature of the instability, although chromaticity was not effective in changing the threshold. The crucial hints in tracking down the cause turned out to be vacuum activity near the rf cavities and observance of signals on the cavity probes of certain rf cavities.
NTIS
Storage Rings (Particle Accelerators); Particle Accelerators

20080017456 Stanford Linear Accelerator Center, Menlo Park, CA, USA; Ruhr Univ., Bochum, Germany
Recent Babar Results in Charm and Charmonium Spectroscopy
Pelizaeus, M.; Jan. 01, 2007; 8 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-907723; SLAC/PUB-12512; No Copyright; Avail.: National Technical Information Service (NTIS)
Recent results related to open charm and charmonium spectroscopy from data collected by the Babar experiment in e(sup +)e(sup -) collisions near radical(s)=10.58 GeV are reviewed.
NTIS
Charm (Particle Physics); Mesons; Collisions

20080017457 Fermi National Accelerator Lab., Batavia, IL, USA; Massachusetts Inst. of Tech., Cambridge, MA, USA
Lifetime Difference in the Bs0 System from Untagged Bs0 to J/psi phi decay at s(1/2)- 1.96 TeV, at DO Detector**
Chandra, A.; Jan. 01, 2006; 167 pp.; In English
Report No.(s): DE2007-907797; FERMILAB-THESIS-2006-40; No Copyright; Avail.: National Technical Information Service (NTIS)
The work presented in this thesis was carried put within the D0 collaboration at the Fermilab Tevatron Collider. Our current understanding of elementary particles and their interactions within the framework of standard model (SM), states that strongly interacting particles are made of fundamental constituents called quarks.
NTIS
Elementary Particles; Mesons; Particle Accelerators

20080017458 Johns Hopkins Univ., Baltimore, MD, USA
B(O)(s) and A(O)(b) Lifetimes and Branching Ratios at the Tevatron
Behari, S.; Jan. 01, 2007; 6 pp.; In English
Report No.(s): DE2007-907799; FERMILAB-CONF-06-493-E; No Copyright; Avail.: National Technical Information Service (NTIS)
No abstract available
Mesons; Particle Accelerators

20080017459 Fermi National Accelerator Lab., Batavia, IL, USA; Northern Illinois Univ., De Kalb, IL, USA
Search for Charge 1/3 Third Generation Leptoquarks in Muon Channels
Uzunyan, S. A.; Jan. 01, 2006; 115 pp.; In English
Report No.(s): DE2007-907801; FERMILAB-THESIS-2006-36; No Copyright; Avail.: National Technical Information Service (NTIS)
Leptoquarks are exotic particles that have color, electric charge, and lepton number and appear in extended gauge theories and composite models. Current theory suggests that leptoquarks would come in three different generations corresponding to the three quark and lepton generations. We are searching for charge 1/3 third generation leptoquarks produced in pp collisions at radical(s)=1.96 TeV using data collected by the D0 detector.
NTIS
Leptons; Muons; Quarks

20080017460 Karlsruhe Univ., Germany
Optimization of the signal selection of exclusively reconstructed decays of B0 and B/s mesons at CDF-II
Doerr, C.; Jan. 01, 2007; 189 pp.; In English
Report No.(s): DE2007-907804; No Copyright; Avail.: National Technical Information Service (NTIS)
No abstract available
Mesons; Collisions

20080017461 Fermi National Accelerator Lab., Batavia, IL, USA; Technische Hochschule, Aachen, Germany
Search for R-parity Violating Supersymmetry in Multilepton Final States with the DO Detector. Dissertation
Kaefer, D.; Nov. 01, 2006; 266 pp.; In English
Report No.(s): DE2007-907810; FERMILAB-THESIS-2006-22; No Copyright; Avail.: National Technical Information Service (NTIS)
This document presents a search for R-parity violating supersymmetry in multilepton final states within the D0 detector. NTIS
Elementary Particles; Leptons; Parity; Supersymmetry

20080017470 Stanford Linear Accelerator Center, Menlo Park, CA, USA
Investigations of Leveling Equipment for High Precision Measurements
Gassner, G. L.; Ruland, R. E.; Jan. 01, 2006; 10 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-903307; SLAC-PUB-12326; No Copyright; Avail.: National Technical Information Service (NTIS)
At SLAC (Stanford Linear Accelerator Center) a fully automated vertical comparator for the calibration of digital levels and invar staffs was developed by the Metrology Department in cooperation with the Institute of Engineering Geodesy and Measurement Systems at the Graz University of Technology. This vertical comparator is the first in the US. With the vertical comparator it is possible to perform system calibration and CCD camera measurements of rods. System calibration uses the height readings of the digital level at different positions of the rod and compares them with the reference readings obtained by the interferometer. In the case of CCD camera measurements, the positions of the edges in the image is determined and again compared with the interferometer readings. This document gives an overview of the current set-up of the SLAC vertical comparator and experimental results of critical applications including measurements at the end sections of the rod, at critical sighting distances, with unfocused optics and under illumination with the digital levels in use at SLAC.
NTIS
Calibrating; Comparators; Leveling; Linear Accelerators; Precision

20080017478 Lawrence Livermore National Lab., Livermore, CA USA
High Pressure Multi-Mbar Conductivity Experiments on Hydrogen. The Quest for Solid Metallic Hydrogen
Jackson, D.; Feb. 14, 2007; 7 pp.; In English
Report No.(s): DE2007-902318; UCRL-TR-228034; No Copyright; Avail.: Department of Energy Information Bridge
Ultra-dense hydrogen has long been the subject of intense experimental and theoretical research due to the fascinating physics which arises from this supposedly simple system. The properties of ultra-dense hydrogen also have important implications for planetary physics, since the interiors of the giant planets Jupiter and Saturn are believed to consist of cores of dense, metallic hydrogen. Finally, ultra-dense hydrogen is of direct programmatic interest, and multiple-shock compression experiments on hydrogen to the metallic state have stimulated the accelerated development of new hydrogen equation-of-state (EOS) models used for ICF and other applications. The focus of our research has often been described as the 'Holy Grail' of high-pressure physics research: The metallization of solid hydrogen. Metallic hydrogen has long been considered to be the prototypical system for the study of insulator-to-metal (I-M) transitions. Although metallic hydrogen (Z=1) may superficially appear to be a very simple material, it is in fact an extremely challenging system for theoretical analysis due to the presence of large zero-point atomic motions and the complete absence of any core electrons. Thus, solid metallic hydrogen promises to be a fascinating material. Among its predicted properties is the possibility of being a high temperature superconductor with a critical temperature Tc of the order of 100K (1). The successful metallization of solid hydrogen would be a groundbreaking scientific discovery and open up new frontiers in science and possibly technology as well.
NTIS
High Pressure; Hydrogen; Metallic Hydrogen; Solid Cryogens

20080017481 Lawrence Livermore National Lab., Livermore, CA USA
DYNS3D Finite Element Analysis of Steam Explosion Loads on a Pedestal Wall Design
Noble, C. R.; Jan. 22, 2007; 50 pp.; In English
Report No.(s): DE2007-902324; UCRL-TR-227386; No Copyright; Avail.: National Technical Information Service (NTIS)
The objective of this brief report is to document the ESBWR pedestal wall finite element analyses that were performed as a quick turnaround effort in July 2005 at Lawrence Livermore National Laboratory and describe the assumptions and failure criteria used for these analyses. The analyses described within are for the pedestal wall design that included an internal steel liner. The goal of the finite element analyses was to assist in determining the load carrying capacity of the ESBWR pedestal wall subjected to an impulsive pressure generated by a steam explosion.
NTIS
Explosions; Finite Element Method; Loads (Forces); Steam; Walls

20080017487 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
MARMOSET: The Path from LHC Data to the New Standard Model Via On-Shell Effective Theories
Arkani-Hamed, N.; Schuster, P.; Toro, N.; Thaler, J.; Wang, L. T.; Jan. 01, 2006; 101 pp.; In English
Report No.(s): DE2007-902546; FERMILAB-FN-0800-CD; No Copyright; Avail.: National Technical Information Service (NTIS)
We describe a coherent strategy and set of tools for reconstructing the fundamental theory of the TeV scale from LHC data. We show that On-Shell Effective Theories (OSETs) effectively characterize hadron collider data in terms of masses, production cross sections, and decay modes of candidate new particles. An OSET description of the data strongly constrains the underlying new physics, and sharply motivates the construction of its Lagrangian. Simulating OSETs allows efficient analysis of new-physics signals, especially when they arise from complicated production and decay topologies. To this end, we present MARMOSET, a Monte Carlo tool for simulating the OSET version of essentially any new-physics model. MARMOSET enables rapid testing of theoretical hypotheses suggested by both data and model-building intuition, which together chart a path to the underlying theory. We illustrate this process by working through a number of data challenges, where the most important features of TeV-scale physics are reconstructed with as little as 5 fb-1 of simulated LHC signals.
NTIS
Hadrons; Collisions; Monte Carlo Method

20080017491 Lawrence Livermore National Lab., Livermore, CA USA
Initial Design Calculations for a Detection System that will Observe Resonant Excitation of the 680 keV State in 238U
Pruet, J.; Hagmann, C.; Feb. 09, 2007; 9 pp.; In English
Report No.(s): DE2007-902615; UCRL-TR-227910; No Copyright; Avail.: National Technical Information Service (NTIS)
No abstract available
Detection; Excitation

20080017492 Stanford Linear Accelerator Center, Menlo Park, CA, USA; California Univ., Santa Cruz, CA, USA
Studies of Rare Hadronic B Decays with Babar
Kroseberg, J.; Jan. 01, 2007; 4 pp.; In English
Report No.(s): DE2007-902739; SLAC-PUB-12484; No Copyright; Avail.: National Technical Information Service (NTIS)
No abstract available
Hadrons; Mesons; Particle Decay

20080017495 Fermi National Accelerator Lab., Batavia, IL, USA
Atmospheric Neutrino Induced Muons in the MINOS Far Detector
Rahman, A. D.; Feb. 01, 2007; 168 pp.; In English
Report No.(s): DE2007-902865; FERMILAB-THESIS-2007-06; No Copyright; Avail.: National Technical Information Service (NTIS)
No abstract available
Muons; Neutrinos; Oscillations

20080017497 Rochester Univ., NY, USA
W/Z+Jets and Z pT Measurements at Tevatron
Chung, Y. S.; Aug. 24, 2006; 5 pp.; In English
Report No.(s): DE2007-902869; FERMILAB-CONF-06-535-E; No Copyright; Avail.: National Technical Information Service (NTIS)
No abstract available
Bosons; Particle Accelerators

20080017840 Lawrence Livermore National Lab., Livermore, CA USA
Science and Technology Review University Relations Program
Jan. 01, 2007; 44 pp.; In English
Report No.(s): DE2007-907857; UCRL-TR-224024; No Copyright; Avail.: National Technical Information Service (NTIS)
;Contents: Collaborative Research Prepares Our Next- Generation Scientists and Engineers; Next-Generation Scientists and Engineers Tap Lab's Resources; The Best and the Brightest Come to Livermore; Faculty on Sabbatical Find a Good Home at Livermore.
NTIS
Engineers; Research and Development; Technologies; University Program

20080017850 Baker and Botts, New York, NY, USA
Process and System for Laser Crystallization Processing of Film Regions on a Substrate to Provide Substantial Uniformity, and a Structure of Such Film Regions
Im, J. S., Inventor; Aug. 19, 2003; 27 pp.; In English
Contract(s)/Grant(s): DARPA-N66001-98-1-8913
Patent Info.: Filed Filed 19 Aug 03; US-Patent-Appl-SN-10-525 288
Report No.(s): PB2007-104801; No Copyright; Avail.: CASI: A03, Hardcopy
A process and system for processing a thin film sample (e.g., a semiconductor thin film), as well as the thin film structure are provided. In particular, a beam generator can be controlled to emit at least one beam pulse. With this beam pulse, at least one portion of the film sample is irradiated with sufficient intensity to fully melt such section of the sample throughout its thickness, and the beam pulse having a predetermined shape. This portion of the film sample is allowed to resolidify, and the re-solidified at least one portion is composed of a first area and a second area. Upon the re-solidification thereof, the first area includes large grains, and the second area has a region formed through nucleation. The first area surrounds the second area and has a grain structure which is different from a grain structure of the second area. The second area is configured to facilitate thereon an active region of an electronic device.
NTIS
Crystallization; Lasers; Patent Applications; Substrates; Thin Films

20080017939 Stanford Linear Accelerator Center, Menlo Park, CA, USA; Grenoble-1 Univ., Annecy, France
Hadronic B Decays at BaBar (April 18, 2007)
Zghiche, A.; Apr. 01, 2007; 4 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-902500; SLAC-PUB-12475; No Copyright; Avail.: Department of Energy Information Bridge
By means of hadronic B decays, the BABAR experiment aims to constrain the CKM matrix performing CP parameter measurements. It also seeks to test QCD factorization predictions and other models for B structure and decay mechanisms. We will present some of the on-going CP related analyses in the first section, while the second section will be dedicated to report on the conducted investigations on subjects as diverse as probing the gluon component in the B meson wave function, new physics and final state interactions in annihilation processes, intrinsic charm searches and first observation of strange charmed baryon production in B decays.
NTIS
Hadrons; Mesons; Particle Decay; Charm (Particle Physics); Quantum Chromodynamics; Wave Functions

20080017963 Stanford Linear Accelerator Center, Stanford, CA, USA
Asymptotic Behavior of the Electron Cloud Instability
Heifets, S. A.; May 2007; 30 pp.; In English
Report No.(s): DE2007-908563; SLAC-PUB-12538; No Copyright; Avail.: National Technical Information Service (NTIS)
The fast beam-ion instability and the single bunch electron-cloud instability are substantially nonlinear phenomena and

can be analyzed in a similar way. The initial exponential growth of the amplitudes known for both instabilities takes place only in the linear approximation. Later, in the nonlinear regime, amplitudes grow according to a power law or even decrease. We analyze the nonlinear regime describing the growth of amplitudes in time and along the train of bunches. Analytic analysis is compared with simulations.
NTIS
Asymptotic Properties; Electron Clouds

20080017972 Lawrence Livermore National Lab., Livermore, CA USA
Monte Carlo Method for Calculating Initiation Probability
Greenman, G. M.; Procassini, R. J.; Clouse, C. J.; Mar. 06, 2007; 13 pp.; In English
Report No.(s): DE2007-908387; UCRL-PROC-228717; No Copyright; Avail.: National Technical Information Service (NTIS)

A Monte Carlo method for calculating the probability of initiating a self-sustaining neutron chain reaction has been developed. In contrast to deterministic codes which solve a non-linear, adjoint form of the Boltzmann equation to calculate initiation probability, this new method solves the forward (standard) form of the equation using a modified source calculation technique. Results from this new method are compared with results obtained from several deterministic codes for a suite of historical test problems. The level of agreement between these code predictions is quite good, considering the use of different numerical techniques and nuclear data. A set of modifications to the historical test problems has also been developed which reduces the impact of neutron source ambiguities on the calculated probabilities.
NTIS
Monte Carlo Method; Probability Theory

20080018007 Lawrence Livermore National Lab., Livermore, CA USA
In situ Investigation of the Silver-CTAB System
Gray, J. J.; Orme, C. A.; Du, D.; Srolovitz, D.; Apr. 23, 2007; 7 pp.; In English
Report No.(s): DE2007-908103; UCRL-CONF-230182; No Copyright; Avail.: National Technical Information Service (NTIS)

Recent research has shown that biologically inspired approaches to materials synthesis and self-assembly, hold promise of unprecedented atomic level control of structure and interfaces. In particular, the use of organic molecules to control the production of inorganic technological materials has the potential for controlling grain structure to enhance material strength; controlling facet expression for enhanced catalytic activity; and controlling the shape of nanostructured materials to optimize optical, electrical and magnetic properties. In this work, we use organic molecules to modify silver crystal shapes towards understanding the metal-organic interactions that lead to nanoparticle shape control. Using in situ electrochemical AFM (EC-AFM) as an in situ probe, we study the influence of a cationic surfactant cetyltrimethylamminobromide (CTAB) on Ag growth during electrochemical deposition on Ag(100). The results show that the organic surfactant promotes the growth of steps on the (100) surface and changes the surface evolution from island nucleation to step flow growth. Overall, this leads to a smoother, faster growing (100) surface, which may promote plate-formation.
NTIS
Catalysis; Silver

71
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*.

20080016745 Naval Surface Warfare Center, Indian Head, MD, USA
Integrated Maritime Portable Acoustic Scoring and Simulator Control and Improvements
Karabin, C. R., Inventor; Chandler, B. P., Inventor; Padgett, J. E., Inventor; Theisen, J., Inventor; Smith, S. A., Inventor; Mar. 18, 2004; 10 pp.; In English
Patent Info.: Filed Filed 18 Mar 04; US-Patent-Appl-SN-10-807 574
Report No.(s): PB2007-105200; No Copyright; Avail.: CASI: A02, Hardcopy

The invention, as embodied herein, comprises an improved portable maritime scoring and simulation system that comprises three or more buoys that are deployed in an area of water selected for maritime combat training. Attached to each

buoy are a global positioning system receiver, an RF radio system, an acoustic analysis system, and a microprocessor. The acoustic analysis system is designed to capture an acoustic signature of ordnance impacting the water with predetermined characteristics. The system includes an RF radio repeater system linked to a system controller to control and monitor the elements of the system. In operation, when an acoustic signature is captured by the acoustic analysis system, the RF radio system, in one embodiment, transmits the time of the capture along with the GPS location of the buoy to the RF radio repeater system linked to the system controller. When three or more buoys transmit a captured acoustic signature, the system controller computes the location of impact using a location process. The invention also includes an improved method of controlling the system.
NTIS
Acoustic Measurement; Buoys; Combat; Education; Global Positioning System; Radio Frequencies; Scoring; Signal Analyzers; Simulators

20080017418 NASA Dryden Flight Research Center, Edwards, CA, USA
Initial Results from the Variable Intensity Sonic Boom Propagation Database
Haering, Edward A., Jr.; Cliatt, Larry J., II; Bunce, Thomas J.; Gabrielson, Thomas B.; Sparrow, Victor W.; Locey, Lance L.; May 05, 2008; 58 pp.; In English; 14th AIAA/CEAS Aeroacoustics Conference, 5-8 May 2008, Vancouver, BC, Canada; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A04, Hardcopy

An extensive sonic boom propagation database with low- to normal-intensity booms (overpressures of 0.08 lbf/sq ft to 2.20 lbf/sq ft) was collected for propagation code validation, and initial results and flight research techniques are presented. Several arrays of microphones were used, including a 10 m tall tower to measure shock wave directionality and the effect of height above ground on acoustic level. A sailplane was employed to measure sonic booms above and within the atmospheric turbulent boundary layer, and the sailplane was positioned to intercept the shock waves between the supersonic airplane and the ground sensors. Sailplane and ground-level sonic boom recordings were used to generate atmospheric turbulence filter functions showing excellent agreement with ground measurements. The sonic boom prediction software PCBoom4 was employed as a preflight planning tool using preflight weather data. The measured data of shock wave directionality, arrival time, and overpressure gave excellent agreement with the PCBoom4-calculated results using the measured aircraft and atmospheric data as inputs. C-weighted acoustic levels generally decreased with increasing height above the ground. A-weighted and perceived levels usually were at a minimum for a height where the elevated microphone pressure rise time history was the straightest, which is a result of incident and ground-reflected shock waves interacting.
Author
Sonic Booms; Atmospheric Turbulence; Turbulent Boundary Layer; Atmospheric Circulation; Acoustic Measurement

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*.

