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Langley Research Center

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Information Program Office

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NASA STI Program ... in Profile

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- TECHNICAL MEMORANDUM. Scientific and technical findings that are of preliminary or specialized interest, e.g., quick release reports, working papers, and bibliographies that contain minimal annotation. Does not contain extensive analysis.
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  Hanover, MD 21076-1320

Introduction

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

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

STAR includes citations to Research & Development (R&D) results reported in:

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

The NASA STI Program

The NASA Scientific and Technical Information (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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For more information on the most up to date NASA STI, visit the STI Program's website at http://www.sti.nasa.gov.

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NASA Center for AeroSpace Information (CASI)

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

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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.

The Federal Depository Library Program (FDLP)

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

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

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

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Subject Term Index

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SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

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01
AERONAUTICS (GENERAL)

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

20040004279 National Park Service, Atlanta, GA, USA
Wright Brothers National Memorial: Historic Resource Study
Chapman, W. R.; Hanson, J. K.; Jan. 1997; 98 pp.
Report No.(s): PB2004-101846; No Copyright; Avail: CASI; A05, Hardcopy

This study documents historic buildings, structures, and other resources within the Wright Brothers National Memorial, located in Kill Devil Hills, North Carolina. It has been conducted in compliance with Sections 106 and 110 of the National Historic Preservation Act of 1966, as amended, and as set out in 36 CFR Parts 63 and 800. It has been undertaken as part of a cooperative agreement between the University of Georgia Research . Foundation and the Southeast Region of the National Park Service (NPS), U.S. Department of the Interior (Cooperative Agreement Number 5000-8, Sub-Agreement Number 5). The study includes a detailed inventory of historic buildings, structures, and sites in accordance with recognized survey procedures as set out in the Secretary of the Interiors Standards for Identification and Evaluation (FR, No. 190, Sep. 29, 1983, pp. 44,720 - 44,726) and, most recently, in National Register Bulletins 15, 16, 18, and 21. An immediate product of the survey is an updated set of List of Classified Structures (LCS) forms for the Park together with completed state inventory forms on each property. Completed LCS forms and photographs are submitted with the study. Additionally, the study includes physical descriptions, historical background information, and assessments of significance, as well as management recommendations. Information provided in this study will be used to update National Register documentation for the park district.
NTIS
Aeronautics; Histories; Buildings

20040006403 Wichita State Univ., Wichita, KS, USA, Boeing Co., Wichita, KS, USA, NASA Glenn Research Center, Cleveland, OH, USA, Federal Aviation Administration, Washington, DC
Experimental Study of Supercooled Large Droplet Impingement Effects
Papadakis, M.; Rachman, A.; Wong, S. C.; Hung, K. E.; Vu, G. T.; Sep. 2003; In English
Report No.(s): PB2004-101412; No Copyright; Avail: National Technical Information Service (NTIS)

Typically, ice accretion results from small supercooled droplets (droplets cooled below freezing), usually 5 to 50 microns in diameter, which can freeze upon impact with an aircraft surface. Recently, ice accretions resulting from supercooled large droplet (SLD) conditions have become a safety concern. Current ice accretion codes have been extensively tested for Title 14 Code of Federal Regulations Part 25, Appendix C icing conditions but have not been validated for SLD icing conditions. This report presents experimental methods for investigating large droplet impingement dynamics and for obtaining small and large water droplet impingement data.
NTIS
Ice Formation; Drops (Liquids)

20040006405 Dayton Univ. Research Inst., OH, USA
Using Modern Computing Tools to Fit the Pearson Type III Distribution to Aviation Loads Data
Hovey, P.; DeFiore, T.; Sep. 2003; 88 pp.; In English
Report No.(s): PB2004-101414; No Copyright; Avail: CASI; A05, Hardcopy

The question of obtaining a relatively simple and at the same time accurate functional representation of asymmetric

frequency distributions gives rise to one of the most important practical problems in mathematical statistics. The famous mathematician Karl Pearson solved this with a considerable degree of success in the development of his Type III frequency function. This function is a comparatively simple exponential expression, which is completely defined in terms of the mean, standard deviation, and the skewness of the distribution. The Type III function produces, with considerable accuracy, a large number of different distributions, both skew and symmetric, and reduces to the standard normal frequency function when skewness is zero. The Pearson Type III distribution is used by the U.S. Army Corps of Engineers in flood frequency analysis, by the National Oceanic and Atmospheric Administration in the analysis of precipitation data, and by the U.S. Navy in specifying airplane touchdown sink speed of non-carrier-based airplanes. A derivation of the Pearson Type III probability function, a table containing a complete set of Pearson Type III probability values for skewness values up to 1.1, an example describing how to use the tables, and a procedure and example for setting up an Excel spreadsheet and graphical applications are presented herein.
NTIS
Statistical Analysis; Wind Velocity

20040006520 Illinois Univ., Urbana-Champaign, IL, USA
Effect of Airfoil Geometry on Performance with Simulated Ice Accretions Volume 1: Experimental Investigation
Broeren, A. P.; Lee, S.; LaMarre, C. M.; Bragg, M. B.; Aug. 2003; 124 pp.; In English
Report No.(s): PB2004-101416; No Copyright; Avail: CASI; A06, Hardcopy

This report presents the key findings of a 3-year experimental investigation into the effects of ice shape and airfoil geometry on airfoil performance. The overall objective of this report was to improve the understanding of the relationship between airfoil geometry, ice shape geometry, and the resulting degradation in aerodynamic performance. Three airfoils were tested with three different types of simulated ice accretions. The types of ice shapes were (1) supercooled, large droplet (SLD) ridge-type ice, (2) intercycle ice, and (3) glaze horn type ice. The NACA 23012, NLF 0414, and NACA 3415 airfoils were chosen to provide a broad range of aerodynamic characteristics.
NTIS
Airfoils; Aerodynamics

20040006526 NASA Glenn Research Center, Cleveland, OH, USA
Learning to Fly: The Wright Brothers' Adventure. A Guide for Educators and Students with Activities in Aeronautics
Storm, R.; Benson, T.; Galica, C.; McCredie, P.; 2003; 120 pp.
Report No.(s): PB2004-101980; No Copyright; Avail: CASI; A06, Hardcopy

This guide was produced by the NASA Glenn Research Center Office of Educational Programs in Cleveland, OH, and the NASA Aerospace Educational Coordinating Committee. It includes activity modules for students, including the history of the Wright Brothers and their family in Dayton, Ohio and flight experimentation in Kitty Hawk, North Carolina. Student activities such as building models of the Wright Brothers glider and writing press releases of the initial flight are included.
NTIS
Education; Students

20040008437 Swedish Defence Research Establishment, Stockholm
Effects of Geometrical Imperfections on Postbuckling Behaviour of Delaminated Composite Plates
Grahn, T.; Jan. 2003; 28 pp.; In English
Report No.(s): PB2004-101748; FOI-R-0791-SE; Copyright; Avail: National Technical Information Service (NTIS)

This paper investigates how geometrical imperfections, which in most cases are present for impacted laminates, affect the postbuckling behavior of delaminated composite plates under compression. Delaminations are one of the most frequently appearing material damage due to impact. The influence of different shapes of the geometrical imperfections on the response has been studied. The program system DEBUGS, which is developed and specialized to simulate delamination buckling and growth, is used for the analyses. DEBUGS is based on the finite element program ADINA. It is found that the geometrical imperfections influence the buckling behavior, and thus also possibly the initiation of delamination growth. A more accurate model of delamination buckling of impact damaged laminated composites should thus include a feature where the initial shape of the composite may be varied, e.g. in a model where the material degradation in the impact damaged zone is modeled.
NTIS
Composite Materials; Computer Programs; Finite Element Method

20040008549 Swedish Defence Research Establishment, Linkoeping, Sweden
Communication in Expert Teams: PILOT A Method of Analysis
Bjork, J.; Furberg, B.; Granaesen, M.; Johansson, K.; Lange, A.; May 2002; 68 pp.; In Swedish
Report No.(s): PB2004-101531; FOI-R-0910-SE; Copyright; Avail: National Technical Information Service (NTIS)

The purpose of this report is also to shed some light on the communication within a military expert team, with focus on military fighter pilots and control officers. The purpose is also to find a way of analyzing such communication. The theoretical background deals with central theories on communication and teamwork, as well as some basic aspects of simulation and transcription. Also, the fighter pilots communication situation is described. An empirical study was conducted in a simulated environment using an off-the-shelf computer network game to collect communication between participants. A communication analysis based on the collected data and theory showed that general features such as planning, role playing, performance and workload might influence communication. Even more concrete aspects of communication, such as use of ambiguous words and feedback, play an important role. With the communication analysis as a foundation, a new method of analysis, the PILOT-method, was created. This method consists of three parts: problem identification, localization and causality description. The method can be adapted to any other domain of interest. The use of the PILOT-method will give information on when problems in communication occur and the extent of these problems. This, inc combination with knowledge about the domain at hand, gives understanding of how these problems can be avoided in the future, and the communication can be improved. NTIS

Pilots (Personnel); Armed Forces; Pilot Performance; Optical Communication

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*.

20040005807 Quebec Univ., Chicoutimi, Quebec, Canada
Low Takeoff Rotation Speed Commuter Type Aircraft Aerodynamic Performance of Type II and Type IV Fluids
Beisswenger, A.; Laforte, J. L.; Aug. 2003; 244 pp.; In English
Report No.(s): PB2004-101406; No Copyright; Avail: CASI; A11, Hardcopy

Type II and Type IV aircraft ground anti-icing fluids are currently used on commuter type aircraft, although they are being certified to AMS1428 Annex B, which corresponds to aerodynamic acceptance test for large transport type jet aircraft whose takeoff rotation speeds generally exceed 100 to 110 knots. Some aircraft manufacturers have indicated certain performance adjustments or other commuter type operational procedures to be followed for selected aircraft when operators employ these Type II and IV fluids. At the request of the Federal Aviation Administration (FAA) William J. Hughes Technical Center, the Anti-icing Materials International Laboratory conducted AMS1428D Annex C Flat Plate Elimination Tests (FPET) for commuter type aircraft to ascertain their level of performance. The aerodynamic acceptance tests were conducted at three temperature intervals for two Type II fluids and three Type IV fluids in their neat, 75/25, and 50/50 dilution forms. A deicing and anti-icing fluid is considered acceptable at a test temperature if none of the independent boundary layer displacement thickness measurements are greater than the acceptance criteria defined by the military fluid that is tested simultaneously. NTIS

Aircraft Icing; Ice Prevention; Aerodynamics; Antifreezes; General Aviation Aircraft

20040005814 Quebec Univ., Chicoutimi, Quebec, Canada
Investigation of Type II and Type IV Aircraft Ground Anti-Icing Fluid Aerodynamic Certification Standards
Beisswenger, A.; Fortin, G.; Laforte, J. L.; Jul. 2003; In English
Report No.(s): PB2004-101409; No Copyright; Avail: National Technical Information Service (NTIS)

The certification process for aircraft ground anti-icing fluids involves flat-plate wind tunnel aerodynamic flow-off tests. This test method was developed in 1990 from flight and wind tunnel test results of full-scale and model airfoils and flat plates. The resulting lift losses were then correlated to the Boundary Layer Displacement Thickness (BLDT) on a flat plate. This correlation was made for Type II fluids existing at the time. Since the introduction of Type IV fluids in 1994, with significantly longer anti-icing endurance times, the same test procedure was applied. However, Type IV fluids are generally more viscous than Type II fluids of the same concentration. At the Federal Aviation Administration's request, a study was undertaken to determine if aerodynamic certification testing should be different for Type IV fluids compared to Type II. A comparison of

existing certification BLDT data showed no significant differences between fluids, nor, more specifically, between Type II and Type IV fluids. Tests on five commercial fluids, two typical Type II and three typical Type IV fluids, with initial thicknesses of 1, 2, and 4 mm showed that the thickness had little effect on BLDT and fluid elimination data, with the exception of one fluid. This effect manifested itself near the end of the temperature range at which this fluid is acceptable. Examination of energy data showed that more energy was required by the wind tunnel to move the Type II fluids compared to Type IV fluids. When these fluids were tested using an identical fixed fan speed profile at 0 degrees, -10 degrees, and -25 degrees C, little difference was seen in the BLDTs compared to those generated by a certification profile adjusted to obtain the same acceleration.
NTIS
Aerodynamic Characteristics; Antiicing Additives; Aircraft Icing; Wind Tunnel Tests

20040006521 Illinois Univ., Urbana-Champaign, IL, USA
Effect of Airfoil Geometry on Performance with Simulated Ice Accretions, Volume 2: Numerical Investigation
Pan, J.; Loth, E.; Aug. 2003; In English
Report No.(s): PB2004-101417; No Copyright; Avail: National Technical Information Service (NTIS)

This report summarizes the key findings of a 3-year computational investigation into the effects of ice shape and airfoil geometry on airfoil performance. The overall objective of this investigation was to improve the understanding of the relationship between airfoil geometry, ice shape geometry, and the resulting degradation in aerodynamic performance. A companion experimental study was also completed during this time, and also examined these issues. The present numerical study additionally sought to investigate the robustness of current methodologies in predicting iced airfoil aerodynamics and three-dimensional effects.
NTIS
Airfoils; Aerodynamic Characteristics; Ice

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*.

20040004327 Leonelli (F. J.), Ashburn, VA, USA
Continuing Analysis and Surveillance System (CASS) Description and Models
Leonelli, F. J.; Oct. 2003; In English
Report No.(s): PB2004-101419; No Copyright; Avail: National Technical Information Service (NTIS)

Since 1964, all air carriers have been required by regulation to conduct continuous evaluations of their maintenance programs. Specifically, Title 14 Code of Federal Regulations (CFR) Parts 121.373 and 135.431 require air carriers to establish a Continuing Analysis and Surveillance System (CASS) to evaluate, analyze, and correct deficiencies in the performance and effectiveness of their inspection and maintenance programs. While the regulation governing CASS is short, its sparse language nonetheless requires a complex system. Each CASS must set high goals, and the Federal Aviation Administration (FAA) is empowered by the regulations to require changes to an air carriers maintenance program if it shows signs of weakness. To assist industry maintenance personnel and FAA inspectors to understand and comply with CASS requirement, this report proposes three models that illustrate how the structure of CASS can be established based on an air carriers size and complexity. Each model represents a complete system that should meet, or exceed, the regulatory requirements, and on which new entrant air carriers can base their CASS. Existing air carriers can also use the models as a comparison to their existing CASS and determine its effectiveness. The results in this report are based on the information gathered through research and on-site interviews with industry, FAA, and trade association representatives. Interviews of eighteen 14 CFR Part 121 air carriers, five 14 CFR Part 135 air carriers, four aviation industry associations, and a representative of the Joint Aviation Authorities of Europe were conducted over a 6-month period. Interviews of personnel at the FAA Flight Standards District Office, Certificate Management Office, and Headquarters were also conducted to gain input from the regulatory perspective.
NTIS
Aircraft Maintenance; Models; Regulations; Airline Operations; Surveillance

20040004331 National Transportation Safety Board, Washington, DC
National Transportation Safety Board Aircraft Accident Brief: EgyptAir Flight 990, Boeing 767-366ER, SU-GAP, 60 Miles South of Nantucket, Massachusetts
Mar. 13, 2002; 162 pp.
Report No.(s): PB2004-101336; NTSB/AAB-02/01; No Copyright; Avail: CASI; A08, Hardcopy

On October 31, 1999, about 0152 eastern standard time (EST), EgyptAir flight 990, a Boeing 767-366ER (767), SU-GAP, crashed into the Atlantic Ocean about 60 miles south of Nantucket, Massachusetts. EgyptAir flight 990 was being operated under the provisions of Egyptian Civil Aviation Regulations (ECAR) Part 121 and U.S. 14 Code of Federal Regulations Part 129 as a scheduled, international flight from John F. Kennedy International Airport (JFK), New York, New York, to Cairo International Airport, Cairo, Egypt. The flight departed JFK about 0120, with 4 flight crew members, 10 flight attendants, and 203 passengers on board. All 217 people on board were killed, and the airplane was destroyed. Visual meteorological conditions prevailed for the flight, which operated on an instrument flight rules (IFR) flight plan.
NTIS
Aircraft Safety; Flight Safety; Aircraft Accidents

20040004355 Air Force Occupational Measurement Center, Randolph AFB, TX
AFSC 2T2X1, ANG/AFRC, Air Transportation, ANG/AFRC, OSSN 2514
Sep. 2003; 106 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418495; No Copyright; Avail: CASI; A06, Hardcopy

The enclosed training extract has been compiled to assist in making training decisions. It is comprised of a series of computer printouts which show data collected from this speciality. By learning to understand this document and how it applies to training programs, one will find it to be a valuable source of information.
DTIC
Air Transportation; Education; Extraction

20040004358 Air Force Occupational Measurement Center, Randolph AFB, TX
Training Extract, AFSC 2T2X1 - Active Duty, Air Transportation, Active Duty, OSSN 2514
Sep. 2003; 307 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418497; No Copyright; Avail: CASI; A14, Hardcopy

The enclosed training extract has been compiled to assist in making training decisions. It is comprised of a series of computer printouts which show data collected from this specialty. By learning to understand this document and how it applies to training programs, one will find it to be a valuable source of information.
DTIC
Air Transportation; Education

20040006518 Air Force Research Lab., Wright-Patterson AFB, OH
Simulation Validation for an Automatic Air Collision Avoidance System in Preparing for Flight Test
Ikeda, Yutaka; Nguyen, Ba; Oct. 2003; 5 pp.; In English
Report No.(s): AD-A418624; AFRL-VA-WP-TP-2003-341; No Copyright; Avail: CASI; A01, Hardcopy

This paper presents performance evaluation of an algorithm for an Automatic Air Collision Avoidance System (Auto ACAS or simply ACAS) that has been developed by the U.S. Air Force and its Swedish counter part, Forsvaret Materielverk (FMV). The algorithm uses the optimal coordinated escape maneuvers to avoid mid-air collision, while satisfying the imposed system requirements. In addition, the algorithm can simultaneously accommodate multiple aircraft in a collision course by activating the coordinated escape maneuvers.
DTIC
Collision Avoidance; Midair Collisions; Performance Tests

20040006525 Federal Aviation Administration, Atlanta, GA, USA
Land Use Compatibility and Airports
2003; 146 pp.
Report No.(s): PB2004-101968; No Copyright; Avail: CASI; A07, Hardcopy

The objective of aviation-related land use planning is to guide incompatible land uses away from the airport environs and to encourage compatible land uses to locate around airport facilities. This compatible land use guide has been prepared for

airport managers, local land use planners, developers, and elected or appointed public officials. Its purpose is to provide information on FAA programs and sources of support and to promote an understanding of land use compatibility planning issues around airports that could result in improved compatibility in the airport environs. While not the only compatibility issue, aircraft noise has been the primary driver of airport land use compatibility conflicts. Since the introduction of turbo jet aircraft in the late 1950s, there has been a constant technical effort to reduce aircraft noise emissions. Although there has been significant reduction in aircraft engine noise, little more can be expected in the field of noise-reduction technology. Consequently the focus must now be on airport-specific noise and land use compatibility planning.
NTIS
Land Use; Airports

20040008267 NASA Langley Research Center, Hampton, VA, USA
Experimental Aerothermodynamics In Support Of The Columbia Accident Investigation
Horvath, Thomas J.; [2004]; 18 pp.; In English; 42nd AIAA Aerospace Sciences Meeting and Exhibit, 5-8 Jan. 2004, Reno, NV, USA
Report No.(s): AIAA Paper 2004-1387; No Copyright; Avail: CASI; A03, Hardcopy

The technical foundation for the most probable damage scenario reported in the Columbia Accident Investigation Board's final report was largely derived from synergistic aerodynamic/aerothermodynamic wind tunnel measurements and inviscid predictions made at NASA Langley Research Center and later corroborated with engineering analysis, high fidelity numerical viscous simulations, and foam impact testing near the close of the investigation. This report provides an overview of the hypersonic aerothermodynamic wind tunnel program conducted at NASA Langley and illustrates how the ground-based heating measurements provided early insight that guided the direction and utilization of agency resources in support of the investigation. Global surface heat transfer mappings, surface streamline patterns, and shock shapes were measured on 0.0075 scale models of the Orbiter configuration with and without postulated damage to the thermal protection system. Test parametrics include angle of attack from 38 to 42 degs, sideslip angles of 38 to 42 degs, sideslip angles of plus or minus 1 deg, Reynolds numbers based upon model length from 0.05 x 10(exp 6) to 6.5 x 10(exp 6), and normal shock density ratios of 5 (Mach 6 Air) and 12 (Mach 6 CF4). The primary objective of the testing was to provide surface heating characteristics on scaled Orbiter models with outer mold line perturbations to simulate various forms of localized surface damage to the thermal protection system. Initial experimental testing conducted within two weeks of the accident simulated a broad spectrum of thermal protection system damage to the Orbiter windward surface and was used to refute several hypothesized forms of thermal protection system damage, which included gouges in the windward thermal protection system tiles, breaches through the wing new the main landing gear door, and protuberances along the wing leading edge that produced asymmetric boundary layer transition. As the forensic phase of the investigation developed and the condition of recovered debris was examined, increasing emphasis was placed on identifying wing leading edge damage (partially and fully missing reinforced carbon-carbon panels, and eventually holes in the wing leading edge with venting to the wing upper surface) that produced off-nominal heating trends consistent with extracted Orbiter flight recorder temperature data.
Author
Aerothermodynamics; Columbia (Orbiter); Aircraft Accident Investigation; Hypersonic Wind Tunnels; Computational Fluid Dynamics

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*.

20040008301 Air Force Research Lab., Wright-Patterson AFB, OH
Automatic Air Collision Avoidance System - Design & Development
Swihart, D. E.; Nguyen, B. T.; Barfield, A. F.; Griffin, E. M.; Oct. 2003; 10 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418477; AFRL-VA-WP-TP-2003-338; No Copyright; Avail: CASI; A02, Hardcopy

Air to air collisions are a major concern for manned aircraft especially fighters during combat training exercises. The potential of such collisions of unmanned vehicles is much higher due to the lack of a pilot to see and avoid other aircraft. A system is needed to prevent such collisions as fighters become more complex and as unmanned vehicles are used to

accomplish more missions. In fact automatic collision avoidance must be developed if unmanned vehicles are to become an integral part of military air operations.
DTIC
Collision Avoidance; Systems Engineering; Warning Systems; Air Traffic Control; Automatic Control

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*.

20040004145 National Aerospace Lab., Tokyo
Technical Report of National Aerospace Laboratory. Strain and Joint Measurement for Airship Envelop Materials in High Temperature
Kakuta, Y.; Komatsu, K.; Sano, M.; 2003; In Japanese
Report No.(s): PB2004-100481; NAL/TR-1457; Copyright; Avail: National Technical Information Service (NTIS)

Materials ideal for use in pressurized non-rigid airship envelopes would have the following properties: (1) High strength to weight ratio, (2) Resistance to environmental degradation, (3) High tear resistance, (4) Low helium permeability, and (5) Strong, reliable joints not subject to creep. For the stratospheric airship platform, the temperature environment is estimated to be from -80 deg C to 80 deg C (Maximum under solar cell layer). There has been a need therefore for basic strength data recorded under these conditions. In this report, the validity of the video extensometer was evaluated by comparing it with the strain-gage method for the use of envelope material tests at high temperature. Tensile strength and overlap joint strength tests were then conducted at 20 (RT), 40, 50, 60, and 80 deg C. The stress-strain relationship and fracture properties for envelope materials were investigated.
NTIS
Strain Gages; Airships; Joints (Junctions); Structural Analysis; Fracture Strength

20040004270 Technical Research Centre of Finland, Espoo, Finland
Active Vibration Control of Rotor in Desktop Test Environment
Tammi, K.; 2003; In English
Report No.(s): PB2004-101986; VTT/PUB-498; No Copyright; Avail: National Technical Information Service (NTIS)

The goal of this work was to set up a test environment for active vibration control of rotors, to study the dynamics of the system, and to design a control system for controlling rotor vibrations. The principal idea was to use a noncontacting magnetic actuator without a load-carrying function. The test environment consisted of a desktop rotor test rig, a magnetic actuator, and a programmable control unit. The rotor was supported by conventional bearings at the ends, and the control forces were applied at the midpoint of the bearing span. The work reports modal analysis and open-loop measurement results on the test environment. The system was found to vibrate excessively when the rotor was run close to its bending critical speed at 40 Hz. Damping the system, considered as the Jeffcott rotor, by means of a velocity feedback controller was studied. The controller parameters were selected on the basis of estimates derived experimentally from the measured data. According to the simulations and experiments performed, the velocity feedback control system reduced the vibration response significantly.
NTIS
Rotors; Vibration Damping; Active Control; Rotary Wings; Control Systems Design

20040006399 Army Command and General Staff Coll., Fort Leavenworth, KS
Unmanned Aerial Logistics Vehicles: A Concept Worth Pursuing?
McCoy, John V.; Jun. 6, 2003; 68 pp.; In English; Original contains color illustrations
Report No.(s): AD-A416527; ATZL-SWD-GD; No Copyright; Avail: CASI; A04, Hardcopy

Presently, USA Army battlefield supply distribution does not involve unmanned aerial logistic vehicles. The United State military's Joint Vision 2020 and its tenet of Focused Logistics provide vision for force development allowing for the exploration of the unmanned aerial logistics vehicles concept. This thesis explores the primary research question: Could the USA Army benefit by pursuing an unmanned aerial logistic vehicle concept? Secondary questions are defined and addressed: (1) Can unmanned aircraft realize a logistic supply delivery process? (2) Which of the possible unmanned aircraft processes is the recommended process? and (3) Which existing logistic processes are to be improved? All questions are explored by

applying the Wisconsin 7-Step Problem-Solving Strategy: stating the problem, determining solution criteria, gathering needed information, generating potential solutions, comparing solutions and the problem, selecting the solution, and preparing communications. Multiple unmanned aerial logistics concept options provide potential solutions involving unmanned fixed-wing aircraft, rotary-wing aircraft, blimps, and precision airdrop systems, alone or in combination, and each yielding potential benefits when compared to existing supply distribution processes. Were an unmanned aerial logistic vehicle system actualized, some part of the USA Army s existing supply distribution process could be improved.
DTIC
Pilotless Aircraft; Logistics

20040006401 Wichita State Univ., Wichita, KS, USA
Fatigue and Stress Relaxation of Adhesives in Bonded Joints
Tomblin, J.; Seneviratne, W.; Escobar, P.; Yap, Y. K.; Oct. 2003; In English
Report No.(s): PB2004-101410; No Copyright; Avail: National Technical Information Service (NTIS)

Increased confidence in composite materials have increased the use of adhesively bonded components in primary aircraft structures. Applications on primary structures require rigorous characterization of the material, unlike applications on secondary structures. Previously funded Federal Aviation Administration programs at the National Institute for Aviation Research at Wichita State University in Wichita, Kansas, have extensively researched thick bondline adhesive joint behavior, as well as adhesive joint behavior for a wide range of bondline thickness, with respect to several aircraft operating environmental conditions. The primary goal of this investigation was to characterize the long-term durability of adhesives. Two simultaneous investigations were performed to characterize fatigue and stress relaxation behavior. To gain more information about high-stress behavior (low-cycle fatigue), stress amplitudes resulting in adhesive failure at low levels of 1,000 to 100,000 cycles were used. Other subsequent tests were conducted at those levels, including temperature and frequency dependence of adhesives. In addition, stress relaxation behavior of various cases, such as during fuselage pressurization, was studied under three different environmental conditions and at three different stress levels. Both fatigue and stress relaxation tests provide vital design data for long-term durability of adhesive-bonded structures. Fatigue tests showed that moisture absorption shortened the fatigue life of adhesives from the lives at ambient room temperature or cold dry conditions.
NTIS
Bonded Joints; Adhesives; Fatigue Tests; Stress Analysis