20080016689 Sandia National Labs., Albuquerque, NM USA
Substructured Multibody Molecular Dynamics
Crozier, P. S.; Draganescu, A. I.; Grest, G. S.; Ismail, A. E.; Lehoucq, R. B.; Nov. 01, 2006; 107 pp.; In English
Contract(s)/Grant(s): DE-AC04-94AL85000
Report No.(s): DE2007-902881; SAND 2006-7085; No Copyright; Avail.: National Technical Information Service (NTIS)

We have enhanced our parallel molecular dynamics (MD) simulation software LAMMPS (Large-scale Atomic/Molecular Massively Parallel Simulator) to include many new features for accelerated simulation including articulated rigid body dynamics via coupling to the Rensselaer Polytechnic Institute code POEMS (Parallelizable Open-source Efficient Multibody Software). We use new features of the LAMMPS software package to investigate rhodopsin photoisomerization, and water model surface tension and capillary waves at the vapor-liquid interface. Finally, we motivate the recipes of MD for practitioners and researchers in numerical analysis and computational mechanics.
NTIS
Molecular Dynamics; Parallel Processing (Computers); Computerized Simulation; Computer Programs

73
NUCLEAR PHYSICS

Includes nuclear particles; and reactor theory. For space radiation see *93 Space Radiation*. For atomic and molecular physics see *72 Atomic and Molecular Physics*. For elementary particle physics see *77 Physics of Elementary Particles and Fields*. For nuclear astrophysics see *90 Astrophysics*.

20080016629 Wisconsin Univ., Madison, WI, USA

Investigation of the Rayleigh-Taylor and Richtmyer-Meshkov Instabilities. (Final Report, November 2002-March 2006)

Bonazza, R.; Anderson, M.; Oakley, J.; Jan. 01, 2006; 40 pp.; In English

Report No.(s): DE2007-894506; No Copyright; Avail.: National Technical Information Service (NTIS)

The present research program is centered on the experimental and numerical study of two instabilities that develop at the interface between two different fluids when the interface experiences an impulsive or a constant acceleration. The instabilities, called the Richtmyer-Meshkov and Rayleigh-Taylor instability, respectively, adversely affect target implosion in experiments aimed at the achievement of nuclear fusion by inertial confinement by causing the nuclear fuel contained in a target and the shell material to mix, leading to contamination of the fuel, yield reduction or no ignition at all. The laboratory experiments summarized in this report include shock tube experiments to study a shock-accelerated bubble and a shock-accelerated 2-D sinusoidal interface; and experiments based on the use of magnetorheological fluids for the study of the Rayleigh-Taylor instability. Computational experiments based on the shock tube experimental conditions are also reported.

NTIS

Stability; Taylor Instability; Magnetorheological Fluids; Nuclear Fusion; Nuclear Fuels; Inertial Confinement Fusion; High Energy Interactions

20080016781 Knolls Atomic Power Lab., Niskayuna, NY, USA

Hafnium Resonance Parameter Analysis Using Neutron Capture and Transmission Experiments

Trbovich, M. J.; Barry, D. P.; Slovacek, R. E.; Danon, Y.; Block, R. C.; Feb. 06, 2006; 29 pp.; In English

Contract(s)/Grant(s): DE-AC12-00SN39357

Report No.(s): DE2007-903190; LM-07K004; No Copyright; Avail.: National Technical Information Service (NTIS)

The focus of this work is to determine the resonance parameters for stable hafnium isotopes in the 0.005 200 eV region, with special emphasis on the overlapping 176Hf and 178Hf resonances near 8 eV. Accurate hafnium cross sections and resonance parameters are needed in order to quantify the effects of hafnium found in zirconium, a metal commonly used in reactors. The accuracy of the cross sections and the corresponding resonance parameters used in current nuclear analysis tools are rapidly becoming the limiting factor in reducing the overall uncertainty on reactor physics calculations. Experiments measuring neutron capture and transmission are routinely performed at the Rensselaer Polytechnic Institute (RPI) LINAC using the time-of-flight technique. 6Li glass scintillation detectors were used for transmission experiments at flight path lengths of 15 and 25 m, respectively. Capture experiments were performed using a sixteen section NaI multiplicity detector at a flight path length of 25 m. These experiments utilized several thicknesses of metallic and isotope-enriched liquid Hf samples. The liquid Hf samples were designed to provide information on the 176Hf and 178Hf contributions to the 8 eV doublet without saturation. Data analyses were performed using the R-matrix Bayesian code SAMMY. A combined capture and transmission data analysis yielded resonance parameters for all hafnium isotopes from 0.005 200 eV.

NTIS

Capture Effect; Hafnium Isotopes; Neutrons; Resonance; Absorption Cross Sections

20080018000 Lawrence Livermore National Lab., Livermore, CA USA

Effect of Pre-equilibrium Spin Distribution on Neutron Induced 150Sm Cross Sections

Dashdorj, D.; Kwanano, T.; Apr. 17, 2007; 6 pp.; In English

Report No.(s): DE2007-908099; UCRL-PROC-230015; No Copyright; Avail.: Department of Energy Information Bridge

Prompt gamma-ray production cross section measurements were made as a function of incident neutron energy (E (sub n)= 1 to 35 MeV) on an enriched (95.6%) 150Sm sample. Energetic neutrons were delivered by the Los Alamos National Laboratory spallation neutron source located at the Los Alamos Neutron Science Center (LANSCE) facility. The prompt-reaction gamma rays were detected with the large-scale Compton-suppressed Germanium Array for Neutron Induced Excitations (GEANIE). Above E (sub n) approx. 8 MeV the pre-equilibrium reaction process dominates the inelastic reaction. The spin distribution transferred in pre-equilibrium neutron-induced reactions was calculated using the quantum mechanical theory of Feshbach, Kerman, and Koonin (FKK). These preequilibrium spin distributions were incorporated into the Hauser-Feshbach statistical reaction code GNASH and the gamma-ray production cross sections were calculated and

compared with experimental data. Neutron inelastic scattering populates 150Sm excited states either by (1) forming the compound nucleus 151Sm and decaying by neutron emission, or (2) by the incoming neutron transferring energy to create a particle-hole pair, and thus initiating the pre-equilibrium process. These two processes produce rather different spin distributions: the momentum transfer via the pre-equilibrium process tends to be smaller than in the compound reaction. This difference in the spin population has a significant impact on the gamma-ray de-excitation cascade and therefore in the partial gamma-ray cross sections. The difference in the partial gamma-ray cross sections using spin distributions with and without preequilibrium effects was significant, e.g., for the 558-keV transition between 8+ and 6+ states the calculated partial gamma-ray production cross sections changed by 70% at E(sub n) = 20 MeV with inclusion of the spin distribution of pre-equilibrium process.
NTIS
Neutron Cross Sections; Neutrons; Quantum Theory; Neutron Scattering; Inelastic Scattering; Gamma Rays

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*.

20080016653 Piper Rudnick, LLP, Washington, DC, USA
Optical Fiber Sensors for Harsh Environments
Xu, J., Inventor; Wang, A., Inventor; Mar. 04, 2004; 10 pp.; In English
Contract(s)/Grant(s): DEFC3601G01050
Patent Info.: Filed Filed 4 Mar 04; US-Patent-Appl-SN-10-791 841
Report No.(s): PB2007-109323; No Copyright; Avail.: CASI: A02, Hardcopy

A diaphragm optic sensor comprises a ferrule including a bore having an optical fiber disposed therein and a diaphragm attached to the ferrule, the diaphragm being spaced apart from the ferrule to form a Fabry-Perot cavity. The cavity is formed by creating a pit in the ferrule or in the diaphragm. The components of the sensor are preferably welded together, preferably by laser welding. In some embodiments, the entire ferrule is bonded to the fiber along the entire length of the fiber within the ferrule; in other embodiments, only a portion of the ferrule is welded to the fiber. A partial vacuum is preferably formed in the pit. A small piece of optical fiber with a coefficient of thermal expansion chosen to compensate for mismatches between the main fiber and ferrule may be spliced to the end of the fiber.
NTIS
Optical Fibers; Patent Applications

20080016659 Heslin Rothenberg Faley and Mesiti, P.C., Albany, NY, USA
Optical Device for Directing X-Rays Having a Plurality of Optical Crystals
Chen, Z., Inventor; Feb. 01, 2005; 21 pp.; In English
Contract(s)/Grant(s): NIH-1-R43-RR14935-01
Patent Info.: Filed Filed 1 Feb 05; US-Patent-Appl-SN-11-048 146
Report No.(s): PB2007-104742; No Copyright; Avail.: CASI: A03, Hardcopy

Devices for improving the capturing and utilization of high-energy electromagnetic radiation, for example, x-rays, gamma rays, and neutrons, for use in physical, medical, and industrial analysis and control applications are disclosed. The devices include optics having a plurality of optical crystals, for example, doubly-curved silicon or germanium crystals, arranged to optimize the capture and redirection of divergent radiation via Bragg diffraction. In one aspect, a plurality of optic crystals having varying atomic diffraction plane orientations are used to capture and focus divergent x-rays upon a target. In another aspect, a two- or three-dimensional matrix of crystals is positioned relative to an x-ray source to capture and focus divergent x-rays in three dimensions.
NTIS
Crystals; Optical Equipment; Patent Applications; X Rays

20080016732 Reed Smith, LLP, Philadelphia, PA, USA
Split Image Optical Display
Veligdan, J. T., Inventor; 27 May 05; 15 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886

Patent Info.: Filed Filed 27 May 05; US-Patent-Appl-SN-11-139 243
Report No.(s): PB2007-105199; No Copyright; Avail.: CASI: A03, Hardcopy

A video image is displayed from an optical panel by splitting the image into a plurality of image components, and then projecting the image components through corresponding portions of the panel to collectively form the image. Depth of the display is correspondingly reduced.

NTIS

Display Devices; Image Reconstruction; Image Processing; Imaging Techniques; Video Equipment; Optical Equipment

20080016743 Department of the Army, Washington, DC, USA

Dual Mode Mirror Imaging System

Vizgaitis, J. N., Inventor; Mar. 31, 2004; 7 pp.; In English
Patent Info.: Filed Filed 31 Mar 04; US-Patent-Appl-SN-10-813 068
Report No.(s): PB2007-105864; No Copyright; Avail.: CASI: A02, Hardcopy

A dual mode mirror imaging system comprising a Cassegrain-type objective assembly having a primary mirror with a hole in its center and a secondary mirror spaced in front of the primary mirror, and imager optics disposed in the hole. The secondary mirror is adapted to receive laser wavelength light and infrared wavelength light reflected from the primary mirror and to reflect the light back through the imager optics to a focal plane. The secondary mirror has one reflecting surface for the laser light and another reflecting surface for the infrared light. The pair of reflecting surfaces is positioned to change the optical path length between the laser light and the infrared light so that the laser light and the infrared light are imaged at the same focal plane without defocusing.

NTIS

Imaging Techniques; Mirrors

20080016744 Swedish Defence Research Establishment, Linkoeping, Sweden

MOMS. Multi Optical Mine Detection System. Initial Report.

Sjoekvist, S.; Linderhed, A.; Abrahmson, S.; Andersson, P.; Chevalier, T.; Sep. 01, 2005; 208 pp.; In English
Report No.(s): PB2007-105546; FOI-R-1721-SE; No Copyright; Avail.: National Technical Information Service (NTIS)

This report shows the first year of research and investigations carried out within the project 'Multi Optical Mine Detection System', MOMS. Activities have mainly been focused on basic principles, phenomena, acquisition of knowledge and literature studies. The report introduces the reader with the aim of the project and interpretations of the task. This report will serve as a common base for the evolution of the project. A survey of relevant mines and UXO has been performed, considering the functionality, geometry, size and color. A field test with passive and active electro optical sensors was carried out in close cooperation with SWEDEC. The purpose was to collect data from surface laid mines, UXO, submunitions, and environmental background. Laboratory experiments have been made. Initial results are shown. An initial evaluation of sensor candidates and their detection phenomenology is discussed. Considered sensor phenomenologies are: 3-D shape, retro reflection, spectral characteristics, angular reflection characteristics, temporal characteristics, spatial characteristics, polarization and fluorescence.

NTIS

Detection; Mine Detectors; Optical Measurement; Ordnance; Surveys; Electro-Optics

20080016753 Nutter, McClennen and Fish, Boston, MA, USA

Subwavelength-Diameter Silica Wires for Low Loss Optical Waveguiding

Mazur, E., Inventor; Tong, L., Inventor; Gattass, R., Inventor; Dec. 15, 2004; 29 pp.; In English
Contract(s)/Grant(s): PHY-0117795
Patent Info.: Filed Filed 15 Dec 04; US-Patent-Appl-SN-11-013 198
Report No.(s): PB2007-105191; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention provides nanometer-sized diameter silica fibers that exhibit high diameter uniformity and surface smoothness. The silica fibers can have diameters in a range of a about 20 nm to about 1000 nm. An exemplary method according to one embodiment of the invention for generating such fibers utilizes a two-step process in which in an initial step a micrometer sized diameter silica preform fiber is generated, and in a second step, the silica preform is drawn while coupled to a support element to form a nanometer sized diameter silica fiber. The portion of the support element to which the preform

is coupled is maintained at a temperature suitable for drawing the nansized fiber, and is preferably controlled to exhibit a temporally stable temperature profile.
NTIS
Silicon Dioxide; Wire

20080016754 Christie, Parker and Hale, LLP, Pasadena, CA, USA
Optical Switches Incorporating Multi-Layer Dispersion- Engineered Waveguides
Painter, O. J., Inventor; Vernooy, D. W., Inventor; Vahala, K. J., Inventor; Nov. 16, 2004; 81 pp.; In English
Contract(s)/Grant(s): N00014-00-3-0023
Patent Info.: Filed Filed 16 Nov 04; US-Patent-Appl-SN-10-991 138
Report No.(s): PB2007-105192; No Copyright; Avail.: CASI: A05, Hardcopy

A multi-layer laterally-confined dispersion-engineered optical waveguide may include one multi-layer reflector stack for guiding an optical mode along a surface thereof, or may include two multi-layer reflector stacks with a core therebetween for guiding an optical mode along the core. Dispersive properties of such multi-layer waveguides enable modal-index-matching between low-index optical fibers and/or waveguides and high-index integrated optical components and efficient transfer of optical signal power therebetween. Integrated optical devices incorporating such multi-layer waveguides may therefore exhibit low (<3 dB) insertion losses. Incorporation of an active layer (electro-optic, electro-absorptive, non-linear-optical) into such waveguides enables active control of optical loss and/or modal index with relatively low-voltage/low-intensity control signals. Integrated optical devices incorporating such waveguides may therefore exhibit relatively low drive signal requirements.
NTIS
Optical Waveguides; Reflectors; Switches; Waveguides

20080016774 Pacific Northwest National Lab., Richland, WA, USA
Long Wave Infrared Detection of Chemical Weapons Simulants
Phillips, M. C.; Taubman, M. S.; Scott, D. C.; Myers, T. L.; Munley, J. T.; Apr. 01, 2007; 19 pp.; In English
Report No.(s): DE2007-903252; PNNL-16557; No Copyright; Avail.: National Technical Information Service (NTIS)

The purpose of Task 3.b under PL02-OP211I-PD07 (CBW simulant detection) was to demonstrate the applicability of the sensor work developed under this project for chemical and biological weapons detection. To this end, the specific goal was to demonstrate the feasibility of detection of chemical agents via that of simulants (Freons) with similar spectroscopic features. This has been achieved using Freon-125 as a simulant, a tunable external cavity quantum cascade laser (ECQCL), and a Herriott cell-based sensor developed at Pacific Northwest National Laboratory (PNNL) specifically for this task. The experimentally obtained spectrum of this simulant matches that found in the Northwest Infrared (NWIR) spectral library extremely well, demonstrating the ability of this technique to detect the exact shape of this feature, which in turn indicates the ability to recognize the simulant even in the presence of significant interference. It has also been demonstrated that the detected features of a typical interferent, namely water, are so different in shape and width to the simulant, that they are easily recognized and separated from such a measurement. Judging from the signal-to-noise ratio (SNR) of the experimental data obtained, the noise equivalent absorption sensitivity is estimated to be 0.5 x 10-7 to 1 x 10-6 cm-1. For the particular feature of the simulant examined in this work, this corresponds to a relative concentration of 50 to 25 parts-per-billion by volume (ppbv).
NTIS
Chemical Warfare; Infrared Detectors

20080017027 Morris Manning and Martin, LLP, Atlanta, GA, USA; Vanderbilt Univ., Nashville, TN, USA
System and Methods for Optical Stimulation of Neural Tissues
Jansen, A. M., Inventor; Wells, J. D., Inventor; Jansen, E. D., Inventor; Konrad, P. E., Inventor; Kao, C. C., Inventor; Mar. 03, 2005; 20 pp.; In English
Contract(s)/Grant(s): FA 9550-04-1-0045
Patent Info.: Filed Filed 3 Mar 05; US-Patent-Appl-SN-10-071-060
Report No.(s): PB2007-105248; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention, in one aspect, relates to a system for stimulating neural tissue of a living subject. The system comprises an energy source capable of generating optical energy, a connector having a first end and a second end capable of transmitting optical energy, and a probe operably coupled to the second end of the connector and having an end portion for

delivering optical energy to a target neural tissue. In one embodiment, the energy source comprises a tunable laser.
NTIS
Stimulation; Tissues (Biology); Neurology; Optics

20080017031 Allen, Dyer, Doppelt, Milbrath and Gilchrist, PA, Orlando, FL, USA; Harris Corp., Melbourne, FL, USA
Ruggedized Module for Securely Retaining Multi-Optical Fiber Interconnect Ferrules
Brief, J. B., Inventor; Lee, Y. M., Inventor; Wells, R. G., Inventor; Carpenter, J. W., Inventor; Apr. 01, 2004; 11 pp.; In English
Contract(s)/Grant(s): N0019-02-C-3002
Patent Info.: Filed Filed 1 Apr 04; US-Patent-Appl-SN-10-816-323
Report No.(s): PB2007-105264; No Copyright; Avail.: CASI: A03, Hardcopy

A ruggedized, snap-together, module securely retains a pair of mutually abutting fiber optic interconnect MT ferrules, that have been joined together by a ferrule aligning pin clamp structure. The module includes a generally rectangular base member having a ferrule retention cavity that is configured to retain a pair of MT ferrules and an associated pin clamp assembly therefor. A cover is configured to engage the base in such a manner that the two MT ferrules are firmly held in their intended face-to-face abutting condition as captured between the base and the cover. A bias compression spring is captured between the cover and the base in a manner that facilitates removal of the cover when it is desired to open the module and gain access to the two MT ferrules.
NTIS
Fiber Optics; Optical Fibers; Modules

20080017032 EM Photonics, Inc., Wilmongton, DE, USA
Fiber Bragg Grating Compression Sensor System
Behrmann, G. P., Inventor; Prather, D. W., Inventor; Nov. 18, 2004; 5 pp.; In English
Contract(s)/Grant(s): R43 HD 44288-01
Patent Info.: Filed Filed 18 Nov 04; US-Patent-Appl-SN-10-992-047
Report No.(s): PB2007-105265; No Copyright; Avail.: CASI: A01, Hardcopy

A fiber Bragg grating compression sensor and a flexure mount that is attached to the sensor to significantly enhance its compression sensitivity. By incorporating the flexure mount, compressive forces are converted to tensile forces allowing an entire new set of measurement possibilities. The sensor may be used in implantable tendon and ligament force sensing or as a generalized compression sensor.
NTIS
Bragg Gratings; Fiber Optics; Detection

20080017033 Jenkins, Wilson, Taylor and Hunt, P.A., Durham, NC, USA
Methods and Systems for Laser Based Real-Time Structured Light Depth Extraction
Ackerman, J. D., Inventor; Keller, K. P., Inventor; Jun. 09, 2003; 20 pp.; In English
Contract(s)/Grant(s): DABT63-93-C-0048; ASC8920219
Patent Info.: Filed Filed 9 Jun 03; US-Patent-Appl-SN-10-515-305
Report No.(s): PB2007-105272; No Copyright; Avail.: CASI: A03, Hardcopy

Laser-based methods and systems for real-time structured light depth extraction are disclosed. A laser light source produces a collimated beam of laser light. A pattern generator generates structured light patterns including a plurality of pixels. The beam of laser light emanating from the laser light source interacts with the patterns to project the patterns onto the object. The patterns are reflected from the object of interest and detected using a high-speed, low-resolution detector. A broadband light source illuminates the object with broadband/light, and a separate high-resolution, low-speed detector detects broadband light reflected from the object. A real-time structured light depth extraction engine/controller based on the transmitted and reflected patterns and the reflected broadband light.
NTIS
Depth; Extraction; Lasers; Light Beams; Light Sources; Real Time Operation