20040006402 Lawrence Livermore National Lab., Livermore, CA
Failure Modeling of Titanium 6Al-4V and Aluminum 2024-T3 with the Johnson-Cook Material Model
Kay, G.; Sep. 2003; In English
Report No.(s): PB2004-101411; No Copyright; Avail: National Technical Information Service (NTIS)

Johnson-Cook failure strain parameters were developed for Ti-6Al-4V and 2024-T3 aluminum. The titanium parameters, obtained from simulations of split Hopkinson bar tensile tests, were successfully used to simulate blade fragment impact tests on 0.602, 0.250, and 0.737 thick titanium targets. Titanium failure parameters that were derived from scaled down ballistic limit testing produced a failure envelope which was not suitable for use on full-scale tests. 2024-T3 aluminum failure parameters were obtained from simulations of one-third-scale ballistic limit test results. The aluminum failure parameters were used to simulate three blade fragment impact tests against a commercial transport aircraft fuselage.
NTIS
Titanium Alloys; Aluminum Alloys

20040006406
Development and Evaluation of the V-Notched Rail Shear Test for Composite Laminates
Adams, D. O.; Moriarty, J. M.; Gallegos, A. M.; Adams, D. F.; Sep. 2003; In English
Report No.(s): PB2004-101415; No Copyright; Avail: National Technical Information Service (NTIS)

The V-notched rail shear test developed in this investigation appears to be well-suited for measuring the in-plane shear modulus and shear strength of unidirectional and multidirectional composite laminates. This test method incorporates attractive features from both the Iosipescu V-notched shear test and the standard two-rail shear test. The proposed V-notched specimen provides a larger gage section than the standard Iosipescu shear specimen and enhanced loading capability compared to either existing test method. Finite element analysis was used to evaluate several notched and tabbed rail shear specimen configurations. A 90 degree notch-angle V-notched specimen configuration, with notch depths that were 22.7 percent of the

gage section height, was found to produce a desirable stress state in the gage section. Extensive rail shear testing was performed on a series of 16-ply carbon/epoxy laminates. The V-notched specimen configuration was selected over the tabbed rectangular configuration based on the higher shear strengths obtained, acceptable gage section failures produced, ease and economy of specimen preparation, and accuracy of shear modulus measurements.
NTIS
Shear Strength; Laminates; Epoxy Matrix Composites

20040006472 Icosystem Corp., Cambridge, MA, USA
Swarm Intelligence: A New C2 Paradigm with an Application to Control Swarms of UAVs
Gaudiano, Paolo; Shargel, Benjamin; Bonabeau, Eric; Clough, Bruce T.; Oct. 2003; 14 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F33615-02-M-3232; Proj-3005
Report No.(s): AD-A418490; AFRL-VA-WP-TP-2003-335; No Copyright; Avail: CASI; A03, Hardcopy

We have developed an agent-based model to simulate command and control of a swarm of Unmanned Air Vehicles (UAVs). Our approach makes use of decentralized strategies to control a UAV swarm carrying out a search mission. In this paper, we introduce our approach, we present the details of the proposed model, and we provide results of simulations testing our control strategies under a variety of configurations. We also outline some initial results obtained by extending our simulation tool to include the ability to carry out missions in which UAVs can track moving targets, strike targets, and perform Battle Damage Assessment.
DTIC
Aerial Reconnaissance; Command and Control

20040006522 Dimensions International, Inc., Alexandria, VA, USA, Anteon Corp., USA
Helicopter Visual Segment Evaluation: Phase 1, Performance Testing Report
Lord, R. M.; Werner, R. K.; Finley, T.; Sep. 2003; In English
Report No.(s): PB2004-101418; No Copyright; Avail: National Technical Information Service (NTIS)

This report presents the results of a study, funded by the Federal Aviation Administration (FAA), of helicopter performance capabilities. Tests were conducted simulating instrument approaches with five different helicopter models. A total of five different helicopter models were included in the test matrix (S-76A, Bell 206L, Bell 430, AS-365 N2, and EC-135). The objective was to establish the maximum angle of descent from a missed approach point (MAP) for a given altitude and approach speed. All tests were flown by an FAA Aircraft Certification Test Pilot. Descent maneuver profiles were collected using an Ashtech Z-12 Differential Global Positioning System provided by the FAA. The flight profile characteristics were observed and the descent maneuver success rate was tabulated for each helicopter. Data was analyzed by plotting each approach and departure individually. Summary statistics were calculated and composite plots were created for further analysis of aircraft behavior.
NTIS
Helicopter Performance; Aircraft Maneuvers

20040006523
Vertical Drop Test of a Narrow-Body Transport Fuselage Section with Overhead Stowage Bins
Abramowitz, A.; Smith, T. G.; Vu, T.; Zvanya, J. R.; Sep. 2002; In English
Report No.(s): PB2004-101421; DOT/FAA/AR-01/100; No Copyright; Avail: National Technical Information Service (NTIS)

A 10-foot-long fuselage section from a Boeing 737-100 was dropped from a height of 14 feet, generating a final velocity at impact of 30 feet per second. The fuselage section was configured to simulate the load density at the maximum takeoff weight condition. The final weight of 8870 pounds included cabin seats, dummy occupants, overhead stowage bins with contents, and cargo compartment luggage. The fuselage section was instrumented with strain gages, accelerometers, and high-speed cameras. The fuselage section sustained severe deformation of the cargo compartment. The cargo compartment luggage influenced the manner in which the fuselage crushed, affecting the g forces experienced by the fuselage section and the pulse duration. The seat tracks experienced a vertical impact pulse of 15 g and a pulse duration of approximately 135 milliseconds. Although numerous fuselage structural members fractured during the test, a habitable environment was maintained for the occupants, and the impact was considered survivable. Both overhead stowage bins maintained their structural integrity and remained attached to the fuselage. The bins sustained up to 14 g vertical loading. Distribution of the

loads among the bin supports was different in the dynamic versus static case.
NTIS
Boeing 737 Aircraft; Deformation; Fuselages; Fuel Tanks

20040008315 Federal Aviation Administration, Atlantic City, NJ, USA
Limiting Oxygen Concentration Required to Inert Jet Fuel Vapors Existing at Reduced Fuel Tank Pressures
Summer, S. M.; Aug. 2003; In English
Report No.(s): PB2004-101420; No Copyright; Avail: National Technical Information Service (NTIS)

Table of Contents: Executive summary; Introduction; Experimental apparatus; Experimental procedures; Discussion of results; Conclusions; References; Appendix A: Commercial and military aviation fuel specifications; List of figures and List of tables.
NTIS
Fuel Tanks; Concentration (Composition); Tests; Jp-8 Jet Fuel; Oxygen

20040008408 NASA Langley Research Center, Hampton, VA, USA
Measurement of Force Balance Repeatability and Reproducibility in the NTF
Hemsch, M. J.; Tuttle, D. G.; Houlden, H. P.; Graham, A. B.; [2004]; 15 pp.; In English
Report No.(s): AIAA Paper 2004-0771; No Copyright; Avail: CASI; A03, Hardcopy

A recently published statistical approach for measuring and evaluating wind tunnel force balance repeatability and reproducibility is applied to three check standard tests in the National Transonic Facility at NASA Langley Research Center. Two different airframe models and force balances were used. The short-term repeatability and within-test reproducibility are separately estimated and correlations with tunnel parameters are carried out. Conjectures are presented for the development of scaling laws for predicting the repeatability and reproducibility of other force balance tests in the tunnel.
Author
Force Distribution; Transonic Wind Tunnels; Wind Tunnel Tests; Aircraft Models; Airframes

20040008423 NASA Langley Research Center, Hampton, VA, USA
Statistical Analysis of CFD Solutions from 2nd Drag Prediction Workshop
Hemsch, M. J.; Morrison, J. H.; [2004]; 31 pp.; In English; 42nd AIAA Aerospace Sciences Meeting and Exhibit
Report No.(s): AIAA Paper 2004-0556; No Copyright; Avail: CASI; A03, Hardcopy

In June 2001, the first AIAA Drag Prediction Workshop was held to evaluate results obtained from extensive N-Version testing of a series of RANS CFD codes. The geometry used for the computations was the DLR-F4 wing-body combination which resembles a medium-range subsonic transport. The cases reported include the design cruise point, drag polars at eight Mach numbers, and drag rise at three values of lift. Although comparisons of the code-to-code medians with available experimental data were similar to those obtained in previous studies, the code-to-code scatter was more than an order-of-magnitude larger than expected and far larger than desired for design and for experimental validation. The second Drag Prediction Workshop was held in June 2003 with emphasis on the determination of installed pylon-nacelle drag increments and on grid refinement studies. The geometry used was the DLR-F6 wing-body-pylon-nacelle combination for which the design cruise point and the cases run were similar to the first workshop except for additional runs on coarse and fine grids to complement the runs on medium grids. The code-to-code scatter was significantly reduced for the wing-body configuration compared to the first workshop, although still much larger than desired. However, the grid refinement studies showed no sign$cant improvement in code-to-code scatter with increasing grid refinement.
Author
Computational Fluid Dynamics; Statistical Analysis; Aerodynamic Drag; Body-Wing Configurations; Computational Grids

06
AVIONICS AND AIRCRAFT INSTRUMENTATION

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

20040008407 Swedish Defence Research Establishment, Linkoeping, Sweden
Fault Management with an Operator-Friendly Fault Identification System
Caster, M.; Magnusson, S.; May 2002; 36 pp.; In Swedish
Report No.(s): PB2004-101523; FOI-R-0503-SE; Copyright; Avail: National Technical Information Service (NTIS)

In the report an experimental study of operators fault management with the help of two fault identification systems is described. The study was conducted in SAAB Avionics flight simulator T3Sim. The two systems studies were the current fault identification system in the JAS 3p Gripen aircraft and one alternative system. The study was conducted in an aviation setting, but the conclusions and design suggestions are valid for fault identification systems in all types of platforms. Fault management with help of the alternative system was 20-95% faster than fault management with the current system. In average this resulted in approx. 20 seconds shorter time for fault management, with most evident effects in complex fault situations. In the report a future adaptive fault identification system is sketched. This system would be adaptive with regard to both the psycho-physiological status of the operator and the situation, thus giving the operators a 'smart system' which adapt to their needs.
NTIS
Human Factors Engineering; Fault Detection; Management; Man Machine Systems

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*.

20040004189 National Taiwan Univ., Taipei, Taiwan, Province of China
Process Exhaust Duct System Design Using Dynamic Programming Methods
Chen, Huei-Jiunn; Shiu, Huan-Ruei; Chen, Sih-Li; Journal of the Chinese Institute of Engineers, Volume 26, No. 2; March 2003, pp. 155-164; In English; See also 20040004187; Copyright; Avail: Other Sources

This paper explores the design methods for process exhaust duct systems, including velocity method, the equal friction method, the static regain method and the T-method, and produces actual case designs and system simulations to compare the applicability of respective design methods. The study shows that none of the methods are able to meet the demand of cost optimization under the constraints of duct size and velocity, and the requirement of pressure balance. Dynamic programming is there- fore proposed. The results show that dynamic programming is better than the other methods. It is able to achieve the optimization of life-cycle cost while satisfying all constraints (flow rate, duct size, velocity and pressure balancing). The differences between the design and simulation results using dynamic programming are much lower than those of other methods. Thus a process exhaust duct system that approximates the actual operation best may be designed using dynamic programming.
Author
Exhaust Systems; Ducts; Design Analysis; Dynamic Programming

20040008282 NASA Langley Research Center, Hampton, VA, USA
Propulsion Simulations Using Advanced Turbulence Models with the Unstructured Grid CFD Tool, TetrUSS
Abdol-Hamid, Khaled S.; Frink, Neal T.; Deere, Karen A.; Pandya, Mohangna J.; [2004]; 14 pp.; In English; 42nd AIAA Aerospace Sciences Meeting and Exhibit, 5-8 Jan. 2004, Reno, NV, USA
Report No.(s): AIAA Paper 2004-0714; No Copyright; Avail: CASI; A03, Hardcopy

A computational investigation has been completed to assess the capability of TetrUSS for exhaust nozzle flows. Three configurations were chosen for this study (1) an axisymmetric supersonic jet, (2) a transonic axisymmetric boattail with solid sting operated at different Reynolds number and Mach number, and (3) an isolated non-axisymmetric nacelle with a supersonic cruise nozzle. These configurations were chosen because existing experimental data provided a means for measuring the ability of TetrUSS for simulating complex nozzle flows. The main objective of this paper is to validate the implementation of advanced two-equation turbulence models in the unstructured-grid CFD code USM3D for propulsion flow cases. USM3D is the flow solver of the TetrUSS system. Three different turbulence models, namely, Menter Shear Stress Transport (SST), basic k epsilon, and the Spalart-Allmaras (SA) are used in the present study. The results are generally in agreement with other implementations of these models in structured-grid CFD codes. Results indicate that USM3D provides accurate simulations for complex aerodynamic configurations with propulsion integration.
Author
Turbulence Models; Unstructured Grids (Mathematics); Computational Fluid Dynamics; Exhaust Nozzles; Computerized Simulation; Propulsion System Configurations

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*.

20040005806 Wichita State Univ., Wichita, KS, USA, Raytheon Aircraft Co., Wichita, KS, USA
Simulation and Flight Test Assessment of Safety Benefits and Certification Aspects of Advanced Flight Control Systems
Steck, J. E.; Rokhsaz, K.; Pesonen, U. J.; Bruner, S.; Duerksen, N.; Aug. 2003; 62 pp.; In English
Report No.(s): PB2004-101405; No Copyright; Avail: CASI; A04, Hardcopy

An adaptive inverse controller for customized fight control systems for general aviation aircraft is presented. The purpose of the system is to render a general aviation aircraft easier to fly via decoupling its flight control system. Artificial neural networks are used to counteract the errors due to nonlinearities and noise and to adapt to partial control failure, thus allowing the pilot to continue to safely control the aircraft. The system was verified with MATLAB simulations for longitudinal flight. Simulations of changing configurations, payload, and partial control system failures have shown that the controller does rapidly adapt to these changes without a need for pilot response. It has also been demonstrated that the controller code can be generated from the Simulink model that is compatible with existing code in the flight computer on a Raytheon Beech Bonanza F33C fly-by-wire test bed. The longitudinal flight theory was extended to lateral-directional flight and an inverse controller was derived. The potential increased safety and certification issues are discussed.
NTIS
Flight Simulation; Flight Control; General Aviation Aircraft; Flight Tests

20040008441 Air Force Research Lab., Wright-Patterson AFB, OH, USA
Hardware-In-The-Loop Simulation Using Open Control Platform
Pruett, Stanley H.; Slutz, Gary J.; Paunicka, James L.; Portilla, Eric; Jul. 2003; 13 pp.; In English
Report No.(s): AD-A416514; AFRL-VA-WP-TP-2003-316; No Copyright; Avail: CASI; A03, Hardcopy

Air Force Research Laboratory (AFRL) researchers at the Aerospace Vehicle Technology Assessment and Simulation (AVTAS) Laboratory are currently conducting the Open Control Platform (OCP) Hardware-In-The-Loop (HITL) project sponsored by the DARPA Software Enabled Control (SEC) Program. The purpose of this project is to develop the capability to be an OCP test-bed and to evaluate the OCP controls and simulation environment for a specific test case. The OCP provides an open, middleware-enabled software framework and development platform for developers of distributed and embedded software applications. The middleware isolates the programmer from the details of the operating system and provides a mechanism for communication with other OCP software components. A Traffic Collision Avoidance System (TCAS) was chosen as a representative flight controls application to exercise OCP. The programmatic approach taken by the OCP-HITL project is a series of simulation experiments with increasing complexity.
DTIC
Flight Control; Hardware-In-the-Loop Simulation; Collision Avoidance; Computerized Simulation

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)*.

20040005812 National Center for Atmospheric Research, Boulder, CO
Endurance Time Testing Using the NCAR Snow Machine: Reconciliation of Outdoor and Indoor Tests of Type IV Fluids
Rasmussen, R. M.; Landolt, S.; Tryhane, M.; Hills, A.; Oct. 2003; In English
Report No.(s): PB2004-101408; No Copyright; Avail: National Technical Information Service (NTIS)

This report summarizes the progress made in determining the causes for the shorter fluid endurance times of anti-icing fluids for the National Center for Atmospheric Research (NCAR) snow machine compared to outdoor natural tests. The report also sought to determine if a correlation exists between the NCAR snow machine tests and the natural snow tests for the same anti-icing fluids. Outdoor tests were conducted by Aviation Planning Services (APS) and NCAR during the winter of 2000/2001 using several Type IV fluids in which the snowfall rate, plate temperature, and air temperature were recorded every

6 seconds. Using the parameters recorded for the outdoor tests, snow machine tests were conducted for each of the outdoor tests and a comparison between the outdoor and indoor tests was made.
NTIS
Snow; Antiicing Additives; Tests; Endurance; Test Equipment

20040008238 NASA Langley Research Center, Hampton, VA, USA
Measuring Wall Interference Correction Accuracy: An Overview of the NTF Program (Invited)
Walker, Eric L.; 2004; 12 pp.; In English; 42nd AIAA Aerospace Sciences Meeting and Exhibit, 5-8 Jan. 2004, Reno, NV, USA
Report No.(s): AIAA Paer 2004-0770; No Copyright; Avail: CASI; A03, Hardcopy

An off-line version of the Transonic Wall Interference Correction System (TWICS) has been implemented for the NASA Langley National Transonic Facility (NTF). The correction capability includes both solid and horizontally slotted test section configurations. A study is underway to assess and characterize the accuracy of the TWICS code as implemented in the NTF. The purpose of this paper is to present the test program and display preliminary results.
Author
Aerodynamic Interference; Transonic Wind Tunnels; General Overviews; Wind Tunnel Walls; Accuracy

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*.

20040008154 Boeing Co., Huntington Beach, CA, USA
Lean Transition of Emerging Industrial Capability (LeanTEC)
Shroyer, E.; Mar. 2002; 102 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F33615-97-2-5153; Proj-2865
Report No.(s): AD-A418625; AFRL-ML-WP-TR-2002-4191; No Copyright; Avail: CASI; A06, Hardcopy

Lean Transition of Emerging Industrial Capability (LeanTEC) program was a cooperative agreement between the Boeing Company and AFRL conducted from January 1998 to January 2002. The results of this program are documented in the Manual for Effective Technology Transition Processes included as an attachment to this report. This manual provides processes, procedures, and tools for greatly improving technology transition in the aerospace industry. Methodology for the implementation of these improvements is given along with methods for customizing the various processes, procedures, and tools for a given company or business unit. The indicated methodology was tested by the LeanTEC team and results are documented in the report.
DTIC
Technology Transfer; Research Management

20040008380 Xian Jiaotong Univ., China
Hangtian YiXue Yu Yuxye Gongcheng) Volume 16, Number 4, August, 2003
Aug. 2003; In Chinese; In English
Report No.(s): PB2004-100916; Copyright; Avail: National Technical Information Service (NTIS)

Contents include the following: Effects of Simulated Weightlessness on Myosin Heavy Chain Expression of Soleus Intrafusal Muscle Fibers in Rats (in English); Changes of Cardiac Catecholamines in Rats after Repeated +Gz Exposures and Protective Effects of Low-G Preconditioning and Tea Polyphenols (in English); Volume Rendering Based on Sorted Volumetric Data (in English); Changes of Dentin, Dental Pulp and Periodontium Tissue in Tail-suspended Rats; Changes in Potassium Channel Activity of Hindlimb Arterial Smooth Muscle Cells in Tail-suspended Rats; Effects of Simulated Weightlessness and Bone Mechanical Loading on Bone Interstitial Fluid Flow in Rats; Changes of Osteocalcin in Bone and Bone Marrow in Tail Suspended Rats; Exercise Training during 21 d -6 percent Head Down Bed Rest on Dynamic Posture Equilibrium and Motor Coordination; Changes of Bone Morphogenesis Proteins and Transforming Growth Factor-Beta in Hind-limb Bones of 21 d Tail-suspended Rats; Effects of Qiang Gu Kang Wei Prescription Morphology of Bone in Rats under Simulated Weightlessness; Effects of Modanfinil on Visual and Auditory Reaction Abilities and Subjective Fatigue Level

during 48 h Sleep Deprivation; Development of Self-generating Lower Body Negative Pressure Device; Changes of Endocrine Hormones during -6 deg Head Down Bed Rest in Human; Experimental Research on the Effects of Hydrophobic Coating Porous Plates on Heat Dissipation of Water Sublimator; Effects of Field Viewing Angles on Object Judgment in Virtual Environment; Development of a Shock Response Spectrum Test Facility; Integrated Evaluation on System Reliability of a Space Metabolism Simulation Device; Spatial and Temporal Characteristic of Eye Movement in Human-Computer Interface Design; Changes of Serum IL-1, IL-2R and TNF-alpha Levels in Divers after 150 m Heliox Saturation -182 m Excursion in the Open Sea Diving; and Literature Review: Progress and Application of Free Radical Determination Techniques in the Biological Domain.
NTIS
Medical Science; Aerospace Medicine

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)*.

20040008377 National Aerospace Lab., Tokyo
NAL Research Progress 2001
Oct. 31, 2002; In English
Report No.(s): PB2004-100484; Copyright; Avail: National Technical Information Service (NTIS)

The role of the National Aerospace Laboratory newly established as an Independent Administrative Institute in April 2001 is to promote vital research for aeronautics and space technology and to provide large-scale advanced testing facilities to respond to the needs of related organizations. Here we introduce the major areas of research activity conducted at NAL in 2001. This annual report presents a summary of papers of which publication in English was essential.
NTIS
Research Projects; Aerospace Industry; Technologies; Laboratories; Test Facilities

15
LAUNCH VEHICLES AND LAUNCH OPERATIONS

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

20040008311 Aerospace Corp., El Segundo, CA
Cure Evaluation of Two Critical Composite Hybrid Flat Panels for use in a High-Dimensional Stability Satellite Application
Zaldivar, R. J.; Casteneda, R.; Jul. 20, 2003; 17 pp.; In English
Contract(s)/Grant(s): FO4701-00-C-0009
Report No.(s): AD-A418488; TR-2003(8565)-6; SMC-TR-04-04; No Copyright; Avail: CASI; A03, Hardcopy

Two large composite panels critical to a composite structure were recently fabricated. The panels consist of a complex hybrid of different fibers along with an ultra-low- moisture absorption siloxane-modified polycyanurate resin. After fabrication, the contractor noticed that the panels exhibited signs of partial cure by performing an acetone solvent wipe test. We were asked by the program office to assist the contractor in determining the extent of the contamination and whether the parts could be salvaged. Numerous composite tag samples were machined from the periphery of the part as well as moving inward from the edges. Dynamic mechanical analysis was performed on all samples to determine the extent of contamination. Our data suggested that severe carbamate formation had occurred in one of the panels. The suspected areas of the panel appeared compromised, as evidenced by a multimode loss modulus curve indicating several depressed glass-transition temperatures for the first panel. The second panel exhibited only minimal degradation. The contamination was primarily observed in the outer inch of the panel. The majority of the panel appeared well consolidated and cured. Machining the outer portions of the part salvaged the second panel. The other panel was too greatly compromised.
DTIC
Composite Structures; Siloxanes; Fabrication; Stability; Flat Panel Displays

20040008433 NASA Langley Research Center, Hampton, VA, USA
Ascent, Stage Separation and Glideback Performance of a Partially Reusable Small Launch Vehicle
Pamadi, Bandu N.; Tartabini, Paul V.; Starr, Brett R.; [2004]; 16 pp.; In English; 42nd AIAA Aerospace Sciences Meeting and Exhibit, 5-8 Jan. 2004, Reno, NV, USA
Report No.(s): AIAA Paper 2004-0876; No Copyright; Avail: CASI; A03, Hardcopy

An integrated analysis is presented for ascent, stage separation and glide back performance of a small, partially reusable launch vehicle sized for a payload of about 330 lbs to a 150 nm polar orbit. The altitude margin was used a performance metric for the glideback performance. Aerodynamic databases for each of these three phases of flight were developed using a combination of engineering level code, free stream and proximity wind tunnel test data and Euler CFD results. The ascent and glideback trajectories were generated using POST and the stage separation simulation was done using the in-house software Sep-Sim as a front end to the commercially available multi-body dynamic simulation code ADAMS. The payload to the designated polar orbit was optimized subject to the constraints imposed by stage separation and adequate performance reserve for the glideback booster in addition to the usual ascent trajectory constraints.
Author
Gliding; Reusable Launch Vehicles; Stage Separation; Ascent Trajectories; Wind Tunnel Tests; Flight Characteristics

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*.

20040006343 NASA Johnson Space Center, Houston, TX, USA
STS-107 Mission Highlights Resource Tape, Part 1 of 4
[2003]; In English; 57 min., 45 sec. playing time, in color, with sound
Report No.(s): JSC-1952; No Copyright; Avail: CASI; V03, Videotape-VHS; B03, Videotape-Beta

This video, Part 1 of 4, shows the activities of the STS-107 crew during flight days 1 through 3 of the Columbia orbiter's final flight. The crew consists of Commander Rick Husband, Pilot William McCool, Payload Commander Michael Anderson, Mission Specialists David Brown, Kalpana Chawla, and Laurel Clark, and Payload Specialist Ilan Ramon. Before launch on flight day 1 the astronauts are seen at their pre-flight banquet, during suit-up, and while being seated on the orbiter. David Brown takes footage of the space shuttle's external tank after it is jettisoned. The video includes replays of the launch from several angles. The onboard views of launch are narrated by William McCool and Kalpana Chawla. On flight days 2 and 3 student microgravity experiments in the SpaceHab module in the shuttle's payload bay are profiled. These experiments address microgravity effects on crystal growth, ants, bees, fish embryos, silkworms, and spiders. Other experiments profiled include the Mediterranean Israeli Dust Experiment (MEIDEX), FAST (surface tension of bubbles), SOLS (Ozone), an experiment to culture prostate cancer cells in a bioreactor, and a commercial plant growth experiment. Earth views include lightning at night, and a view of the Strait of Gibraltar, including Spain and Morocco.
CASI
Columbia (Orbiter); Spacecraft Launching; Spacecrews; Spaceborne Experiments

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*.