20080017092 Sandia National Labs., Albuquerque, NM USA
VCSEL Polarization Control for Chip-Scale Atomic Clocks
Keeler, G. A.; Geib, K. M.; Serkland, D. K.; Peake, G. M.; Wendt, J. R.; Jan. 01, 2007; 15 pp.; In English
Contract(s)/Grant(s): DE-AC04-94AL85000
Report No.(s): DE2007-902214; SAND2007-0069; No Copyright; Avail.: National Technical Information Service (NTIS)

Sandia National Laboratories and Mytek, LLC have collaborated to develop a monolithically-integrated vertical-cavity

surface-emitting laser (VCSEL) assembly with controllable polarization states suitable for use in chip-scale atomic clocks. During the course of this work, a robust technique to provide polarization control was modeled and demonstrated. The technique uses deeply-etched surface gratings oriented at several different rotational angles to provide VCSEL polarization stability. A rigorous coupled-wave analysis (RCWA) model was used to optimize the design for high polarization selectivity and fabrication tolerance. The new approach to VCSEL polarization control may be useful in a number of defense and commercial applications, including chip-scale atomic clocks and other low-power atomic sensors.
NTIS
Atomic Clocks; Chips; Laser Cavities; Lasers; Polarization (Waves); Surface Emitting Lasers

20080017441 Federal Trade Commission, Washington, DC, USA
Strength of Competition in the Sale of Rx Contact Lenses: An FTC (Federal Trade Commission) Study
Feb. 1, 2005; 69 pp.; In English
Report No.(s): PB2007-111723; No Copyright; Avail.: CASI: A04, Hardcopy

On December 6, 2003, Congress passed the Fairness to Contact Lens Consumers Act (FCLCA or the Act), which became effective on February 4, 2004. Congress enacted the FCLCA to enhance competition in the market for contact lenses by providing consumers with a greater ability to fill their contact lens prescriptions from sellers other than their prescribing eye care practitioner (ECP). The Act, along with the Federal Trade Commissions (FTC or Commission) implementing regulations, impose on prescribers and sellers several requirements intended to enhance prescription portability. Among other things, ECPs must release a contact lens prescription to a patient and may not tie the prescription release to the purchase of lenses from the ECP. Sellers may dispense contact lenses only in accordance with a contact lens prescription that the patient or ECP presents directly to the seller, or that has been verified by the ECP. In addition to these provisions, the Act also requires the FTC to undertake a study to examine the strength of competition in the sale of prescription contact lenses.
NTIS
Contact Lenses; Requirements

20080017443 Sandia National Labs., Albuquerque, NM USA
Widefield Laser Doppler Velocimeter. Development and Theory
Reu, P. L.; Hansche, B. D.; Massad, J. E.; Mar. 01, 2007; 73 pp.; In English
Contract(s)/Grant(s): DE-AC04-94AL85000
Report No.(s): DE2007-902222; SAND2007-0311; No Copyright; Avail.: National Technical Information Service (NTIS)

The widefield laser Doppler velocimeter is a new measurement technique that significantly expands the functionality of a traditional scanning system. This new technique allows full-field velocity measurements without scanning, a drawback of traditional measurement techniques. This is particularly important for tests in which the sample is destroyed or the motion of the sample is non-repetitive. The goal of creating velocity movies was accomplished during the research, and this report describes the current functionality and operation of the system. The mathematical underpinnings and system setup are thoroughly described. Two prototype experiments are then presented to show the practical use of the current system. Details of the corresponding hardware used to collect the data and the associated software to analyze the data are presented.
NTIS
Laser Doppler Velocimeters; Velocity Measurement

20080017474 Lawrence Livermore National Lab., Livermore, CA USA
Mirror Sub-Assembly End-Effector Design
Butlin, B.; Feb. 09, 2007; 107 pp.; In English
Report No.(s): DE2007-902232; UCRL-TR-227909; No Copyright; Avail.: Department of Energy Information Bridge

;Contents: Introduction; Design requirements; Design interface requirements; The MSA NOID End-Effector Design (Design overview, Rail sub-assembly design, Tilt sub-assembly design, Twist sub-assembly design, The Design as a whole); Design calculations; Procure; Assembly; and Test; Conclusion; Appendices.
NTIS
End Effectors; Mirrors

20080017488 Sandia National Labs., Albuquerque, NM USA

Radical Advancement in Multi-Spectral Imaging for Autonomous Vehicles (UAVs, UGVs, and UUVs) Using Active Compensation

Bagwell, B. E.; Wick, D. V.; Clark, B. F.; Jan. 01, 2007; 37 pp.; In English

Report No.(s): DE2007-902558; SAND2007-0148; No Copyright; Avail.: National Technical Information Service (NTIS)

The purpose of this LDRD was to demonstrate a compact, multi-spectral, refractive imaging systems using active optical compensation. Compared to a comparable, conventional lens system, our system has an increased operational bandwidth, provides for spectral selectivity and, non-mechanically corrects aberrations induced by the wavelength dependent properties of a passive refractive optical element (i.e. lens). The compact nature and low power requirements of the system lends itself to small platforms such as autonomous vehicles. In addition, the broad spectral bandwidth of our system would allow optimized performance for both day/night use, and the multi-spectral capability allows for spectral discrimination and signature identification.

NTIS

Autonomy; Goggles; Imaging Techniques; Night Vision; Radicals

20080017833 Lawrence Livermore National Lab., Livermore, CA USA

Abstract Proceedings Signal and Imaging Sciences Workshop CASIS Workshop 2006

Roberts, R.; Nov. 09, 2006; 58 pp.; In English

Report No.(s): DE2007-900184; UCRL-PROC-225960; No Copyright; Avail.: Department of Energy Information Bridge

These abstracts cover the following topics: (1) Analysis of massive datasets; (2) Nondestructive evaluation; (3) Imaging methodology; (4) NIF optics inspection; (5) Model-based signal processing and estimation; and (6) Image processing and analysis.

NTIS

Image Processing; Imaging Techniques; Signal Processing; Image Analysis; Imagery

20080017851 Crawford Maunu PLLC, Saint Paul, MN, USA

Laser Diode Device with Nitrogen Incorporating Barrier

Spruytte, S., Inventor; Larson, M. C., Inventor; Harris, J. S., Inventor; Mar. 09, 2005; 9 pp.; In English

Contract(s)/Grant(s): DAAG55-98-1-0437

Patent Info.: Filed Filed 9 Mar 05; US-Patent-Appl-SN-11-075 951

Report No.(s): PB2007-104802; No Copyright; Avail.: CASI: A02, Hardcopy

In an active region of an optical-electronic semiconductor device, nitrogen is incorporated in a barrier adjacent a GaNAs-based (e.g., GaInNAs) quantum well to improve device performance at wavelength bands above 1.2 microns. In a specific example embodiment, a mirror or cladding layer is grown over the active region in a manner that removes nitrogen complex otherwise present with Ga--N bonds in the active region. The embodiment can be implemented as one of a number of configurations including vertical cavity surface emitting lasers (VCSEL) and edge emitting lasers.

NTIS

Diodes; Nitrogen; Semiconductor Lasers; Surface Emitting Lasers

20080017928 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

All-optical Photonic Oscillator with High-Q Whispering Gallery Mode Resonators

Savchenkov, Anatoliy A.; Matsko, Andrey B.; Strekalov, Dmitry; Mohageg, Makan; Iltchenko, Vladimir S.; Maleki, Lute; October 4, 2004; 4 pp.; In English; IEEE International Topical Meeting on Microwave Photonics, 2004. MWP '04, 4-6 Oct. 2004, Ogunquit, ME, USA; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/40742

We demonstrated low threshold optical photonic hyper-parametric oscillator in a high-Q 10(exp 10) CaF2 whispering gallery mode resonator which generates stable 8.5 GHz signal. The oscillations result from the resonantly enhanced four wave mixing occurring due to Kerr nonlinearity of the material.

Author

Oscillators; Whispering Gallery Modes; Four-Wave Mixing; Oscillations; Resonators; Q Factors

20080017968 Humphreys Engineer Center Support Activity, Alexandria, VA, USA
Measurement Device and Method
Ryerson, C. C., Inventor; Yankielun, N. E., Inventor; 16 Jun 04; 14 pp.; In English
Patent Info.: Filed Filed 16 Jun 04; US-Patent-Appl-SN-10 867 700
Report No.(s): PB2007-109397; No Copyright; Avail.: CASI: A03, Hardcopy

Apparatus for determining the thickness of a configuration having flat, parallel surfaces that are transparent, or nearly so, to pre-specified types of energy. Embodiments comprise a mechanism for illuminating a front surface with an energy source and mechanisms for measuring reflections of the illumination from a parallel back surface. The energy is contained in a spectrum of wavelengths, the energy being refracted in components at unique wavelengths, e.g., different colored light bands, and similarly reflected from the back surface. The measuring mechanisms, e.g., spectrometers, determine the relative lateral displacement between two spectral lines in the refracted and reflected beams to enable determination of thickness. Other characteristics of the material of the configuration may be ascertained, e.g., chemical composition is ascertained by measuring the intensity of responses at multiple wavelengths and comparing this to responses of known materials.
NTIS
Measuring Instruments; Illumination; Energy; Refraction; Reflection; Beams

20080017969 Ross (Sheridan) PC, Denver, CO, USA
Polychromic Laser Scanning System and Method of Use
Horchner, U., Inventor; Kantor, L. B., Inventor; 25 Mar 05; 21 pp.; In English
Contract(s)/Grant(s): 70NANB0H3000
Patent Info.: Filed Filed 25 Mar 05; US-Patent-Appl-SN-11 090 673
Report No.(s): PB2007-109398; No Copyright; Avail.: CASI: A03, Hardcopy

A system for laser scanning provides spectral flexibility needed for the spectroscopic monitoring of highly multiplexed samples, such as cellular and particle assays in whole blood or other suspensions. In accordance with embodiments of the present invention, the system comprises a scanner to direct an excitation laser through a sample, an objective to collect light emitted by the sample in response to the excitation laser, a spectrograph to disperse the emitted light over a plurality of wavelengths as a spectrum, and a charge coupled device for detecting the spectrum. The system can be used with samples having a variety of reporter tags, including one or more SERS tags, fluorescent organic and protein tags, and quantum dot tags. A laser scanning apparatus and method of using the same is also provided.
NTIS
Laser Applications; Lasers; Patent Applications; Scanners; Scanning

20080017997 Lawrence Livermore National Lab., Livermore, CA USA
Short Pulse Laser Absorption and Energy Partition at Relativistic Laser Intensities
Shepherd, R.; Chen, H.; Ping, Y.; Dyer, G.; Wilks, S.; Mar. 30, 2007; 15 pp.; In English
Report No.(s): DE2007-908084; UCRL-TR-229579; No Copyright; Avail.: National Technical Information Service (NTIS)

We have performed experiments at the COMET and Calisto short pulse laser facilities to make the first comprehensive measurements of the laser absorption and energy partition in solid targets heated with an ultrashort laser pulse focused to relativistic laser intensities (>1017 W/cm2). The measurements show an exceedingly high absorption for P polarized laser-target interactions above 1019 W/cm2. Additionally, the hot electron population is observed to markedly increase at the same intensity range. An investigation of the relaxation process was initiated using time-resolved Ka spectroscopy. Measurements of the time-resolved Ka radiation suggest a 10-20 ps relativistic electron relaxation time. However modeling difficulties of these data are apparent and a more detailed investigation on this subject matter is warranted.
NTIS
Absorption Spectroscopy; Laser Spectroscopy; Lasers; Pulsed Lasers

20080018008 Stanford Linear Accelerator Center, Stanford, CA, USA
Commissioning the SPEAR3 Diagnostic Beamlines
Corbett, J.; Limborg-Deprey, C.; Mok, W.; Ringwall, A.; January 2007; 3 pp.; In English
Report No.(s): DE2007-908581; SLAC-PUB-12543; No Copyright; Avail.: National Technical Information Service (NTIS)

SPEAR3 has two diagnostic beam lines: an x-ray pinhole camera and a visible/UV beam line. The pinhole camera images approx. 8 keV dipole synchrotron radiation (SR) incident on a phosphor screen. The visible beam line delivers conventional optical radiation to an array of cameras and diagnostic elements on a 1x3m optical bench. This paper briefly reviews the

pinhole camera system while concentrating more on visible beam line power transmission calculations and streak camera data. Impedance estimates in the nominal optics and bunch length measurements in low-alpha optics are presented.
NTIS
Cameras; Synchrotron Radiation; Measurement; Optics; Emittance; Charge Distribution; Photon Beams

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PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

20080016919 McCarter and English, LLP, Newark, NJ, USA
Method and Apparatus for Stabilizing of the Glow Plasma Discharges
Kunhardt, E., Inventor; Becker, K., Inventor; May 4, 2005; 11 pp.; In English
Patent Info.: Filed Filed 4 May 05; US-Patent-Appl-SN-11-121 803
Report No.(s): PB2007-104784; No Copyright; Avail.: CASI: A03, Hardcopy

A method and apparatus for stabilizing glow plasma discharges by suppressing the transition from glow-to-arc includes a perforated dielectric plate having an upper surface and a lower surface and a plurality of holes extending there through. The perforated dielectric plate is positioned over the cathode. Each of the holes acts as a separate active current limiting micro-channel that prevents the overall current density from increasing above the threshold for the glow-to-arc transition. This allows for a stable glow discharge to be maintained for a wide range of operating pressures (up to atmospheric pressures) and in a wide range of electric fields include DC and RF fields of varying strength.
NTIS
Glow Discharges; Plasma Jets; Stabilization; Plasmas (Physics); Perforated Plates; Arc Discharges

20080017445 Sandia National Labs., Albuquerque, NM USA
Overview of the Dynamic-Hohlraum X-ray Source at Sandia National Laboratories
Sanford, T. W.; Apr. 01, 2007; 31 pp.; In English
Report No.(s): DE2007-903429; SAND2007-1734; No Copyright; Avail.: National Technical Information Service (NTIS)

Progress in understanding the physics of Dynamic-Hohlraums is reviewed for a system capable of generating 10 TW of axial radiation for high temperature (>200 eV) radiation-flow experiments and ICF capsule implosions. 2D magneto-hydrodynamic simulation comparisons with data show the need to include wire initiation physics and subsequent discrete wire dynamics in the simulations if a predictive capability is to be achieved.
NTIS
Hohlraums; Laboratories; X Ray Sources

20080017462 Lawrence Livermore National Lab., Livermore, CA USA
Large-Timestep Mover for Particle Simulations of Arbitrarily Magnetized Species
Cohen, R. H.; Friedman, A.; Grote, D. P.; Vay, J. L.; Jun. 16, 2006; 13 pp.; In English
Report No.(s): DE2007-907827; UCRL-CONF-222185; No Copyright; Avail.: National Technical Information Service (NTIS)

For self-consistent ion-beam simulations including electron motion, it is desirable to be able to follow electron dynamics accurately without being constrained by the electron cyclotron timescale. To this end, we have developed a particle-advance that interpolates between full particle dynamics and drift motion. By making a proper choice of interpolation parameter, simulation particles experience physically correct parallel dynamics, drift motion, and gyroradius when the timestep is large compared to the cyclotron period, though the effective gyro frequency is artificially low; in the opposite timestep limit, the method approaches a conventional Boris particle push. By combining this scheme with a Poisson solver that includes an interpolated form of the polarization drift in the dielectric response, the movers utility can be extended to higher-density problems where the plasma frequency of the species being advanced exceeds its cyclotron frequency. We describe a series of tests of the mover and its application to simulation of electron clouds in heavy-ion accelerators.
NTIS
Particle Accelerators; Plasmas (Physics); Simulation

20080018006 Lawrence Livermore National Lab., Livermore, CA USA

Stabilized Spheromak Fusion Reactors

Fowler, T. K.; Apr. 04, 2007; 21 pp.; In English

Report No.(s): DE2007-908102; UCRL-TR-229698; No Copyright; Avail.: Department of Energy Information Bridge

The U.S. fusion energy program is focused on research with the potential for studying plasmas at thermonuclear temperatures, currently epitomized by the tokamakbased International Thermonuclear Experimental Reactor (ITER) but also continuing exploratory work on other plasma confinement concepts. Among the latter is the spheromak pursued on the SSPX facility at LLNL. Experiments in SSPX using electrostatic current drive by coaxial guns have now demonstrated stable spheromaks with good heat confinement, if the plasma is maintained near a Taylor state, but the anticipated high current amplification by gun injection has not yet been achieved. In future experiments and reactors, creating and maintaining a stable spheromak configuration at high magnetic field strength may require auxiliary current drive using neutral beams or RF power. Here we show that neutral beam current drive soon to be explored on SSPX could yield a compact spheromak reactor with current drive efficiency comparable to that of steady state tokamaks. Thus, while more will be learned about electrostatic current drive in coming months, results already achieved in SSPX could point to a productive parallel development path pursuing auxiliary current drive, consistent with plans to install neutral beams on SSPX in the near future. Among possible outcomes, spheromak research could also yield pulsed fusion reactors at lower capital cost than any fusion concept yet proposed.

NTIS

Fusion Reactors; Spheromaks; Thermonuclear Reactions

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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*.

20080016641 Myers Bigel Sibley and Sajovec, Raleigh, NC, USA

Sequential Lithographic Methods to Reduce Stacking Fault Nucleation Sites and Structures having Reduced Stacking Fault Nucleation Sites

Hallin, C., Inventor; Lendenmann, H., Inventor; Sumakeris, J. J., Inventor; Aug. 30, 2004; 19 pp.; In English

Contract(s)/Grant(s): DARP-N00014-02-C-0302

Patent Info.: Filed Filed 30 Aug 04; US-Patent-Appl-SN-10-929 911

Report No.(s): PB2007-104787; No Copyright; Avail.: CASI: A03, Hardcopy

An epitaxial silicon carbide layer is fabricated by forming first features in a surface of a silicon carbide substrate having an off-axis orientation toward a crystallographic direction. The first features include at least one sidewall that is orientated nonparallel (i.e., oblique or perpendicular) to the crystallographic direction. A first epitaxial silicon carbide layer is then grown on the surface of the silicon carbide substrate that includes first features therein. Second features are then formed in the first epitaxial layer. The second features include at least one sidewall that is oriented nonparallel to the crystallographic direction. A second epitaxial silicon carbide layer is then grown on the surface of the first epitaxial silicon carbide layer that includes the second features therein.

NTIS

Epitaxy; Nucleation; Semiconductors (Materials); Silicon Carbides; Substrates; Lithography; Single Crystals

20080016658 Lockheed Martin Corp., Bethesda, MD, USA

Raman Spectroscopy Determination of Hole Concentration in p-Type GaSb

Maslar, J. E.; Hurst, W. S.; Wang, C. A.; Apr. 05, 2007; 39 pp.; In English

Report No.(s): DE2007-903188; LM-07K003; No Copyright; Avail.: Department of Energy Information Bridge

Room temperature p-type GaSb bulk coupled mode spectra were measured as a function of hole concentration. These spectra were obtained using an optical system based on 752.55 nm excitation in order to obtain more sensitivity to bulk GaSb coupled mode scattering than possible with visible wavelength excitation-based systems. A relatively simple spectral model for the electronic contribution to the dielectric function was evaluated for determination of hole concentration from the bulk coupled mode spectra. Optically-derived values for hole concentration were determined by minimizing the sum of the residuals squared between an experimental and simulated spectrum as a function of total hole concentration and a plasmon damping parameter. Hole concentrations obtained from the Raman spectroscopic measurements deviated from the values

determined from single field Hall effect measurements that were corrected to account for two band conduction by 20% to 65%. These deviations were attributed to the limitations of the spectral model employed and uncertainties in GaSb materials properties.
NTIS
Gallium Antimonides; Raman Spectroscopy; Holes (Electron Deficiencies); Spectra

20080016714 California Univ., San Diego, CA, USA
Experimental Investigation of Magnetic, Superconducting and Other Phase Transitions in Novel F-electron Materials at Ultrahigh Pressures. Final Progress Report, May 1, 2003-April 30, 2006
Maple, B.; Jeffirees, J.; Jul. 01, 2006; 13 pp.; In English
Contract(s)/Grant(s): DE-FG52-03NA00068
Report No.(s): DE2007-887456; No Copyright; Avail.: Department of Energy Information Bridge

This grant, entitled 'Experimental investigation of magnetic, superconducting and other phase transitions in novel f-electron materials at ultrahigh pressures,' spanned the funding period from May 1st, 2003 until April 30th, 2006. The major goal of this grant was to develop and utilize an ultrahigh pressure facility--capable of achieving very low temperatures, high magnetic fields, and extreme pressures as well as providing electrical resistivity, ac susceptibility, and magnetization measurement capabilities under pressure-- for the exploration of magnetic, electronic, and structural phases and any corresponding interactions between these states in novel f-electron materials. Realizing this goal required the acquisition, development, fabrication, and implementation of essential equipment, apparatuses, and techniques. The following sections of this report detail the establishment of an ultrahigh pressure facility (Section 1) and measurements performed during the funding period (Section 2), as well as summarize the research project (Section 3), project participants and their levels of support (Section 4), and publications and presentations (Section 5).
NTIS
Magnetic Materials; Phase Transformations; Superconductivity; Superconductors (Materials)

20080016719 Imperial Coll. of London, London, UK
b-Tagging and the Search for Neutral Supersymmetric Higgs Bosons at D0
Scanlon, T.; Oct. 01, 2006; 216 pp.; In English
Report No.(s): DE2007-899990; No Copyright; Avail.: National Technical Information Service (NTIS)

A search for neutral supersymmetric Higgs bosons and work relating to the improvement of the b-tagging and trigger capabilities at the DO detector during Run II of the Fermilab Tevatron collider is presented. The search for evidence of the Higgs sector in the Standard Model (SM) and supersymmetric extensions of the SM are a high priority for the DO collaboration, and b-tagging and good triggers are a vital component of these searches. The development and commissioning of the first triggers at DO which use btagging is outlined, along with the development of a new secondary vertex b-tagging tool for use in the Level 3 trigger. Upgrades to the Level 3 trigger hit finding code, which have led to significant improvements in the quality and efficiency of the tracking code, and by extension the b-tagging tools, are also presented.
NTIS
Actuators; Higgs Bosons; Marking; Particle Accelerators; Supersymmetry

20080016770 Lockheed Martin Corp., Denver, CO, USA
Computing the External Magnetic Scalar Potential Due to an Unbalanced Six-Pole Permanent Magnet Motor
Selvaggi, J.; Salon, S.; Kwon, O.; Chari, M. V. K.; Feb. 12, 2007; 14 pp.; In English
Report No.(s): DE2007-903191; LM-07K005; No Copyright; Avail.: National Technical Information Service (NTIS)

The accurate computation of the external magnetic field from a permanent magnet motor is accomplished by first computing its magnetic scalar potential. In order to find a solution which is valid for any arbitrary point external to the motor, a number of proven methods have been employed. Firstly, A finite element model is developed which helps generate magnetic scalar potential values valid for points close to and outside the motor. Secondly, charge simulation is employed which generates an equivalent magnetic charge matrix. Finally, an equivalent multipole expansion is developed through the application of a toroidal harmonic expansion. This expansion yields the harmonic components of the external magnetic scalar potential which can be used to compute the magnetic field at any point outside the motor.
NTIS
Magnetic Fields; Permanent Magnets; Scalars

20080016920 Pietragallo Gordon Alfano Bosick and Raspanti, LLP, Pittsburgh, PA, USA
Thermally Isolated Granular Media for Heat Assisted Magnetic Recording
Lu, B., Inventor; Weller, D., Inventor; Ju, G., Inventor; Mar. 10, 2004; 6 pp.; In English
Contract(s)/Grant(s): NIST-70NANB1H3056
Patent Info.: Filed Filed 10 Mar 04; US-Patent-Appl-SN-10-797 204
Report No.(s): PB2007-104761; No Copyright; Avail.: CASI: A02, Hardcopy

A method of fabricating a magnetic storage medium comprises: forming an underlayer on a heat sink layer; co-sputtering a magnetic material and a thermally insulating nonmagnetic material to form a recording layer on the underlayer, wherein the recording layer includes grains of the magnetic material in a matrix of the thermally insulating nonmagnetic material; and heating the recording layer to align an easy axis of magnetization of the magnetic material in a direction perpendicular to the underlayer. A magnetic storage medium fabricated using the method is also provided.
NTIS
Magnetic Materials; Magnetic Recording; Magnetic Storage; Thin Films; Temperature Effects; Heat

20080017009 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Testing Guideline for Single Event Gate Rupture (SEGR) of Power MOSFETs
Scheick, Leif; February 2008; 50 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAS7-03001; WBS 939904.01.11.30; Project No. 102197; Task No. 3.23.5
Report No.(s): JPL Publication 08-10; Copyright; Avail.: CASI: A03, Hardcopy

The use of power MOSFETs in space can be challenging due to the ubiquitous and diverse nature of radiation that these devices encounter. Radiation can degrade the electrical properties of the device, which depending on the type and severity of the radiation can render the device non-functional. Radiation testing provides a method for characterizing, or at least highlighting, radiation susceptible devices planned for use in space missions. The purpose of this document is two-fold. First, the document lists and discusses many of the issues important to understand when testing power MOSFETs. Second, the recommended approach for using radiation test data to define the device application requirements is presented. These include SEE rate calculation, data analysis, and derating guidelines.
Author
Field Effect Transistors; Metal Oxide Semiconductors; Electrical Properties

20080017080 Jefferson (Thomas) National Accelerator Facility, Newport News, VA, USA
Deeply Virtual Compton Scattering on the Neutron at JLab Hall A
Mazouz, M.; Feb. 01, 2007; 8 pp.; In English
Report No.(s): DE2007-902152; JLAB-PHY-07-617R; DOE/ER/40150-4255; No Copyright; Avail.: Department of Energy Information Bridge

Deeply virtual Compton scattering (DVCS) is the simplest hard exclusive process to access generalized parton distributions (GPDs). In the case of a neutron this process is mostly sensitive to E, the least constrained GPD, which enters Ji's sum rule linking GPDs to the total quark angular momentum. We present the first dedicated DVCS experiment on the neutron which took place in the Hall A of Jefferson Lab in fall 2004. Experimental setup and preliminary results are discussed.
NTIS
Compton Effect; Electron Scattering; Neutrons; Angular Momentum

20080017082 Hampton Univ., VA, USA; Jefferson (Thomas) National Accelerator Facility, Newport News, VA, USA; Virginia Univ., Charlottesville, VA, USA; Pennsylvania Univ., Philadelphia, PA, USA
Transversity and Transverse Spin in Nucleon Structure through SIDIS at Jefferson Lab
Afanasev, A.; Anselmino, M.; Avakain, H.; Cates, G.; Chen, J. P.; Feb. 13, 2007; 7 pp.; In English
Report No.(s): DE2007-902158; No Copyright; Avail.: National Technical Information Service (NTIS)

The JLab 12 GeV upgrade with a proposed solenoid detector and the CLAS12 detector can provide the granularity and three-dimensional kinematic coverage in longitudinal and transverse momentum, $0.1/le x /le 0.5$, $0.3 /le z /le 0.7$ with $P(underscore)T /le 1.5 (/rm GeV)$ to precisely measure the leading twist chiral-odd and T-odd quark distribution and fragmentation functions in SIDIS. The large x experimental reach of these detectors with a 12 GeV CEBAF at JLab makes it (/em ideal) to obtain precise data on the (/em valence-dominated) transversity distribution function and to access the tensor charge.
NTIS
Nucleons; Transverse Momentum; Linear Accelerators; Quarks

20080017086 Fermi National Accelerator Lab., Batavia, IL, USA

Upgrade of the D0 Luminosity Monitor Readout System

Anderson, J.; Bridges, L.; Casey, B.; Enari, Y.; Green, J.; Dec. 01, 2006; 4 pp.; In English

Report No.(s): DE2007-902190; FERMILAB-CONF-06-470-E; No Copyright; Avail.: National Technical Information Service (NTIS)

We describe upgrades to the readout system for the DO Luminosity Monitor. The DO Luminosity Monitor consists of plastic scintillation detectors with fine-mesh photomultiplier readout that cover the pseudorapidity range 2.7 < (n) < 4.4. The detector is designed to provide a precise measurement of the rate for non-diffractive inelastic collisions that is used to calculate the TeVatron luminosity at DO. The new readout system is based on custom VME electronics that make precise time-of-flight and charge measurements for each luminosity counter. These measurements are used to identify beam crossings with non-diffractive interactions by requiring in-time hits in both the forward and backward luminosity counters. We have also significantly increased signal/noise for the photomultiplier signals by developing a new front-end preamplifier and improving the grounding scheme.

NTIS

Luminosity; Particle Accelerators; Readout; Scintillation Counters

20080017087 Fermi National Accelerator Lab., Batavia, IL, USA

Tune Calculation at the Injection

Yang, X.; Mar. 28, 2007; 2 pp.; In English

Contract(s)/Grant(s): DE-AC02-76CH03000

Report No.(s): DE2007-902193; FERMILAB-TM-2383-AD; No Copyright; Avail.: Department of Energy Information Bridge

Injection tunes in the Booster can be adjusted via quadrupole correctors. Quadrupole correctors at short and long sections are ramped as two different groups, and they control horizontal and vertical tunes separately since the horizontal beta function reaches the maximum at short sections and the vertical beta function reaches the maximum at long sections. A simple linear model is used to calculate the tune based upon quad corrector settings.

NTIS

Injection; Particle Accelerators; Quadrupoles

20080017475 Lawrence Livermore National Lab., Livermore, CA USA

2005 Physics and Advanced Technologies in the News

Hazi, A. U.; Dec. 19, 2006; 32 pp.; In English

Report No.(s): DE2007-902236; UCRL-TR-227148; No Copyright; Avail.: Department of Energy Information Bridge

Several outstanding research activities in the Physics and Advanced Technologies Directorate in 2005 were featured in Science and Technology Review, the monthly publication of Lawrence Livermore National Laboratory. Reprints of those articles accompany this report. Here we summarize other science and technology highlights, as well as the awards and recognition received by members of the Directorate in 2005. As part of the World Year of Physics commemorating the 100th anniversary of Einsteins miraculous year, we also highlight ongoing physics research that would not be possible without Einsteins pioneering accomplishments.

NTIS

Physics; Scientists; Awards

20080017480 Lawrence Livermore National Lab., Livermore, CA USA

Time Resolved Phase Transitions via Dynamic Transmission Electron Microscopy

Reed, B. W.; Armstrong, M. R.; Blobaum, K. J.; Browning, N. D.; Burnham, A. K.; Feb. 26, 2007; 11 pp.; In English

Report No.(s): DE2007-902321; UCRL-TR-228336; No Copyright; Avail.: National Technical Information Service (NTIS)

The Dynamic Transmission Electron Microscope (DTEM) project is developing an in situ electron microscope with nanometer- and nanosecond-scale resolution for the study of rapid laser-driven processes in materials. We report on the results obtained in a year-long LDRD-supported effort to develop DTEM techniques and results for phase transitions in molecular crystals, reactive multilayer foils, and melting and resolidification of bismuth. We report the first in situ TEM observation of the HMX a-a phase transformation in sub-im crystals, computational results suggesting the importance of voids and free surfaces in the HMX transformation kinetics, and the first electron diffraction patterns of intermediate states in fast multilayer

foil reactions. This project developed techniques which are applicable to many materials systems and will continue to be employed within the larger DTEM effort.
NTIS
Electron Microscopes; Electron Microscopy; Lasers; Phase Transformations; Transmission Electron Microscopy

20080017482 Lawrence Livermore National Lab., Livermore, CA USA
Comparative Experimental Study of X-Ray Absorption Spectroscopy and Electron Energy Loss Spectroscopy on Passivated U Surfaces
Nelson, A.; Moberlychan, W.; Bliss, R. A.; Siekhaus, W.; Felter, T.; Dec. 13, 2006; 7 pp.; In English
Report No.(s): DE2007-902332; UCRL-PROC-226789; No Copyright; Avail.: National Technical Information Service (NTIS)

X-ray absorption spectroscopy and electron energy loss spectroscopy are complementary analytical techniques on energy and spatial resolution. These techniques are based on the same fundamental physical process of core excitation with either an incident photon or incident electron. In the proper experimental configuration the electron and photon inelastic scattering amplitudes are comparable and thus the x-ray and electron absorption edges look identical. We have applied these two complementary analytical techniques to investigate the electronic structure of C ion implanted U. Implantation of C+ ions into U238 has been shown to produce a physically and chemically modified surface layer that passivates the surface preventing further air oxidation and corrosion. Comparison of the resultant spectra reveal that transitions between the initial state and a series of final states yield numerous strong features at the absorption edge that can provide structural information and information on the local chemical environment, including the character of the U 5f state.
NTIS
Absorption Spectroscopy; Electron Energy; Energy Dissipation; Spectroscopy; X Ray Absorption

20080017836 Oxford Univ., Oxford, UK
Physics with Tau Leptons at CDF
Hays, C. P.; Jan. 01, 2007; 6 pp.; In English
Report No.(s): DE2007-902872; FERMILAB-CONF-06-534-E; No Copyright; Avail.: National Technical Information Service (NTIS)

No abstract available
Leptons; Particle Collisions

20080017849 Sandia National Labs., Albuquerque, NM USA
Atomistic Simulations of Brittle Crack Growth
Hoyt, J. J.; Apr. 01, 2007; 7 pp.; In English
Report No.(s): DE2007-908078; SAND2007-0901; No Copyright; Avail.: National Technical Information Service (NTIS)

Ceramic materials such as lead zirconium titanates (PZT), low temperature co-fired ceramics and silica glasses are used in several of Sandias mission critical components. Brittle fracture, either during machining and processing or after many years in service, remains a serious reliability and cost issue. Despite its technological importance, brittle fracture remains poorly understand, especially the onset and propagation of sub-critical cracks. However, some insights into the onset of fracture can be gleaned from the atomic scale structure of the amorphous material. In silica for example, it is well known (1) that the Si-O-Si bonds are relatively weak and, in angle distribution functions determined from scattering experiments, the bonds exhibit a wide spread around a peak at 150 degrees. By contrast the O-Si-O bonds are strong with a narrow peak in the distribution around the 109 degrees dictated by the SiO4 tetrahedron. In addition, slow energy release in silica, as deduced from dissolution experiments, depends on the distribution of 3-fold and higher rings in the amorphous structure (2). The purpose of this four month LDRD project was to investigate the atomic structure of silica in the bulk and in the vicinity of a crack tip using molecular dynamics simulations. Changes in the amorphous structure in the neighborhood of an atomically sharp tip may provide important clues as to the initiation sites and the stress intensity required to propagate a sub-critical crack.
NTIS
Brittleness; Ceramics; Crack Propagation; Cracks; Lead Zirconate Titanates; Silicon; Simulation

20080017869 Fletcher Yoder, Houston, TX, USA
System and Method for Cooling a Super Conducting Device
Bray, J. W., Inventor; Steinbach, A. E., Inventor; Dawson, R. N., Inventor; Laskaris, E. T., Inventor; Huang, X., Inventor; Mar. 30, 2004; 11 pp.; In English
Contract(s)/Grant(s): DE-FC36-02GO011100

Patent Info.: Filed Filed 30 Mar 04; US-Patent-Appl-SN-10-813-366
Report No.(s): PB2007-105276; No Copyright; Avail.: CASI: A03, Hardcopy

A system and method for cooling a superconductive rotor coil. The system comprises a rotatable shaft coupled to the superconductive rotor coil. The rotatable shaft may comprise an axial passageway extending through the rotatable shaft and a first passageway extending through a wall of the rotatable shaft to the axial passageway. The axial passageway and the first passageway are operable to convey a cryogenic fluid to the superconductive rotor coil through the wall of the rotatable shaft. A cryogenic transfer coupling may be provided to supply cryogenic fluid to the first passageway.
NTIS
Cooling; Patent Applications; Rotors; Superconductors (Materials)

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*.

20080016694 Fermi National Accelerator Lab., Batavia, IL, USA; California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Performance of the CDF Calorimeter Simulation in Tevatron Run II
Fernandez, P. A. M.; Jan. 01. 2006; 8 pp.; In English
Report No.(s): DE2007-892495; FERMILAB-CONF-06-258-E; No Copyright; Avail.: National Technical Information Service (NTIS)

The CDF experiment is successfully collecting data from pp collisions at the Tevatron in Run II. As the data samples are getting larger, systematic uncertainties due to the measurement of the jet energy scale assessed using the calorimeter simulation have become increasingly important. In many years of operation, the collaboration has gained experience with GFLASH, a fast parametrization of electromagnetic and hadronic showers used for the calorimeter simulation. We present the performance of the calorimeter simulation and report on recent improvements based on a refined in situ tuning technique. The central calorimeter response is reproduced with a precision of 1-2%.
NTIS
Calorimeters; Simulation; Particle Collisions; Particle Accelerators

20080016711 Illinois Univ., Chicago, IL, USA
Search for the Higgs Boson in the ZH Channel with the D-Zero Detector at the Fermilab Tevatron Collider
Heinmiller, J. M.; Jan. 01, 2007; 280 pp.; In English
Report No.(s): DE2007-903138; No Copyright; Avail.: National Technical Information Service (NTIS)

This analysis describes a search for a standard model Higgs boson produced in association with a Z boson through the decay mode ZH right arrow e(sup +)e(sup -) bb in pp collisions at sqare root of s = 1:96 TeV at the Fermilab Tevatron Collider. The data sample used in this analysis corresponds to 452 pb to the minus 1 power of integrated luminosity accumulated with the D0 detector. Agreement between data and standard model predictions is observed. A 95% confidence level upper exclusion limit for the sigma(pp right arrow ZH) times BR(H right arrow bb) channel is set between 3.2-8.2 pb for Higgs masses of 105 to 145 GeV.
NTIS
Higgs Bosons; Particle Accelerators; Particle Collisions

20080016727 Kyungpook National Univ., Taegu, Korea, Republic of
Non Susy Searches at the Tevatron
Kim, J.; Jan. 01, 2006; 4 pp.; In English
Report No.(s): DE2007-901947; FERMILAB-CONF-06-529-E; No Copyright; Avail.: National Technical Information Service (NTIS)

While the Standard Model (SM) of particle physics has been tested sucessfully with very precise measurements, there are still many questions remained open, for instance the number of lepton and quark generations, their mass hierarchy or a unified description of all gauge symmetry. The searches to new particles in high energy experiments have been performed in an attempt to resolve in a way, in which mostly done with direct comparison of data and the SM background predictions using final state signatures as hadronic jets, charged and neutral leptons. In search results so far from D0 and CDF collider

experiments at Fermilab, no significant excesses have been found and we set the limit on the model dependent way.
NTIS
Bosons; Particle Accelerators; Standard Model (Particle Physics)

20080016728 Florida Univ., Gainesville, FL, USA; Fermi National Accelerator Lab., Batavia, IL, USA
Physics at the Tevatron
Field, R.; Apr. 01, 2006; 48 pp.; In English
Report No.(s): DE2007-901949; FERMILAB-CONF-06-530-E; No Copyright; Avail.: National Technical Information Service (NTIS)

The theme of the XXXIV International Meeting on Fundamental Physics held in El Escorial, Spain on April 2-7, 2006 was From HERA and the TEVATRON to the LHC. This is a summary of the four lectures I presented on Physics at the Tevatron. Heavy quark production and the production of photons, bosons, and jets at the Tevatron are discussed. Also, a detailed study at the underlying event at CDF is presented together with a discussion of PYTHIA 6.2 tunes. A look back at the old days of Feynman-Field collider phenomenology is included.
NTIS
Elementary Particles; High Energy Interactions; Particle Accelerators