20040005877 NASA Marshall Space Flight Center, Huntsville, AL, USA
Status on Technology Development of Optic Fiber-Coupled Laser Ignition System for Rocket Engine Applications
Trinh, Huu P.; Early, Jim; Osborne, Robin; Thomas, Matthew; Bossard, John; April 11, 2003; 1 pp.; In English; JANNAF CS/APS/PSHS/MSS Meeting, 3 Dec. 2003, Colorado Springs, CO, USA; Copyright; Avail: Other Sources; Abstract Only

To pursue technology developments for future launch vehicles, NASA/Marshall Space Flight Center (MSFC) is examining vortex chamber concepts for liquid rocket engine applications. Past studies indicated that the vortex chamber

schemes potentially have a number of advantages over conventional chamber methods. Due to the nature of the vortex flow, relatively cooler propellant streams tend to flow along the chamber wall. Hence, the thruster chamber can be operated without the need of any cooling techniques. This vortex flow also creates strong turbulence, which promotes the propellant mixing process. Consequently, the subject chamber concept: not only offer system simplicity, but also enhance the combustion performance. Test results have shown that chamber performance is markedly high even at a low chamber length-to-diameter ratio. This incentive can be translated to a convenience in the thrust chamber packaging.
Author
Liquid Propellant Rocket Engines; Vortices; Turbulence; Thrust Chambers

20040008086 NASA Langley Research Center, Hampton, VA, USA
Satellite Attitude Control using a Combination of Inertia Wheels and a Bar Magnet
Adams, James J.; Brissenden, Roy F.; November 1960; 43 pp.; In English
Report No.(s): NASA-TN-D-626; No Copyright; Avail: CASI; A03, Hardcopy

The use of inertia wheels to control the attitude of a satellite has currently aroused much interest. The stability of such a system has been studied in this investigation. A single-degree-of-freedom analysis indicates that a response with suitable dynamic characteristics and pre- cise control can be achieved by commanding the angular velocity of the inertia wheel with an error signal that is the sum of the attitude error, the attitude rate, and the integral of the attitude error. A digital computer was used to study the three-degree-of-freedom response to step displacements, and the results indicate that the cross-coupling effects of inertia coupling and precession coupling had no effect on system sta- bility. A study was also made of the use of a bar magnet to supplement the inertia wheels by providing a means of removing any momentum intro- duced into the system by disturbances such as aerodynamic torques. A study of a case with large aerodynamic torques, with a typical orbit, indicated that the magnet was a suitable device for supplying the essential trimming force.
Author
Satellite Attitude Control; Reaction Wheels; Magnets

19
SPACECRAFT INSTRUMENTATION AND ASTRIONICS

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

20040004322 Syntonics, LLC, Columbia, MD, USA
A Micro-Ultrastable Oscillator (micro-US0) for Micro/Nano Sciencecraft
[2003]; 27 pp.; In English
Contract(s)/Grant(s): NAG5-10395; No Copyright; Avail: CASI; A03, Hardcopy

Syntonics LLC developed a prototype micro-Ultra Stable Oscillator (micro-USO) under a Space Base Technology Grant (NAGS-10395). Syntonics conducted the micro-USO Program in two phases. In Phase I, we developed a set of verified analytical models (including thermal, electrical, and control models) for a baseline USO, conducted a series of six technology studies, and built three approx.9OOg prototype units. These prototypes provided a tool for evaluating competing design topologies. In Phase II we prepared the conceptual design of a approx.100-15Og micro-USO.
Author
Oscillators; Temperature Control; Space Bases; Mathematical Models

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*.

20040004194 Jin-Wen Inst. of Tech., Taipei, Taiwan, Province of China
Double Ignitions of Ni-Al Combustion Reactions
Li, Hung-Pin; Journal of the Chinese Institute of Engineers, Volume 26, No. 2; March 2003, pp. 191-200; In English; See also 20040004187
Contract(s)/Grant(s): NSC-90-2216-E-228-001; Copyright; Avail: Other Sources

Double ignitions of Ni-Al combustion reactions have been numerically studied in this research. Due to the lower exothermic heat of the metallic reactions, the propagation of Ni-Al combustion front during combustion synthesis is found to extinguish half way for some reactions. To allow the combustion front to propagate completely, the reaction is always ignited again during the experimental demonstration. In this research, different positions in the combusted region, the reacting region, and the pre-heating region are chosen to study the effect of the second ignition. The second ignition time and position are found to influence the subsequent temperature profiles. It is noted that the combustion temperature is significantly enhanced or incomplete reaction is occurred as the reaction is ignited again in the combusted region or the pre-heating region. Stable propagation is observed as the reaction is ignited again in the reacting region. A process map for double ignitions is also generated in this study. From the knowledge of the process map, appropriate double-ignition circumstances can be chosen to acquire stable propagation and homogeneous microstructure.
Author
Combustion Synthesis; Propagation (Extension); High Temperature; Nickel Aluminides; Ignition

20040004272 Technical Research Centre of Finland, Espoo, Finland
Probabilistic Fire Simulator. Theory and User's Manual for Version 1.2
Hostikka, S.; Keski-Rahkonen, O.; Korhonen, T.; 2003; In English
Report No.(s): PB2004-101990; VTT/PUB-503; No Copyright; Avail: National Technical Information Service (NTIS)
Risk analysis tool is developed for computation of the distributions of fire model output variables. The tool, called Probabilistic Fire Simulator, combines Monte Carlo simulation and CFAST two-zone fire model. This document describes the physical models and contains a detailed user's manual. In the applications, the tool is used to estimate the failure probability of redundant cables in a cable tunnel fire, and the failure and smoke filling probabilities of electronics room during a fire of an electronics cabinet. Sensitivity of the output variables to the input variables is calculated in terms of the rank order correlations. Various steps of the simulation process, i.e. data collection, generation of the input distributions, modeling assumptions, definition of the output variables and the actual simulation, are described.
NTIS
Fires; Probability Theory; Simulators; User Manuals (Computer Programs)

20040005901 NASA Glenn Research Center, Cleveland, OH, USA
High Power MPD Nuclear Electric Propulsion (NEP) for Artificial Gravity HOPE Missions to Callisto
McGuire, Melissa L.; Borowski, Stanley K.; Mason, Lee M.; Gilland, James; December 2003; 12 pp.; In English; Space Technology and Applications International Forum, 2-6 Feb. 2003, Albuquerque, NM, USA
Contract(s)/Grant(s): WBS 22-706-87-02
Report No.(s): NASA/TM-2003-212349; E-13937; No Copyright; Avail: CASI; A03, Hardcopy
This documents the results of a one-year multi-center NASA study on the prospect of sending humans to Jupiter's moon, Callisto, using an all Nuclear Electric Propulsion (NEP) space transportation system architecture with magnetoplasmadynamic (MPD) thrusters. The fission reactor system utilizes high temperature uranium dioxide (UO2) in tungsten (W) metal matrix cermet fuel and electricity is generated using advanced dynamic Brayton power conversion technology. The mission timeframe assumes on-going human Moon and Mars missions and existing space infrastructure to support launch of cargo and crewed spacecraft to Jupiter in 2041 and 2045, respectively.
Author
Nuclear Electric Propulsion; Artificial Gravity; Callisto; Magnetoplasmadynamic Thrusters; NASA Space Programs; Space Transportation System; Manned Space Flight

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*.

20040004274 Technical Research Centre of Finland, Espoo, Finland
Adsorption Studies on Iron Oxides with Reference to the Oxide Films Formed on Material Surfaces in Nuclear Power Plants
Sten, P.; Puhakka, E.; Ikaevalko, E.; Lehikoinen, J.; Olin, M.; 2003; In English
Report No.(s): PB2004-101993; VTT-RN-2182; No Copyright; Avail: National Technical Information Service (NTIS)

The construction materials used in coolant systems in nuclear power plants become covered with oxide films as a result of exposure to the aqueous coolant. The present work belongs to a research program on the properties of such films and especially on the transport of inorganic species through the films. The focus is on the incorporation of the highly energetic long-lived cobalt isotope Cobalt 60 in the films causing build-up of radiation fields in the out-of-core system. The present report concentrates on experimental adsorption studies both in ambient conditions and in high-temperature (573 K and 507 K), high-pressure conditions closely resembling those prevailing in the cooling circuits of nuclear power plants. In addition to cobalt adsorption, adsorption of zinc and nickel were studied, as a novel method to decrease the activity incorporation due to Cobalt 60 is injection of zinc into the primary coolant.
NTIS
Adsorption; Iron Oxides; Nuclear Power Plants; Surface Properties

20040005851 Massachusetts Inst. of Tech., Cambridge, MA
Artificial Muscle Technology: Physical Principles and Naval Prospects
Hunter, Ian W.; Madden, John D.; Vandesteeg, Nate; Madden, Peter G.; Takshi, Arash; Nov. 4, 2003; 22 pp.; In English
Contract(s)/Grant(s): N00014-02-1-0778
Report No.(s): AD-A418610; No Copyright; Avail: CASI; A03, Hardcopy

Understanding of the advantages of unsteady flow and locomotion in fish and insects is creating a demand for biomimetic actuator technologies. New actuator materials that employ voltage, field, or temperature driven dimensional changes to produce forces and displacements are suggesting new approaches to propulsion and maneuverability. The fundamental properties of these new materials are presented, and examples of potential undersea applications are examined to assist those involved in hydrodynamic design and actuator research evaluate the current status and the developing potential of these artificial muscle technologies. The technologies described are based on newly explored materials developed over the past decade, and also on older materials whose properties are not widely known. The materials are dielectric elastomers, ferroelectric polymers, liquid crystal elastomers, molecular actuators, giant magnetostrictive materials, thermal and ferromagnetic shape memory alloys, ionic polymer/metal composites, conducting polymers, and carbon nanotubes. All the technologies involve materials that change dimensions in response to input electrical, thermal, or optical power. A table of the mechanical properties of mammalian skeletal muscle is presented for comparison with the properties of each of the materials described. The properties are maximum strain, maximum stress, work density, density, peak strain rate, power to mass, bandwidth, life cycle, coupling, efficiency, modulus of elasticity, speed of sound, coefficient of thermal expansion, strength, voltage, charge, and maximum field. Fundamental mechanisms, basic properties, synthesis, fabrication, and applications are presented. The paper concludes with two case studies presenting the best artificial muscle technologies for a variable camber propeller and for increasing thrust by generating unsteady flow conditions when used with a REMUS autonomous underwater vehicle (AUV) propeller. (13 tables, 3 figures, 125 refs7
DTIC
Actuators; Muscles; Underwater Propulsion

20040008293, IBM Watson Research Center, Yorktown Heights, NY, USA
Construction of Representative Pore Morphologies in Disordered Nanoporous Two-Phase Materials
Hedstrom, J. A.; Toney, M. F.; Huang, E.; Kim, H.-C.; Volksen, W.; Mar. 2003; In English
Report No.(s): DE2003-812995; SLAC-PUB-9699; No Copyright; Avail: National Technical Information Service (NTIS)

Materials with nanometer size heterogeneities are commonplace in the physical and biological sciences and often exhibit complex morphologies. Although this morphology has a dramatic effect on the materials properties (e.g., transport and reaction processes), it is often difficult to accurately characterize. We describe a method, using a novel analysis of small angle X-ray scattering data, of generating representative three-dimensional morphologies of isotropic two-phase materials (one class of heterogeneous materials) where the morphology is disordered. This is applied to thin films containing nanometer sized pores with a range of porosities (4-44%). These representations provide a visualization of the pore morphology, give the pore size scale and extent of interconnection, and permit the determination of the transitions from closed pore to interconnected pores to bicontinuous morphology. This methodology will be valuable for characterizing two-phase systems, such as polymer blends, microemulsions, porous geological materials, bones, cements and ceramics.
NTIS
Morphology; Porous Materials; Cements; Ceramics

20040008526 Battelle Memorial Inst., Columbus, OH
Reductive Anaerobic Biological In Situ Treatment Technology Treatability Testing
Alleman, Bruce; Morse, Jeff; Gossett, Jim; Feb. 14, 2002; 163 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F08637-95-C-6004; Proj-4531
Report No.(s): AD-A418707; AFRL-ML-TY-TR-2003-4514; No Copyright; Avail: CASI; A08, Hardcopy

Enhanced biological reductive dechlorination (EBRD) shows a great deal of promise for efficiently treating groundwater contaminated with chlorinated solvents, but demonstration sites around the country were reporting mixed results. Because individual demonstrations commonly used dissimilar methods, the limitations of the technology were not clear and its applicability at any given site was unknown. As a result, the Environmental Security Technology Certification Program (ESTOP) invested in the development of a standardized protocol to test the technology's effectiveness at any site. A draft protocol was developed that included microcosm and field- testing and an extensive array of sampling and monitoring. Once developed, the draft protocol was applied at four sites to evaluate its overall effectiveness. Data generated at the four sites was used to refine the protocol by eliminating less valuable components while maintaining a testing methodology that provides scientifically defensible data that would satisfy the regulatory community at a reasonable cost. Microcosm testing was used to evaluate the performance of a suite of electron donors, which included yeast extract, lactate, butyrate, benzoic add, propionic add, and acetic add. The testing examined the rate, onset, and extent of dechlorination as well as donor fermentation pathways. Microcosm testing data revealed an apparently heterogeneous distribution of dechlorinating organisms within Individual sites, and that most electron donors will eventually yield the same dechlorination endpoint, though the onset and rate of dechlorination may differ significantly. The electron donor showing the most rapid and complete dechlorination in microcosm studies (usually butyrate) was used in the four 6- month field demonstrations.
DTIC
Ground Water; Soil Pollution; Water Pollution; Biotechnology

24
COMPOSITE MATERIALS

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

20040004089 Naval Postgraduate School, Monterey, CA
Molecular Dynamic Modeling and Simulation for Polymers
Harrell, Anthony F.; Sep. 2003; 67 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418526; No Copyright; Avail: CASI; A04, Hardcopy

Polymers have been widely used in various engineering applications. For more than a quarter century, the materials have been utilized intensively for the binding materials for composites. The material properties of the binding materials called matrix materials play an important role for the composite material behaviors, As a result, the objective of this study was to understand the mechanical properties of polymers. In particular, the goal was to develop insights as to how a molecular level structure is connected to the bulk properties of materials assuming homogeneity. To this end, molecular dynamics was used to model and simulate the polymeric behaviors. Polymeric chains were modeled using the bead and spring model along with interacting potentials. The study examined the effects of different sizes, densities, and numbers of molecules per chain on the shear moduli of the polymers. Furthermore, some preliminary study was also conducted for metallic particle reinforced polymer composites.
DTIC
Composite Materials; Polymers; Molecular Dynamics

20040008319 Association of American Railroads, Pueblo, CO, USA
Vertical Track Modulus in Plastic Composite Tie Test Zones at FAST
Jimenez, R.; Jan. 2003; 26 pp.; In English
Report No.(s): PB2004-101474; No Copyright; Avail: CASI; A03, Hardcopy

Transportation Technology Center (TTCI) conducted vertical track modulus (stiffness) tests on existing plastic composite tie test zones on the High Tonnage Loop (HTL) at the Federal Railroad Administration's (FRA) Facility for Accelerated Service Testing (FAST), Pueblo, Colorado, Warm- and Cold-weather tests were performed during the late summer and winter of 2002 to document the effect of temperature on the stiffness of track fitted with plastic ties. An adjacent solid-sawn oak-wood-tie test zone was used as a control zone. The static measurement results indicated that the vertical track modulus of plastic-tie track in the 6-degree curve of the HTL was comparable to oak-wood-tie track in the same curve during a

57-degree change in ambient temperature and concurrent 88-degree change in center-of-tie temperature. The dynamic measurements provided a relative comparison of the low rail vertical stiffness in plastic-tie track and the low-rail stiffness of wood-tie track throughout the 6-degree curve. The results of the dynamic measurements agree with those of the static measurements in the comparability of plastic-tie track and wood-tie track. Results of this test indicate that there was no significant change in the vertical track stiffness that can be attributed to the change in plastic-tie temperature within the range evaluated. Due to climatic conditions, temperature during testing, type of subgrade, and maintenance standards under which tests are conducted at FAST, the performance of plastic tie track may differ in revenue service. Neither TTCI nor the AAR endorses any specific manufacturer's product or service.
NTIS
Railroad Humping Tests; Composite Materials; Deflection

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*.

20040004138
Guidelines for the Use of Lithium to Mitigate or Prevent Alkali-Silica Reaction (ASR)
Folliard, K. J.; Thomas, M. D.; Kurtis, K. E.; Jul. 2003; 94 pp.; In English
Report No.(s): PB2004-100121; No Copyright; Avail: CASI; A05, Hardcopy

Alkali-silica reactions (ASR) is a significant durability program that has resulted in premature deterioration of various types of concrete structures in the USA and throughout the world. This report first provides a basic overview of ASR, including information on mechanisms, symptoms of ASR damage in field structures, mitigation approaches, test methods, and specifications. A comprehensive summary of lithium compounds is provided next, including information of their production, availability, and use in laboratory concrete studies and field applications (including a range of case studies). Guidelines for using lithium compounds as an admixture in new concrete and for treating existing structures suffering from ASR-induced damaged then are presented, including information on how to assess the efficacy of lithium compounds in laboratory tests. Some basic information also is provided on the economics of using lithium both in new concrete and as a treatment for existing structures. Finally, the report provides a summary of conclusions and identifies several technical and practical issues that should be considered for future laboratory studies and field applications.
NTIS
Alkalies; Lithium Compounds; Silicon Dioxide; Chemical Reactions

20040004139
Long-Term Performace of Corrosion Inhibitors Used in Repair of Reinforced Concrete Bridge Components
Islam, M.; Sohanghpurwala, A. A.; Scannell, W. T.; 2003; 64 pp.; In English
Report No.(s): PB2004-100129; No Copyright; Avail: CASI; A04, Hardcopy

In 1987 the Strategic Highway Research Program (SHRP) launched multiple research efforts to study all aspects of reinforced concrete deterioration. One of the projects (SHRP C-103) under the Structures portion of SHRP evaluated the effectiveness of using corrosion inhibitors as a means for mitigating corrosion in reinforced concrete bridge components. That project, completed in 1993, involved a laboratory study and field validation, and concluded that corrosion inhibitors could be successfully applied with field repair and rehabilitation techniques. A follow-on study of the SHRP effort was initiated by the Federal Highway Administration (FHWA) in August 1994 and ended in July 1999. The primary objective of this multitask project was to determine the effectiveness of cathodic protection, electrochemical chloride extraction, and corrosion-inhibitor treatment systems installed during the SHRP effort through the long-term evaluation of 32 field test sites and a number of laboratory concrete slab specimens. One task the FHWA program required was monitoring the long-term performance of corrosion inhibitor treatments on selected components of four bridges that were treated and evaluated under SHRP C-103. Three evaluations over a period of 5 years were conducted on structures located in Minnesota, New York, and Pennsylvania, and two evaluations were conducted on a structure in Washington State. An analysis of the results concluded that neither of

the corrosion inhibitors evaluated in this study, using the specified repairs and exposed to the specific environments, provided any corrosion-inhibiting benefit.
NTIS
Reinforcement (Structures); Bridges (Structures); Corrosion Resistance; Concretes

20040005847 Naval Submarine Medical Research Lab., Groton, CT
BESTSRCH: An Automated System for Identification of GC/MS Peaks
Tappen, D. V.; Hayder, E.; Mooney, L. W.; Oct. 17, 1988; 24 pp.; In English
Report No.(s): AD-A418603; NSMRL-1125; No Copyright; Avail: CASI; A03, Hardcopy

In order to carry out time consuming data reduction processes while simultaneously conducting gas chromatographic/mass spectrometric (GC/MS) analyses with a single computerized control system, it has been necessary to develop software capable of making sophisticated decisions without assistance from the analyst for use during off hours when the computer is not otherwise occupied. A software routine has been devised and tested that determines the quality of a series of spectral library searches to find the best average spectrum for removing background contamination and the interference of overlapping chromatographic peaks from each peak of a GC/MS total ion chromatogram (TIC). Peak spectra are corrected for interference, searched against a library of known mass spectra, and the results are printed without operator intervention by the software developed. Either preliminary or optimized searches for the identity of the organic materials separated in an entire chromatogram or in a selected portion of a TIC obtained by GC/MS analysis may be made. The procedure, which has wide general utility, has been applied to the analysis of volatile organic components found in samples of submarine air.
DTIC
Computer Programs; Gas Chromatography; Mass Spectroscopy

20040005855 Virginia Univ., Charlottesville, VA, USA
Semiconductor Nanostructures on High Index Surfaces
Towe, Elias; Pal, Debdas; Stoleru, Valeria-Gabriela; Oct. 31, 2003; 51 pp.; In English
Contract(s)/Grant(s): DAAD19-00-1-0442
Report No.(s): AD-A418611; ARO-41625.1-EL; No Copyright; Avail: CASI; A04, Hardcopy

This report summarizes work on semiconductor quantum dot nanostructures that was carried out at the University of Virginia from July 2000 to April 2003. The key findings of the work are that: the emission and absorption properties of these nanostructures are intimately linked to the control of their size and ordering. The size of the quantum dot nanostructures was found to be more dominant in affecting the optical properties of the structures. It was determined that the dots could be ordered in the vertical direction. This ordering however, led to a reduction in the in- plane area density. Some minimal in-plane ordering could be achieved when the structures are grown on high index surfaces. The best surface for dot uniformity (without lateral ordering) was the (001) surface misoriented by 1 to 2 degrees. in this configuration, the surface can technically be represented as a high index surface. Semi-analytical calculations have been carried out to determined the energy structure of the dot nanostructures. These calculations were used in some of the experimental studies reported in the attached papers. These studies were carried out on quantum dot inter-band as well as intra-band laser and photodetector structures.
DTIC
Nanostructures (Devices); Quantum Dots; Semiconductor Devices

20040005856 Army Engineer Research and Development Center, Champaign, IL, USA
Use of Pyrolysis GC/MS for Predicting Emission Byproducts from the Incineration of Double-Base Propellant
Cropek, Donald M.; Kemme, Patricia A.; Day, Jean M.; Cochran, Jack; Sep. 2003; 11 pp.; In English
Contract(s)/Grant(s): Proj-622720D048
Report No.(s): AD-A418613; ERDC/CERL MP-03-5; No Copyright; Avail: CASI; A03, Hardcopy

Gas chromatography/mass spectrometry was used to analyze the pyrolytic byproducts from an Army-unique propellant compound (AA2) that is composed of predominantly nitrocellulose and nitroglycerin. Compounds produced by AA2 pyrolysis were compared to compounds detected in the gaseous effluent from AA2 incineration. The light permanent gases and most of the higher molecular weight byproducts produced by AA2 incineration are replicated by laboratory pyrolysis on AA2. The reverse case also holds whereby 18 out of 24 high molecular weight AA2 pyrolytic byproducts are found in the incinerator emissions. Poor matching, however, was obtained between the two processes for the volatile, water-soluble species. None of these low molecular weight compounds produced under pyrolytic conditions were detected in the AA2 incinerator samples, likely indicating inefficient capture of these compounds from the effluent stream. Separate pyrolytic degradation of the

individual components of AA2 provides evidence that nearly all of the incomplete combustion products detected during incineration originate not from the prevalent energetic ingredients but rather from the minor and trace additives in AA2. In addition, pyrolysis successfully identified the AA2 components capable of surviving the incineration process intact. This work illustrates the potential of bench-scale pyrolysis for predicting incineration behavior.
DTIC
Gas Chromatography; Pyrolysis; Combustion Products; Double Base Propellants; Mass Spectroscopy

20040005858
Stimulating the Anaerobic Biodegradation of Explosives by the Addition of Hydrogen or Electron Donors That Produce Hydrogen
Adrian, Neal R.; Arnett, Clint M.; Hickey, Robert F.; Sep. 2003; 14 pp.; In English
Contract(s)/Grant(s): Proj-611102AH68
Report No.(s): AD-A418612; ERDC/CERL MP-03-3; No Copyright; Avail: CASI; A03, Hardcopy

The anaerobic biodegradation of hexahydro-1,3 ,5- trinitro- 1,3 ,5-triazine (RDX), octahydro-1,3,5,7- tetranitro- 1,3,5,7-tetrazocine (HMX), and 2,4,6-trinitrotoluene (TNT) by a methanogenic mixed culture was investigated. Microcosms containing a basal medium and the mixed culture were amended with ethanol, propylene glycol (PG), butyrate or hydrogen gas as the electron donor and a mixture of TNT (50 micrometer), RDX (25 micrometer), and HMX (8 micrometer). After 29 days, TNT and RDX were completely transformed to unidentified end products in the bottles amended with ethanol, hydrogen, or PG, while 53%, 40%, and 22% of the HMX was transformed, respectively. There was no loss of RDX or HMX in the electron donor unamended control bottles. The ethanol and PG were transformed to near stoichiometric amounts of acetate and propionate, suggesting the immediate electron donor supporting the transformation of the H2 or electron donors that produce H2 may be a useful strategy for enhancing the anaerobic biodegradation of explosives in contaminated groundwater and soils.
DTIC
Hydrogen; Biodegradation; Explosives

20040005874 Civil Aerospace Medical Inst., Oklahoma City, OK, USA
Ethanol Origin in Postmortem Urine: An LC/MS Determination of Serotonin Metabolites
Jonson, Robert D.; Lewis, Russell J.; Canfield, Dennis V.; Blank, C. LeRoy; November 2003; 18 pp.; In English
Contract(s)/Grant(s): FAA-AM-B-02-TOX-204
Report No.(s): DOT/FAA/AM-03/18; No Copyright; Avail: CASI; A03, Hardcopy

Specimens from fatal aviation accident victims are submitted to the FAA Civil Aerospace Medical Institute for toxicological analysis. During toxicological evaluations, ethanol analysis is performed on all cases. Care must be taken when interpreting a positive ethanol result due to the potential for postmortem ethanol formation. Several indicators of postmortem ethanol formation exist; however, none are completely reliable. The consumption of ethanol has been shown to alter the concentration of two major serotonin metabolites, 5-hydroxytryptophol (5- HTOL) and 5-hydroxyindole-3-acetic acid (5-HIAA). While the 5-HTOL/5-HIAA ratio is normally very low, previous studies using live subjects have demonstrated that the urinary 5-HTOL/5-HIAA ratio is significantly elevated for 11-19 hours after acute ethanol ingestion. We investigated the 5-HTOL/5-HIAA ratio as a potential indicator of ethanol origin in postmortem urine samples. We developed and validated a method for the simultaneous determination of 5-HTOL and 5-HIAA in forensic urine samples using a simple liquid/liquid extraction and LC/MS/MS and LCIMSIMSIMS. A typical recovery of approximately 80% was achieved for both compounds. The LClMS method proved highly selective and sensitive, having an LOD of 0.1 ng/mL for both compounds. The accuracy and precision was also very good. Utilizing our LC/MS method, we examined the 5-HTOL/5-HLAA ratio in 21 ethanol-negative and 23 true ethanol-positive postmortem urine specimens. We found that all ethanol-negative specimens had 5-HTOL/5-HIAA ratios below 15 pmol/nmol, a previously established antemortem urine cutoff for recent ethanol ingestion. All ethanol-positive urine samples had 5-HTOL/5-HIAA ratios above 15 pmol/nmol. These results validated the antemortem cutoff for use with postmortem urine specimens. This method was then applied to cases where postmortem ethanol formation was suspected.
Author
Metabolites; Urine; Ethyl Alcohol

20040005884 South Carolina Univ., Columbia, SC, USA
Modeling of Power Systems for Marines
White, Ralph E.; Dougal, Roger A.; Nov. 20, 2003; 5 pp.; In English
Contract(s)/Grant(s): N00014-00-1-0368
Report No.(s): AD-A418450; No Copyright; Avail: CASI; A01, Hardcopy

The authors have developed dynamic simulation models for portable, lightweight, high-energy-density power sources, especially those utilizing advanced electrochemical energy sources (e.g., polymer electrolyte membrane fuel cells) and energy storage elements (e.g., batteries, ultra- capacitors) and used those simulation models to study the performance of those power sources in specific applications such as electric vehicles or man-portable electronics. They developed component models and then used the VTB environment to assemble those components into complex systems. They produced models of photovoltaic solar cells, hydrogen-fueled polymer electrolyte membrane fuel cells, and electrochemical double-layer capacitors. They leveraged other work that developed models of lithium-ion batteries, and developed strong synergistic relationships between the departments of Electrical Engineering and Chemical Engineering. The work developed models of soldier system loads, both in the form of individual components such as radios and computers, and in the form of abstract electronic suites that have probabilistically determined power demands.
DTIC
Electrochemistry; Mathematical Models; Electric Power; Energy Technology; Electric Batteries