20080016778 Fermi National Accelerator Lab., Batavia, IL, USA
High Precision Double Tubed Hydrostatic Leveling System for Accelerator Alignment Applications
Singatulin, S.; Volk, J.; Shiltsev, V.; Jan. 01, 2007; 9 pp.; In English
Report No.(s): DE2007-903418; FERMILAB-CONF-06-508-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

Since 1998 several hydrostatic leveling systems (HLS) have been installed in different locations at Fermilab. This work was in collaboration with Budker Institute and SLAC. All systems were either half-filled pipe (HF) or full-filled pipe (FF). Issues assembling HLS are covered in this article. An improved and cost-effective water system with temperature stabilized of water media is presented. This proposal is a double-tube full-filled DT-FF system. Examples of hardware configurations are included for systems located at Fermilab.
NTIS
Alignment; Hydrostatics; Leveling; Particle Accelerators; Precision

20080016814 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Recent Results from RHIC & Some Lessons for Cosmic-Ray Physicists
Klein, S. R.; Oct. 01, 2006; 8 pp.; In English
Contract(s)/Grant(s): DE-AC02-05CH11231
Report No.(s): DE2007-902025; LBNL--62046; No Copyright; Avail.: National Technical Information Service (NTIS)

The Relativistic Heavy Ion Collider (RHIC) studies nuclear matter under a variety of conditions. Cold nuclear matter is probed with deuteron-gold collisions, while hot nuclear matter (possibly a quark-gluon plasma (QGP)) is created in heavy-ion collisions. The distribution of spin in polarized nucleons is measured with polarized proton collisions, and photoproduction is studied using the photons that accompany heavy nuclei.
NTIS
Cosmic Rays; Heavy Ions; Ionic Collisions; Nucleons; Matter (Physics); Photoproduction

20080016815 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Longitudinal Spin Transfer in Inclusive Lambda and Lambda Barproduct Ion in Polarized Proton-Proton Collisions at sqrt s = 200GeV
Xu, Q.; Oct. 01, 2006; 4 pp.; In English
Contract(s)/Grant(s): DE-AC02-05CH11231
Report No.(s): DE2007-902029; LBNL--62052; No Copyright; Avail.: National Technical Information Service (NTIS)

This contribution reports on a proof-of principle measurement of the longitudinal spin in inclusive lambda and lambda production in polarized proton-proton collisions at a center of mass energy at sqrt s = 200 GeV.
NTIS
Ionic Collisions; Nucleon-Nucleon Interactions; Proton-Proton Reactions; Polarization

20080016992 Stanford Linear Accelerator Center, Menlo Park, CA, USA
Measurement of the Hadronic Form factor in D(sup O) to K(sup -)e(sup +)nu(sub e) Decays
Aubert, B.; Bona, M.; Boutigny, D.; Karyotakis, Y.; Lee, J. P.; Apr. 01, 2007; 21 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-902100; SLAC-PUB-12417; No Copyright; Avail.: National Technical Information Service (NTIS)
Measurements of exclusive semileptonic D decays provide an accurate determination of the hadronic form factors entering in these decays.
NTIS
Hadrons; Particle Decay

20080017076 Fermi National Accelerator Lab., Batavia, IL, USA
D Phi QCD Studies
Voutilainen, M.; Jan. 01, 2006; 4 pp.; In English
Report No.(s): DE2007-897178; FERMILAB-CONF-06-363-E; No Copyright; Avail.: National Technical Information Service (NTIS)
A number of recent measurements from D that can be used to constrain parton distributions and tune QCD Monte Carlo models are presented. The selection includes W charge asymmetry, Z+jet event properties, dijet azimuthal decorrelations and the inclusive jet cross section.
NTIS
Quantum Chromodynamics; Partons

20080017079 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Study of the OCS6 Lattice Using Frequency Maps
Reichel, I.; Jan. 02, 2007; 24 pp.; In English
Report No.(s): DE2007-902149; LBNL-62173; No Copyright; Avail.: National Technical Information Service (NTIS)
Frequency maps are employed to study the baseline damping ring lattice. The study is aimed at understanding the reduced dynamic aperture in the lattice with four short straight sections compared to the one with eight short straight sections. Measures to increase the dynamic aperture based on results of this study are suggested.
NTIS
Apertures; Damping; Frequencies

20080017285 Stanford Linear Accelerator Center, Menlo Park, CA, USA
Measurement of the CKM Angle Gamma with B-+ Approaches D(*)(K0(s) Pi - Pi+)K(*)-+Decays in BaBar
Martinez-Vidal, F.; May 2007; 5 pp.; In English
Report No.(s): DE2007-907720; SLAC-PUB-12517; No Copyright; Avail.: National Technical Information Service (NTIS)
This document reports on the measurement of the Cabibbo-Kobayashi-Maskawa angle gamma through a Dalitz analysis of neutral D decays.
NTIS
High Energy Interactions; Invariance; Standard Model (Particle Physics); CP Violation

20080017287 Stanford Linear Accelerator Center, Menlo Park, CA, USA; Perugia Univ., Perugia, Italy
CP Violation in B Decays
Biasini, M.; May 2007; 8 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-907722; SLAC/PUB-12513; No Copyright; Avail.: National Technical Information Service (NTIS)
We present recent results on CP violation in the B meson system from the BaBar experiment at the PEP II asymmetric e(+)e(-) collider. We discuss the study of CP violation in B-mixing and present measurements of unitarity-triangle angles and constraints.
NTIS
CP Violation; Invariance; Mesons; Particle Decay

80
SOCIAL AND INFORMATION SCIENCES (GENERAL)

Includes general research topics related to sociology; educational programs and curricula. For specific topics in these areas see *categories 81 through 85*.

20080017108 Florida Univ., Gainesville, FL, USA
Non-Official Roads Dilemma in Amazonia
Perz, Stephen G.; Arima, Eugenio; Souza, Carlos, Jr.; Caldas, Marcellus; Brandao, Amintas de O., Jr.; Araujo de Souza, Francisco Kennedy; Walker, Robert; Ciencia Hoje [Science Today]; [2005]; Volume 37, No. 222, pp. 56-58; In Portuguese Contract(s)/Grant(s): NCC5-694; Copyright; Avail.: Other Sources; Abstract Only

At the beginning of this millennium, 'non-official' roads predominate in Amazonia. The opening of these roads, a phenomenon that has not been studied in depth, represents a major dilemma - it generates environmental and social impacts, but it helps to reduce the isolation of the communities in Amazonia and to improve the quality of life for those rural populations. The combined positive and negative aspects of this dilemma mean that it is a matter of crucial importance for the government at last to do a proper job in building these roads; if this is disregarded, in the future, the environment and the Brazilians living in that region will be at risk.
Transl. by Schreiber
Amazon Region (South America); Roads; Environment Effects; Man Environment Interactions; Social Factors; Social Isolation

20080017128 National Inst. of Information and Communications Technology, Tokyo, Japan
Review of the National Institute of Information and Communications Technology, Volume 53, No. 3
September 2007; ISSN 1349-3191; 166 pp.; In English; See also 20080017129 - 20080017143; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

Topics covered include: Information Access Technologies for Processing a Very Large Number of Natural Language Documents; Automatic Construction Technology for Parallel Corpora; Acquisition of Taxonomic Relations among Words from Huge Corpora and Its Application; Development of Language Resources for Natural Language Processing in Deep Level; Fusion of Communication Content and Broadcast Content; Digital Content Embedded in Real World Environment and Its Utilization Technologies; Basic Study for Cognition and Manipulation of the Body Image; Cognitive Mechanisms of Preverbal Communication; Interaction Analysis at the Dialog by Nonverbal Behavior; Outdoor Environment Recognition and Semi-Autonomous Mobile Vehicle for Supporting Mobility of the Elderly and Disabled People; Barrier-Free on the Mobility and the Information for Visually Impaired People and Hearing Impaired People; Universal Designed Mobility Support Geographic Information System for All Pedestrians; Distributed and Cooperative Service Platforms for Home Network Services; Real Living Experiments with Conversational Robots at Ubiquitous-Home; and A Looking-for-Objects Service in Ubiquitous Home.
Derived from text
Autonomy; Cognition; Data Processing; Embedding; Geographic Information Systems; Natural Language (Computers); Taxonomy

20080017129 National Inst. of Information and Communications Technology, Japan
Universal Designed Mobility Support Geographic Information System for All Pedestrians
Yairi, Ikuko Euguchi; Igi, Seiji; Review of the National Institute of Information and Communications Technology, Volume 53, No. 3; September 2007, pp. 117-125; In Chinese; See also 20080017128; Copyright; Avail.: Other Sources

This paper introduces Mobility Support GIs which provides the accessibility information of routes for all pedestrians including the disabled and elderly people. We have developed universal-designed data of barrier/barrier-free terrains and facilities which1 satisfies all pedestrians' needs for routes and area accessibility information retrieval, and collected the data of barrierlbarrier-free objects in Koganei City (approx. 12 sq km) and famous sight-seeing area of Kyoto (approx. 2 sq km) by exploring roads. These prototype systems have intelligent user interface which offers suitable accessibility information to all pedestrians with different physical difficulties and preferences. Our final goal is to publish the GIs development knowhow as a guideline, to release software tools for developing and managing the GIs and to propose the universal database as a Japanese standard.
Author
Geographic Information Systems; Visual Perception; Support Systems; Mobility; Routes

20080017130 National Inst. of Information and Communications Technology, Japan

Barrier-Free on the Mobility and the Information for Visually Impaired People and Hearing Impaired People

Oyama, Shin'ya; IGI, Seiji; Nishimura, Takuichi; Yari, Ikiko Eguchi; Review of the National Institute of Information and Communications Technology, Volume 53, No. 3; September 2007, pp. 109-115; In Chinese; See also 20080017128; Copyright; Avail.: Other Sources

We have been developing Robotic Communication Terminals (RCT) which support the self-mobility of the elderly and disabled people. One of the terminals we developed is 'user-carried mobile terminal' which gives the information such as the navigation to visually and hearing impaired people who can walk by themselves. In this paper, we introduce the animation system to show the sign language for hearing impaired people and the voice guidance system for visually impaired people with the infrared communication and AM radio communication.

Author

Robotics; Radio Communication; Telecommunication; Mobility; Disabilities; Navigation

20080017131 National Inst. of Information and Communications Technology, Japan

Digital Content Embedded in Real World Environment and Its Utilization Technologies

Kidawara, Yutaka; Kadobayashi, Rieko; OH, Sooyeon; Kawai, Yukiko; Kanjo, Daisuke; Nakamura, Satoshi; Minakuchi, Mitsuru; Adam Jatowt; Zettsu, Koji; Review of the National Institute of Information and Communications Technology, Volume 53, No. 3; September 2007, pp. 63-71; In Chinese; See also 20080017128; Copyright; Avail.: Other Sources

The Interactive Media and Contents Group focused on merger technology communications and broadcasting in previous NICT five years projects. We also focused on transition of network environment from broadband to ubiquitous, and developed a lot of technologies. The research group mainly concentrated on development a basic technology, publishing of research papers, and giving a significant technical impact internationally. We have already published 246 journal and refereed papers. Some of papers are accepted the highest top conference such as WWW conference and ACM Multimedia. Additionally, the outcome is not only academic but also practical such as 51 patents and 2 technical transfer to private company. We also give high impacts to industry. We describe our digital content merged into real-world and it's utilization technology, which is selected from research activities in the Interactive Media and Contents group.

Author

Embedding; Information Retrieval; Technology Transfer; Technology Utilization; Communication; Information Flow

20080017132 National Inst. of Information and Communications Technology, Japan

Automatic Construction Technology for Parallel Corpora

Utiyama, Masao; Tanimura, Midori; Review of the National Institute of Information and Communications Technology, Volume 53, No. 3; September 2007, pp. 23-28; In Chinese; See also 20080017128; Copyright; Avail.: Other Sources

We have aligned Japanese and English news articles and sentences, extracted from the Yomiuri and the Daily Yomiuri newspapers, to make a large parallel corpus. We first used a method based on cross-lingual information retrieval to align the Japanese and English articles and then used a method based on dynamic programming (DP) matching to align the Japanese and English sentences in these articles. However, the articles and sentences included many incorrect alignments. To remove these, we propose two measures that evaluate the validity of the alignments. Using these measures, we successfully extracted valid article and sentence alignments.

Author

Sentences; Information Retrieval; Dynamic Programming; Alignment

20080017133 National Inst. of Information and Communications Technology, Japan

Real Living Experiments with Conversational Robots at Ubiquitous-Home

Ueda, Hirotada; Minoh, Michihiko; Chikama, Masaki; Satake, Junji; Kobayashi, Akihiro; Miyawaki, Kenzaburo; Matsumoto, Naoko; Kidode, Masatsugu; Review of the National Institute of Information and Communications Technology, Volume 53, No. 3; September 2007, pp. 145-152; In Chinese; See also 20080017128; Copyright; Avail.: Other Sources

The situation recognition ability of the robot is enhanced by connecting a home ubiquitous network and conversational robots and context-aware services can be provided suitably. By taking such an approach, the situation explanation ability of the robot is also enhanced by acquiring information through the network. The new development of the human robot interaction can be expected in total. In this paper we describe a prototype system that is developed in the Ubiquitous-Home based on such

a concept. Then, the study of the actual proof experimental life in the house is discussed.
Author
Conversation; Robots; Prototypes

20080017134 National Inst. of Information and Communications Technology, Japan
Fusion of Communication Content and Broadcast Content
Miyamori, Hisashi; Kumamoto, Tadahiko; Nadamoto, Akiyo; Sumi, Kaoru; Nakamura, Satoshi; Qiang, Ma; Minakuchi, Mitsuru; Tanaka, Katsumi; Review of the National Institute of Information and Communications Technology, Volume 53, No. 3; September 2007, pp. 53-61; In Chinese; See also 20080017128; Copyright; Avail.: Other Sources

This paper explains an overview of research results of 'Fusion of Communication Content and Broadcast Content', one of the two main pillars of 'Content Fusion' research project conducted at the Interactive Communication and Media Contents Group of NICT. 'Fusion of Communication and Broadcast' is a conventional keyword which means technology of converging communication and broadcasting networks as an infrastructure, whereas 'Fusion of Communication and Broadcast Content' represents a technology of converging Web content and TV programs at content level. Fundamental technologies and model systems were established which can efficiently utilize Internet and TV programs without complicated operations even for people who are not familiar with computer operation, such as efficient methods of accessing information and utilization methods of newly added value of information, towards the age of multitude content of TV programs and Web content available in daily lives.
Author
Broadcasting; Television Systems; World Wide Web; Web Services

20080017135 National Inst. of Information and Communications Technology, Japan
Information Access Technologies for Processing a Very Large Number of Natural Language Documents
Murata, Masaki; Review of the National Institute of Information and Communications Technology, Volume 53, No. 3; September 2007, pp. 15-21; In Chinese; See also 20080017128; Copyright; Avail.: Other Sources

We have developed various information access technologies for information retrieval, information extraction (text mining), question answering, and document classification used in processing natural language documents. The effectiveness of these technologies was confirmed when they produced the highest level of precision in the NTCIR evaluation workshop. As the number of electronic documents continues to increase, these information access technologies will become increasingly useful.
Author
Data Mining; Information Retrieval; Natural Language (Computers); Documents; Knowledge Representation

20080017136 National Inst. of Information and Communications Technology, Japan
A Looking-for-Objects Service in Ubiquitous Home
Fujii, Tetsuya; Ueda, Hirotada; Minoh, Michihiko; Review of the National Institute of Information and Communications Technology, Volume 53, No. 3; September 2007, pp. 153-158; In Chinese; See also 20080017128; Copyright; Avail.: Other Sources

We have constructed test bed for proof experiment in real home environment 'Ubiquitous home' which have appliances and network and embedded many sensors in home environment. And we have done the proof experiments of home network interconnection and dynamic information services (distributed home network services) which cooperates siensors, home robots, the consumer electronics and appliances. In this paper, we describe a looking-for-objects service system which analyze the relationship of human and objects, and the change of the continuity of human behavior with the embedded sensors in ubiquitous home (especially floor pressure sensor) and find the place of lost properties. We examined the effectiveness of a looking-for -objects service by using sensor information in real family life scene at Ubiquitous home.
Author
Information Systems; Human Behavior; Robots; Proving; Pressure Sensors

20080017137 National Inst. of Information and Communications Technology, Japan
Outdoor Environment Recognition and Semi-Autonomous Mobile Vehicle for Supporting Mobility of the Elderly and Disabled People
Kayama, Kentaro; Yairo, Ikuko Eguchi; Igi, Seiji; Review of the National Institute of Information and Communications Technology, Volume 53, No. 3; September 2007, pp. 99-107; In Chinese; See also 20080017128; Copyright; Avail.: Other Sources

Elderly and disabled people with impaired vision, hearing, and mobility often find it difficult to get around because their

physical impairment mean that they partially lack the three elemental abilities necessary for mobility, i.e., recognition of the environment, actuation through their legs, and ready access to information for navigation. We developed Robotic Comrn~dnication Terminals (RCT) as a system to support these three elemental abilities comprehensively for mobility outdoors. General road observation system and semi-autonomous outdoor mobile vehicle (Intelligent City Walker, ICW) are some components of the RCT. General road observation system detects various types of moving objects for all times and weathers by a camera mounted about 5 meters above the ground alongside a road. ICW, which is based on commercial electric scooter and equipped with variable sensors and interfaces, can avoid obstacles semi-autonomously. We also performed field experiments on public roads by cooperating these terminals.
Author
Disabilities; Robotics; Mobility; Navigation; Age Factor; Autonomy; Access Time

20080017140 National Inst. of Information and Communications Technology, Japan
Development of Language Resources for Natural Language Processing in Deep Level
Zhang, Yujie; Kuroda, Kow; Izumi, Emi; Nozawa, Hajime; Review of the National Institute of Information and Communications Technology, Volume 53, No. 3; September 2007, pp. 45-52; In Chinese; See also 20080017128; Copyright; Avail.: Other Sources

Techniques for both text analysis and speech transcription are still in an unsatisfactory state even though they cannot be dispensed with Natural Language Processing. To achieve high performance techniques, a large amount of language resources are urgently required. To resolve this problem, Computational Linguistics Group at NICT has been constructing language resources of several sorts, targeting different cases of application. This paper presents some of such resources, including Corpus Annotated for Semantic Frames and their Elements, Japanese Learner's Corpus, and Japanese-Chinese Parallel Corpus.
Author
Natural Language Processing; Linguistics; Texts; Annotations

20080017141 National Inst. of Information and Communications Technology, Japan
Acquisition of Taxonomic Relations among Words from Huge Corpora and Its Application
Kanzaki, Kyoko; Yamamoto, Eiko; Isahara, Hitoshi; Review of the National Institute of Information and Communications Technology, Volume 53, No. 3; September 2007, pp. 29-37; In Chinese; See also 20080017128; Copyright; Avail.: Other Sources

Thesaurus is very important lexical knowledge for our inference activity. However, we have only thesaurus compiled by human because we didn't have huge corpora and the algorism to organize concepts using such corpora. For sake of a verification of an existing thesaurus made by human, we automatically extract lexical knowledge from huge corpora. In our method, we extracted attribute concepts whose instances are adjectives from corpora and calculated similarity relations by Self-organizing Map and hypernym-hyponym relations by Complimentary Similarity Measures. As a result, we constructed the taxonomic relations of attribute concepts of adjectives on a map. Also we applied our methods to extract related word sets which can be useful for retrieval support. Concretely, in order to extract word sets with thematic relation, we extract related word sets with non-taxonomical relation. Then, we verified the effectiveness of such word sets as key words for information retrieval.
Author
Indexes (Documentation); Words (Language); Thesauri; Taxonomy; Information Retrieval; Grammars; Extraction

20080017357 Prins Maurits Lab. TNO, Soesterberg, Netherlands
Who do we Deploy for Psychological Operations?: A Function Profile for TPT Members
Wetzer, I. M.; vanBemmel, I. E.; January 2008; 2 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): V401; TNO Proj. 032.10192
Report No.(s): TD2007-0293; TNO-DV 2007 A542; Copyright; Avail.: Other Sources

Purpose; Within the Defense research program V401 'Information Operations for the Army TNO Defense, Security and Safety has conducted research on many aspects of Psychological Operations. The purpose of this report is to develop a function profile for members of Tactical PSYOPS Teams. Methods; The function profile is based on the competence framework developed earlier by TNO for Defense. Besides this framework, profiles from related functions were combined with knowledge on PSYOPS acquired by TNO to come to the final function profile. Results; We describe 1) a function profile for TPT members and 2) an example of how to measure these competences. Conclusions; This function profile describes

personality characteristics and competences that are relevant for TPT members. Each personality characteristic and each competence is defined. and behavioral indicators are described in which they reflect. In addition, a method that enables to measure them is described.
Author
Personality; Personnel Selection; Psychological Tests; Psychology

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ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20080017061 Geological Survey, Reston, VA USA
Performance Audit of the U.S. Geological Survey, Energy Resource Program Inorganic Geochemistry Laboratory
Luppens, J. A.; Janke, L. G.; McCord, J. D.; Bullock, J. H.; Brazeau, L.; Jan. 01, 2007; 93 pp.; In English
Report No.(s): PB2007-112148; USGS-OFR-2007-1136; No Copyright; Avail.: National Technical Information Service (NTIS)

A performance audit of the U.S. Geological Survey (USGS), Energy Resource Program (ERP) Inorganic Geochemistry Laboratory (IGL) was conducted between August, 2003 and October, 2005. The goals were to ensure that a high level of analytical performance was maintained and identify any areas that could be enhanced. The audit was subdivided into three phases. Phase 1 was a preliminary assessment of current performance based on recent performance on CANSPEX samples. IGL performance was also compared to laboratories worldwide with similar scope. Phase 2 consisted of the implementation of the recommended changes made in Phase 1. Phase 3 of the audit consisted of a reassessment effort to evaluate the effectiveness of the recommendations made in the Phase 1 and an onsite audit of the laboratory facilities. Phases 1 and 3 required summary reports that are included in Appendices A and B of this report. The audit found that the IGL was one of the top two laboratories compared for trace element analyses. Several recommendations to enhance performance on major and minor elemental parameters were made and implemented. Demonstrated performance improvements as a result of the recommended changes were documented. Several initiatives to sustain the performance improvements gained from the audit have been implemented.
NTIS
Geochemistry; Geological Surveys

20080017419 Government Accountability Office, Washington, DC, USA
Human Capital: Transforming Federal Recruiting and Hiring Efforts
Goldenkoff, Robert N.; May 08, 2008; 17 pp.; In English
Report No.(s): GAO-08-762T; No Copyright; Avail.: CASI: A03, Hardcopy

To address the challenges that the nation faces, it will be important for federal agencies to change their cultures and create the institutional capacity to become high-performing organizations. This includes recruiting and retaining a federal workforce able to create, sustain, and thrive in organizations that are flatter, results-oriented, and externally focused. In 2001, GAO identified strategic human capital management as a government-wide high-risk area because federal agencies lacked a strategic approach to human capital management that integrated human capital efforts with their missions and program goals. Although progress has been made since that time, strategic human capital management still remains a high-risk area. This testimony, based on a large body of completed work issued from January 2001 through April 2008, focuses on (1) challenges that federal agencies have faced in recruiting and hiring talented employees, (2) progress in addressing these challenges, and (3) additional actions that are needed to strengthen recruiting and hiring efforts. In its prior reports, GAO has made a range of recommendations to the Office of Personnel Management (OPM)--the government s personnel agency--and to agencies in such areas as hiring, workforce planning, and diversity management; a number of these recommendations have since been implemented. GAO is making no new recommendations at this time.
Author
Personnel; Personnel Management; Management Planning; United States; Governments

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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*.

20080016635 Government Accountability Office, Washington, DC, USA
Information Technology: Immigration and Customs Enforcement Needs to Fully Address Significant Infrastructure Modernization Program Management Weaknesses
Apr. 01, 2007; 71 pp.; In English
Report No.(s): PB2007-111089; GAO-07-565; No Copyright; Avail.: CASI: A04, Hardcopy

The Department of Homeland Security (DHS) fiscal year 2006 appropriations act provided $40.15 million for the Immigration and Customs Enforcement's (ICE) program to modernize its information technology (IT) infrastructure. As mandated by the appropriations act, the department is to develop and submit for approval an expenditure plan for the program, referred to as 'Atlas,' that satisfies certain legislative conditions, including a review by GAO. In performing its review of the Atlas plan, GAO (1) determined whether the plan satisfies certain legislative conditions and (2) provided other observations about the plan and management of the program. To do this, GAO analyzed the fiscal year 2006 Atlas expenditure plan and supporting documents against the legislative conditions, federal requirements, and related best practices. GAO also interviewed relevant DHS officials. The fiscal year 2006 Atlas expenditure plan, in combination with related program documentation and program officials' statements, satisfies or partially satisfies the legislative conditions set forth by Congress. This satisfaction, however, is based on plans and commitments that provide for meeting these conditions rather than on completed actions to satisfy them. For example, to address the legislative condition related to capital planning and investment control review requirements, the program plans to, among other things, update its cost-benefit analysis in September 2007 to reflect emerging requirements and other program changes and to complete a privacy impact assessment by April 2007. In addition, the program is in the process of defining how it plans to use its independent verification and validation agent. GAO also observed that DHS has not implemented key system management practices.
NTIS
Ice; Information Systems; Procurement; Project Management; Security

20080016645 Agricultural Research Service, Beltsville, MD, USA
National Agricultural Library 2003
Mar. 01, 2007; 34 pp.; In English
Report No.(s): PB2007-111374; No Copyright; Avail.: CASI: A03, Hardcopy

This document summarizes the accomplishments of the National Agricultural Library in 2003.
NTIS
Agriculture; Data Bases; Information Systems; Libraries

20080016816 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Colour Picking: The Pecking Order of Form and Function
Nack, F. M.; Manniesing, A. S. K.; Hardman, H. L.; Apr. 30, 2003; 20 pp.; In English
Report No.(s): PB2007-111346; INS-R0303; Copyright; Avail.: National Technical Information Service (NTIS)

Multimedia presentation generation has to be able to balance the functional aspects of a presentation that address the information needs of the user, and its aesthetic form. We demonstrate our approach using automatic colour design for which we integrate relevant aspects of colour theory. Colour selection takes the relative importance of form and function into account through the use of weights in the generation process. We do not provide a definition of the relative importance of form versus function, but seek to explore the roles of subjective elements in the generation process.
NTIS
Color; Multimedia

20080016817 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Rule Discovery: Tough, Not Meaningless
Struzik, Z. R.; Apr. 30, 2003; 14 pp.; In English
Report No.(s): PB2007-111348; INS-R0304; Copyright; Avail.: National Technical Information Service (NTIS)

Model free rule discovery from data has recently been subject to considerable criticism, which has cast a shadow over

the emerging discipline of time series data mining. However, other than in data mining, rule discovery has long been the subject of research in statistical physics of complex phenomena. Drawing from the expertise acquired therein, we suggest explanations for the two mechanisms of the apparent 'meaninglessness' of rule recovery in the reference data mining approach. One reflects the universal property of self-affinity of signals from real life complex phenomena. It further expands on the issue of scaling invariance and fractal geometry, explaining that for ideal scale invariant (fractal) signals, rule discovery requires more than just comparing two parts of the signal. Authentic rule discovery is likely to look for the possible 'structure' pertinent to the failure mechanism of the (position and/or resolution-wise) invariance of the time series analysed. The other reflects the redundancy of the 'trivial' matches, which effectively smoothes out the rule which potentially could be discovered. Orthogonal scale space representations and appropriate redundancy suppression measures over autocorrelation operations performed during the matches are suggested as the methods of choice for rule discovery.
NTIS
Data Mining; Time Series Analysis

20080016822 Center for Mathematics and Computer Science, Amsterdam, Netherlands
SampLe: Towards a Framework for System-Supported Multimedia Authoring
Falkovych, K. I.; Nack, F. M.; van Ossenbruggen, J. R.; Rutledge, L. W.; Aug. 31, 2003; 12 pp.; In English
Report No.(s): PB2007-111343; INS-E0302; Copyright; Avail.: National Technical Information Service (NTIS)
Much current research on hypermedia generation accepts user input only at the start of an otherwise fully-automated process. However, since multimedia presentation creation is often a complex and creative process, it has multiple phases which would each benefit from human intervention. This paper presents a hypermedia generation model that lets the user influence all phases of this computer-assisted human-guided process. The main focus is on providing extra support for helping the user find relevant media items and combine them meaningfully into a rich and coherent multimedia presentation. Like fully-automated systems, our approach uses explicit knowledge about the presentation's topic domain, narrative structures, hypermedia presentation and distinctions between media modalities. This paper presents a motivating scenario that is used to derive a number of system requirements and to discuss the pros and cons of the presented approach.
NTIS
Computer Techniques; Information Systems; Multimedia; Automatic Control

20080016824 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Towards Smart Style: Combining RDF Semantics with XML Document Transformations
van Ossenbruggen, J. R.; Hardman, L.; Rutledge, L. W.; Oct. 27, 2003; 18 pp.; In English
Report No.(s): PB2007-111345; INS-E0303; Copyright; Avail.: National Technical Information Service (NTIS)
The 'Document Web' has established itself through the creation of an impressive family of XML and related languages. In addition to this, the 'Semantic Web' is developing its own family of languages based primarily on RDF. Although these families were both developed specifically for 'the Web', each language family has been developed from different premises with specific goals in mind. The result is that combining both families in a single application is surprisingly difficult. This is unfortunate, since the combination of semantic processing with document processing provides advantages in both directions, namely using semantic inferencing for more intelligent document processing and using document processing tools for presenting semantic representations to an end-user. In this paper, we investigate this integration problem, focusing on the role of (RDF) semantics in selecting, structuring and styling (XML) content. We analyze the approaches taken by two example architectures and use our analysis to derive a more integrated alternative.
NTIS
Document Markup Languages; Semantics

20080016932 National Inst. of Standards and Technology, Gaithersburg, MD USA; National Security Agency, Fort Meade, MD, USA; Saflink Corp., Redmond, WA, USA
Common Biometric Exchange Formats Framework (CBEFF)
Podio, F. L.; Dunn, J. S.; Reinert, L.; Tilton, C. J.; Struif, B.; Apr. 05, 2004; 39 pp.; In English
Report No.(s): PB2007-111235; No Copyright; Avail.: CASI: A03, Hardcopy
This specification, the Common Biometric Exchange Formats Framework, is an augmented and revised version of the original CBEFF, the Common Biometric Exchange File Format, published in January 2001 as NISTIR 6529. This version, NISTIR 6529-A, was developed by the CBEFF team based on the specification approved by the Biometrics Interoperability, Performance, and Assurance Working Group (NIST/BC WG) cosponsored by NIST and the Biometric Consortium. In addition

to the name change, which reflects more accurately the scope of the specification, this revised version incorporates the following new features: A CBEFF Nested Structure; A Subheader/Basic Structure Count; Additional and redefined fields; Two new Formats have been added: 1. Biometric Information Data Objects for Use within Smart Cards or Other Tokens. This format has been defined with the collaboration of technical experts from ISO/IEC JTC 1 SC 17 WG4 and INCITS Technical Committee B10. 2. CBEFF Patron Format B, a simple root header for use in domains where more than one Patron Format, simple or nested, may be encountered. In addition, more detailed information on the concept of CBEFF Patrons, the current list of Patrons and how to apply for a new CBEFF Patron have been added.
NTIS
Biometrics; Format

20080016934 Alan W. Cannon, Sunnvale, CA, USA; California Univ., Berkeley, CA USA
Systems Tools and Methods for Transferring Files and Metadata to and from a Storage Means
Hyun, W., Inventor; Bigos, M., Inventor; Chiang, A., Inventor; Roberts, L., Inventor; Feb. 09, 2005; 16 pp.; In English
Contract(s)/Grant(s): 2R44RRO18043-02
Patent Info.: Filed Filed 9 Feb 05; US-Patent-Appl-SN-11-055 424
Report No.(s): PB2007-105175; No Copyright; Avail.: CASI: A03, Hardcopy

Methods, tools and systems for efficiently and intuitively transferring files from client computers, via a network, to a centralized location for storage of the files as well as storage of metadata associated with the files in a manner such that the metadata as well as the files may be searched in the database by users to identify files of interest.
NTIS
Metadata; Data Bases; Computers

20080017039 Government Accountability Office, Washington, DC, USA
Federal Research: Policies Guiding the Dissemination of Scientific Research from Selected Agencies Should Be Clarified and Better Communicated
May 01, 2007; 102 pp.; In English
Report No.(s): PB2007-111151; GAO-07-653; No Copyright; Avail.: CASI: A06, Hardcopy

Researchers at federal agencies disseminate their research results through a variety of approaches, including scientific publications, presentations, press releases, and media interviews. Because of recent concerns about some federal researchers possibly being restricted from disseminating their research on controversial topics, GAO determined (1) the policies that guide the dissemination of federal research at the National Aeronautics and Space Administration (NASA), the National Institute of Standards and Technology (NIST), and the National Oceanic and Atmospheric Administration (NOAA); (2) how effectively these agencies have communicated their policies to researchers; and (3) the extent to which researchers have been restricted in disseminating their research. GAO conducted a survey of 1,811 researchers randomly selected at the three agencies, and had a 66 percent response rate. Most of the NASA, NIST, and NOAA policies that guide the dissemination of federally funded research generally facilitate the dissemination process, but some do not. GAO found that overall NASA's policies, including its recently revised media policy, are clear and should help facilitate dissemination regardless of the dissemination approach used. At NIST and NOAA, GAO found that the agencies' policies for dissemination through publications and presentations were generally clear and should facilitate dissemination; but their policies for disseminating research through media interviews and press releases may hinder it.
NTIS
Information Dissemination; NASA Programs; Policies

20080017444 Geological Survey, Reston, VA USA
Map and Database of Probable and Possible Quaternary Faults in Afghanistan
Ruleman, C. A.; Crone, A. J.; Machette, M. N.; Haller, K. M.; Rukstales, K. S.; Jan. 1, 2007; 45 pp.; In English
Report No.(s): PB2007-112127; USGS-OFR-2007-1103; No Copyright; Avail.: National Technical Information Service (NTIS)

The U.S. Geological Survey (USGS) with support from the U.S. Agency for International Development (USAID) mission in Afghanistan, has prepared a digital map showing the distribution of probable and suspected Quaternary faults in Afghanistan. This map is a key component of a broader effort to assess and map the countrys seismic hazards. Our analyses of remote-sensing imagery reveal a complex array of tectonic features that we interpret to be probable and possible active faults within the country and in the surrounding border region. In our compilation, we have mapped previously recognized

active faults in greater detail, and have categorized individual features based on their geomorphic expression. We assigned mapped features to eight newly defined domains, each of which contains features that appear to have similar styles of deformation. The styles of deformation associated with each domain provide insight into the kinematics of the modern tectonism, and define a tectonic framework that helps constrain deformational models of the Alpine-Himalayan orogenic belt.
NTIS
Afghanistan; Data Bases; Digital Data; Geological Surveys; Maps; Surveys

20080017464 Lawrence Livermore National Lab., Livermore, CA USA
Estimating Missing Features to Improve Multimedia Information Retrieval
Bagherjeiran, A.; Love, N. S.; Kamath, C.; Oct. 08, 2006; 14 pp.; In English
Report No.(s): DE2007-907852; UCRL-CONF-225087; No Copyright; Avail.: National Technical Information Service (NTIS)

Retrieval in a multerent modalities of data, such ascombining text and images. However, all modalities of the data may not be available to form the query. The retrieval results from such a partial query are often less than satisfactory. In this paper, we present an approach to complete a partial query by estimating the missing features in the query. Our experiments with a database of images and their associated captions show that, with an initial text-only query, our completion method has similar performance to a full query with both image and text features. In addition, when we use relevance feedback, our approach outperforms the results obtained using a full query.
NTIS
Estimating; Information Retrieval; Multimedia

20080017844 Sandia National Labs., Albuquerque, NM USA
Cross-Language Information Retrieval Using PARAFAC2
Chew, P. A.; Bader, B. W.; Kolda, T. G.; Abdelali, A.; May 01, 2007; 13 pp.; In English
Report No.(s): DE2007-908061; SAND2007-2706; No Copyright; Avail.: National Technical Information Service (NTIS)

A standard approach to cross-language information retrieval (CLIR) uses Latent Semantic Analysis (LSA) in conjunction with a multilingual parallel aligned corpus. This approach has been shown to be successful in identifying similar documents across languages - or more precisely, retrieving the most similar document in one language to a query in another language. However, the approach has severe drawbacks when applied to a related task, that of clustering documents language-independently, so that documents about similar topics end up closest to one another in the semantic space regardless of their language. The problem is that documents are generally more similar to other documents in the same language than they are to documents in a different language, but on the same topic. As a result, when using multilingual LSA, documents will in practice cluster by language, not by topic. We propose a novel application of PARAFAC2 (which is a variant of PARAFAC, a multi-way generalization of the singular value decomposition (SVD)) to overcome this problem. Instead of forming a single multilingual term-by-document matrix which, under LSA, is subjected to SVD, we form an irregular three-way array, each slice of which is a separate term-by-document matrix for a single language in the parallel corpus. The goal is to compute an SVD for each language such that V (the matrix of right singular vectors) is the same across all languages. Effectively, PARAFAC2 imposes the constraint, not present in standard LSA, that the concepts in all documents in the parallel corpus are the same regardless of language. Intuitively, this constraint makes sense, since the whole purpose of using a parallel corpus is that exactly the same concepts are expressed in the translations.
NTIS
Information Retrieval; Query Languages; Translating; Identifying

20080017873 Banner and Witcoff, Washington, DC, USA; StreamSage, Inc., Washington, DC, USA
Method and System for Indexing and Searching Timed Media Information Based Upon Relevance Intervals
Morton, M. S., Inventor; Sibley, T. V., Inventor; Unger, N. C., Inventor; Rubinoff, R., Inventor; Davis, A. R., Inventor; Feb. 12, 2003; 43 pp.; In English
Contract(s)/Grant(s): 70NANB1H3037
Patent Info.: Filed Filed 12 Feb 03; US-Patent-Appl-SN-10-364-408
Report No.(s): PB2007-105247; No Copyright; Avail.: CASI: A03, Hardcopy

A method and system for indexing, searching, and retrieving information from timed media files based upon relevance intervals. The method and system for indexing, searching, and retrieving this information is based upon relevance intervals so that a portion of a timed media file is returned, which is selected specifically to be relevant to the given information

representations, thereby eliminating the need for a manual determination of the relevance and avoiding missing relevant portions. The timed media includes streaming audio, streaming video, timed HTML, animations such as vector-based graphics, slide shows, other timed media, and combinations thereof.
NTIS
Document Markup Languages; Manuals; Information Systems; Information Retrieval

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ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

20080017222 Government Accountability Office, Washington, DC, USA
NASA: Challenges in Completing and Sustaining the International Space Station
Chaplain, Cristina T.; April 24, 2008; 26 pp.; In English; Original contains black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

The International Space Station (ISS), the most complex scientific space project ever attempted, remains incomplete. NASA expects the station's final construction cost will be $31 billion and expects sustainment costs through the station's planned retirement in fiscal year 2016 to total $11 billion. The space shuttle, the only vehicle capable of transporting large segments of the station into orbit, is critical to its completion. NASA plans to complete ISS assembly and retire the shuttle in 2010 in order to pursue a new generation of space flight vehicles, which will not begin to be available until 2015. To provide crew rotation and logistical support during this 5-year gap, NASA plans to rely on spacecraft developed by the commercial sector and other countries. In light of these circumstances, GAO examined the risks and challenges NASA faces in (1) completing assembly of the ISS by 2010 and (2) providing logistics and maintenance to the ISS after 2010. GAO's work to accomplish this included reviewing budget, planning, and other documents from NASA; reviewing NASA officials testimonies; and interviewing NASA and foreign space program officials.
Author
Costs; International Space Station; NASA Space Programs; Construction; Economic Analysis

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TECHNOLOGY UTILIZATION AND SURFACE TRANSPORTATION

Includes aerospace technology transfer; urban technology; surface and mass transportation. For related information see also *03 Air Transportation and Safety, 16 Space Transportation and Safety*, and *44 Energy Production and Conversion*. For specific technology transfer applications see also the category where the subject is treated.