20040008307 Naval Academy, Annapolis, MD
Reaction Kinetics of Sc, V, Cr, Co and Ni With N2O
Kolsch, Erica J.; May 7, 1997; 51 pp.; In English
Report No.(s): AD-A418485; No Copyright; Avail: CASI; A04, Hardcopy

The purpose of this experiment was to determine the gas phase reactivities of N2O with the following first-row transition metal atoms: Sc(a2D3/2), V(a4F3/ 2), Cr(a7S3), Co(a4F9/2) and Ni(a3D3, a3F4). Reactions were studied in the temperature range of 298K-623K. Sc, V, Cr, Co and Ni atoms were produced by photodissociation of Sc(hfa)3, Sc(TMHD)3, V(CO)6, V(CO)4(C5H5), V(C5H5)2, Cr(CO) 6, Co(C5H5)(CO)2 and Ni(C5H5)2 respectively. Pseudo first-order conditions were maintained (Transition Metal<<N2O), and atoms were detected using a laser-induced florescence technique. Reactions of the ground states with N2O were temperature dependent. Reactions of Sc, V, Cr and Co with N20 were found to be pressure independent, indicating a bimolecular abstraction mechanism. Removal rate constants for the excited a6DJ and a5S2 states of Cr were found to be fast compared to reactions with the ground state. The rate constants for Sc, V, Cr and Co can be described in Arrhenius form (k=Aexp(-Ea/RT)) by k=1.6x10- 10exp(-11.7 kJ/mol/RT) cm3s-1, k=4.6xl0-11 exp(-10.7 kJ/mol/RT) cm3s-1, k=4.2x10-11 exp(-20.4 kJ/mol/RT) cm3s-1, and k=2.Ox1O-10exp (kJ/mol/RT) cm3s-1, respectively. The rate constants for Ni were found to be pressure dependent at low temperatures suggesting a termolecular reaction.
DTIC
Reaction Kinetics; Nitrogen Oxides; Transition Metals; Photodissociation

20040008346 Northwestern Univ., Evanston, IL
MURI: Electrochemically-Controlled Orthogonal Assembly of Monolayers on a Gold Surface via DPN
Mirkin, Chad A.; Oct. 28, 2003; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F4962O-OO-1-0345
Report No.(s): AD-A418486; AFRL-SR-AR-TR-03-0467; No Copyright; Avail: CASI; A03, Hardcopy

Nature utilizes molecular recognition between complex macromolecules to form sophisticated meso- and macroscopic architectures with tremendous control over the placement and orientation of nanoscopic building blocks within the extended architectures. The structures of proteins, duplex DNA, and phospholipid bilayers are maintained by cumulative weak and reversible interactions (hydrogen bonding and van der Waals interactions), and pairing principles for the constituent molecules. The biosyntheses are remarkably efficient, self-correcting, and high yielding; therefore, they are excellent models for how the synthetic chemist should consider designing complex nanostructured materials. The specific objective of the proposed research was to demonstrate orthogonal assembly of charged particles by electrochemically controlling particle deposition. In addition, the use of applied potentials to selectively miniaturize microscopic features to nanoscopic dimensions was explored.
DTIC
Gold; Lithography; Nanofabrication; Orthogonality; Electrochemistry

20040008411 Stanford Linear Accelerator Center, Stanford, CA, USA
Dynamic Response of Magnetization to Hot Spins
Weber, W.; Riesen, S.; Siegmann, H. C.; Jun. 2003; 32 pp.; In English
Report No.(s): DE2003-813276; SLAC-PUB-10018; No Copyright; Avail: Department of Energy Information Bridge

When electrons interact with a ferromagnet, their spin polarization vector is expected to move, depending on the magnetization of the ferromagnetic material. This spin motion, consisting of an azimuthal precession and a polar rotation about the magnetization direction, is measured. The precession of the spin polarization vector generates a torque on magnetization that turns out to be large with low-energy electrons. This makes injection as well as reflection of spin-polarized electrons an attractive alternative concept for magnetization switching.
NTIS
Magnetic Fields; Magnetic Materials

26
METALS AND METALLIC MATERIALS

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

20040004278 State Univ. of New York, Buffalo, NY, USA
Experimental Investigation of Light-Gauge Steel Plate Shear Walls for the Seismic Retrofit of Buildings
Berman, J. W.; Bruneau, M.; May 02, 2003; 196 pp.; In English
Report No.(s): PB2004-101622; MCEER-03-0001; No Copyright; Avail: CASI; A09, Hardcopy

Steel plate shear walls (SPSW), which are allowed to buckle in shear and form a diagonal tension field, have been used as lateral load resisting systems for buildings. Research, both analytical and experimental, shows that these systems can be ductile, stiff, and have stable hysteretic energy dissipation when hot-rolled infill plates are used. However, the demands imparted on the surrounding framing in a seismic retrofit situation are substantial, and in most cases, the existing framing is likely insufficient. SPSW utilizing light-gauge cold-rolled infill plates could be a more viable option for retrofit scenarios. The work presented here experimentally investigates the seismic adequacy of such a system. This report describes the prototype design, specimen design, experimental set-up, and experimental results of three light-gauge steel plate shear wall concepts. Additionally, a design procedure for SPSW based on the application of plastic analysis to an accepted analytical model for the representation of SPSW is proposed.
NTIS
Buildings; Metal Plates; Steels; Walls; Retrofitting; Seismic Waves

20040004324 Toledo Univ., OH, USA
Investigation of Pressurized Wave Bearings
Keith, Theo G., Jr.; Dimofte, Florin; December 2003; 22 pp.; In English
Contract(s)/Grant(s): NAG3-2408; No Copyright; Avail: CASI; A03, Hardcopy

The wave bearing has been pioneered and developed by Dr. Dimofte over the past several years. This bearing will be the main focus of this research. It is believed that the wave bearing offers a number of advantages over the foil bearing, which is the bearing that NASA is currently pursuing for turbomachinery applications. The wave bearing is basically a journal bearing whose film thickness varies around the circumference approximately sinusoidally, with usually 3 or 4 waves. Being a rigid geometry bearing, it provides precise control of shaft centerlines. The wave profile also provides good load capacity and makes the bearing very stable. Manufacturing techniques have been devised that should allow the production of wave bearings almost as cheaply as conventional full-circular bearings.
Derived from text
Journal Bearings; Turbomachinery; Shafts (Machine Elements); Film Thickness

20040004384 Nebraska Univ., Lincoln, NE, USA
Design of Experiments for the Thermal Characterization of Metallic Foam
Crittenden, Paul E.; Cole, Kevin D.; Optimal Experiment Design for Thermal Characterization of Functionally Graded Materials; August 18, 2003; 18 pp.; In English; See also 20040004381
Contract(s)/Grant(s): NAG1-01087; No Copyright; Avail: CASI; A03, Hardcopy

Metallic foams are being investigated for possible use in the thermal protection systems of reusable launch vehicles. As a result, the performance of these materials needs to be characterized over a wide range of temperatures and pressures. In this

paper a radiation/conduction model is presented for heat transfer in metallic foams. Candidates for the optimal transient experiment to determine the intrinsic properties of the model are found by two methods. First, an optimality criterion is used to find an experiment to find all of the parameters using one heating event. Second, a pair of heating events is used to determine the parameters in which one heating event is optimal for finding the parameters related to conduction, while the other heating event is optimal for finding the parameters associated with radiation. Simulated data containing random noise was analyzed to determine the parameters using both methods. In all cases the parameter estimates could be improved by analyzing a larger data record than suggested by the optimality criterion.
Author
Metal Foams; Heat Transfer

20040005819 Naval Surface Warfare Center, Bethesda, MD, USA
Spray Forming Iron Based Amorphous Metals
Kohler, Leslie K.; Aprigliano, Louis F.; Rao, A. S.; Sep. 2003; 46 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418501; NSWCCD-61-TR-2003/09; No Copyright; Avail: CASI; A03, Hardcopy

Spray metal forming has been used to produce deposits of iron-based alloys DAR1A, DAR27, DAR35, and BMA1. The deposits were made on tubular and flat plate substrates and were up to 1.25 inches in thickness. Most of the deposits were found to be partially amorphous in the as-sprayed condition. Measurements were made of microhardness and porosity, and corrosion and wear tests were conducted. Severe cracking occurred in the thick section spray formed deposits, most likely arising from thermal stresses. The use of a pre- heated substrate is being investigated to minimize or eliminate this cracking. The spray formed deposits had high hardness (900 to 1200 HV), low porosity, (0.5 to 3%), and better wear resistance than a conventional hull steel and a tool steel. In a standardized salt fog chamber test, the spray- formed alloys were found to corrode like a conventional hull steel. This is probably a result of the partially devitrified nature of the spray-formed material.
DTIC
Amorphous Materials; Iron Alloys; Metals; Metal Spraying; Forming Techniques

20040008274 Kentucky Univ., Lexington, KY, USA, National Research Council of Canada, Boucherville, Quebec, Canada
Textures in Strip-Cast Aluminum Alloys: Their On-Line Monitoring and Quantitative Effects on Formability
Jul. 2003; In English
Report No.(s): DE2003-812500; No Copyright; Avail: National Technical Information Service (NTIS)

Aluminum sheets produced by continuous casting (CC) provide energy and economic savings of at least 25 and 14 percent, respectively, over sheets made from conventional direct chill (DC) ingot casting and rolling. As a result of the much simpler production route in continuous casting, however, the formability of CC aluminum alloys is often somewhat inferior to that of their DC counterparts. The mechanical properties of CC alloys can be improved by controlling their microstructure through optimal thermomechanical processing. Suitable annealing is an important means to improve the formability of CC aluminum alloy sheets. Recrystallization of deformed grains occurs during annealing, and it changes the crystallographic texture of the aluminum sheet.
NTIS
Aluminum Alloys; Casting; Mechanical Properties; Forming Techniques; Metal Sheets

20040008509 Swedish Inst. for Metals Research, Stockholm, Sweden
Interphase Precipitation in Incoherent Austenite/Ferrite Interfaces: A Model and an Analysis of the Lateral Motion of Superledges along the Precipitate Sheet
Lagneborg, R.; Mar. 2000; 20 pp.; In English
Report No.(s): PB2004-100932; IM-2000-012; No Copyright; Avail: CASI; A03, Hardcopy

A model for interphase precipitation controlled by boundary diffusion was recently formulated by Lagneborg and Zajac (1) and was applied on V-microalloyed structural steels. Although it was strictly developed for interphase precipitation in semicoherent gamma/alpha-interfaces it was suggested, based on a first analysis, that it was also capable of accounting for interphase precipitation in incoherent interfaces. In the case of incoherent gamma/alpha interfaces the initial, local interface bow, bulging at a point where the interphase precipitation is thinly spaced, is stopped in its forward motion by precipitation in the foremost part. The further advance of the arrested bow occurs by lateral movement of the flanks of the bow along the precipitate sheet in a stepwise manner. The flank bows expand until the V-content in its centre is high enough for renewed V(C,N) nucleation. The part of the bow facing forward arrests permanently and the part connected to the precipitate sheet continue the lateral advance. In this paper it is demonstrated how a new precipitate sheet can be formed by means of the

stepwise lateral motion of interface bows along an existing sheet and that the shape and size of the bow, including the interface spacing, rapidly converges after the first local bulging. An important consequence of this process is that the lateral advance of the bows occurs by a velocity varying linearly over the bow length, and not a constant velocity as for semicoherent interfaces. It is shown how this affects the V-profile in the moving bows and eventually the intersheet spacing. The main conclusion of the work is that, if allowance is made for the variable interface velocity, a perfect match is obtained between the predicted spacings for interphase precipitation in incoherent and semicoherent interfaces.
NTIS
Nucleation; Austenite; Ferrites; Interfaces

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*.

20040004271 Technical Research Centre of Finland, Espoo, Finland
Preparation of Multifunctional Coating Materials and their Applications
Kololuoma, T.; 2003; In English
Report No.(s): PB2004-101987; VTT/PUB-499; No Copyright; Avail: National Technical Information Service (NTIS)

Sol-gel technique has been utilized for the fabrication of multifunctional inorganic-organic hybrid materials for specific applications. Synthesized methacrylic acid and benzoylacetone modified tin alkoxide precursors were used for the first time for the realization of directly UV-photopatternable antimony-doped tin dioxide coatings. These single-layered coatings have transmission values over 80% at visible wavelengths and maximum electrical conductivity values around 15 S/cm. In comparison, multi-layered coatings without UV-photopatternability properties were fabricated. In this case, electrical conductivities are in the range of 10(2) S/cm. A novel material technique approach for laser protective eyewear was utilized for the synthesis and preparation of the mechanically tolerant and near-infrared absorbing filter coatings. Optical densities from 2 to 4 at laser threat wavelength, a ten fold increase in scratch resistance, and a hundred-fold increase in abrasion resistance, compared to uncoated polycarbonate substrates, were obtained by using absorbing dye-molecule doped sol-gel materials. Fabrication of a diffractive optical element, namely axicon, using hybrid-glass materials was demonstrated for the first time. Hybrid-glass material was tailored to fulfill the requirements of the functional axicon element.
NTIS
Fabrication; Protective Coatings; Sol-Gel Processes; Organic Materials

20040006292 College of William and Mary, Williamsburg, VA, USA
Large-Scale Production of Carbon Nanotubes Using the Jefferson Lab Free Electron Laser
Holloway, Brian C.; [2003]; 20 pp.; In English
Contract(s)/Grant(s): NCC1-01056; No Copyright; Avail: CASI; A03, Hardcopy

We report on our interdisciplinary program to use the Free Electron Laser (FEL) at the Thomas Jefferson National Accelerator Facility (J-Lab) for high-volume pulsed laser vaporization synthesis of carbon nanotubes. Based in part on the funding of from this project, a novel nanotube production system was designed, tested, and patented. Using this new system nanotube production rates over 100 times faster than conventional laser systems were achieved. Analysis of the material produced shows that it is of as high a quality as the standard laser-based materials.
Author
Carbon Nanotubes; Vaporizing; Synthesis (Chemistry); Design Analysis; Performance Tests

28
PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; their storage and handling procedures; and aircraft fuels. For nuclear fuels see *73 Nuclear Physics*. For related information see also *07 Aircraft Propulsion and Power; 20 Spacecraft Propulsion and Power*, and *44 Energy Production and Conversion*.

20040008395 Lockheed Martin Space Operations, Bay Saint Louis, MS, USA
Oxygen Mass Flow Rate Generated for Monitoring Hydrogen Peroxide Stability
Ross, H. Richard; September 15, 2002; 9 pp.; In English; 5th International Hydrogen Peroxide Propulsion Conference, 15-19 Sep. 2002, Indianapolis, IN, USA
Contract(s)/Grant(s): NAS13-650
Report No.(s): SE-2002-09-00064-SSC; No Copyright; Avail: CASI; A02, Hardcopy

Recent interest in propellants with non-toxic reaction products has led to a resurgence of interest in hydrogen peroxide for various propellant applications. Because peroxide is sensitive to contaminants, material interactions, stability and storage issues, monitoring decomposition rates is important. Stennis Space Center (SSC) uses thermocouples to monitor bulk fluid temperature (heat evolution) to determine reaction rates. Unfortunately, large temperature rises are required to offset the heat lost into the surrounding fluid. Also, tank penetration to accomodate a thermocouple can entail modification of a tank or line and act as a source of contamination. The paper evaluates a method for monitoring oxygen evolution as a means to determine peroxide stability. Oxygen generation is not only directly related to peroxide decomposition, but occurs immediately. Measuring peroxide temperature to monitor peroxide stability has significant limitations. The bulk decomposition of 1% / week in a large volume tank can produce in excess of 30 cc / min. This oxygen flow rate corresponds to an equivalent temperature rise of approximately 14 millidegrees C, which is difficult to measure reliably. Thus, if heat transfer were included, there would be no temperature rise. Temperature changes from the surrounding environment and heat lost to the peroxide will also mask potential problems. The use of oxygen flow measurements provides an ultra sensitive technique for monitoring reaction events and will provide an earlier indication of an abnormal decomposition when compared to measuring temperature rise.
Author
Hydrogen Peroxide; Mass Flow Rate; Stability; Chemical Evolution; Oxygen

29
SPACE PROCESSING

Includes space-based development of materials, compounds, and processes for research or commercial application. Also includes the development of materials and compounds in simulated reduced-gravity environments. For legal aspects of space commercialization see *84 Law, Political Science and Space Policy*.

20040008425 NASA Marshall Space Flight Center, Huntsville, AL, USA
Bubble Formation and Transport during Microgravity Materials Processing: Model Experiments on the International Space Station
Grugel, R. N.; Anilkumar, A. V.; Lee, C. P.; [2003]; 1 pp.; In English; Microgravity Transport Processes in Fluid, Thermal, Biological and Materials Sciences Conference III, 14-19 Sep. 2003, Davos, Switzerland; No Copyright; Avail: Other Sources; Abstract Only

Flow Visualization experiments on the controlled melting and solidification of succinonitrile were conducted in the glovebox facility of the International Space Station (ISS). The experimental samples were prepared on ground by filling glass tubes, 1 cm ID and approximately 30 cm in length, with pure succinonitrile (SCN) under 450 millibar of nitrogen. Porosity in the samples arose from natural shrinkage, and in some cases by direct insertion of nitrogen bubbles, during solidification of the liquid SCN. The samples were processed in the Pore Formation and Mobility Investigation (PFMI) apparatus that is placed in the glovebox facility (GBX) aboard the ISS. Experimental processing parameters of temperature gradient and translation speed, as well as camera settings, were remotely monitored and manipulated from the ground Telescience Center (TSC) at the Marshall Space Flight Center. During the experiments, the sample is first subjected to a unidirectional melt back, generally at 10 microns per second, with a constant temperature gradient ahead of the melting interface. The temperatures in the sample are monitored by six in situ thermocouples. Real time visualization of the controlled directional melt back shows bubbles of different sizes initiating at the melt interface and, upon dislodging from the melting solid, migrating at different speeds into the temperature field ahead of them, before coming to rest. The thermocapillary flow field set up in the melt, ahead of the interface, is dramatic in the context of the large bubbles, and plays a major role in dislodging the bubble. A preliminary

analysis of the observed bubble formation and mobility during melt back and its implication to future microgravity experiments is presented and discussed.
Author
Bubbles; Transport Theory; Space Processing; International Space Station; Microgravity; Spaceborne Experiments; Flow Visualization

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*.

20040004329 National Inst. of Standards and Technology, Gaithersburg, MD
Journal of Research of the National Institute of Standards and Technology, Volume 108, No. 4
Aug. 31, 2003; 104 pp.; In English
Report No.(s): PB2004-101621; No Copyright; Avail: CASI; A06, Hardcopy
Table of Contents: Review of Instrumented Indentation (PB2004-101623): Towards High Accuracy Reflectometry for Extreme-Ultraviolet Lithography (PB2004-101624); Virtual Environment for Manipulating Microscopic Particles With Optical Tweezers (PB2004-101625); On the Stability of Exponential Backoff (PB2004-101626); and A Link-Level Simulator of the cdma2000 Reverse-Link Physical Layer (PB2004-101627).
NTIS
Metrology; Lithology; Nanotechnology; Packet Transmission; Wireless Communication; Nanoindentation

20040008295
Microfabrication of Laser-Driven Accelerator Structures
Cowan, B.; Aug. 2002; In English
Report No.(s): DE2003-812999; SLAC-PUB-9704; No Copyright; Avail: National Technical Information Service (NTIS)
We discuss the potential for using microfabrication techniques for laser-driven accelerator construction. We introduce microfabrication processes in general, and then describe our investigation of a particular trial process. We conclude by considering the issues microfabrication raises for possible future structures.
NTIS
Particle Accelerators; Micromachining

20040008378 Chinese Inst. of Engineers, Taipei
Journal of the Chinese Institute of Engineers, Volume 26, No. 4, July 2003. Transactions of the Chinese Institute of Engineers, Series A
Jul. 2003; In English
Report No.(s): PB2004-100914; Copyright; Avail: National Technical Information Service (NTIS)
Contents include the following: Robust Stability for Discrete-Time Linear Regulators with Computational Delays under Finite Wordlength Effects and Time-Varying Parameter Perturbations; Flow Patterns and Stresses on the Wall in a Two-Dimensional Flat-Bottomed Bin; Use of Artificial Neural Networks in the Determination of Hydrogen/Oxygen Laminar Diffusion Flames at High-Pressures; Singular Stresses Near Apex of Wedge by Finite Element Analysis; Flow Control on Swirling Jets Using a Dual-Disc Blockage; Force Control of a Constrained One-Link Flexible Arm: A Distributed-Parameter Modeling Approach; A Database for Interpolation of Poiseuille Flow Rate for Arbitrary Knudsen Number Lubrication Problems; Solder Joint Reliability Analysis of a Water-Level CSP Assembly with Cu Studs Formed on Solder Pads; Tracking the Radiometric Performance of the ROCSAT-1 Ocean Color Imager; A Microcontroller-Based Implantable Neuromuscular Stimulation System with Wireless Power and Data Transmission for Animal Experiments; Geometrically Nonlinear Analysis of Cable-Stayed Bridges Subject to Wind Excitations; Mechanical Properties of Carbonated Concrete; Influences of Fiber Content on Properties of Self-Compacting Steel Fiber Reinforced Concrete; Kinematic Analysis of Mechanisms with Rolling Pairs Using Matrix Transformation Method; A Decomposition Methdology for Design of Mechanisms from Functional and Structural Perspectives; Quadratic Guaranteed Cost Control of Uncertain Neutral Delay-Differential Systems; and Analysis of Electrical Fields Inside a Parallel-Plate NEMP Simulator by the Time-Domain Moment Method.
NTIS
Research Projects; Engineering; Japan

20040008379 Chinese Inst. of Engineers, Taipei
Journal of the Chinese Institute of Engineers: Transactions of the Chinese Institute of Engineers, Series A, Volume 26, No. 2
Mar. 2003; In English
Report No.(s): PB2004-100915; Copyright; Avail: National Technical Information Service (NTIS)

Contents include the following: Evolving Robot Brains and Bodies: An Experimental Investigation; The One-Time Learning Hierarchical CMAC and the Memory Limited CA-CMAC for Image Data Compression; A Software Controlled Pulse Compression Technique Applied to Ultrasonic Non-Destructive Testing; Process Exhaust Duct System Design Using Dynamic Programming Methods; Optimal Alignment of the Distal Screws in the Tibial Nailing; The Steady-State Behavior of the Prandti-Reuss Material Bifurcated under Nonproportional Circular Strain Paths; Double Ignitions of Ni-Al Combustion Reactions; Measurement and Simulation of Turbulent Flow in a Steep Open-Channel with Smooth Boundary; Feedforward Artificial Neural Networks for Nutrient Removal Simulation in a Multiple Stage Enhanced Biological Nutrient Removal Process; Assessment of Sludge Dewaterability Using Rheological Properties; The Use of Building Rubbles in Concrete and Mortar; Capacitive Micro Pressure Sensors with Underneath Readout Circuit Using a Standard CMOS Process; Bifurcations for Fluid Stirring in Circular Cavity; Working-Strain Based Design of Landfill Final Cover Systems; and A Combination Logic Design for a High Speed IEEE 802.11 MAC Controller.
NTIS
Research Projects; Engineering; China

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*.

20040004140 Foster-Miller Associates, Inc., Waltham, MA, USA
Railroad Dispatcher Communications Training Materials
Gertler, J.; Acton, S.; Jan. 2003; 134 pp.; In English
Report No.(s): PB2004-100159; No Copyright; Avail: CASI; A07, Hardcopy

Readback/hearback errors by railroad dispatchers and train crews or other track users can potentially result in accidents and derailments. The training materials developed under this project are designed to improve dispatcher communication skills with the goal of reducing the occurrence of readback/hearback errors. The course is based on a similar one developed and offered to air traffic controllers by the Federal Aviation Administration. The basic structure of the FAA course was adapted to be applicable to railroad dispatchers. The course has nine topics including Barriers to Communication, Listening Skills and Memory Skills. The course materials include a course pretest to assess initial skills, a formative assessment to assess progress after the first day of training and a summative test to evaluate the instructor's guide and all written training materials. An accompanying videotape contains the complementary auditory exercises.
NTIS
Rail Transportation; Education; Radio Communication

20040004143 Naval Postgraduate School, Monterey, CA
The Security Aspects of Wireless Local Area Network (WLAN)
Jaiaree, Thoetsak; Sep. 2003; 97 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418533; No Copyright; Avail: CASI; A05, Hardcopy

Wireless Local Area Networks (WLAN) are increasing in number in both home and business uses due to the convenience, mobility and affordable prices for wireless devices. Wireless technology allows the mobile stations to freely move within the range of Access Points without being physically connected to the wired network. Ideally, the WLAN gives mobility and flexibility to users in homes and hot spot environments, such as airports and campuses. However, WLANs have serious security problems because the wireless signal of the WLAN is broadcast through the air in all directions simultaneously. An unauthorized user can easily capture this signal using freeware tools to exploit WLAN vulnerability. This thesis provides an introduction to WLAN technology, security vulnerabilities in the WLAN, and the recommended countermeasures for the Software Metrics Laboratory in Ingersoll 158, in the Naval Postgraduate School, with particular emphasis on security concerns

for the implementation of the WLAN extension to the existing wired LAN.
DTIC
Local Area Networks; Software Engineering; Security

20040004154 Nippon Telegraph and Telephone Public Corp., Japan
An LPC Vocoder Based on Phase-equalized Pitch Wave-form
Hiwasaki, Y.; Mano, K.; Kaneko, T.; NTT Technical Review, Volume 1, No. 5; August 2003, pp. 101; In English; See also 20040004150; Copyright; Avail: Other Sources; Abstract Only

An LPC Vocoder Based on Phase-equalized Pitch Waveform Y. Hiwasaki, K. Mano, and T. Kaneko Speech Communication, Vol. 40, No. 3, pp. 277-290,2003. This paper presents a speech coder operating at a very low bit-rate using a model called phase-equalized pitch waveform. The basic idea of the coder is to employ pitchwise extraction of the linear predictive residual signal, a pitch waveform, in voiced speech. The residual signal is processed with a phase-equalization filter to increase the efficiency of both the pitch waveform quantization and interpolation. Listening tests showed that efficient and high-quality coding is achieved at 2.0 kbitsk The quality of the coder is equal to that of the DoD FS1016 standard CELP at 4.8 or 2.4 kbitsls MELP.
Author
Vocoders; Waveforms; Artificial Intelligence; Pitch

20040004158 Nippon Telegraph and Telephone Public Corp., Yokosuka, Japan
Portable Wireless System for Digital Video Transmission
Yoshie, Tomotaka; Maruyama, Hideyuki; Saito, Toshio; NTT Technical Review, Volume 1, No. 5; August 2003, pp. 74-78; In English; See also 20040004150; Copyright; Avail: Other Sources

A portable wireless system that enables digital video transmission in a simple fashion has been developed at NTT Access Network Service Systems Laboratories to provide a temporary TV terminal link between a TV terminal station operated by NTT Communications Corporation and a TV station. This system enables stable digital video transmission even under severe interference conditions. For easier portability, its volume and weight have been decreased compared with portable wireless systems for analog video transmission that NTT developed in the past.
Author
Digital Television; Video Equipment; Wireless Communication; Portable Equipment; Television Equipment; Television Transmission; Communication Equipment

20040004165 Nippon Telegraph and Telephone Public Corp., Japan
Ahead of the World's Telecom Carriers in Developing a Photonic Network for IP
Takigawa, Yoshihiro; NTT Technical Review, Volume 1, No. 5; August 2003, pp. 4-9; In English; See also 20040004150; Copyright; Avail: Other Sources