20080017143 National Inst. of Information and Communications Technology, Japan
Distributed and Cooperative Service Platforms for Home Network Services
Yamazaki, Tatsuya; Sawada, Atsuchi; Nishimura, Toshikazu; Takaoka, Masanori; Tajika, Yosuke; Minoh, Michihiko; Review of the National Institute of Information and Communications Technology, Volume 53, No. 3; September 2007, pp. 135-144; In Chinese; See also 20080017128; Copyright; Avail.: Other Sources

In the UKARI (Universal Knowledgeable Architecture for Real-life appliances) project, we studied and developed distributed and cooperative service platforms for home network services, which provide services by cooperating functions from networked appliances (NWs). The NAs include consumer appliances as well as sensors, robots, and so on. Main research results were 'Ukari-Core' and 'Ukari-Kernel', which constitute the platforms. UKARI-Core is (a middleware with must and core modules of distributed function cooperation. UKARI-Kernel is, moreover, another middleware as an extension of UKARI-Core with additional functions for flexible user adaptation. We implemented the middleware into various kinds of real appliances and constructed home network services in a real environment to evaluate the efficiency of the proposed service platforms.
Author
Consumers; Web Services; Networks; Technology Utilization

20080017372 MM Associates, Moffett Field, CA, USA

Commercialization of Nanotechnology

Meyyappan, M.; Nanotechnology Aerospace Applications; March 2007, pp. 10-1 - 10-4; In English; See also 20080017367; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Nanotechnology is an enabling technology and as such, will have an impact on electronics, computing, data storage, communications, materials and manufacturing, energy, environment, transportation, health and medicine, national security and space exploration. This lecture will cite examples in each of these sectors and present a forecast of short term (< 5 years), medium term (10 years) and long term (> 15 years) prospects. In addition, the challenges currently being faced to commercialize nanotechnology will be discussed in detail. A summary outlining efforts across the world in terms of commercialization, startup activities, participation of major multinational corporations, government funding etc. will be presented.

Author

Commercialization; Nanotechnology; Nanostructures (Devices); Product Development; Technology Transfer

20080017944 Wooldridge, John P., Kihei, HI, USA

Inductract Configuration

Post, R. F., Inventor; Aug. 27, 2003; 8 pp.; In English

Contract(s)/Grant(s): DE-W-7405-ENE-45

Patent Info.: Filed Filed 27 Aug 03; US-Patent-Appl-SN-10-651 346

Report No.(s): PB2007-105162; No Copyright; Avail.: CASI: A02, Hardcopy

A simple permanent-magnet-excited maglev geometry provides levitation forces and is stable against vertical displacements from equilibrium but is unstable against horizontal displacements. An Inductrack system is then used in conjunction with this system to effect stabilization against horizontal displacements and to provide centering forces to overcome centrifugal forces when the vehicle is traversing curved sections of a track or when any other transient horizontal force is present. In some proposed embodiments, the Inductrack track elements are also employed as the stator of a linear induction-motor drive and braking system.

NTIS

Magnetic Levitation Vehicles; Magnetic Fields; Induction Motors

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*.

20080017367 Research and Technology Organization, Neuilly-sur-Seine, France

Nanotechnology Aerospace Applications

March 2007; In English; Applied Vehicle Technology Panel, 16-17 Oct. 2006, Seattle, WA, USA; See also 20080017368 - 20080017377

Report No.(s): RTO-EN-AVT-129bis; AC/323(AVT-129)TP/108; Copyright; Avail.: CASI: C01, CD-ROM

Topics covered include: Introduction to Nanotechnology; Fabrication for Nanotechnology; Nano Materials; Characterisation; Nanotechnology and Lifestyle; Defence Applications; Nanotechnology in Aerospace Applications; Energetics and Power Generation; MEMS / Nanotechnology Integration for Bio-Medical Applications; and Commercialization of Nanotechnology.

Derived from text

Aerospace Engineering; Microelectromechanical Systems; Nanotechnology; Fabrication

20080017368 Schadow (Klaus), San Clemente, CA, USA

Energetics and Power Generation

Schadow, Klaus; Nanotechnology Aerospace Applications; March 2007, pp. 8-1 - 8-4; In English; See also 20080017367; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A04, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Materials that are produced on the nanoscale have the promise for increased performance for energetics (such as

propellants & explosives) and power generation devices (such as batteries & fuel cells and hydrogen storage). 1. Energetics For solid propellants, nanomaterials promise increased energy density, controlled energy release, reduced sensitivity, reduced environmental impact, and long-term stability (Ref. 1 and 2). In the near-term novel propellants with nanoscale material will be used to reduce particle size dispersion (greater uniformity), reduce agglomeration of aluminum (increased combustion efficiency), and increase reaction rates (increased burning rates). In the long-term radical new propellant approaches will be explored to utilize 3-dimensional nanostructures that might yield controllable energy release and tailorable sensitivity. Novel nanostructured propellants have the potential to combine the advantages of conventional composite and monomolecular propellants (Ref. 3). In conventional propellant composites, oxidizer and fuel are mixed to obtain desired energy properties. However, due to the granular nature the reaction kinetics are slow, as they are controlled by thermal and mass transport between micron and millimeter-sized particles. In monomolecular materials, where the energy release is controlled by chemical kinetics and not by mass transfer, much higher burning rates and greater power can be achieved than composites. The total energy density of monomolecular materials is only half of that achievable with composites. Based on nanotechnology it may be possible to combine the advantages of monomolecular materials (high burning rates) and conventional composites (tailoring of properties and high energy density).
Derived from text
Nanostructures (Devices); Solid Propellants; Reaction Kinetics; Composite Propellants; Combustion Efficiency; Rocket Oxidizers

20080017369 Schadow (Klaus), San Clemente, CA, USA
MEMS/Nanotechnology Integration for Bio-Medical Applications
Schadow, Klaus; Nanotechnology Aerospace Applications; March 2007, pp. 9-1 - 9-6; In English; See also 20080017367; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A04, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The integration of MEMS and nanotechnologies has resulted in new capabilities for environmental monitoring and bio-nano sciences. The capabilities are enabled through a new type class of gas sensors and novel techniques for identifying and manipulating biological cells. After a brief introduction into micromachining, the lecture will discuss three examples each of (1) a new generation of gas sensors with higher sensitivity, lighter weight, and lower power consumption, (2) ultra-sensitive molecular detection and characterization devices, and (3) manipulation techniques for singles cells. 1. Gas Sensors The first sensor example is the use of nanoparticles for conventional tin-oxide gas sensors (Ref. 1). To improve the long-term stability of gas sensors, MicroChemical Systems (MiCS) is manufacturing silicon micromachined gas sensors that combine silicon microstructures with nanomaterials. MiCS deposits precise amounts of nanoparticle metal oxide material as the sensitive layer on a micro-hotplate. Due to the very small grain size, such sensors have high stability and sensitivity. Key elements of the sensor include a sensitive metal oxide layer whose resistance/conductivity changes upon exposure to the gas of interest, a heater that keeps the sensitive layer at a specific temperature, and a thin dielectric membrane with low power consumption. These novel sensors avoid drawbacks of conventional tin/metal oxide semiconductor gas sensors that include compromised selectivity and long-term drift, and temperature/humidity dependence. In the second example, Forschungszentrum Karlsruhe (Ref. 2) has developed a compact electronic nose (KAMINA - KArlsruhe MIcroNOse) based on a highly integrated gradient microarray chip. All segments respond to nearly all gases (except rare gases or nitrogen) with a gradually different sensitivity, even at concentration of less than 1 ppm. The heart of the KAMINA device is a chip consisting of several gradually different gas sensors. The chip carries only one single metal oxide film (tin dioxide or tungsten trioxide) with its electric conductivity at higher temperatures (about 300C for tin oxide) sensitively and reversibly depending on the composition of the ambient gas. The chip is fabricated by partitioning the oxide film with parallel electrode strips, to form an array of individual gas sensor segments.
Author
Microelectromechanical Systems; Micromachining; Nanoparticles; Nanotechnology; Gas Detectors; Detection; Dielectrics; Energy Consumption

20080017370 enablingMNT, Dordrecht, Netherlands
Fabrication for Nanotechnology
vanHeeren, Henne; Nanotechnology Aerospace Applications; March 2007, pp. 2-1 - 2-4; In English; See also 20080017367; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A04, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

There is much discussion what nanotechnology really is: anything produced in the nanometer scale, manipulating atoms or small particles. Seeing the wide variety of materials and fabrication technologies one could better speak of

nanotechnologies. The currently best developed area is the top-down nanofabrication with its base in the semiconductor industry. This industry is rapidly entering the sub nanometer area, and they need increasingly more accurate and therefore more expensive equipment. For semiconductor lithography nanoimprinting can offer a less complex process using more affordable equipment. The process uses a stamp instead of the more commonly used transparent mask. On a longer time frame, nanotubes are becoming of interest. In the deposition area much attention is given to processes like Atomic Layer Deposition (ALD) and Molecular Layer Epitaxy, cyclic processes to make gap layers with high conformality and breakdown voltage. Basically the build up is layer by layer, whereby the layers can be varied according to need for specific layer properties. Another deposition option is plasma deposition. The core is a DC magnetron which is used to sputter material into a liquid nitrogen cooled, high pressure aggregation/ drift region. The clusters (nanoparticles) formed in this region and are then channelled though apertures into the user s system and guided, as they have the properties of a beam, to a (cooled) substrate on which a layer is formed.
Author
Nanotechnology; Nanoparticles; Nanotubes; Fabrication; Semiconductors (Materials); Gas Pressure; High Voltages

20080017373 enablingMNT, Dordrecht, Netherlands
Nano Materials
vanHeeren, Henne; Nanotechnology Aerospace Applications; March 2007, pp. 3-1 - 3-4; In English; See also 20080017367; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A04, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Nanomaterials is a new step in the evolution of understanding and utilization of materials. Material science started with the realization that chemical composition is the main factor in determining what a material is. Hereafter it was discovered that the fabrication and after fabrication steps could influence those properties substantially. Also small additives proved to be able to modify these properties. Finally with the arrival of nanotechnology, it was discovered that the ability to create small particles could expand the capability to create and modify materials. Nanotechnology is as well as evolutionary as revolutionary in nature. Evolutionary are the many applications where the same material is incrementally improved by using nanotechnology. (Examples of this are seen in cosmetics). Revolutionary it can be called where new (enabling) properties originate from nanotechnology like for example in quantum dots. Those new properties can be divided in: 1) Properties based on the fact that the surface is large compared to the weight/volume. 2) In addition to size, low energy dissipation and high processing speeds are important. 3) New properties not found in bulk or micro sized particles.
Author
Chemical Composition; Nanotechnology; Quantum Dots; Energy Dissipation; Fabrication

20080017374 MM Associates, Moffett Field, CA, USA
Introduction to Nanotechnology
Meyyappan, M.; Nanotechnology Aerospace Applications; March 2007, pp. 1-1 - 1-2; In English; See also 20080017367; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Nanotechnology deals with creation of materials, devices and systems in the nanometer scale (1-100 nm) through manipulating matter at that scale and exploiting novel properties arising because of the nanoscale. This lecture will first define nanotechnology, particularly describing what it is and what it is not, followed by detailed examples of change in various properties seen by going from bulk to nanoscale. The effect of nanoscale on physical properties, bandgap, etc. will be illustrated. Examples of novel nanomaterials such as nanotubes, nanowires, nanoparticles, etc. will be introduced. Also, the tools used in nanotechnology research such as the scanning probe microscopes, scanning tunneling microscopes etc. will be mentioned and a summary of top-down and bottom-up processes needed in manufacturing will be presented as an introduction to the more detailed coverage later. Finally, a broad overview of the potential of nanotechnology on a sector-by-sector basis will be given to set the stage for the subsequent lectures in this NATO series
Author
Nanotechnology; Nanoparticles; Nanotubes

20080017376 enablingMNT, Dordrecht, Netherlands
Nanotechnology and Lifestyle
vanHeeren, Henne; Nanotechnology Aerospace Applications; March 2007, pp. 5-1 - 5-2; In English; See also 20080017367; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A04, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Perhaps surprisingly the earliest commercialized applications of nanotechnology are seen in lifestyle applications. Textile,

sports and cosmetics are among the first products to use nanomaterials. This overview discusses these and other examples of nanotechnology materials and technologies in lifestyle applications. Treating textiles with nanotechnology materials is a method to improve the properties of the textile, making it longer durable, have nicer colours etc. Nanotechnology can also be used to add new functionalities like energy storage and communications. The next figures show some of the opportunities offered by nanotechnology to improve the functionality of textiles.
Author
Nanotechnology; Energy Storage; Textiles

20080017377 MM Associates, Moffett Field, CA, USA
Nanotechnology in Aerospace Applications
Mayyappan, M.; Nanotechnology Aerospace Applications; March 2007, pp. 7-1 - 7-2; In English; See also 20080017367; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The aerospace applications for nanotechnology include high strength, low weight composites, improved electronics and displays with low power consumption, variety of physical sensors, multifunctional materials with embedded sensors, large surface area materials and novel filters and membranes for air purification, nanomaterials in tires and brakes and numerous others. This lecture will introduce nanomaterials particularly carbon nanotubes, and discuss their properties. The status of composite preparation - polymer matrix, ceramic matrix and metal matrix - will be presented. Examples of current developments in the above application areas, particularly physical sensors, actuators, nanoelectromechanical systems etc. will be presented to show what the aerospace industry can expect from the field of nanotechnology.
Author
Aerospace Engineering; Nanotechnology; Energy Consumption; Embedding; Ceramic Matrix Composites; Nanotubes

20080017964 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Error Modeling of Multi-baseline Optical Truss, Part II, Application to ESA Metrology Truss Field Dependent Error
Zhang, Liwei Dennis; Milman, Mark; Korechoff, Robert; August 2, 2004; 11 pp.; In English; International Symposium on Optical Science and Technology 49th Annual Meeting, 2-6 Aug. 2004, Denver, CO, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40751

The current design of the Space Interferometry Mission (ESA) employs a 19 laser-metrology-beam system (also called L19 external metrology truss) to monitor changes of distances between the fiducials of the flight system's multiple baselines. The function of the external metrology truss is to aid in the determination of the time-variations of the interferometer baseline. The largest contributor to truss error occurs in ESA wide-angle observations when the articulation of the siderostat mirrors (in order to gather starlight from different sky coordinates) brings to light systematic errors due to offsets at levels of instrument components (which include comer cube retro-reflectors, etc.). This error is labeled external metrology wide-angle field-dependent error. Physics-based model of field-dependent error at single metrology gauge level is developed and linearly propagated to errors in interferometer delay. In this manner delay error sensitivity to various error parameters or their combination can be studied using eigenvalue/eigenvector analysis. Also validation of physics-based field-dependent model on ESA testbed lends support to the present approach. As a first example, dihedral error model is developed for the comer cubes (CC) attached to the siderostat mirrors. Then the delay errors due to this effect can be characterized using the eigenvectors of composite CC dihedral error. The essence of the linear error model is contained in an error-mapping matrix. A corresponding Zernike component matrix approach is developed in parallel, first for convenience of describing the RMS of errors across the field-of-regard (FOR), and second for convenience of combining with additional models. Average and worst case residual errors are computed when various orders of field-dependent terms are removed from the delay error. Results of the residual errors are important in arriving at external metrology system component requirements. Double CCs with ideally co-incident vertices reside with the siderostat. The non-common vertex error (NCVE) is treated as a second example. Finally combination of models, and various other errors are discussed.
Author
Space Missions; Trusses; Measuring Instruments; Error Analysis; Eigenvectors; Cubes (Mathematics); Metrology; Laser Beams

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ASTRONOMY

Includes observations of celestial bodies; astronomical instruments and techniques; radio, gamma-ray, x-ray, ultraviolet, and infrared astronomy; and astrometry.

20080016798 Lawrence Livermore National Lab., Livermore, CA USA
Science and Technology Review. April 2007. Stardust Returns
Radousky, H. B.; Apr. 01, 2007; 32 pp.; In English
Report No.(s): DE2007-902888; UCRL-TR-52000-07-4; No Copyright; Avail.: National Technical Information Service (NTIS)

The April 2007 edition highlights several projects on the solar systems, the Stardust mission, the underground coal gasification, the computational physics, the creation of element 118, and the mathematical solutions being conducted at the Lawrence Livermore National Laboratory.
NTIS
Research and Development; Stardust Mission; Technologies

20080016993 Stanford Univ., Stanford, CA USA
Modern Statistical Methods for GLAST Event Analysis
Morris, R. D.; Tanugi, J. C.; Mar. 01, 2007; 3 pp.; In English
Report No.(s): DE2007-902101; SLAC-PUB-12426; No Copyright; Avail.: Department of Energy Information Bridge

We describe a statistical reconstruction methodology for the GLAST LAT. The methodology incorporates in detail the statistics of the interactions of photons and charged particles with the tungsten layers in the LAT, and uses the scattering distributions to compute the full probability distribution over the energy and direction of the incident photons. It uses model selection methods to estimate the probabilities of the possible geometrical configurations of the particles produced in the detector, and numerical marginalization over the energy loss and scattering angles at each layer. Preliminary results show that it can improve on the tracker-only energy estimates for muons and electrons incident on the LAT.
NTIS
Gamma Ray Astronomy; Statistical Analysis; Coulomb Collisions

20080017207 Science Applications International Corp., San Diego, CA, USA
Using Global Simulations to Relate the Three-Part Structure of Coronal Mass Ejections to In Situ Signatures
Riley, Pete; Lionello, Roberto; Mikic, Zoran; Linker, Jon; Astrophysical Journal; January 10, 2008; Volume 672, pp. 1221-1227; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NNH05CD89C; Copyright; Avail.: Other Sources
ONLINE: 10.1086/523893

White-light observations of coronal mass ejections (CMEs) often show the classic 'three-part' structure consisting of (1) a bright front; (2) a dark cavity; and (3) a bright, compact core. It has proven difficult to unambiguously associate these features with in situ measurements of interplanetary CMEs (ICMEs), in all but a few cases. In this study we use a global MHD model to simulate the eruption and evolution of a CME out to 0.25 AU, allowing us to continuously track these features from the Sun and through the solar wind. Our results support the generally held view that the interplanetary flux rope corresponds to the dark cavity. We find that the bright front merges with solar wind material swept up by the ICME. Thus, the sheath material found ahead of fast ejecta is in fact composed from both ambient solar wind material, as well the bright front. We also note that, in this simulation, the bright front is formed from the overlying streamer configuration from within which the CME erupted and is not itself coronal material swept up during the early phase of the eruption. The conclusions reached in this study are undoubtedly sensitive to the initial configuration and mechanism used to initiate the CME, and thus care should be taken when using them to interpret specific observations. On the other hand, they provide a unique, unbroken connection between remote solar and interplanetary observations. Ultimately, detailed comparisons between observations and simulation results may be able to constrain or even rule out some mechanisms of CME initiation
Author
Coronal Mass Ejection; Magnetohydrodynamics; Magnetic Fields; Solar Wind; Ejecta; In Situ Measurement

20080017924 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
White Light Modeling, Algorithm Development, and Validation on the Micro-arcsecond Metrology Testbed
Milman, Mark H.; Regher, Martin; Shen, Tsae Pyng; June 21, 2004; 11 pp.; In English; SPIE Conference on Astronomical Telescopes and Instrumentation, 21 Jun. 2004, Glasgow, UK; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40756