In response to the rapid increase in IP traffic volumes, research into photonic networks that dramatically improve the quality and economy of networking has become an arena for fierce competition among the world's large telecom carriers. At NTT, the Photonic Networking Research Group of the Network Innovation Laboratories has played the leading research role in the development of Photonic Multi-Protocol Label Switching (MPLS) routers. The Group's research in this area is now moving toward its final stage. We spoke to Group Leader Yoshihiro Takigawa to clarify the present situation as his group's research heads for commercial application at the end of fiscal 2005 and to talk about the future.
Author
Telecommunication; Communication Networks; Protocol (Computers); Optical Communication

20040004166 Nippon Telegraph and Telephone Public Corp., Yokosuka, Japan
SHD Digital Cinema Distribution over a Global High-speed Network: Internet2
Yamaguchi, Takahiro; Shirai, Daisuke; Fujii, Tatsuya; Fujii, Tetsuro; NTT Technical Review, Volume 1, No. 5; August 2003, pp. 10-15; In English; See also 20040004150; Copyright; Avail: Other Sources

We have developed a prototype SHD (Super High Definition) digital cinema distribution system that can store, transmit, and display motion pictures with eight million pixels per frame. In a long-distance SHD digital cinema transmission experiment performed on the Internet2 network in October 2002, we used an enlarged TCP (transmission control protocol) window, multiple TCP connections, and a shaping function to control the data transmission quantity. As a result, we succeeded

in transmitting contents at about 300 Mbit/s between Chicago and Los Angeles, a distance of more than 3000 km. In this paper, we review the lessons we learned from this experiment.
Author
Data Transmission; Motion Pictures; Digital Systems; High Speed

20040004167 Nippon Telegraph and Telephone Public Corp., Yokosuka, Japan
Global Experiment on Dynamic Admission Control of UDP Flows
Takahara, Atsushi; Shimizu, Takashi; NTT Technical Review, Volume 1, No. 5; August 2003, pp. 16-23; In English; See also 20040004150; Copyright; Avail: Other Sources

Video conferencing applications are causing congestion problems on the Internet. These applications mostly use UDP (User Datagram Protocol) for video and audio transmission, which unlike TCP (Transmission Control Protocol), does not have any standardized mechanisms for congestion control. Therefore, they can cause severe congestion that can significantly degrade network utilization. To overcome this problem, we introduce a new flow-aware forwarding policy to enable dynamic admission control of UDP flows and propose the MXQ (Maximal Queuing) mechanism to achieve this policy. In a large-scale trans-Pacific field trial conducted at the Fall 2002 Internet2 Member Meeting, we tested MXQ by applying it to video conferencing traffic. The results show that its dynamic admission control could effectively control congestion in a real environment, suggesting that we can make better use of best-effort networks.
Author
Dynamic Control; Video Conferencing; Information Flow

20040004168 Nippon Telegraph and Telephone Public Corp., Atsugi, Japan
Global Multi-Point Streaming Experiments Based on the Flexcast Protocol
Tani, Seiichiro; Inoue, Takeru; Minato, Shin-Ichi; Takahashi, Hirokazu; Kotabe, Satoshi; Miyazaki, Toshiaki; NTT Technical Review, Volume 1, No. 5; August 2003, pp. 24-30; In English; See also 20040004150; Copyright; Avail: Other Sources

With more individuals starting to create streaming data as a broadcast service, IP-multicast is the most popular mechanism for multicasting to recipients located over a wide area. However, there are several difficulties in using IP multicast as a personal broadcasting tool. IP-unicast-based multicast technologies are now attracting attention because they offer several advantages. Flexcast, one such technology, offers both excellent scalability and dynamic tree-optimization. This paper describes stream delivery experiments on the Flexcast protocol among widely dispersed locations in Japan and the U.S. The results verify the robustness and stability of the Flexcast protocol.
Author
Data Transmission; Protocol (Computers)

20040004169 Nippon Telegraph and Telephone Public Corp., Musashino, Japan
GEMnet2: New Network Testbed for Global R and D
Uose, Hisao; Yamaguchi, Masayasu; Kishigami, Junichi; NTT Technical Review, Volume 1, No. 5; August 2003, pp. 31-38; In English; See also 20040004150; Copyright; Avail: Other Sources

NTT has been successfully operating its experimental network GEMnet (Global Enhanced Multifunctional Network) for research and development of global information-sharing services since 1998. To adapt to new requirements in the business environment and technical advances, we have formulated a new testbed concept, GEMnet2, and begun construction. Its three key aims are to let us test technologies for every aspect of communications, provide very wide bandwidth that can accommodate very fast applications without any restraints, and promote collaboration with other research networks. We are using wavelength division multiplexing to build 10-Gbit/s circuits between NTT's R&D centers in Musashino, Yokosuka, and Atsugi.
Author
Test Stands; Information Systems; Communication Networks

20040004170 Nippon Telegraph and Telephone Public Corp., Musashino, Japan
Application of Ultrahigh-speed Network to Advanced Science
Uose, Hisao; NTT Technical Review, Volume 1, No. 5; August 2003, pp. 39-47; In English; See also 20040004150; Copyright; Avail: Other Sources

A joint research project on real-time very long baseline interferometry (VLBI) called GALAXY is being conducted by NTT Laboratories, the Communications Research Laboratory, the National Astronomical Observatory, Yamaguchi University,

and the Institute of Space and Aeronautical Science to explore the effectiveness of ultrahigh-speed communications technologies when applied to advanced scientific research. VLBI is a very precise measurement tool for radio astronomy and earth science based on cross-correlating observed radio signals received at a number of antennas located far apart. Using an ultrahigh-speed network allows us to raise the bandwidth of the radio signals used for the cross-correlation, so the performance of the observation system can be greatly improved. This paper outlines the project and presents recent developments in our research activities focusing on new networking technologies utilizing the Internet protocol.
Author
Communication Networks; High Speed; Very Long Base Interferometry; Research Facilities; Astronomical Observatories

20040004184 Nippon Telegraph and Telephone Public Corp., Japan
Successful Demonstration of Simultaneous Wide-area Multipoint Transmission of High-definition Streams for the Broadband Ubiquitous Era: The World's First Large-scale Confirmation of Broadband Content Distribution by End Users
NTT Technical Review, Volume 1, No. 5; August 2003, pp. 98-99; In English; See also 20040004150; Copyright; Avail: Other Sources

The Telecommunications Advancement Organization of Japan (TAO) and NTT succeeded in jointly demonstrating multi-origin, multi-program simultaneous content distribution of high-definition(HD)-class IP streams on May 15, 2003. The experiment was conducted on the Japan Gigabit Network (JGN(exp *1)), a research network operated and administered by TAO, and the streams were transmitted using Flexcast, which is multipoint transmission technology developed by NTT, and TAO's load balancing technology (details are described later). It involved more than twenty video receivers located at four TAO-owned research facilities.
Author
Broadband; Telecommunication; Multiprogramming; Proving

20040004360 CACI Technologies, Inc., Chantilly, VA, USA
Command, Control, Communications & Intelligence (C3I) Systems Analysis and Trade-Offs
Mineo, Jack; Aug. 2003; 28 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-00-D-0221; Proj-558B
Report No.(s): AD-A418498; AFRL-IF-RS-TR-2003-188; No Copyright; Avail: CASI; A03, Hardcopy

This report presents the results of a system analysis of many of the AFRL/ IF programs that support target engagement under the banner of Sensor to Decision-maker to Shooter. Some of these programs cut across AFRL directorates, are funded by multiple sources and have joint service and coalition partner involvement. The analysis also included a review of the current threat and architecture issues being flagged by Air Force as important to warfighter capabilities. The analysis focused on meeting current needs as well as outlining technical design difficulties, and transition opportunities. The AFRL/IF has done an excellent job in gaining support and funding for key programs. Strong partnerships have been established across the Air Force, Joint and Coalition communities, putting AFRL/IF in a great position to make significant technical contributions leading to a fully compliant fielded capability. This report summarizes key program findings and Recommendations.
DTIC
Systems Analysis; Command and Control; Telecommunication; Intelligence

20040004365 Army Research Lab., Adelphi, MD
Experiment Protocol Boosters Over Inmarsat-ISDN Communication Link
Luu, Brian B.; Sadler, Christopher M.; Oct. 2003; 18 pp.; In English
Report No.(s): AD-A418502; ARL-TR-3082; No Copyright; Avail: CASI; A03, Hardcopy

The International Maritime Satellite (Inmarsat) communication service can be used to provide a wide area network (WAN) connection for a local area network (LAN) to the home LAN from almost anywhere on the earth. The communication link of the WAN connection is achieved through the satellite network of Inmarsat and a land-earth digital telephone network, such as Integrated Services Digital Network (ISDN). We determined the throughput data rate of data transmission in the Transmission Control Protocol/Internet Protocol (TCP/IP) environment over the Inmarsat link and compared it with the throughput data rate over a null-modem link (assumed to be error free) for the WAN connection. We also used the protocol boosters that provide forward error correction for the TCP/IP environment to test the improvement of data transmission over the satellite link. Communication over satellite tends to be noisy and delay prone. However, our analysis shows that the Inmarsat satellite-ISDN link is so reliable that the data transmission rate is nearly an error-free link in the TCP/IP network,

and the application of forward error correction on the network causes a reduction in the throughput data rate.
DTIC
Satellite Communication; Error Analysis; Inmarsat Satellites; Internets; Transmission Rate (Communications)

20040004377 Naval Postgraduate School, Monterey, CA
A Qualitative Assessment and Analysis of Stakeholder Expectations
Bullard, Steven G.; Sep. 2003; 107 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418553; No Copyright; Avail: CASI; A06, Hardcopy

A Department of Defense acquisition program is influenced by a large number of external stakeholders, including operational users, oversight authorities, contractors and suppliers, and interfacing program managers. Key stakeholders will readily agree that meeting the Warfighting needs of operational users is the primary objective of an acquisition program, however many stakeholders have developed their own strategies to achieve that goal. The job of the program manager within the acquisition system is to deliver a product that best meets stakeholder expectations (the right product delivered the right way). This research defines a methodology for eliciting strategic inputs from key stakeholders associated with an acquisition program. The methodology includes an environmental analysis leading to identification of key stakeholders and focus area for stakeholder interviews. The methodology is applied to the Global Command and Control System-Maritime program to obtain stakeholder input targeted for future strategic plans.
DTIC
Qualitative Analysis; Command and Control

20040005813 Naval Postgraduate School, Monterey, CA, USA
Seventh Fleet Field Training Exercise Fleet Battle Experiment Kilo Fires Initiatives
Schacher, Gordon; Pilnick, Steve; Irvine, Nelson; Gallup, Shelley; Aug. 2003; 237 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418499; NPS-97-03-006; No Copyright; Avail: CASI; A11, Hardcopy

Fleet Battle Experiment Kilo was conducted during Seventh Fleet exercise Tandem Thrust 03. During the Field Training Exercise phase testing of Time Sensitive Targets processes using the joint Fires Network was carried out. This report contains results obtained on contributions made by the joint Fires Network to Navy Time Sensitive Targeting and experiment lessons learned.
DTIC
Command and Control; Education; Field Tests; Testing Time

20040006306 Computer Networks and Software, Inc., Springfield, VA, USA
Industry Support
December 17, 2003; 9 pp.; In English
Contract(s)/Grant(s): NAS3-99165; No Copyright; Avail: CASI; A02, Hardcopy

NASA Glenn Research Center (GRC) is responsible for the Advanced Communications for Air Traffic Management (AC/ATM) Project, a sub-element task of the Advanced Air Transportation Technologies (AATT) Project of the NASA Aviation System Capacity Program (ASC). The AC/ATM Project is developing new communications technologies and tools that will improve throughput in the U.S. Air Traffic Control System. The goal of the AC/ATM Project is to enable a communications infrastructure providing the capacity, efficiency, and flexibility necessary to realize benefits of the future mature Free-Flight environment. The capabilities and scope of communications technologies needed to accomplish this goal depend on characteristics of the future Free-Flight environment. There are many operational concepts being proposed for a future ATM system to enable user flexibility and efficiency. GRC s focus is on developing new technologies and techniques to support the digital communication of information involving airborne and ground-based users. However, the technologies and techniques must be integrated with the systems and services that industry and the Federal Aviation Administration (FAA) are developing. Thus, GRC needs to monitor and provide input to the various industry and FAA organizations and committees that are specifying new systems and services. Adoption of technologies by the FAA is partially dependent on acceptance of the technology by the aviation community. The commercial aviation community in particular would like to adopt technologies that can be used throughout the world. As a result, the adoption of common or at least compatible technologies by European countries is a key factor in getting commitments to those technologies by the US aviation community. GRC desires to keep

informed of European activities that relate to aviation communication technologies, particularly those that are being supported by Eurocontrol.
Derived from text
Air Traffic Control; Telecommunication; Technology Assessment; Air Transportation

20040008300 Air War Coll., Maxwell AFB, AL
The Command or Control Dilemma. When Technology and Organizational Orientation Collide
Roman, Gregory A.; Mar. 1997; 39 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418465; No Copyright; Avail: CASI; A03, Hardcopy

In this well-researched and insightful study, Lt Col Gregory A. Roman examines the relationships between military organizational hierarchies and the impact of battlespace information. Drawing on a sophisticated range of studies and data and using numerous illustrations, the author contends that the outmoded effects of traditionally centralized (and technologically proliferating) command and control orientations preclude the US military (and particularly the Air Force) from effectively applying and acting upon the benefits of information-age technologies in an age of information warfare. The author sees future warfare characterized by faster decision making, faster operational tempos, and a torrent of tactical battlefield information. These new realities necessitate greater decentralization of control, more flexible information gathering, and creative, nontraditional military organizational arrangements.
DTIC
Command and Control; Electronic Warfare; Armed Forces (United States)

20040008324 General Accounting Office, Washington, DC
Satellite Communications: Strategic Approach Needed for DOD's Procurement of Commercial Satellite Bandwidth
Dec. 2003; 44 pp.
Report No.(s): PB2004-101882; GAO-04-206; No Copyright; Avail: CASI; A03, Hardcopy

In recent years, the Department of Defense (DOD) has come to rely more heavily on commercial satellite communications to plan and support operations and move toward a network-centric warfare environment. DOD acquires commercial satellite bandwidth services to support a variety of critical missions such as surveillance performed by unmanned aerial vehicles. GAO was asked to assess (1) whether DOD's process for acquiring these services is fair to vendors and providers, (2) whether the process meets users' needs, and (3) whether spending on these services is managed effectively and efficiently. GAO's recommendations to DOD focus on the need to develop and implement a strategic approach to acquire commercial satellite bandwidth services, along with correcting specific oversight and management weaknesses. To ensure the successful implementation of a strategic management framework, GAO recommends that DOD develop performance metrics to assess user satisfaction, strengthen core internal technical expertise and information systems, and assess whether the existing acquisition process requires changes to facilitate a strategic approach. In comments on a draft of this report, DOD generally concurred with GAO's recommendations.
NTIS
Bandwidth; Telecommunication; Procurement

20040008370 Stanford Linear Accelerator Center, Stanford, CA, USA
iGrid2002 Demonstration: Bandwidth from the Low Lands
Cottrell, R. L.; Antony, A.; Logg, C.; Navratil, J.; Oct. 31, 2002; 12 pp.; In English
Report No.(s): DE2003-812985; SLAC-PUB-9560; No Copyright; Avail: Department of Energy Information Bridge

We report on a demonstration of several complementary high performance end-to-end active network throughput measurement tools. These include: the PingWorld Java applet that displays the Round Trip Time (RTT) and losses to sites around the world from the user's host; the multi-path analysis tool that visualizes common paths from traceroutes to selected hosts; the IEPM high-performance BandWidth monitoring toolkit which gives achievable throughput for several types of TCP data transfer applications; and the Available Bandwidth Estimation (ABWE) tool that reports in real time the available bandwidth to several paths within the range from Mbits/s to Gbit/s. We also demonstrated sending high-speed data from 4 hosts at iGrid2002 to over 30 hosts in 10 countries to simulate a high energy physics experiment distributing data to collaborators. The demonstration utilized the high-speed, long latency, trans-Atlantic network set up for iGrid2002 in Amsterdam during September 2002.
NTIS
Bandwidth; Communication Networks

20040008387 Swedish Defence Research Establishment, Linkoeping
Digital Array Antennas: DGA
Nelander, A.; Alm, A.; Boman, T.; Ferrer, I.; Grahn, P.; Dec. 2002; In Swedish
Report No.(s): PB2004-100953; FOI-R-0693-SE; Copyright; Avail: National Technical Information Service (NTIS)

This report summarizes four years studies of technologies for digital array antennas (DGA) at FOI. The studies Digital Array Antenna and later Array Antenna Technology started in 1998 as a continuation of the earlier program Antenna Integrated Microwave Technology (AIMT) that was carried out in cooperation between then FOA and Ericsson Microwave Systems AB (EMW). The AIMT program gave as a result an experimental digital array antenna at S-band. Digital array antenna technology and the experimental array antenna have been studied and developed further for use in radar measurements and technology evaluations. Array antenna technology for millimeter waves has also been studied and developed. The DGA program has developed the digital array antenna technology for new concepts in radar networks and command and control systems. Different methods for control, fusion and optimization have been developed for digital array antenna radar systems. Measurements with the experimental digital array antenna have given new insights into digital beamforming for different functions. Developments of array antenna technologies and microwave MMIC modules have given new experiences in design of digital array antennas. Different types of circuit design have been studied to develop digital array antennas.
NTIS
Radar Receivers; Antenna Arrays

20040008421 Swedish Defence Research Establishment, Stockholm, Sweden
Anonymous Communication over the Internet. Articles from a Workshop in Stockholm, 2001
Ritchey, T.; Dec. 2002; 50 pp.; In English
Report No.(s): PB2004-101734; FOI-R-0675-SE; Copyright; Avail: National Technical Information Service (NTIS)

The articles presented here resulted from a series of informal workshops held by FOI-the Swedish Defense Research Agency-during 2001 concerning anonymous communication and the Internet. Four areas are covered: a general, social-historical background; a legal perspective; and IT-technical perspective; and certain aspects of the management of anonymous communication.
NTIS
Internets; Computer Information Security

20040008429 Newcastle-upon-Tyne Univ., Newcastle
Survey of Reliable Broadcast Protocols for Mobile Ad-hoc Networks
Vollset, E.; Ezhilchelvan, P.; 2003; 12 pp.; In English
Report No.(s): PB2004-102048; Copyright; Avail: National Technical Information Service (NTIS)

Providing reliable multicast is a basic requirement to build more advanced distributed protocols such as total order or leader election, and much research has gone into providing this functionality for wired networks. However, the protocols developed for wired networks tend to be unsuitable for deployment on mobile ad hoc networks (MANETs), as these do not take into account the node mobility or increased sensitivity to network load and congestion. Recently, a few reliable multicast protocols designed explicitly for MANETs have been proposed which take into account the characteristics of MANETs. This paper will given an overview of the proposed protocols and evaluate the relative merit of each. of each analyzed. Additionally, the general strengths and weaknesses of each class of protocol will be discussed.
NTIS
Communication Networks; Broadcasting; Computer Techniques; Protocol (Computers); Mobile Communication Systems

20040008434 Newcastle-upon-Tyne Univ., Newcastle
Proving the Correctness of Simpson's 4-Slot ACM Using an Assertional Rely-Guarantee Proof Method
Henderson, N.; Jun. 06, 2003; 22 pp.; In English
Report No.(s): PB2004-102050; Copyright; Avail: National Technical Information Service (NTIS)

This paper describes a rely-guarantee proof to show that Simpson's 4-slot single-reader, single-writer ACM is Lamport atomic (as described fully in the paper). First an abstract ACM specification is proved Lamport atomic using an exhaustive assertional method. A formal model of Simpson's 4-slot is then given and this has been proved to be a refinement of the abstract specification using Nipkow's retrieve relation rule. Simpson's 4-slot is then shown to be Lamport atomic using an

interleaved concurrency rely-guarantee proof method for shared variable concurrency.
NTIS
Asynchronous Transfer Mode; Communication Networks

20040008537 Swedish Defence Research Establishment, Linkoeping, Sweden
Modeling of Distributed Systems Focusing on IT Security Aspects
Hunstad, A.; Hallberg, J.; Dec. 2002; 64 pp.
Report No.(s): PB2004-101281; FOI-R-0712-SE; Copyright; Avail: National Technical Information Service (NTIS)

The appearance of widely distributed systems providing services and information critical to both organizations and individuals results in new challenges for systems and security engineers. While adequate solutions to solve the unavoidable security issues have to be designed and implemented, the systems are increasingly difficult to be comprehended and assessed. Thus efficient design frameworks and modeling techniques are crucial for the development of future systems. Since no distributed information system can be designed secure, but can include the necessary prerequisites to be secured during operation; the aim is design for securability. To achieve design for securability, three steps have to be supported in the design of distributed systems. Firstly, the interactions and relations between the system and its environment have to be captured. Secondly, a set of security requirements on the system has to be formulated. Thirdly, the set of requirements has to be implemented in the system. This report is focused on the third step, which requires system models and design methods and tools. Especially, efforts regarding the identification of security-relevant characteristics and the formulation of adequate modeling techniques are presented. The long-term goal is to build an environment suitable for modeling simulation and assessment of security architectures.
NTIS
Security; Data Processing Equipment; Models; Distribution (Property); Information Systems

20040008538 Swedish Defence Research Establishment, Linkoeping, Sweden
Final Report: The Radio Channel: Vegetation Project, Influence on Radio Wave Propagation from the Vegetation
Waem, A.; Eriksson, G.; Lundborg, B.; Holm, P.; Loefsved, E.; Dec. 2002; In Swedish
Report No.(s): PB2004-101294; FOI-R-0708-SE; Copyright; Avail: National Technical Information Service (NTIS)

During the years 2000-2002 the 'Radio Channel-Vegetation' project has studied the influence on radio wave propagation from the vegetation. This report sums up the project and gives a simple description of our model based on parabolic equation technique. The report concludes with two examples calculated with our PE-model and finally we suggest some areas for further research.
NTIS
Vegetation; Radio Waves; Attenuation; Radio Transmission

20040008545 Swedish Defence Research Establishment, Stockholm, Sweden
Methods for Assessment of Network-Centric Ware - Base Data Report to FoRMA
Hoestbeck, L.; Dec. 2002; 58 pp.; In Swedish
Report No.(s): PB2004-101263; FOI-R-0671-SE; Copyright; Avail: National Technical Information Service (NTIS)

Studies about Network Centric Warfare, NCW, are in progress in the project FoRMA at FOI. NCW describes a system for warfare, where the functions are separated into different platforms and at the same time are working together, through a network that is realized by information technology. The working group NCW was formed in May 2001 and the task was to develop and apply methods to assess armed combat in net-centric environment. The issue when analyzing NCW should be if NCW is possible and what limitations and advantages NCW can provide compared to Platform Centric Warfare. This report describes the work done by the working group during the autumn of 2001. The report describes the method with various Measures of Effectiveness (MOE) and charts that have been developed in order to assess the sensor-to-sensor loops the group has decided to work with. The report also compares the method developed to three different methods reported in the literature.
NTIS
Computer Networks; Information Systems; Command and Control

20040008550 Swedish Defence Research Establishment, Linkoeping, Sweden
Interworking of Tactical ad hoc and Static IP-Network
Thoren, P.; Mar. 2003; 64 pp.
Report No.(s): PB2004-101736; FOI-R-0822-SE; Copyright; Avail: National Technical Information Service (NTIS)

In this report the authors investigate the relationship between host/network mobility within an ad hoc network to support seamless connectivity between a fixed core network infrastructure and an autonomous mobile tactical ad hoc network. There are several command and control systems within the Swedish defense to guide warfare operations and military efforts. By integrating these in the network centric warfare system, higher efficiency and information dominance can be achieved. Mobile ad hoc network designs provide means for members to join and leave particular radio frequency subsystems as their position changes. The problem is that the nodes (or sub-networks) should always be addressed with the same IP-address to be reachable. In this report the authors assume the protocol Mobile IPv6 to be used when meeting the goals of this integrated architecture. Five tactical scenarios have been studied analytically and the problems and the effects on the network layer have been defined with the ad hoc network has been moving and changing access points to the fixed network. The conclusions were that using Mobile IPv6 together with Ad hoc On Demand Vector routing protocol is not enough to manage the access network in a tactical scenario. In this report the authors introduce a mobility management model that can provide seamless traffic management and connectivity to host applications in the network centric warfare system.
NTIS
Warfare; Command and Control; Communication; System Effectiveness

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*.