The Space Interferometry Mission (ESA) scheduled for launch in early 2010, is an optical interferometer that will perform narrow angle and global wide angle astrometry with unprecedented accuracy, providing differential position accuracies of 1uas, and 4uas global accuracies in position, proper motion and parallax. The astrometric observations of the ESA instrument are performed via delay measurements provided by three Michelson-type, white light interferometers. Two 'guide' interferometers acquire fringes on bright guide stars in order to make highly precise measurements of variations in spacecraft attitude, while the third interferometer performs the science measurement. ESA derives its performance from a combination of precise fringe measurements of the interfered starlight (a few ten-thousandths of a wave) and very precise (tens of picometers) relative distance measurements made between a set of fiducials. The focus of the present paper is on the development and analysis of algorithms for accurate white light estimation, and on validating some of these algorithms on the MicroArcsecond Testbed.
Author
Algorithms; Interferometers; Metrology; Optical Measuring Instruments; Space Missions; Astrometry

90
ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

20080016713 Lawrence Livermore National Lab., Livermore, CA USA
RADSRC/Monte Carlo Code Interface Manual
Hiller, L.; Gronberg, J.; Gosnell, T.; Wright, D. M.; Mar. 28, 2007; 8 pp.; In English
Report No.(s): DE2007-902610; UCRL-TR-229498; No Copyright; Avail.: Department of Energy Information Bridge

RADSRC is a library for calculating gamma ray distributions. An initial material specification is aged and the daughter isotopes calculated to create the complete spectrum. RADSRC can be linked into, initialized, and called from other programs. This document specifies how to do this in GEANT4, COG and MCNP(X).
NTIS
Coding; Manuals; Monte Carlo Method

20080016776 Stanford Linear Accelerator Center, Menlo Park, CA, USA
Synthesis of CNO Elements in Standard BBN
Iocco, F.; Serpico, P. D.; Apr. 01, 2007; 7 pp.; In English
Report No.(s): DE2007-903301; SLAC-PUB-12477; No Copyright; Avail.: National Technical Information Service (NTIS)

We perform an analysis of the CNO elements production in a standard big bang nucleosynthesis (BBN) scenario. The goal is to provide a sound estimate on the very low but yet poorly explored abundance of such elements (with critical importance in Population III Stars). We examine the synthesis channels for these elements in the Wagoner-Kawano code (already critically revised and updated in recent analysis); in light of the findings on CNO elements productions in BBN we add 4 nuclides and more than 200 reactions to the existing network; our results show no major discrepancies with the ones from smaller nuclear network. The robustness of the standard BBN predictions--Population III Stars were metal-free--is confirmed.
NTIS
Astrophysics; Nuclear Fusion

20080017433 Stanford Linear Accelerator Center, Menlo Park, CA, USA; Naples Univ., Italy
PArthENoPE: Public Algorithm Evaluating the Nucleosynthesis of Primordial Elements
Pisanti, O.; Cirillo, A.; Esposito, S.; Locco, F.; Mangano, G.; May 1, 2007; 15 pp.; In English
Contract(s)/Grant(s): DE-AC02-776SF00515
Report No.(s): DE2007-903003; SLAC-PUB-12488; No Copyright; Avail.: Department of Energy Information Bridge

We describe a program for computing the abundances of light elements produced during Big Bang Nucleosynthesis. Starting from nuclear statistical equilibrium conditions the program solves the set of coupled ordinary differential equations, follows the departure from chemical equilibrium of nuclear species, and determines their asymptotic abundances as function

of several input cosmological parameters as the baryon density, the number of effective neutrino, the value of cosmological constant and the neutrino chemical potential.
NTIS
Algorithms; Astrophysics; Nuclear Fusion; Nuclei; Atoms; Light Elements; Big Bang Cosmology

20080017455 Stanford Linear Accelerator Center, Menlo Park, CA, USA
Studies of EGRET Sources with a Novel Image Restoration Technique
Tajima, H.; Finazzi, S.; Cohen-Tanugi, J.; Chiang, J.; Kamae, T.; May 01, 2007; 4 pp.; In English
Report No.(s): DE2007-907718; SLAC-PUB-12508; No Copyright; Avail.: National Technical Information Service (NTIS)
We have developed an image restoration technique based on the Richardson-Lucy algorithm optimized for GLAST-LAT image analysis. Our algorithm is original since it utilizes the PSF (point spread function) that is calculated for each event. This is critical for EGRET and GLAST-LAT image analysis since the PSF depends on the energy and angle of incident gamma-rays and varies by more than one order of magnitude. EGRET and GLAST-LAT image analysis also faces Poisson noise due to low photon statistics. Our technique incorporates wavelet filtering to minimize noise effects. We present studies of EGRET sources using this novel image restoration technique for possible identification of extended gamma-ray sources.
NTIS
Gamma Ray Observatory; Gamma Ray Telescopes; Gamma Rays; Restoration

20080017839 Lawrence Livermore National Lab., Livermore, CA USA
Planets and Stars under the Magnifying Glass
Hazi, A. U.; Feb. 16, 2007; 6 pp.; In English
Report No.(s): DE2007-907853; UCRL-TR-228150; No Copyright; Avail.: National Technical Information Service (NTIS)
The small, frozen planet has planetary scientists taking note. A popular model of planetary formation suggests that red dwarf stars should be likely suns for Earth- to neptune-mass planets with orbits up to 10 times greater than Earth's orbit of the Sun. The discovery of ogLE-2005-BLg- 290-Lb supports this theory. ' It's not an exaggeration to say that the discovery opens a new chapter in the search for planets that could support life,' says Cook. The collaboration continues, with the observing networks on call to monitor microlensing alerts for evidence of other planets. in the future, astrophysicists hope a microlensing detection system can be launched in space.
NTIS
Glass; Gravitational Lenses; Halos; Magnification; Planets; Telescopes

20080017927 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Differential Phase Interferometry with the Keck Telescopes
Vasisht, Gautam; Colavita, M. Mark; June 21, 2004; 10 pp.; In English; SPIE Astronomical Telescopes and Instrumentation, 21-24 Jun. 2004, Glasgow, Scotland, UK; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40741
We summarize the Differential Phase (DP) technique as well as the planned implementation at the Keck Interferometer. Multicolor phase measurements are potentially a powerful astrophysical probe - and can allow ground-based direct detection of extrasolar planets. Better than 0.1 mrad phase measurements in the infrared can allow the Keck Interferometer to detect radiation from the so-called hot-Jupiter or 'Roaster' class of planets. At JPL, we are presently developing and testing instrumentation that will enable these extremely sensitive measurements. First on-sky observations are expected to start in mid-2004. In this article we describe DP and other related techniques, provide an outline of the instrument and present results from preliminary laboratory experiments.
Author
Differential Interferometry; Astronomical Interferometry; Infrared Telescopes; Infrared Radiation; Extrasolar Planets; Astrophysics

20080017962 Stanford Linear Accelerator Center, Stanford, CA, USA; Royal Inst. of Tech., Stockholm, Sweden; Kavli Institute for Particle Astrophysics and Cosmology, Stanford, CA, USA
Simulation of Gamma Rays from Proton Interaction in Local Galaxies
Karlsson, N.; Cohen-Tanugi, J.; Kamae, T.; Tajima, H.; Jun. 2007; 2 pp.; In English
Report No.(s): DE2007-908562; SLAC-PUB-12547; No Copyright; Avail.: National Technical Information Service (NTIS)
The GLAST Large Area Telescope will provide unprecedented opportunities to detect cosmic GeV gamma rays, thanks

to its large effective area, field of view and angular resolution compared with earlier telescopes. We present here the possibility of detecting GeV gamma rays produced by interactions of accelerated protons (or hadrons) with surrounding ambient material. Sources where such detection could be made include local galaxies, such as the Large Magellanic Cloud (LMC), molecular clouds and other extended sources. We have calculated the expected gamma-ray spectrum for an isotropic distribution of protons in the LMC and simulated a one-year GLAST-LAT observation.
NTIS
Astrophysics; Galaxies; Gamma Rays; Protons; Simulation; Gamma Ray Astronomy

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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*.

20080017219 National Academy of Sciences - National Research Council, Washington, DC, USA
USA Civil Space Policy: Summary of a Workshop
[2008]; 18 pp.; In English
Contract(s)/Grant(s): NASW-01001; Copyright; Avail.: Other Sources

What are the principal purposes, goals, and priorities of the U.S. civil space program? This question was the focus of the workshop on civil space policy held November 29-30, 2007, by the Space Studies Board (SSB) and the Aeronautics and Space Engineering Board (ASEB) of the National Research Council (NRC). In addressing this question, invited speakers and panelists and the general discussion from this public workshop explored a series of topics, including the following: (1) Key changes and developments in the U.S. civil space program since the new national Vision for Space Exploration2 (the Vision) was articulated by the executive branch in 2004; (2) The fit of space exploration within a broader national and international context; (3) Affordability, public interest, and political will to sustain the civil space program; (4) Definitions, metrics, and decision criteria for the mix and balance of activities within the program portfolio; (5) Roles of government in Earth observations from space; and (6) Gaps in capabilities and infrastructure to support the program.
Derived from text
Priorities; Space Exploration; Space Programs; United States

20080017454 Stanford Linear Accelerator Center, Menlo Park, CA, USA
Studies of Cosmic Rays with GeV Gamma Rays
Tajima, H.; Kamae, T.; Finazzi, S.; Cohen-Tanugi, J.; Chiang, J.; May 01, 2007; 9 pp.; In English
Report No.(s): DE2007-907717; SLAC-PUB-12509; No Copyright; Avail.: National Technical Information Service (NTIS)

We describe the role of GeV gamma-ray observations with GLAST-LAT (Gamma-ray Large Area Space Telescope - Large Area Telescope) in identifying interaction sites of cosmic-ray proton (or hadrons) with interstellar medium (ISM). We expect to detect gamma rays from neutral pion decays in high-density ISM regions in the Galaxy, Large Magellanic Cloud, and other satellite galaxies. These gamma-ray sources have been detected already with EGRET (Energetic Gamma Ray Experiment Telescope) as extended sources (eg. LMC and Orion clouds) and GLAST-LAT will detect many more with a higher spatial resolution and in a wider spectral range. We have developed a novel image restoration technique based on the Richardson-Lucy algorithm optimized for GLAST-LAT observation of extended sources. Our algorithm calculates PSF (point spread function) for each event. This step is very important for GLAST-LAT and EGRET image analysis since PSF varies more than one order of magnitude from one gamma ray to another depending on its energy as well as its impact point and angle in the instrument. The GLAST-LAT and EGRET image analysis has to cope with Poisson fluctuation due to low number of detected photons forects due to the fluctuations. Our technique incorporates wavelet filtering to minimize. Preliminary studies on some EGRET sources are presented, which shows potential of this novel image restoration technique for the identification and characterisation of extended gamma-ray sources.
NTIS
Cosmic Rays; Gamma Ray Astronomy; Gamma Ray Telescopes; Gamma Rays

20080017920 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
NASA STARDUST Sample Return Mission
Duxbury, Thomas C.; July 23, 2004; 14 pp.; In English; 35th COSPAR Scientific Assembly, 17-24 Jul. 2004, Paris, France; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40753

This viewgraph presentation reviews the Stardust mission. The objectives of the mission is to rendezvous with the Wild

2 comet, and using a specially designed aerogel capture some of the cometary material, and then return a capsule with the material to Earth. Other objectives are to provide images of the comet, and capture interstellar dust. There is a description of the aerogel, the trajectory, and views of the Stardust Sample Return Capsule (SRC), Cometary and Interstellar Dust Analyzer (CIDA) instrument, and the JPL designed camera. Also included is a timeline of the projected release of data to the Planetary Data System.
Author
Stardust Mission; Wild 2 Comet; Aerogels; Interstellar Matter

20080017921 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
NASA's Exploration of the Red Planet: An Overview
Naderi, Firouz M.; July 21, 2004; 9 pp.; In English; International Mars Exploration Working Group (IMEWG), 21 Jul. 2004, Paris, France; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40767
This viewgraph presentation reviews NASA's plans for the exploration of Mars. The reasons for the choice of Mars for exploration are reviewed: launch opportunity every 26 months, the closest planet, and potential extraterrestrial life.
CASI
Mars Exploration; Mars Missions; NASA Space Programs

20080017929 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Terrestrial Planet Finder: Technology Development Plans
Lindensmith, Chris; June 21, 2004; 7 pp.; In English; SPIE Astronomical Telescopes Conference, 21-24 Jun. 2004, Glasgow, Scotland, UK; Original contains color illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40743
One of humanity's oldest questions is whether life exists elsewhere in the universe. The Terrestrial Planet Finder (TPF) mission will survey stars in our stellar neighborhood to search for planets and perform spectroscopic measurements to identify potential biomarkers in their atmospheres. In response to the recently published President's Plan for Space Exploration, TPF has plans to launch a visible-light coronagraph in 2014, and a separated-spacecraft infrared interferometer in 2016. Substantial funding has been committed to the development of the key technologies that are required to meet these goals for launch in the next decade. Efforts underway through industry and university contracts and at JPL include a number of system and subsystem testbeds, as well as components and numerical modeling capabilities. The science, technology, and design efforts are closely coupled to ensure that requirements and capabilities will be consistent and meet the science goals.
Author
Space Exploration; Terrestrial Planets; Coronagraphs; Infrared Interferometers; Light (Visible Radiation); Biomarkers

20080017965 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Analyses of the P/Wild 2 Images from STARDUST
Duxbury, Thomas C.; July 22, 2004; 26 pp.; In English; 35th COSPAR Scientific Assembly, 18-25 Jul. 2004, Paris, France; Original contains black and white illustrations
Report No.(s): 04-A-00009; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40762
This viewgraph presentation reviews the design of the Stardust spacecraft, and the trajectory that took it to rendezvous with the comet, Wild-2. Included are views of the comet, and comparisons with other astronomical bodies. Close up views show size, shape and orientation.
CASI
Stardust Mission; Wild 2 Comet; Comet Nuclei; Photographs

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SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots. For related information see *93 Space Radiation*.

20080017208 Science Applications International Corp., San Diego, CA, USA
1997 May 12 Coronal Mass Ejection Event. I. A Simplified Model of the Preeruptive Magnetic Structure
Titov, V. S.; Mikic, Z.; Linker, J. A.; Lionello, R.; Astrophysical Journal; March 10, 2008; Volume 657, pp. 1614-1628; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNH05CD89C; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1086/527280

A simple model of the coronal magnetic field prior to the coronal mass ejection (CME) eruption on 1997 May 12 is developed. First, the magnetic field is constructed by superimposing a large-scale background field and a localized bipolar field to model the active region (AR) in the current-free approximation. Second, this potential configuration is quasi-statically sheared by photospheric vortex motions applied to two flux concentrations of the AR. Third, the resulting force-free field is then evolved by canceling the photospheric magnetic flux with the help of an appropriate tangential electric field applied to the central part of the AR. To understand the structure of the modeled configuration, we use the field line mapping technique by generalizing it to spherical geometry. We demonstrate that the initial potential configuration contains a hyperbolic flux tube (HFT) which is a union of two intersecting quasi-separatrix layers. This HFT provides a partition of the closed magnetic flux between the AR and the global solar magnetic field. Such a partition is approximate since the entire flux distribution is perfectly continuous. The vortex motions applied to the AR inter-lock the field lines in the coronal volume to form additionally two new HFTs pinched into thin current layers. Reconnection in these current layers helps to redistribute the magnetic flux and current within the AR in the flux-cancellation phase. In this phase, a magnetic flux rope is formed together with a bald patch separatrix surface wrapping around the rope. Other important implications of the identified structural features of the modeled configuration are also discussed.
Author
Coronal Mass Ejection; Magnetic Fields; Solar Corona; Solar Magnetic Field; Solar Flares; Force-Free Magnetic Fields; Magnetic Flux

20080017917
TID Effects in Space-like Variable Dose Rates
Harris, Richard D.; April 2008; 14 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40770

The degradation of the LM193 dual voltage comparator has been studied with different types of TID dose rates. These include several different constant dose rates and a variable dose rate that simulates the behavior of a solar flare. The varying dose rate of a solar flare is the type of real total dose exposure that a space mission might see in lunar or Martian orbit. A comparison of these types of dose rates is made to explore how well the constant dose rates used for typical part testing predicts the performance during a simulated space-like mission.
Author
Dosage; Rates (Per Time); Solar Flares; Space Missions; Traveling Ionospheric Disturbances; Lunar Orbits; Degradation; Comparators

93
SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth radiation belts. For biological effects of radiation on plants and animals see *51 Life Sciences*; on human beings see 52 Aerospace Medicine. For theory see *73 Nuclear Physics*.

20080016738 Lawrence Livermore National Lab., Livermore, CA USA
Monto-Carlo Simulation of Proton-induced Cosimc Ray Cascades in the Atmosphere
Hagmann, C. A.; Lange, D. J.; Wright, D. M.; Mar. 28, 2007; 9 pp.; In English
Report No.(s): DE2007-902609; UCRL-TR-229452; No Copyright; Avail.: National Technical Information Service (NTIS)

We have developed a Monte Carlo model of the Earth's atmosphere and implemented it in three different codes (GEANT4, MCNPX, and FLUKA). Primary protons in the energy range of 1 GeV - 100 TeV are injected at the top of the

atmosphere. The codes follow the tracks of all relevant secondary particles (neutrons, muons, gammas, electrons, and pions) and tally their fluxes at selectable altitudes. Comparisons with cosmic ray data at sea level show good agreement.
NTIS
Cosmic Rays; Monte Carlo Method; Protons; Simulation; Aerospace Environments; Stellar Radiation; Earth Atmosphere; Extraterrestrial Radiation

20080017014 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Virtex-4VQ Static SEU Characterization Summary
Allen, Gregory; Swift, Gary; Carmichael, Carl; April 2008; 23 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAS7-03001; WBS 939904.01.11.30; JPL Project No. 102197; Task No. 3.18.4
Report No.(s): JPL Publication 08-16; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2014/40768

This report is the result of the combined efforts of the Xilinx Radiation Test Consortium (XRTC), sometimes known as the Xilinx SEE Test Consortium. The XRTC is a voluntary association of aerospace entities, including leading aerospace companies, universities, and national laboratories, combining resources to characterize reconfigurable field programmable gate arrays (FPGAs) for aerospace applications. Previous publications of Virtex-4 radiation results are for commercial (non-epitaxial) devices. This report of upset susceptibility to heavy ions and protons of the static memory elements in the Virtex-4 QPro family is a direct parallel to the XRTC report on the thin epitaxial devices in the Virtex-2 family released exactly four years ago.
Author
Computer Storage Devices; Field-Programmable Gate Arrays; Heavy Ions; Memory (Computers); Protons; Single Event Upsets; Radiation Damage

20080017437 Nexsen, Pruet, Jacobs and Pollard, LLC, Greenville, SC, USA
Thick Radiation Sensitive Devices
Patel, G. N., Inventor; Aug. 13, 2003; 27 pp.; In English
Contract(s)/Grant(s): 1 R43 CA89909-01A1
Patent Info.: Filed Filed 13 Aug 03; US-Patent-Appl-SN-10-524 096
Report No.(s): PB2007-105215; No Copyright; Avail.: CASI: A03, Hardcopy

Described is radiation sensitive imaging and dosimeter composition (20) containing a radiation sensitive material (21), e.g., a diacetylene (R--C double-- C--C double-- C--R', where R and R' are substituent groups) or a radiochromic dye, a polymeric binder (22) and optionally a solvent (23) and/or an activator (24). Radiation sensitive materials are incorporated into a moldable or castable material and are molded or casted into shaped-articles (100), such as coatings, films, fiber, plaques, rods and blocks. Upon exposure to high-energy radiations, radiation sentitive material develops color thereby producing a visible image. Because of the higher thickness, a significantly lower dose of radiation can be monitored and an image is produced in three dimensions. Materials, processes and usages for thick radiation sensitive devices are described. A thick block can be used for monitoring radiation dosages in the three dimensions.
NTIS
Sensitivity; Radiation Dosage; Dosimeters

Subject Term Index

Personal Author Index