20040004080 Department of the Navy, Washington, DC
Laser-Based Acousto-Optic Uplink Communications Technique
Blackmon, Fletcher A., Inventor; Aug. 18, 2003; 12 pp.; In English
Patent Info.: Filed 18 Aug. 2003; US-Patent-Appl-SN-10644574
Report No.(s): AD-D020102; No Copyright; Avail: Other Sources

An apparatus for enabling acousto-optic communication comprising an in-water platform comprising means for emitting an acoustic signal to an acousto-optic interaction zone, an in-air platform comprising the ability for transmitting a first optical interrogation beam, the ability for receiving a portion of the first interrogation beam and a second laser beam formed from the reflection of the first interrogation beam off of the acousto- optic interaction zone, the ability for measuring and outputting a plurality of optical interferences between the portion of the first interrogation beam and the second reflected beam, and a signal converter receiving as input the plurality of optical interferences and outputting an electrical signal representing the received acoustic telemetry signal at the interrogation point at the air-water interface.
DTIC
Acousto-Optics; Uplinking; Communication; Laser Beams

20040004150 Nippon Telegraph and Telephone Public Corp., Japan
NTT Technical Review, Volume 1, No. 5
August 2003; 102 pp.; In English; See also 20040004151 - 20040004186; Copyright; Avail: Other Sources

This review contains papers regarding wireless networks, wireless portable systems, paralell processing, and information security technology. Thirty-six papers are included.
CASI
Wireless Communication; Digital Electronics

20040004152 Nippon Telegraph and Telephone Public Corp., Tokyo, Japan
MIT Auto-ID Center Advances the Standardization of RFID Tags
Yamato, Junji; Asahi, Toshiaki; NTT Technical Review, Volume 1, No. 5; August 2003, pp. 95-97; In English; See also 20040004150; Copyright; Avail: Other Sources

The Auto-ID Center is a not-for-profit global research organization headquartered at the Massachusetts Institute of Technology (MIT). Its mission is to standardize and build the infrastructure for an open, global network system that will enable

efficient physical distribution. This article introduces the concept and the standardization efforts of the Auto-ID Center. NTT is one of its sponsors.
Author
Research Facilities; University Program; Radio Electronics; Tracking (Position)

20040004156 Nippon Telegraph and Telephone Public Corp., Japan
A 1-V CMOS/SOI Bluetooth RF Transceiver for Compact Mobile Applications
Ugajin, M.; Yamagishi, A.; Kodate, J.; Harada, M.; Tsukahara, T.; NTT Technical Review, Volume 1, No. 5; August 2003, pp. 102; In English; See also 20040004150; Copyright; Avail: Other Sources; Abstract Only

A Bluetooth RF transceiver in 0.2-micron CMOS/SOI achieves 1-V operation and paves the way for further system-size reduction by using a small NiH battery. The transceiver integrates a T/R switch, an image-reject mixer, a quadrature demodulator, gm-C filters, an LC- tank voltage-controlled oscillator, a PLL, and a power amplifier. The phase shifter in the quadrature demodulator is tuned dynamically to deal with carrier-frequency drift. A gm cell in the filters uses depletion-mode PMOS transistors and has a folded structure. The transceiver shows -77-dBm sensitivity at 0.1% BER.
Author
Cmos; SOI (Semiconductors); Radio Frequencies; Transmitter Receivers; Mobile Communication Systems

20040004160 Nippon Telegraph and Telephone Public Corp., Japan
Electron Pump by a Combined Single-Electron/Field-Effect Transistor Structure
Ono, Y.; Takahashi, Y.; NTT Technical Review, Volume 1, No. 5; August 2003, pp. 100; In English; See also 20040004150; Copyright; Avail: Other Sources; Abstract Only

A silicon-based single-electron pump that operates at much higher temperatures than previous pumps is fabricated on a silicon-on-insulator Substrate. The pump consists of one single-electron transistor (SET) and two ultrasmall metal-oxide-semiconductor field-effect transistors (MOSFETs). We exploit, for the operation, the extremely high off-resistance of the MOSFETs. The high resistance enables us to prevent the unwanted injection (emission) of electrons into (from) the SET nearly perfectly and to make the SET work as a pump. The operation is confirmed at 25 K at the pumping frequency of - I MHz.
Author
Field Effect Transistors; Metal Oxide Semiconductors

20040004162 Nippon Telegraph and Telephone Public Corp., Japan
Electron-Beam Diameter Measurement Using a Knife Edge with a Visor for Scattering Electrons
Yamazaki, K.; Namatsu, H.; NTT Technical Review, Volume 1, No. 5; August 2003, pp. 102; In English; See also 20040004150; Copyright; Avail: Other Sources; Abstract Only

A novel knife edge (KE) for measurement of the electron beam (EB) diameter was made and evaluated. To screen off electrons scattered at the edge, the Si KE has a visor made of Ta, which is formed in a body and aligned with the KE. Monte Carlo simulation revealed that the scattering electrons are not negligible to accurately measure the beam diameter using a KE, and that the visor effectively screens them out, especially at smaller diameters of a few nanometers. An EB diameter of less than 5 nm in a lithography system was accurately measured using the KE, which is consistent with the lithography results.
Author
Electron Beams; Lithography; Monte Carlo Method; Scattering

20040004164 Nippon Telegraph and Telephone Public Corp., Japan
Self-limiting Formation and Optical Properties of Hemispherical Grains of Microcrystalline Silicon on an Amorphous Silicon Film Surface
Akazawa, H.; NTT Technical Review, Volume 1, No. 5; August 2003, pp. 101; In English; See also 20040004150; Copyright; Avail: Other Sources; Abstract Only

Simple thermal annealing of a hydrogen-free film of amorphous silicon deposited by RF-plasma sputtering causes hemispherical grains of microcrystalline Si to nucleate on its surface. The surface of the amorphous Si film stays macroscopically flat, with no protrusions appearing around the grains. Only surface Si atoms contribute to aggregation into hemispherical grains; this occurs because of their fast migration at high temperatures. The size distribution of the self-assembled hemispherical grains has a deviation of plus or minus 10% from the mean, which shows little dependence on the temperature of annealing between 600-850 C. The shape and size of the grains are thus controlled in a self-limiting manner by the energetics of the grains, the mobility of the surface Si atoms, and the network structure of the amorphous Si film. A

nice correspondence between the self-assembling of hemispherical grains and the development of an absorption peak at 2.4-2.6 eV in the imaginary part of the pseudo-dielectric function was confirmed.
Author
Amorphous Silicon; Microcrystals; Optical Properties; Granular Materials; Self Assembly

20040004172 Nippon Telegraph and Telephone Public Corp., Japan
A 43-Gbit/s Clock and Data Recovery OEIC Using InP/lnGaAs HPT/HBTs
Kamitsuna, H.; Shibata, T.; Kurishima, K.; Ida, M.; NTT Technical Review, Volume 1, No. 5; August 2003, pp. 100; In English; See also 20040004150; Copyright; Avail: Other Sources; Abstract Only

A new clock and data recovery (CDR) OEIC that consists of an HIT optically injection-locked oscillator as an optoelectronic clock recovery circuit and a HBT decision circuit is presented. 43-Gbit/s data is successfully regenerated at the HBT decision circuit by using the optoelectronically recovered 43-GHz electrical clock by the HPT optically injection-locked oscillator. Error-free operation for 231-1 PRBS input is confirmed and the extremely low power consumption of 0.79 W, which is less than half compared to the fully electrical CDR IC, is demonstrated.
Author
Indium Phosphides; Indium Gallium Arsenides; Optoelectronic Devices; Clocks

20040004173 Nippon Telegraph and Telephone Public Corp., Japan
Microscopic Observations of Single-electron Island in Si Single-electron Transistors
Nagase, M.; Horiguchi, S.; Fujiwara, A.; Takahashi, Y.; NTT Technical Review, Volume 1, No. 5; August 2003, pp. 100-101; In English; See also 20040004150; Copyright; Avail: Other Sources; Abstract Only

The three dimensional shapes and sizes of the embedded Si nanostructures in Si single-electron transistors (SETS) are observed by using microscopic methods, scanning electron microscopy (SEM), atomic force microscopy (AFM), and transmission electron microscopy (TEM). The width of the Si wire in the SET whose conductance oscillations are observed at 25 K is in the range of 7-15 nm measured by SEM. The height of the wire is estimated to be 5-10 nm by AFM. The size of Si wire is small enough to produce the potential barrier caused by the quantum mechanical effect. The effective length of the single-electron island is determined from the relationship between the gate capacitance and the length of the Si wire. The effective length is 23 nm shorter than the Si wire length. The distortion in the Si wire in SET is evaluated from the high-resolution image of TEM. The length of the distorted region is almost the same as the effective length of the single-electron island. The distortion will produce the potential well in the Si wire. Microscope observations suggested the existence of potential barriers caused by the quantum mechanical effect and that of the potential well originated from the distortion in the Si wire of SET devices, which agrees with the theoretical model of Si SETS fabricated using pattern-dependent oxidation.
Author
Nanostructures (Devices); Silicon; Mathematical Models; Transistors; Fabrication; Scanning Electron Microscopy; Transmission Electron Microscopy

20040004174 Nippon Telegraph and Telephone Public Corp., Japan
Self-organizing Neural Network-based Analysis of Electrostatic Discharge for Electromagnetic Interference Assessment
Masugi, M.; NTT Technical Review, Volume 1, No. 5; August 2003, pp. 102; In English; See also 20040004150; Copyright; Avail: Other Sources; Abstract Only

This paper describes an analysis of the electromagnetic interference (EMI) aspects of electrostatic discharge (ESD), which sometimes causes serious damage to electrical systems. To classify EMI-related properties resulting form ESD events, we used a self-organizing neural network, which can map high-dimensional data into simple geometric relationships on a low-dimensional display. Also, to clarify the effect of a high-speed moving discharge, we generated one-shot discharges repeatedly and measured the ESD current in the time domain to obtain its EMI-related characteristics of this phenomenon. Based on the measured data, we examined several differential properties of ESD waveforms including the maximum amplitude and energy level, and analyzed these multi-dimensional data using the self-organizing neural network scheme. The results showed that the high-speed moving discharges can increase the maximum amplitude, relative energy, and entropy of ESD events, and that the positioning of the EMI level of each ESD event can be effectively visualized in a two-dimensional space.
Author
Electromagnetic Interference; Electrostatics; Neural Nets; Electric Discharges; Self Organizing Systems

20040004177 Nippon Telegraph and Telephone Public Corp., Japan

Suppression of Zn Diffusion into Absorption Layers in Electro-absorption Modulators Due to the Use of Ru-doped Semi-insulating InP Buried Heterostructures

Ogasawara, M.; Iga, R.; Yamanaka, T.; Kondo, S.; Kondo, Y.; NTT Technical Review, Volume 1, No. 5; August 2003, pp. 101; In English; See also 20040004150; Copyright; Avail: Other Sources; Abstract Only

Zn diffusion into the multi quantum well (MQW) absorption layer of semi-insulating InP-buried electroabsorption (EA) modulators is investigated by two methods: One is a novel experimental method in which a planer-structured test sample is used to evaluate the diffusion. The other is a simulation of the extinction characteristics of Zn-diffused MQW absorption layers at various the Zn concentrations. The Zn diffusion experiment shows that Zn diffusion is suppressed by the use of Ru-InP burying layers. Comparing device characteristics to the simulation results shows that Zn diffusion into the absorption layer is effectively suppressed in a Ru-doped InP-buried EA modulator so excellent extinction characteristics can be achieved. These results indicate that Ru-doped 1nP-buried EA modulators are superior to Fe-doped InP-buried ones.

Author

Electromagnetic Absorption; Diffusion; Modulators; Photoabsorption; Quantum Wells

20040004180 Nippon Telegraph and Telephone Public Corp., Japan

Gain Improvement of a 2.4-GHz/5-GHz CMOS Low Noise Amplifier with High-resistivity Silicon-on-insulator Wafers

Kodate, J.; Ugajin, M.; Tsukahara, T.; Douseki, T.; NTT Technical Review, Volume 1, No. 5; August 2003, pp. 102; In English; See also 20040004150; Copyright; Avail: Other Sources

The performance of radio frequency integrated circuits (RFICs) in silicon-on-insulator (SOI) technology can be improved by using a high-resistivity SOI substrate. We investigated the correlation between substrate resistivity and the performance of a low noise amplifier (LNA) on ELTRAN SOI-Epi wafers(TradeMark), whose resistivity can be controlled precisely. The use of high-resistivity ELTRAN wafers improves the Q-factor of spiral inductors, and thereby increases the gain and narrows the band-width of the LNA. Using the high- resistivity ELTRAN wafers, we have successfully fabricated a 2.4-GHz and 5-GHz CMOS LNA in 0.35-pm SOI CMOS technology, whose process cost is lower than the latest CMOS technologies.

Author

Radio Frequencies; Integrated Circuits; Amplifiers; SOI (Semiconductors); Electrical Resistivity; Correlation; Bandwidth

20040004185 Nippon Telegraph and Telephone Public Corp., Japan

Direct Optical Injection Locking of a 52-GHz Inp/InGaAs HPT Oscillator IC for over-l00-Gbit/s Half- or Full-rate Optoelectronic Clock Recovery

Kamitsuna, H.; Shibata, T.; Kurishima, K.; Ida, M.; NTT Technical Review, Volume 1, No. 5; August 2003, pp. 100; In English; See also 20040004150; Copyright; Avail: Other Sources; Abstract Only

We present a fully monolithic 52-GHz oscillator integrated circuit (IC) that uses a back-illuminated InP-InCaAs heterojunction phototransistor (HPT). The HPT with an emitter size of 5 micron phi, where the whole emitter area can be illuminated from the back side of the substrate, exhibits a maximum oscillation frequency of 135 GHz, thus enabling us to achieve a 52-GHz oscillator with a wide margin. Optical injection locking was evaluated by using two laser diodes with a frequency difference of around 104 GHz, which corresponds to the oscillator's second-harmonic frequency. Injection locking is successfully achieved for the second harmonic as well as for the fundamental spectrum. The oscillator IC promises to achieve a half- or full-rate optoelectronic clock extraction from over-100-Gbit/s optical data streams.

Author

Indium Gallium Arsenides; Integrated Circuits; Injection Locking; Optoelectronic Devices; Oscillators; Heterojunctions; Phototransistors

20040004296 NASA Langley Research Center, Hampton, VA, USA

Detecting the Use of Intentionally Transmitting Personal Electronic Devices Onboard Commercial Aircraft

Woods, Randy; Ely, Jay J.; Vahala, Linda; [2003]; 6 pp.; In English; IEEE Electromagnetic Compatibility Meeting, 18-22 Aug. 2003, Boston, MA, USA

Contract(s)/Grant(s): RTA 722-64-10-53; No Copyright; Avail: CASI; A02, Hardcopy

The need to detect unauthorized usage of intentionally transmitting portable electronic devices (PEDs) onboard commercial aircraft is growing, while still allowing passengers to use selected unintentionally transmitting devices, such as laptop computers and CD players during non-critical stages of flight. The following paper presents an installed system for detecting PEDs over multiple frequency bands. Additionally, the advantages of a fixed verses mobile system are discussed.

While data is presented to cover the frequency range of 20 MHz to 6.5 GHz, special attention was given to the Cellular/PCS bands as well as Bluetooth and the FRS radio bands. Measurement data from both the semi-anechoic and reverberation chambers are then analyzed and correlated with data collected onboard a commercial aircraft to determine the dominant mode of coupling inside the passenger cabin of the aircraft versus distance from the source. As a final check of system feasibility, several PEDs transmission signatures were recorded and compared with the expected levels.
Author
Commercial Aircraft; Detection; Onboard Equipment; Electronic Equipment; Systems Engineering

20040004330 Technical Research Centre of Finland, Espoo, Finland
Packaging and Component Technologies of Future Electronics
Lenkkeri, J.; Majamaa, T.; Jaakola, T.; Karppinen, M.; Kololuoma, T.; 2003; In Finnish
Report No.(s): PB2004-102003; VTT/RN-2213; No Copyright; Avail: National Technical Information Service (NTIS)

The report includes surveys of future trends in electronics packaging and component technologies from both international and national standpoints. The emphasis of the report is in the miniaturization of electronics and in the consequences to technologies in the long term. The report includes many of the most important technologies in electronics manufacturing, their expectations and needs as well as their relationship to the increasing effectiveness of electronics circuits, increasing memory and data storage capacity, signal integrity and reliability of the circuits. Besides the trends of decreasing dimensions and increasing tolerance demands in electronics the most important targets of development are increasing modularity of devices, combining of electronics, photonics and mechanical components into same devices, development of new 3-dimensional design and testing tools and introducing new electronics materials.
NTIS
Electronic Packaging; Electronics; Electronic Modules

20040006404 SRI International Corp., Menlo Park, CA, USA
Silver-Sulfur Deposits on Fuel Quantity Indication System and Attendant Wiring
McKubre, M.; Oct. 2003; In English
Report No.(s): PB2004-101413; No Copyright; Avail: National Technical Information Service (NTIS)

This report describes the results of a 3-year program to explain potential problems in aircraft fuel tanks caused by the presence of electrically conductive deposits containing sulfur and metal. A significant conclusion of the work described herein is that the active and harmful inorganic component of the deposits is silver oxide; the roles of copper and sulfur both appear to be secondary and to suppress conductivity. The electrical properties of deposits formed naturally in fuel tanks, or grown under representative laboratory conditions, can cause misreading in presently employed electrical fuel quantification systems. The chemical and electrochemical properties of silver oxide-derived deposits can contribute a potential ignition hazard by two mechanisms studied and analyzed in this report.
NTIS
Fuel Tanks; Electrical Resistivity

20040006480 Naval Postgraduate School, Monterey, CA
Performance Evaluation of the AN/USQ-146 Jammer Over Uncoded Slow FH/MFSK Military Communication Systems and the IEEE 802.11a Wireless LAN Commercial Communication Standard
Dalakos, Aristeidis; Sep. 2003; 191 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418570; No Copyright; Avail: CASI; A09, Hardcopy

On the modern battlefield communication is critical. Individual units require a steady flow of accurate information between headquarters and field units to remain effective. Just as important, denying the enemy the same needs of communicating with the help of electronic countermeasures (ECM), is essential to success. Communications jamming and surveillance are critical to achieve information superiority. This thesis evaluates the performance and capabilities of one of the most advanced devices that detects, analyzes and denies enemy signals; the Rockwell Colins AN/USQ - 146 transportable communication jammer. The jammer's best strategy varies with respect to the modulation technique that the hostile communication system uses. As the theoretical analysis and the simulation results indicated, the AN/USQ - 146 jammer achieves its best performance over a FH/MFSK system when it selects the repeat multitone jamming strategy. However, when the hostile communication system is the IEEE 802.11a wireless local area network (WLAN) system, the AN/USQ - 146 (Rubicon II) jammer must select the partial-band jamming strategy with $p = 0.1$. The results of the theoretical analysis and the simulation modeling of the specific jammer for all types of jamming in manual spot and repeat modes over FH/MFSK

military communication systems and new advanced wireless standards such as the IEEE 802. 11a can be used as guidelines to select the most effective jamming strategy for the specific type of hostile waveform encountered.
DTIC
Electronic Countermeasures; Communication Equipment; Local Area Networks; Telecommunication

20040006503 Naval Postgraduate School, Monterey, CA
Radiation Dose Analysis of NPS Flash X-Ray Facility Using Silicon Pin Diodes
Jones, Bernard L.; Sep. 2003; 59 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418593; No Copyright; Avail: CASI; A04, Hardcopy

The Naval Postgraduate School (NPS) Center for Radiation Hardened Electronics conducts research in the area of electronics for Department of Defense space and strategic systems. Installed in 1988, the Flash X-ray facility uses thermoluminescent dosimeters (TLDs) as the preferred method of radiation detection for experimentation dose levels. Semiconductor devices have been practically employed as radiation detectors since the early 1960s and technology in this field has vastly improved since then. This thesis is part of the effort to seek alternate means of dosimetry for the Flash X-ray facility. Silicon photodiodes are semiconductor devices that are responsive to high-energy particles and photons. They operate by the absorption of an incident particle or photon that creates an electron-hole pair through ionization. The required energy to produce an electron-hole pair is 3.6 eV. This treed pair, under the influence of an applied electric field, generates current in the device. The amplitude of the current signal is directly proportional to the free charge created within the detector. This study correlated the output signal of commercial silicon PIN diodes to the absorbed dose of CaF(2) TLDs. The silicon PIN diodes were irradiated with photon energies of approximately 1 MeV and dose rates up to 10(exp 10) rad(Si)/s. One issue that was examined was whether measuring the waveform amplitude peak or the waveform integral would provide a more precise correlation to the TLD readings. The results showed that using voltage amplitude peak provided a more accurate correlation to the TLD readings than waveform integral results. The results overall show that PIN diode dosimetry can provide real-time measurements that will increase efficiency in performing experiments at the Flash X-ray facility. (4 tables, 22 figures, 13 refs.)
DTIC
Radiation Dosage; Radiation Hardening; Radiation Detectors; Dosimeters; Electric Potential

20040006517 Naval Academy, Annapolis, MD
Design and Construction of a Thermophotovoltaic Energy Conversion System Using Combustion Gases from a T-58 Gas Turbine
Erickson, Timothy A.; May 7, 1997; 92 pp.; In English
Report No.(s): AD-A418622; USNA-TSPR-246; No Copyright; Avail: CASI; A05, Hardcopy

An ongoing project at the U.S. Naval Academy involves the development of a prototype ThermoPhotovoltaic (TPV) generator that uses a General Electric T-58 gas turbine as the heat source. The combustion gas was tapped from the T- 58's combustor through an ignitor port and then extracted through a silicon carbide composite tube into a ceramic emitter. The emitter was also made from the same silicon carbide composite. The TPV generator was designed to ease removal of the emitter so different materials could be tested at a later date. The ceramic emitter is heated by the combustion gas via convection, and then serves the TPV generator by radiating the heat outwards where it can be absorbed by thermophotovoltaic cells and converted directly into electricity. This paper details the design and construction of the TPV generator and gives results of initial tests of the gas turbine.
DTIC
Gas Turbines; Energy Conversion; Photovoltaic Effect; Thermoelectric Power Generation

20040008286
Active and Passive RF Components for High-Power Systems
Tantawi, S. G.; Nantista, C. D.; Sep. 2002; In English
Report No.(s): DE2003-812624; SLAC-PUB-9499; No Copyright; Avail: National Technical Information Service (NTIS)

In recent years, R&D for pulse compression and power distribution systems for the Next Linear Collider has led to the invention of many novel rf components, some of which must handle up to 600 MW of pulsed power at X-band. These include passive waveguide components, active switch designs, and non-reciprocal devices. Among the former is a class of multi-moded, highly efficient rf components based on planar geometries with overmoded rectangular ports. Multi-moding allows us, by means of input phasing, to direct power to different locations through the same waveguide. Planar symmetry allows the height to be increased to improve power handling capacity. Features that invite breakdown, such as coupling slots,

irises and H-plane septa, are avoided. This class includes hybrids, directional couplers, an eight-port superhybrid/dual-mode launcher, a mode-selective extractor, mode-preserving bends, a rectangular mode converter, and mode-mixers. We are able to utilize such rectangular waveguide components in systems incorporating low-loss, circular waveguide delay lines by means of specially designed tapers that efficiently transform multiple rectangular waveguide modes into their corresponding circular waveguide modes.
NTIS
Radio Frequencies; Linear Accelerators; Radio Electronics

20040008426 Chinese Inst. of Engineers, Taipei
Journal of the Chinese Institute of Engineers. Volume 26, No. 5, September 2003. Transactions of the Chinese Institute of Engineers, Series A
Chen, S. T.; 2003; 184 pp.; In English
Report No.(s): PB2004-101481; No Copyright; Avail: CASI; A09, Hardcopy

Contents include the following: Computations of High-Speed Compressible Flows with Adaptive Cell-Centered Finite Element Method; Thermal Design of a Disk-Array System; The Antiplane Electro-Mechanical Field of a Piezoelectric Wedge under a Pair of Concentrated Forces and Free Charges; A Lightpath Allocation Strategy for Fair Routing in WDM Networks; Numerical Time Domain Bem Experiment for 2-D Elastodynamics; Development of a System Dynamics Model for Sustainable Land Use Management; Analysis of Rigid Frame by Spline Collocation Method; Optimum Design of Truss Structures Using Discrete Lagrangian Method; Reliability Analysis of an Existing Reinforced Concrete Wharf Laden in a Chloride Environment; Color Image Vehicular Detection Systems with and without Fuzzy Neural Network: A Comparison; Shear Strength of High-Strength Concrete Dapped-End Beams; Numerical Simulation of Gravel Deposits using Multi-Circle Granule Model; An Investigation into Restoration of Radial Motion-Blurred Images with Space-Variant Line Spread Functions; Digital Image Watermarking Based on VSS in BTC Domain; A Simple Scheme to Construct K-Arbiters with Uniform Quorum Sizes; The Query Translation between Object-Oriented and Relational Databases; and Separated Shear Layers of Rectangular Prisms in Turbulent Flows.
NTIS
Electrical Engineering; Numerical Analysis

20040008460 Ljubljana Univ., Ljubljana, Slovenia
A Simulation Model of a Middle-Voltage Shunt Circuit Breaker
Bizjak, Grega; Zunko, Peter; Electrotechnical Review; 2002; ISSN 0013-5852; Volume 69, No. 5, pp. 279-284; In Slovene; Copyright; Avail: Other Sources

A shunt circuit breaker (SCB) consists of a circuit breaker with possibility of operating a single pole and a control unit. SCB is connected between busbars and ground.One was installed in Slovenia in order to gain experience, and a model was developed.
Author (revised)
Circuit Breakers; Electric Potential

20040008468 Naval Submarine Medical Research Lab., Groton, CT
Identification of Color Coded Target Lines of Different Orientations on CRT Screens
Luria, S. M.; Neri, David F.; Shim, Matthew J.; Dec. 10, 1990; 20 pp.; In English
Report No.(s): AD-A418655; NSMRL-1164; No Copyright; Avail: CASI; A03, Hardcopy

Current passive broadband sonar ‘waterfall’ displays are monochromatic, but color may be added in the future. One possible use of color would be to have the operator assign different colors to the different target tracks. The speed and accuracy of matching a colored target line on a CRT to a standard set of colors was measured as a function of the orientation of the target line. With lines one pixel wide, performance was significantly worse for diagonal than horizontal or vertical lines. There were no significant differences with the width of the line was doubled. Performance was not affected by the presence of colored distractor lines.
DTIC
Color Coding; Display Devices

20040008522
Periodica Polytechnica Electrial Engineering, Volume 45, No. 3-4, 2001
May 2001; 156 pp.
Report No.(s): PB2004-101229; REPT-2001 45/3-4; No Copyright; Avail: CASI; A08, Hardcopy

Contents include the following: Pulse Width Modulated IGBT AC Chopper; Voltage Spectra of Two-phase PWM Technique with 120deg Cycle; Parameter Identification of a Robot Arm; Adaptive Hysteresis Current Vector Control of Synchronous Servo Drives with Different Tolerance Areas; Properties of the Co-energy Function Why Isn't There a 20 kV Asynchronous Motor; Finite Element Calculation of Double-Cage Skin Factors; Problem-Solving Support by the Multi-Layer Hypermedia Model; Testing the Operation of High T(sub C) Superconducting Fault Current Limiter in a Real System; Possibilities of Rotor Eccentricity; and Computation of Non-Linear Characteristic.
NTIS
Electrical Engineering; Research and Development

20040008531 Texas Technological Univ., Lubbock, TX, USA
Configuring Embeddable Adaptive Computing Systems for Multiple Application Domains with Minimal Size, Weight, and Power
Antonio, John K.; Sep. 2003; 142 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-97-2-0297; DARPA ORDER-F297; Proj-D002
Report No.(s): AD-A418681; AFRL-IF-RS-TR-2003-212; No Copyright; Avail: CASI; A07, Hardcopy
The advantages of using DSP chips for high- performance embedded signal processing applications have been demonstrated during the past decade. However, it is now apparent that even DSP chips can be overkill for some computations found in common embedded military applications. This project investigates the advantages of integrating configurable hardware together with a multiprocessor DSP/GPP platform. The computational engine of the configurable hardware used in this project was comprised of FPGA chips. A primary goal of our project was to demonstrate that for given computational loads--associated with instances of embedded radar signal processing applications-the total size, weight, and power (SWAP) could be reduced by integrating FPGA-based components as part of the embedded computational platform.
DTIC
Signal Processing; Digital Systems; Chips (Electronics)

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*.

20040004195 National Chung Hsing Univ., Taichung, Taiwan, Province of China
Measurement and Simulation of Turbulent Flow in a Steep Open-Channel with Smooth Boundary
Lu, Jau-Yau; Hong, Jian-Hao; Wang, Chuan-Yi; Lee, Kun-Zheng; Yang, Han-Chung; Journal of the Chinese Institute of Engineers, Volume 26, No. 2; March 2003, pp. 201-210; In English; See also 20040004187; Copyright; Avail: Other Sources
Turbulence measurements were performed in a steep open-channel with a smooth boundary using a fiber-optic laser Doppler velocimeter (FLDV). A sophisticated Reynolds-Stress-Model (RSM) was chosen to simulate the fully developed turbulent open-channel flow. The computed mean velocities and turbulence statistical quantities were compared with the high-accuracy turbulence measurements to explore the capabilities and limitations of the existing turbulence model. The measured mean velocity profiles exhibit a clear retardation effect near the free surface, a feature absent from the numerical simulations. In general, the simulated longitudinal turbulence intensities yielded by the RSM were slightly lower than the experimental results, and the simulated vertical turbulence intensities were fairly consistent with the measured data except for the regions near the side walls. Increase of the turbulence intensities for both the longitudinal and the vertical components near the free surface were found for flows with steep slope gradient and small width-to-depth ratio due to the increase of the intensity of secondary current. The relative magnitude of the longitudinal, vertical and transverse turbulence intensities simulated from RSM was consistent with that for hot film measurements under mild slope conditions.
Author
Turbulent Flow; Amount; Boundaries; Fiber Optics; Flow Measurement; Open Channel Flow; Simulation

20040004356 Naval Postgraduate School, Monterey, CA
The Circulation and Variability in the Western Arctic Ocean - Model Results
Dixon, Jeffrey S.; Sep. 2003; 129 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418496; No Copyright; Avail: CASI; A07, Hardcopy
Circulation in the western Arctic Ocean is not well understood. To address some of its outstanding questions, volume

transport and property fluxes are investigated using a coupled ice-ocean model of the pan-Arctic region configured at a 1/12-degree and 45-level grid. Results for analyses are from the last 23 years of a 30-year integration forced with realistic 1939-2001 atmospheric data. Velocity at three depth intervals, mean transports and fluxes are investigated to identify the main current pathways and directions. Variability is determined by comparison of results a decade apart. Mean velocity fields describe a climatological circulation pattern that is cyclonic in nature with increased intensity during the late 1980s and early 1990s. The meander through the Chukchi Borderland Pass is the main pathway for boundary flow across the Chukchi Plateau. The northern Chukchi Plateau is modeled as a region of major volume, heat and freshwater transport into the Canada Basin interior. It also appears to be an area of net upward heat transport, which may be available for melting ice. Northward flow along the eastern side of the Northwind Ridge is identified as a mechanism for advection of freshwater from the Chukchi shelves into the interior.
DTIC
Ocean Models; Arctic Ocean; Climatology; Transport Properties

20040004381 Nebraska Univ., Lincoln, NE, USA
Optimal Experiment Design for Thermal Characterization of Functionally Graded Materials
Cole, Kevin D.; August 18, 2003; 59 pp.; In English; See also 20040004382 - 20040004384
Contract(s)/Grant(s): NAG1-01087; No Copyright; Avail: CASI; A04, Hardcopy

The purpose of the project was to investigate methods to accurately verify that designed , materials meet thermal specifications. The project involved heat transfer calculations and optimization studies, and no laboratory experiments were performed. One part of the research involved study of materials in which conduction heat transfer predominates. Results include techniques to choose among several experimental designs, and protocols for determining the optimum experimental conditions for determination of thermal properties. Metal foam materials were also studied in which both conduction and radiation heat transfer are present. Results of this work include procedures to optimize the design of experiments to accurately measure both conductive and radiative thermal properties. Detailed results in the form of three journal papers have been appended to this report.
Author
Functionally Gradient Materials; Thermodynamic Properties

20040004382 Nebraska Univ., Lincoln, NE, USA
Thermal Characterization of Functionally Graded Materials: Design of Optimum Experiments
Cole, Kevin D.; Optimal Experiment Design for Thermal Characterization of Functionally Graded Materials; August 18, 2003; 20 pp.; In English; See also 20040004381
Contract(s)/Grant(s): NAG1-01087; No Copyright; Avail: CASI; A03, Hardcopy

This paper is a study of optimal experiment design applied to the measure of thermal properties in functionally graded materials. As a first step, a material with linearly-varying thermal properties is analyzed, and several different tran- sient experimental designs are discussed. An optimality criterion, based on sen- sitivity coefficients, is used to identify the best experimental design. Simulated experimental results are analyzed to verify that the identified best experiment design has the smallest errors in the estimated parameters. This procedure is general and can be applied to design of experiments for a variety of materials.
Author
Functionally Gradient Materials; Experiment Design; Thermodynamic Properties

20040004383 Nebraska Univ., Lincoln, NE, USA
Analysis of Photothermal Characterization of Layered Materials: Design of Optimal Experiments
Cole, Kevin D.; Optimal Experiment Design for Thermal Characterization of Functionally Graded Materials; August 18, 2003; 14 pp.; In English; Fifteenth Symposium on Thermophysical Properties, 22-27 Jun. 2003, Boulder, CO, USA; See also 20040004381
Contract(s)/Grant(s): NAG1-01087; No Copyright; Avail: CASI; A03, Hardcopy

In this paper numerical calculations are presented for the steady-periodic temperature in layered materials and functionally-graded materials to simulate photothermal methods for the measurement of thermal properties. No laboratory experiments were performed. The temperature is found from a new Green s function formulation which is particularly well-suited to machine calculation. The simulation method is verified by comparison with literature data for a layered material. The method is applied to a class of two-component functionally-graded materials and results for temperature and sensitivity

coefficients are presented. An optimality criterion, based on the sensitivity coefficients, is used for choosing what experimental conditions will be needed for photothermal measurements to determine the spatial distribution of thermal properties. This method for optimal experiment design is completely general and may be applied to any photothermal technique and to any functionally-graded material.
Author
Functionally Gradient Materials; Thermodynamic Properties

20040005811 Sandia National Labs., Albuquerque, NM, USA
Computational Fluid Dynamics Code for Smoke Transport During an Aircraft Cargo Compartment Fire: Transport Solver, Graphical User Interface, and Preliminary Baseline Validation
Suo-Anttila, J.; Gill, W.; Gallegos, C.; Nelsen, J.; Oct. 2003; In English
Report No.(s): PB2004-101407; No Copyright; Avail: National Technical Information Service (NTIS)
Current regulations require that aircraft cargo compartment smoke detectors alarm within 1 minute of the start of a fire and at a time before the fire has substantially decreased the structural integrity of the airplane. Presently, in-flight tests, which can be costly and time consuming, are required to demonstrate compliance with the regulations. A physics-based Computational Fluid Dynamics (CFD) tool, which couples heat, mass, and momentum transfer, has been developed to decrease the time and cost of the certification process by reducing the total number of both in-flight and ground experiments. The tool provides information on smoke transport in cargo compartments under various conditions, therefore allowing optimal experiments to be designed. The CFD-based smoke transport model has the potential to enhance the certification process by determining worst-case locations for fires, optimum placement of fire detector sensors within the cargo compartment, and sensor alarm levels needed to achieve detection within the required certification time. The model is fast running, allowing for simulation of numerous fire scenarios in a short period of time. In addition, the model is user-friendly since it will potentially be used by air framers and airlines that are not expected to be experts in CFD. Following verification of this CFD code, full-scale experiments have been initiated to aid in the validation of the code and gauge the reliability of using such an approach to increase the efficiency of the aircraft fire detection system certification process. This document includes a description of the CFD model, the pre- and postprocessor, and the initial baseline validation.
NTIS
Fires; Computational Fluid Dynamics; Smoke; Transport Theory

20040008151 Defence Research and Development Canada, Ottawa, Ontario, Canada
Estimation of Submarine Near-Bottom Hydrodynamic Loads and Squat
Mackay, M.; Apr. 2003; 53 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418585; DRDC-ATLANTIC-TM-2003-078; No Copyright; Avail: CASI; A04, Hardcopy
This memorandum outlines a method for estimating the near-bottom loads on a submarine submerged in deep water and for the related problem of predicting submarine squat in deep or shallow water. The method is fully three-dimensional, but has some limitations associated with potential flow and linearization of the free surface. The chief difficulty for this study was the dearth of suitable data available for validation. Nevertheless, the results are encouraging. Overall, it appears that the sinkage component of squat is predicted with greater accuracy than is trim. Further work should include the acquisition of more, reliable, model data and the investigation of scale effects.
DTIC
Loads (Forces); Hydrodynamics; Ocean Bottom; Potential Flow

20040008285 NASA Langley Research Center, Hampton, VA, USA
Agglomeration Multigrid for an Unstructured-Grid Flow Solver
Frink, Neal; Pandya, Mohagna J.; [2004]; 15 pp.; In English; 42nd AIAA Aerospace Sciences Meeting and Exhibit, 5-8 Jan. 2004, Reno, NV, USA
Contract(s)/Grant(s): NAS1-00135
Report No.(s): AIAA Paper 2004-0759; Copyright; Avail: CASI; A03, Hardcopy
An agglomeration multigrid scheme has been implemented into the sequential version of the NASA code USM3Dns, tetrahedral cell-centered finite volume Euler/Navier-Stokes flow solver. Efficiency and robustness of the multigrid-enhanced flow solver have been assessed for three configurations assuming an inviscid flow and one configuration assuming a viscous fully turbulent flow. The inviscid studies include a transonic flow over the ONERA M6 wing and a generic business jet with flow-through nacelles and a low subsonic flow over a high-lift trapezoidal wing. The viscous case includes a fully turbulent

flow over the RAE 2822 rectangular wing. The multigrid solutions converged with 12%-33% of the Central Processing Unit (CPU) time required by the solutions obtained without multigrid. For all of the inviscid cases, multigrid in conjunction with an explicit time-stepping scheme performed the best with regard to the run time memory and CPU time requirements. However, for the viscous case multigrid had to be used with an implicit backward Euler time-stepping scheme that increased the run time memory requirement by 22% as compared to the run made without multigrid.
Author
Agglomeration; Unstructured Grids (Mathematics); Computational Fluid Dynamics; Multigrid Methods; Aerodynamic Configurations; Computer Programs

20040008331 NASA Stennis Space Center, Bay Saint Louis, MS, USA
Nonlinear Modeling and Control of a Propellant Mixer
Barbieri, Enrique; Richter, Hanz; Figueroa, Fernando; June 1, 2003; 13 pp.; In English; 2003 American Control Conference, 4-6 Jun. 2003, Denver, CO, USA
Contract(s)/Grant(s): NASW-99027; NAS13-98033
Report No.(s): SE-2002-08-00056-SSC; No Copyright; Avail: CASI; A03, Hardcopy

A mixing chamber used in rocket engine combustion testing at NASA Stennis Space Center is modeled by a second order nonlinear MIMO system. The mixer is used to condition the thermodynamic properties of cryogenic liquid propellant by controlled injection of the same substance in the gaseous phase. The three inputs of the mixer are the positions of the valves regulating the liquid and gas flows at the inlets, and the position of the exit valve regulating the flow of conditioned propellant. The outputs to be tracked and/or regulated are mixer internal pressure, exit mass flow, and exit temperature. The outputs must conform to test specifications dictated by the type of rocket engine or component being tested downstream of the mixer. Feedback linearization is used to achieve tracking and regulation of the outputs. It is shown that the system is minimum-phase provided certain conditions on the parameters are satisfied. The conditions are shown to have physical interpretation.
Author
Nonlinear Systems; Mimo (Control Systems); Liquid Propellant Rocket Engines; Thermodynamics; Fuel Control

20040008381 Stockholm Univ., Sweden
Perturbative Resolution of a Non-Constant Potential Vorticity Problem in Rotating Hydraulics
Lake, I.; 2003; 32 pp.
Report No.(s): PB2004-100930; DM-89; No Copyright; Avail: CASI; A03, Hardcopy

Hydraulically controlled flow in a rotating channel of parabolic cross-section has been dealt with on the basis of a stationary, inviscid 1.5-layer flow situation, where the rarely invoked situation with a non-constant potential vorticity is taken into account. This complication is taken to be induced by linear and quadratic cross-channel variations being superimposed on a constant distribution of the potential vorticity. Introducing a perturbative parameter, based on the ratio between the linearly varying and constant components of the potential vorticity, the governing equations and the associated boundary/initial conditions are decomposed into zeroth-, first- and second-order problems. After the consecutive resolution of this suite of formal mathematical problems, the results of the analysis are primarily presented in terms of the controlled transport, a convenient quantity for diagnostic purposes.
NTIS
Hydraulics; Vorticity

20040008416 NASA Langley Research Center, Hampton, VA, USA
Study of CFD Variation on Transport Configurations from the Second Drag-Prediction Workshop
Rumsey, Christopher L.; Rivers, S. Melissa; Morrison, Joseph H.; [2004]; 25 pp.; In English; 42nd Aerospace Sciences Meeting and Exhibit, 5-8 Jan. 2004, Reno, NV, USA
Report No.(s): AIAA Paper 2004-0394; No Copyright; Avail: CASI; A03, Hardcopy

This paper describes and analyzes a series of nearly 90 CFD test cases performed as a contribution to the second Drag Prediction Workshop, held in association with the AIAA in June 2003. Two configurations are included: DLR-F6 wing-body and wing-body-nacelle-pylon. The ability of CFD to predict the drag, lift, and pitching moment from experiment-including the 'delta' arising from the addition of the nacelle and pylon-is assessed. In general, at a fixed angle of attack CFD overpredicts lift, but predicts the delta C (sub L) reasonably well. At low lift levels (C (sub L) less than 0.3)), delta C (sub D) is 20-30 drag counts (30-45%) high. At the target lift coefficient of C(sub L) = 0.5, delta C (sub D) is overpredicted by between 11-16 counts. However, the primary contribution of this paper is mot so much the assessment of CFD against experiment, but rather a

detailed assessment and analysis of CFD variation. The series of test cases are designed to determine the sensitivity/variability of CFD to a variety of factors, including grid, turbulence model, transition code, and viscous model. Using medium-level grids (6-11 million points) at the target lift coefficient, the maximum variation in drag due to different grids is 5-11 drag counts, due to code is 5-10 counts, due to turbulence model is 7-15 counts, due to transition is 10-11 counts, and due to viscous model is 4-5 counts. Other specific variations are described in the paper.
Author
Computational Fluid Dynamics; Aerodynamic Drag; Numerical Analysis; Computational Grids; Body-Wing Configurations

20040008444 Massachusetts Inst. of Tech., Cambridge, MA
Aerospace Turbomachinery Flow Physics
Tan, Choon S.; Aug. 2003; 152 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F49620-00-1-0014
Report No.(s): AD-A418327; AFRL-SR-AR-TR-03-0454; No Copyright; Avail: CASI; A08, Hardcopy

This document constitutes the final report on a multi-investigator research program on 'Aerospace Turbo machinery Flow Physics'. The research program encompasses the following four technical areas: (1) Flutter clearance in aircraft engine compressors (2) Physics of coolant/main flow interactions in advanced aircraft/rocket turbines (3) Tip clearance flow effects in axial and centrifugal turbomachines (4) Use of an active rotor to delineate parametric dependence of aerodynamic damping A common theme that threaded through these research areas is three dimensional and/or unsteady flow phenomena, and the enhancement of overall performance of turbomachines through flow management and design. In other words it is our view that the primary challenges to achieving increased overall performance of turbomachines are linked to local phenomena which are inherently three-dimensional and/or unsteady.
DTIC
Centrifugal Force; Fluid Dynamics; Turbomachinery

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*.

20040004142 Naval Postgraduate School, Monterey, CA
Distributed Subarray Antennas for Multifunction Phased-Array Radar
Lin, Chih-heng; Sep. 2003; 89 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418532; No Copyright; Avail: CASI; A05, Hardcopy

As the target radar cross section (RCS) continuously decreases, the need for high-resolution high-gain radar increases, One approach to high resolution is to use distributed subarray antennas (DSAs), because of limited surface available on many radar platforms. The concept of distributed subarray antennas is examined for both Multifunction Array Radar (MFAR) and Very High Frequency (VHF) applications. By combining distributed subarrays located on the available areas of a constrained platforms, the MFAR and VHF DSA can achieve increased resolution and potential reductions in cost and complexity compared to a conventional array. The two-way pattern design of DSA effectively suppresses the undesired grating lobes by using separate transmit and receive antennas. By the pattern multiplication principle, the grating lobes in the receive pattern have been suppressed by proper null placement of subarray in the receive and transmit patterns.
DTIC
High Resolution; Radar Cross Sections; High Gain

20040004197 National Chung Hsing Univ., Taichung, Taiwan, Province of China
Capacitive Micro Pressure Sensors with Underneath Readout Circuit Using a Standard CMOS Process
Dai, Ching-Liang; Chang, Shih-Chen; Lee, Chi-Yuan; Cheng, Ying-Chou; Chang, Chien-Liu; Chiou, Jing-Hung; Chang, Pei-Zen; Journal of the Chinese Institute of Engineers, Volume 26, No. 2; March 2003, pp. 237-241; In English; See also 20040004187
Contract(s)/Grant(s): NSC-89-2218-E-161-005; Copyright; Avail: Other Sources

A capacitive micropressure sensor with readout circuits on a single chip is fabricated using commercial 0.35 microns complementary metal oxide semiconductor (CMOS) process and post-processing. The main break through feature of the chip

is the positioning of its readout circuits under the pressure sensor, allowing the chip to be smaller. Post-processing included anisotropic dry etching and wet etching to remove the sacrificial layer, and the use of plasma enhanced chemical vapor deposition (PECVD) of nitride to seal the etching holes on the pressure sensor. The readout circuit is divided into analog and digital parts, with the digital part being an alternate coupled RS flip-flop with four inverters that sharpened the output wave. The analog part employed switched capacitor methodology. The pressure sensor contained an 8x8 sensing cells array, and the total area of the pressure sensor chip is 2mmx2mm.
Author
Capacitance; Pressure Sensors; Circuits; Readers

20040004223 Stanford Linear Accelerator Center, Stanford, CA, USA
Performance of Large Area Silicon Strip Sensors for GLAST
Yoshida, S.; Masuda, H.; Ohsugi, T.; Fukazawa, Y.; Yamanaka, K.; Mar. 2003; In English
Report No.(s): DE2003-812950; SLAC-PUB-9643; No Copyright; Avail: National Technical Information Service (NTIS)

We report on the performance of silicon strip sensors for GLAST (Gamma-ray Large Area Space Telescope), produced by Hamamatsu Photonics, Japan. The size of the sensors is 89.5 mm x 89.5 mm and they were processed on 6 inch high resistivity wafers. By now, over 1,000 of ultimately 11,500 sensors have been produced and 622 have been investigated in detail. The average leakage current density is only 3.4 nA/cm(sup 2) at 25 C. Such a low leakage current density enables us to screen out a sensor having few strips with high leakage current by looking at the total sensor leakage current, instead of measuring individual strip currents. High breakdown voltage is also achieved. Of 10 sensors investigated for high voltage breakdown, all hold bias voltage up to 500 V without significant increase in the leakage current. The faulty strip rate is about 0.01% of 240 k strips tested.
NTIS
Semiconductor Devices; Silicon; Telescopes

20040004252 Monterey Inst. for Research in Astronomy, CA, USA
Irradiance Calibration of Space-Based Infrared Sensors
Walker, Russell; Cohen, Martin; Jul. 2002; 28 pp.; In English
Contract(s)/Grant(s): F19628-98-C-0047; Proj-MSX8
Report No.(s): AD-A418543; VRISV-1130-AR03; AFRL-VS-TR-2003-1551; No Copyright; Avail: CASI; A03, Hardcopy

The purpose of this work is to develop a basis for irradiance calibration of space-based infrared sensors. It is an extension of previous work that fully defines the context of the calibration, and the concepts of spectral composites and templates. We discuss four areas of work carried out during the past year; our accomplishments and failures; and our plans for the future. The four areas are: 1) Production and release of Version 4.0 of the Walker-Cohen Atlas of Calibrated Spectra, 2) Progress on the production of Version 2. 0 of the Air Force Bright Spectral Atlas, 3) Exploration of the non-rejected Lunar radiance (NRLR) using the radiance data from the MSX Lunar OAR experiment DC32, and 4) Work on understanding the non-ejected Earth radiance that contaminated MSX CBOl scans of the zodiacal dust near the Sun.
DTIC
Infrared Detectors; Contamination; Calibrating

20040004374 Naval Postgraduate School, Monterey, CA
Refractive Conditions of Amazon Environment and Its Effects on Ground and Airborne Radar and ESM Systems
Ferrari, Jair F.; Sep. 2003; 89 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418547; No Copyright; Avail: CASI; A05, Hardcopy

This is a study of abnormal refractive layer occurrence over the Amazon region and possible effects on radar and ESM systems, ground or airborne based. Climatologic data from three stations in that region are analyzed using computations from the Global Tropospheric Experiment (GTE), soundings and satellite imagery. The GTE data provide monthly occurrences and seasonality of atmospheric ducts and superrefractive layers. Further, individual soundings from the March-June 2003 period and the Advanced Refractive Effects Prediction Systems (AREPS) 2.1 software are used in a case study that analyzed these layers and, in addition, subrefractive and multiple layers. Selected soundings were used in simulations to explain the effects of different types of abnormal layers on the electromagnetic propagation. Although abnormal layers did not affect ground systems, airborne ones were. For radar, a region with low or no detection is created when an abnormal layer refracts the electromagnetic energy upwards or downwards. Some combinations of multiple layers may cause effects even stronger. It is concluded that knowledge of the abnormal layers occurrence is important for operations in the Amazon region. Further,

airborne radar platforms should measure local refractive conditions, if possible. A comprehensive study in time and space is recommended to provide forecasting.
DTIC
Airborne Radar; Electromagnetic Wave Transmission; Prediction Analysis Techniques; Atmospheric Stratification

20040005826 Vanguard Research, Inc., Scotts Valley, CA, USA
Irradiance Calibration of Space-Based Infrared Sensors
Walker, Russell; Cohen, Martin; Jul. 2001; 47 pp.; In English
Contract(s)/Grant(s): F19628-98-C-0047Q; Proj-MSX8
Report No.(s): AD-A418506; AFRL-VS-TR-2002-1622; No Copyright; Avail: CASI; A03, Hardcopy

The purpose of this work is to develop a basis for irradiance calibration of spacebased infrared sensors. It is an extension of previous work that fully defines the context of the calibration, and the concepts of spectral composites and templates. We discuss four areas of work carried out during the past year; our accomplishments and failures; and our plans for the future. The four areas are: 1) Production and release of Version 3.0 of the Walker-Cohen Atlas of Calibrated Spectra, 2) Production and release of Version 1.1 of the Air Force Bright Spectral Atlas, 3) Extraction of zodiacal radiance data from the MSX lunar OAR experiment DC32, and 4) Work on removing the non-rejected Earth radiance from MSX CB01 scans of the zodiacal dust near the Sun.
DTIC
Infrared Detectors; Calibrating; Extraction

20040005853 Lockheed Martin Space Operations, Bay Saint Louis, MS, USA
The Joint Agency Commercial Imagery Evaluation Team and Product Characterization Approach
Zanoni, Vicki; Pagnutti, Mary; Ryan, Robert E.; Snyder, Greg; Lehman, William; Roylance, Spencer; September 12, 2003; 2 pp.; In English; Abstract for submittal to ISPRS Commission I/Working Group 2 International Workshop on Radiometric and Geometric Calibration, 2-5 Dec. 2003, Gulfport, MS, USA
Contract(s)/Grant(s): NAS13-650
Report No.(s): NASA/SE-2003-09-00086-SSC; Copyright; Avail: Other Sources; Abstract Only

The Joint Agency Commercial Imagery Evaluation (JACIE) team is a collaborative interagency group focused on the characterization of commercial remote sensing data products. The team members - the National Aeronautics and Space Administration (NASA), the National Imagery and Mapping Agency (NIMA), and the U.S. Geological Survey (USGS) - each have a vested interest in the purchase and use of commercial imagery to support government research and operational applications. For both research and applications, commercial products must be well characterized for precision, accuracy, and repeatability. Since commercial systems are built and operated with no government insight or oversight, the JACIE team provides an independent product characterization of delivered image and image-derived end products. End product characterization differs from the systems calibration approach that is typically used with government systems, where detailed system design information is available. The product characterization approach addresses three primary areas of product performance: geopositional accuracy, image quality, and radiometric accuracy. The JACIE team utilizes well-characterized test sites to support characterization activities. To characterize geopositional accuracy, the team utilizes sites containing several 'photo-identifiable' targets and compares their precisely known locations with those defined by the commercial image product. In the area of image quality, spatial response is characterized using edge targets and pulse targets to measure edge response and to estimate image modulation transfer function. Additionally, imagery is also characterized using the National Imagery Interpretability Rating Scale, a means of quantifying the ability to identify certain targets (e.g., rail-cars, airplanes) within an image product. Radiometric accuracy is characterized using reflectance-based vicarious calibration methods at several uniform sites. Each JACIE agency performs an aspect of product characterization based on its area of expertise, thus minimizing duplication of effort. The JACIE team collaborated to perform comprehensive characterization of products from Space Imaging Inc.'s IKONOS satellite and from DigitalGlobe's QuickBird satellite and is currently characterizing products from OrbImage s OrbView-3. JACIE assessments have resulted in several improvements to commercial image product quality and have enhanced working relationships between government and industry. Assessment results are presented at an annual JACIE High Spatial Resolution Commercial Imagery Workshop.
Author
Spatial Resolution; Reproduction (Copying); Radiometric Resolution; Modulation Transfer Function; Imaging Techniques

20040006447 Maryland Univ. Baltimore County, Catonsville, MD, USA
Pilot Project for Spaceborne Massive Optical Storage Devices
Chen, Y. J.; [1996]; 4 pp.; In English
Contract(s)/Grant(s): NAS5-32337; USRA-5555-64; No Copyright; Avail: CASI; A01, Hardcopy

A space bound storage device has many special requirements. In addition to large storage capacity, fas read/ write time, and high reliability, it also needs to have small volume, light weight, low power consumption, radiation hardening, ability to operate in extreme temperature ranges, etc. Holographic optical recording technology, which has been making major advancements in recent years, is an extremely promising candidate. The goal of this pilot project is to demonstrate a laboratory bench-top holographic optical recording storage system (HORSS) based on nonlinear polymer films 1 and/or other advanced photo-refractive materials. This system will be used as a research vehicle to study relevant optical properties of novel holographic optical materials, to explore massive optical storage technologies based on the photo-refractive effect and to evaluate the feasibility of developing a massive storage system, based on holographic optical recording technology, for a space bound experiment in the near future.
Author
Holography; Optical Measuring Instruments; Recording Instruments; Technology Utilization

20040006510 Naval Postgraduate School, Monterey, CA
Multi-Agent Simulations (MAS) for Assessing Massive Sensor Coverage and Deployment
Hynes, Sean; Sep. 2003; 77 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418620; No Copyright; Avail: CASI; A05, Hardcopy

The thesis presents the design, development, and implementation of a multi-agent simulation that models coverage and deployment of mobile and non-mobile sensors performing collaborative target-detection missions. The focus is on sensor networks with enough sensors that humans cannot individually manage each sensor. Experiments investigate novel search, coverage, and deployment algorithms, and compare them to known methods. The experiments show algorithms productive for area coverage are not useful for detecting unauthorized traversals and vice versa. Obstacles, sensor mechanisms, mission parameters, and deployment schemes are analyzed for their effect on coverage quality. This work facilitates further research in sensor coverage and deployment strategies using sensor agents.
DTIC
Target Acquisition; Detection

20040008261 NASA Langley Research Center, Hampton, VA, USA
Development and Characterization of a Low-Pressure Calibration System for Hypersonic Wind Tunnels
Green, Del L.; Everhart, Joel L.; Rhode, Matthew N.; [2004]; 16 pp.; In English; 42nd AIAA Aerospace Sciences Meeting and Exhibit, 5-8 Jan. 2004, Reno, NV, USA
Report No.(s): AIAA Paper 2004-0600; No Copyright; Avail: CASI; A03, Hardcopy

Minimization of uncertainty is essential for accurate ESP measurements at very low free-stream static pressures found in hypersonic wind tunnels. Statistical characterization of environmental error sources requires a well defined and controlled calibration method. A calibration system has been constructed and environmental control software developed to control experimentation to eliminate human induced error sources. The initial stability study of the calibration system shows a high degree of measurement accuracy and precision in temperature and pressure control. Control manometer drift and reference pressure instabilities induce uncertainty into the repeatability of voltage responses measured from the PSI System 8400 between calibrations. Methods of improving repeatability are possible through software programming and further experimentation.
Author
Hypersonic Wind Tunnels; Low Pressure; Characterization; Calibrating; Pressure Sensors

20040008399 NASA Stennis Space Center, Bay Saint Louis, MS, USA
Strain Gage Measurement System to Determine Cryogenic Propellant Tank Level
Figueroa, Fernando; St.Cyr, William W.; VanDyke, David; McVay, Greg; Mitchell, Mark; Langford, Lester; July 20, 2003; 2 pp.; In English; 39th AIAA/ASME/SAE/ASEE Joint Propulsion Conference, 20-23 Jul. 2003, Huntsville, AL, USA
Contract(s)/Grant(s): NAS13-650
Report No.(s): SE-2002-11-00075-SSC; No Copyright; Avail: Other Sources; Abstract Only

Measurement of tank level, particularly for cryogenic propellants, has proven to be a difficult proposition. Current

methods based on differential pressure, capacitance sensors, temperature sensors, etc.; do not provide sufficiently accurate or robust measurements, especially at run time. This paper describes a simple, but effective method to determine propellant volume by measuring very small deformations of the structure supporting the tank. Results of a laboratory study to validate the method, and experimental data from a deployed system are presented. A comparison with an existing differential pressure sensor shows that the strain gage system provides a very good quality signal even during pressurization.
Author
Strain Gages; Propellant Tanks; Cryogenic Rocket Propellants

20040008427 Swedish Defence Research Establishment, Linkoeping
Determining Multiple Positions and Velocities from Bistatic Measurements: Fast Bistatic Association in AASR
Herberthson, M.; Feb. 2003; 24 pp.; In English
Report No.(s): PB2004-101747; FOI-R-0815-SE; Copyright; Avail: National Technical Information Service (NTIS)
This report considers a method for fast bistatic association and positioning of targets in a radar system like AASR-Associative Aperture Synthesis Radar. AASR consists of a network of distributed radar stations where the stations may be used in both monostatic and bistatic modes. The stations are not assumed to have any angular resolution, which means that the sensor information is range (both monostatic and bistatic) and the corresponding doppler information. The problem of correctly matching data from one sensor with data from another sensor, where data should be matched if they stem from the same target, is called the association problem. In this report the authors describe a new method for fast association which uses bistatic measurements only. The main advantage, besides the fact that bistatic configurations are more numerous than monostatic ditto, is that bistatic measurements has a much better capacity to detect stealth targets.
NTIS
Radar Tracking; Multistatic Radar; Angular Resolution; Synthetic Apertures; Velocity; Position (Location)

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*.

20040008436 Lockheed Martin Aeronautics Co., Fort Worth, TX, USA
Military Utility of HEL Fighter
Burris, Tom K.; Sutton, Jim K.; Menin, Gregg; Oct. 2003; 6 pp.; In English
Contract(s)/Grant(s): F33615-00-D-3052; Proj-2401
Report No.(s): AD-A418650; AFRL-VA-WP-TP-2003-342; ASC-03-0942; No Copyright; Avail: CASI; A02, Hardcopy
This paper gives a very brief overview of the Directed Energy Worth Analysis and Vehicle Evaluation program (DEWAVE), a military utility analysis of a tactical fighter equipped with a high-energy laser. This paper describes the objectives of the effort and discusses, at a very top level only, the analyses and results.
DTIC
High Power Lasers; Fighter Aircraft

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*.

20040004193 National Taiwan Ocean Univ., Keelung, Taiwan, Province of China
The Steady-State Behavior of the Prandtl-Reuss Material Bifurcated under Nonproportional Circular Strain Paths
Liu, Chein-Shan; Journal of the Chinese Institute of Engineers, Volume 26, No. 2; March 2003, pp. 173-190; In English; See also 20040004187
Contract(s)/Grant(s): NSC-90-2212-E-019-007; Copyright; Avail: Other Sources
For periodic nonproportional circular strain paths, exact constitutive solutions of the Prandtl-Reuss material are obtained. Depending on the strain amplitude ratio beta, the irreversibility parameter has three types of solutions. The bifurcation

phenomena of stress, stress relaxation and plastic strain responses are analyzed. When beta varies from beta greater than l to beta less than l, the stress responses change from limit cycle to quasiperiodic orbit, but for the latter case there exists a switch-off time f(sub eff) at which the plastic mechanism shuts down and hence responses are elastic, no longer returning to the plastic phase, while the limit cycles for stress relaxation and plastic strain responses are changed to foci. The cyclic responses, depending on strain amplitude ratio and initial stresses, can be classified into four categories of behavior: shakedown and no turning, shakedown and turning, no shakedown and no turning, and no shakedown with turning. The criteria for elastic shakedown and switch-off are established. The existence of stabilized hysteretic loops and limit cycles ensures the stability of the responses, which is a dominant factor in sketching the long-term steady-state plastic behavior of the modeled material.
Author
Steady State; Behavior; Prandtl Number; Stress Relaxation

20040004379 University of Southern Mississippi, MS, USA
NASA Helps Industry Relieve Pressure Safely
[2003]; 5 pp.; In English
Contract(s)/Grant(s): NAS13-672
Report No.(s): SE-2002-08-00058-SSC; No Copyright; Avail: CASI; A01, Hardcopy

In many industrial applications, pressure relief valves (PRV) perform the critical function of safely releasing pressure before potentially damaging build-ups occur. Conventional relief valves, however, have proven unstable, leading to premature wear and devasting consequences. A high-performance pressure relief valve, the PRV95, now being manufactured my Marotta Scientific Controls, Inc., of Montville, NJ, provides the answer to premature wear and instability. Using an improved valve design developed under a NASA Small Business Innovation Research Program (SBIR) contract from John C. Stennis Space Center (SSC), Marotta's PRV95 pressure relief valve provides stability over the entire operational range, from fully closed to fully open. The valve employs upstream control for valve positioning, that makes the valve more stable and affords excellent repeatability with minimal lag time. 'It opens and closes softly, and does not oscillate or generate hard impacts; oscillation can result in a hard impact pressure release, which can lead to an explosion in the presence of oxygen,' says Bill St. Cyr, Chief of Test Technology Branch at Stennis Space Center. Marotta's PRV95 design is also unique in its ability to maintain a seal near the set point of the relief limit. Typically, relief valves seal tightly up to 90% of set point and then reseat when pressure is reduced to 85% of set point. The PRV95 technology maintains seal integrity until 98% of set point and will reseat a 95-97% of set point. This allows the operator to protect his system while not exceeding its limits.
Author
Relief Valves; Technology Utilization; Product Development

20040008496 Stanford Linear Accelerator Center, Stanford, CA, USA
Microstructure and Properties of Ultra-Thin Amorphous Silicon Nitride Protective Coating
Yen, B. K.; Jun. 2003; 40 pp.; In English
Report No.(s): DE2003-813272; SLAC-PUB-10008; No Copyright; Avail: Department of Energy Information Bridge

The effect of N content on the structure and properties of rf reactively sputtered a-SiN x, has been studied by Rutherford backscattering spectrometry (RBS), x-ray reflectivity (XRR), ellipsometry, and nano-indentation. The N content in the film increased with the N2 concentration in the sputtering gas until the Si3N4 stoichiometry was reached. The hardness of a-SiNx, increased with density, which in turn increased with the N content. The maximum hardness of 25 GPa and density of 3.2 g/cm were attained at the stoichiometric Si3N4 composition. With the application of protective overcoat for magnetic disks in mind, thin a-SiNx, films were deposited on CoPtCr media to examine their coverage, pinhole density, and wear resistance. According to x-ray photoelectron spectroscopy (XPS), the minimum thickness of a-SiNx, required to protect the CoPtCr alloy from oxidation was 10 A, which was 10 A thinner than that of the reference a-CNx. A statistic model showed the lower coverage limit of a-SiNx, can be attributed to its high density, which corresponds to 93% bulk density of Si3N4. Compared with 45 A a-CNx coated disks, 15 A a-SiNx, coated disks had lower pinhole defect density and superior wear resistance.
NTIS
Silicon Nitrides; Protective Coatings; Mass Spectroscopy; Backscattering

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*.

20040004276 Florida Agricultural and Mechanical Univ., Tallahassee, FL, USA
Effect of Vibration on Concrete Strength During Foundation Construction
Tawfiq, K.; Abichou, T.; Sep. 02, 2003; In English
Report No.(s): PB2004-101427; No Copyright; Avail: National Technical Information Service (NTIS)

Many studies have been conducted on the effect of construction vibrations on properties of freshly placed concrete. This study was concerned with the drilled shaft construction and its effect on the green concrete. The differences between the common construction vibrations and those produced during drilled shaft construction are the amplitudes and duration of vibrations. To characterize the type of vibrations induced during drilled shaft construction, a full scale field testing was conducted using a typical steel casting. The peak particle velocities (ppv) were recorded and empirical relationships were suggested to predict the velocity values on the surface and in the ground along the penetration depth of shaft. Laboratory testing was conducted to determine the effect of ppv and different durations of vibration on green concrete properties. The duration of vibration is used in this study, including the initial and final time settings.
NTIS
Construction; Vibration Effects; Concretes; Durability; Vibration

20040008392
HERON, Volume 47, No. 4
2002; 60 pp.; In English
Report No.(s): PB2004-101227; No Copyright; Avail: CASI; A04, Hardcopy

Contents include the following: Combined experimental-computational study to discrete fracture of brittle materials; comparison of the dynamic response of one- and two-dimensional models for an embedded railway track to a moving load; and development of design rules for adhesive bonded joints.
NTIS
Mechanical Properties; Concrete Structures; Fracturing; Numerical Analysis; Dynamic Response; Brittle Materials; Rail Transportation; Adhesive Bonding; Joints (Junctions)

20040008443 Swedish Defence Research Establishment, Stockholm
Automatic Detection of Crack Initiation and Propagation using Optical Techniques
Melin, L. G.; Dec. 2002; 36 pp.; In English
Report No.(s): PB2004-101756; FOI-R-0769-SE; Copyright; Avail: National Technical Information Service (NTIS)

Two new experimental methods to detect crack initiation and monitor crack propagation during fatigue testing have been tried. Both methods are optical and use different kinds of image analysis to locate cracks on images acquired at regular intervals during the fatigue test. In the first method the specimen is illuminated by a laser to create a speckle pattern. By computing the correlation coefficient of the laser speckles, a growing crack tip will appear as a local decrease in the correlation coefficient field. In the other method the specimen is illuminated by white light. The deformation of the natural structure in the images is evaluated by computing the displacement field. The crack tip positions are obtained by analyzing the displacement fields. Both methods have shown to provide useful results from fatigue tests on notched aluminum specimen. In the present state some manual work is needed during the analysis of the images but the experience from the tests can be used for future development of an automatized crack detection system.
NTIS
Mathematical Models; Speckle Patterns; Failure Analysis

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EARTH RESOURCES AND REMOTE SENSING

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

20040004380 NASA Stennis Space Center, Bay Saint Louis, MS, USA
IKONOS Signal-to-Noise Ratio Estimation
Zanoni, Vicki; Ryan, Robert; Holekamp, Kara; Pagnutti, Mary; March 25, 2002; 46 pp.; In English; High Spatial Resolution Commercial Imagery Workshop - IKONOS, 22 Mar. 2002, Reston, VA, USA
Contract(s)/Grant(s): NAS13-650
Report No.(s): SE-2002-03-00020-SSC; No Copyright; Avail: CASI; A03, Hardcopy

This viewgraph presentation focuses on the differences in Signal-to-Noise Ratio (SNR) between IKONOS imagery with and without Modulation Transfer Function Correction (MTFC). The researchers used a simulated scene to evaluate the effects of MTFC on SNR. They also used four very uniform IKONOS scenes, two of Antarctica, one of Ivanpah, CA, and one of Mali to estimate SNR.
CASI
Satellite Imagery; Signal to Noise Ratios; Modulation Transfer Function

20040005850 NASA Stennis Space Center, Bay Saint Louis, MS, USA
The Joint Agency Commercial Imagery Evaluation (JACIE) Team: Overview and IKONOS Joint Characterization Approach
Zanoni, Vicki; Ryan, Robert; Pagnutti, Mary; Baldridge, Braxton; Roylance, Spencer; Snyder, Greg; Lee, George; Stanley, Tom; July 18, 2002; 17 pp.; In English
Contract(s)/Grant(s): NAS13-650
Report No.(s): NASA/ASE-2002-07-0053-SSC; Copyright; Avail: CASI; A03, Hardcopy

An overview of the Joint Agency Commercial Imagery Evalation (JACIE) team is presented. JACIE, composed of the National Aeronautics and Space Administration (NASA), the National Imagery and Mapping Agency (NIMA), and the U.S. Geological Survey (USGS), was formed to leverage government agencies' capabilities for the characterization of commercial remote sensing data. Each JACIE agency purchases, or plans to purchase, commercial imagery to support its research and applications. It is critical that the data be assessed for its accuracy and utility. Through JACIE, NASA, NIMA, and USGS jointly characterized image products from Space Imaging's IKONOS satellite. Each JACIE agency performed an aspect of the characterization based on its expertise. NASA and its university partners performed a system characterization focusing on radiometric calibration, geopositional accuracy, and spatial resolution assessment; NIMA performed image interpretability and feature extraction evaluations; and USGS assessed geopositional accuracy of several IKONOS products. The JACIE team purchased IKONOS imagery of several study sites to perform the assessments and presented results at an industry-government workshop. Future plans for JACIE include the characterization of DigitalGlobe's QuickBird-2 image products.
Author
Space Commercialization; Satellite Imagery; Characterization

20040005861 NASA Stennis Space Center, Bay Saint Louis, MS, USA, Lockheed Martin Space Operations, Bay Saint Louis, MS, USA
Low Altitude AVIRIS Data for Mapping Landform Types on West Ship Island, Mississippi
Spruce, Joseph; Otvos, Ervin; Giardino, Marco; February 08, 2002; 2 pp.; In English; AVIRIS Earth Science and Applications Workshop, 5-8 Mar. 2002, Pasadena, CA, USA
Contract(s)/Grant(s): NAS13-650
Report No.(s): NASA/SE-2002-02-00006-SSC; Copyright; Avail: Other Sources; Abstract Only

A chain of barrier islands provides protection against hurricanes and severe storms along the south and southeastern shores of the USA. Barrier island landform types can be spectrally similar and as small as a few meters across, making highly detailed maps difficult to produce. To determine whether high-resolution airborne hyperspectral imagery could provide detailed maps of barrier island landform types, we used low-altitude hyperspectral and multispectral imagery to map surface environments of West Ship Island, Mississippi. We employed 3.4-meter AVIRIS hyperspectral imagery acquired in July 1999 and 0.5-meter ADAR multispectral data acquired in November 1997. The data were co-registered to digital ortho aerial imagery, and the AVIRIS data was scaled to ground reflectance using ATREM software. Unsupervised classification of AVIRIS

and ADAR data proceeded using ISODATA clustering techniques. The resulting landform maps were field-checked and compared to aerial photography and digital elevation maps. Preliminary analyses indicated that the AVIRIS classification mapped more landform types, while the ADAR-based map enabled smaller patches to be identified. Used together, these maps provided a means to assess landform distributions of West Ship Island before and after Hurricane Gorges. Classification accuracy is being addressed through photo-interpretation and field surveys of sample areas selected with stratified random sampling.
Author
Low Altitude; Barriers (Landforms); Islands; Multispectral Photography; Remote Sensing; Aerial Photography; Infrared Spectrometers

20040005873 Lockheed Martin Space Operations, Bay Saint Louis, MS, USA
The NASA John C. Stennis Environmental Geographic Information System
Cohan, Tyrus; March 04, 2002; 21 pp.; In English; 2002 NASA Environmental Management and Energy Conference, 12-14 Mar. 2002, Norfolk, VA, USA
Contract(s)/Grant(s): NAS13-650
Report No.(s): SE-2002-03-00014-SSC; No Copyright; Avail: CASI; A03, Hardcopy

Contents include the following: 1. Introduction: Background information. Initial applications of the SSC EGIS. Ongoing projects. 2.Scope of SSC EGIS. 3. Data layers. 4. Onsite operations. 5. Landcover classifications. 6. Current activities. 7. GIS/Key. 8. Infrastructure base map - development. 9. Infrastructure base map - application. 10. Incorrected layer. 11. Corrected layer. 12. Emergency environmental response tool. 13. Future directions. 14. Bridging the gaps. 15. Environmental geographical information system.
CASI
Geographic Information Systems; Classifications

20040005904 NASA Stennis Space Center, Bay Saint Louis, MS, USA, Lockheed Martin Space Operations, Bay Saint Louis, MS, USA
Measurement Sets and Sites Commonly Used for Characterization
Pagnutti, Mary; Holekamp, Kara; Ryan, Robert; Sellers, Richard; Davis, Bruce; Zanoni, Vicki; March 11, 2002; 2 pp.; In English; ISPRS Commission I Mid-Term Symposium, 10-15 Nov. 2002, Denver, CO, USA
Contract(s)/Grant(s): NAS13-650
Report No.(s): NASA/SE-2002-03-00019-SSC; No Copyright; Avail: Other Sources; Abstract Only

Scientists at NASA's Earth Science Applications Directorate are creating a well-characterized Verification & Validation (V&V) site at the Stennis Space Center. This site enables the in-flight characterization of remote sensing systems and the data they acquire. The data are predominantly acquired by commercial, high spatial resolution satellite systems, such as IKONOS and QuickBird 2, and airborne systems. The smaller scale of these newer high resolution remote sensing systems allows scientists to characterize the geometric, spatial, and radiometric data properties using a single V&V site. The targets and techniques used to characterize data from these newer systems can differ significantly from the techniques used to characterize data from the earlier, coarser spatial resolution systems. Scientists are also using the SSC V&V site to characterize thermal infrared systems and active LIDAR systems. SSC employs geodetic targets, edge targets, radiometric tarps, and thermal calibration ponds to characterize remote sensing data products. This paper presents a proposed set of required measurements for visible through long-wave infrared remote sensing systems and a description of the Stennis characterization. Other topics discussed include: 1) The use of ancillary atmospheric and solar measurements taken at SSC that support various characterizations; 2) Additional sites used for radiometric, geometric, and spatial characterization in the continental USA; 3) The need for a standardized technique to be adopted by CEOS and other organizations.
Author
Remote Sensing; Characterization; Remote Sensors; In-Flight Monitoring

20040006460 Maryland Univ., College Park, MD, USA
Unsupervised, Robust Estimation-based Clustering for Multispectral Images
Netanyahu, Nathan S.; [1997]; 17 pp.; In English
Contract(s)/Grant(s): NAS5-32337; USRA-5555-37; No Copyright; Avail: CASI; A03, Hardcopy

To prepare for the challenge of handling the archiving and querying of terabyte-sized scientific spatial databases, the NASA Goddard Space Flight Center's Applied Information Sciences Branch (AISB, Code 935) developed a number of

characterization algorithms that rely on supervised clustering techniques. The research reported upon here has been aimed at continuing the evolution of some of these supervised techniques, namely the neural network and decision tree-based classifiers, plus extending the approach to incorporating unsupervised clustering algorithms, such as those based on robust estimation (RE) techniques. The algorithms developed under this task should be suited for use by the Intelligent Information Fusion System (IIFS) metadata extraction modules, and as such these algorithms must be fast, robust, and anytime in nature. Finally, so that the planner/schedule module of the IlFS can oversee the use and execution of these algorithms, all information required by the planner/scheduler must be provided to the IIFS development team to ensure the timely integration of these algorithms into the overall system.
Author
Data Bases; Remote Sensing; Multispectral Photography; Cluster Analysis; Robustness (Mathematics)

20040006509 Naval Postgraduate School, Monterey, CA
Detecting and Measuring Temporal Phenomenon With High Resolution Satellite Imagery
Hittner, Andrew J.; Sep. 2003; 59 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418619; No Copyright; Avail: CASI; A04, Hardcopy

A new operating mode for imaging satellites has been developed. The non-imaging mode is designed to provide high temporal resolution data time varying targets. The idea is to use linear pushbroom arrays with kilohertz sampling rates to not only detect, but also measure the frequency of temporally varying targets. For satellite operations this will involve satellite slewing at a rate which cancels the effects of satellite orbital motion. This concept was explored here with a laboratory simulation of an intended test target consisting of windmills at the Ponnequin Wind Farm in Colorado. Test images were acquired and processed using an inexpensive camera and MATLAB. Results indicate the approach is viable and should produce distinct and useful signatures in time and frequency domain analysis.
DTIC
Mathematical Models; Satellite Imagery

20040008150 Northrop Grumman Corp., Rome, NY, USA
JBI Distributed Test Bed (JBI-DT) Video
Heath, Thomas; Aug. 2003; 9 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-00-D-0159/0007; Proj-JBIT
Report No.(s): AD-A418575; AFRL-IF-RS-TR-2003-190; No Copyright; Avail: CASI; A02, Hardcopy

This final technical report will describe the efforts and accomplishments performed under contract to the Air Force Research Laboratory (AFRL), Rome Research Site (RRS). The original terms of this contract specified the incorporation of Motion Imagery Exploitation capabilities, provided by AFRL's Exploitation Toolkit for Video (XTV), into the Joint Battlespace Infosphere (JBI). However, given the relatively small dollar amount of the contract, and the potential benefits anticipated for this purpose, it was decided to concentrate on enhancing existing exploitation capabilities. Prior Motion Imagery Exploitation work performed by Northrop Grumman Information Technology (IT) under contract to AFRL consisted of a method to automatically determine significant scene changes in compressed MPEG video. This contract extended that effort to add segmentation capabilities to the scene change detection efforts. To make this tool user friendly, a graphical user interface (GUI) was built to support testing and utilization of this automatic segmentation tool. Additionally, this process was loosely integrated with an AFRL developed mosaicking capability to demonstrate a proof of concept for Phase 0 image exploitation. Surveillance video can be of very long duration, often longer than 24 hours, thus making effective use of this video difficult. To facilitate the exploitation of this video and reduce required manpower, tools such as automatic segmentation become necessary. This effort has shown that automatic video segmentation can be an effective tool for partitioning video into homogeneous segments and will assist in the effective exploitation of aerial surveillance video. Integration of the automatic segmentation tool with the mosaicking capability provides the exploiter with a completely hands-free analysis tool that will allow the user to quickly view the mosaics and identify which video clips may be of interest. (2 figures, 5 refs.)
DTIC
Video Compression; Graphical User Interface; Information Systems

20040008326 Lockheed Martin Space Operations, Bay Saint Louis, MS, USA, NASA Stennis Space Center, Bay Saint Louis, MS, USA

Methods for LWIR Radiometric Calibration and Characterization

Ryan, Robert; Harrington, Gary; Howell, Dane; Pagnutti, Mary; Zanoni, Vicki; March 11, 2002; 2 pp.; In English; ISPRS Commission I Mid-Term Symposium, 10-15 Nov. 2002, Denver, CO, USA

Contract(s)/Grant(s): NAS13-650

Report No.(s): SE-2002-03-00017-SSC; No Copyright; Avail: Other Sources; Abstract Only

The utility of a remote sensing system increases with its ability to retrieve surface temperature or radiance accurately. Research applications, such as sea temperature and power plant discharge, require a 0.2 C resolution or better for absolute temperature retrievals. Other applications, including agriculture water stress detection, require at least a 1 C resolution. To achieve these levels of accuracy routinely, scientists must perform laboratory and onboard calibration, as well as in-flight vicarious radiometric characterization. A common approach used for in-flight radiometric characterization incorporates a well-calibrated infrared radiometer that is mounted on a bouy and placed on a uniform water body. The radiometer monitors radiant temperature along with pressure, humidity, and temperature measurements of an associated column of atmosphere. On very still waters, however, a buoy can significantly distrub these measurements. Researchers at NASA's Stennis Space Center (SSC) have developed a novel approach of using an uncooled infrared camera mounted on a boom to quantify buoy effects. Another critical aspect of using buoy-mounted infrared radiometers is the need for extensive laboratory characterization of the instruments' radiometric sensitivity, field of view, and spectral response. Proper surface temperature retrieval also requires detailed knowledge of both the upward emission and the reflected sky emission. Recent work at SSC has demonstrated that the use of a polarization-based radiometer operating at the Brewster angle can greatly simplify temperature retrieval as well as improve overall accuracy.

Author

Remote Sensing; Infrared Radiometers; Calibrating; Characterization

20040008330 NASA Stennis Space Center, Bay Saint Louis, MS, USA, Lockheed Martin Space Operations, Bay Saint Louis, MS, USA

The NASA Scientific Data Purchase: Summary and Evaluation

September 23, 2003; 132 pp.; In English

Contract(s)/Grant(s): NAS13-650

Report No.(s): SE-2003-09-00087-SSC; No Copyright; Avail: CASI; A07, Hardcopy

This report summarizes the results of the NASA Scientific Data Purchase (SDP) program implemented by the Stennis Space Center Earth Science Application Directorate in fiscal years 1998-2002. The SDP was conducted in support of NASA's Mission to Planet Earth (MTPE) program (currently known as NASA's Earth Science Enterprise). This Earth Science Enterprise (ESE) provides major observational capabilities for NASA's Earth system science research and the U.S. Global Change Research Program. Observations supported through the SDP were selected based upon their application to the five science themes of the MTPE/ESE: 1) Land cover and land use change research; 2) Seasonal to interannual climate variability and prediction; 3) Natural hazards research and applications; 4) Long-term climate: Natural variability and change research; 5) Atmospheric ozone research. The MTPE/ESE science themes, although they have evolved over time, are driven by a set of key science questions that help focus the research program on characterizing the Earth system.

Author (revised)

Earth Sciences; Remote Sensing; Space Commercialization; Mission to Planet Earth

20040008397 Lockheed Martin Space Operations, Bay Saint Louis, MS, USA

Parameters Describing Earth Observing Remote Sensing Systems

Zanoni, Vicki; Ryan, Robert E.; Pagnutti, Mary; Davis, Bruce; Markham, Brian; Storey, Jim; September 26, 2003; 2 pp.; In English; ISPRS Commission 1/Working Group 2 International Workshop on Radiometric and Geometric Calibration, 2-5 Dec. 2003, Gulfport, MS, USA

Contract(s)/Grant(s): NAS13-650

Report No.(s): SE-2003-09-00084-SSC; No Copyright; Avail: Other Sources; Abstract Only

The Earth science community needs to generate consistent and standard definitions for spatial, spectral, radiometric, and geometric properties describing passive electro-optical Earth observing sensors and their products. The parameters used to describe sensors and to describe their products are often confused. In some cases, parameters for a sensor and for its products are identical; in other cases, these parameters vary widely. Sensor parameters are bound by the fundamental performance of a system, while product parameters describe what is available to the end user. Products are often resampled, edge sharpened,

pan-sharpened, or compressed, and can differ drastically from the intrinsic data acquired by the sensor. Because detailed sensor performance information may not be readily available to an international science community, standardization of product parameters is of primary performance. Spatial product parameters described include Modulation Transfer Function (MTF), point spread function, line spread function, edge response, stray light, edge sharpening, aliasing, ringing, and compression effects. Spectral product parameters discussed include full width half maximum, ripple, slope edge, and out-of-band rejection. Radiometric product properties discussed include relative and absolute radiometry, noise equivalent spectral radiance, noise equivalent temperature diffenence, and signal-to-noise ratio. Geometric product properties discussed include geopositional accuracy expressed as CE90, LE90, and root mean square error. Correlated properties discussed include such parameters as band-to-band registration, which is both a spectral and a spatial property. In addition, the proliferation of staring and pushbroom sensor architectures requires new parameters to describe artifacts that are different from traditional cross-track system artifacts. A better understanding of how various system parameters affect product performance is also needed to better ascertain the utility of existing datasets and products as well as to specify the performance of new sensors and products. Examples of simulations performed for the Landsat Data Continuity Mission illustrate how various parameters affect system and product performance. Specific examples include the effects of ground sample distance, MTF, and band-to-band registration on various products.
Author
Earth Observations (From Space); Independent Variables; Remote Sensors

20040008401 George Mason Univ., Fairfax, VA, USA
Dimension Reduction of Hyperspectral Data on Beowulf Clusters
El-Ghazawi, Tarek; [2000]; 13 pp.; In English
Contract(s)/Grant(s): NAS5-32337; USRA-5555-28-71; No Copyright; Avail: CASI; A03, Hardcopy

Traditional remote sensing instruments are multispectral, where observations are collected at a few different spectral bands. Recently, many hyperspectral instruments, that can collect observations at hundreds of bands, have been operation. Furthermore, there have been ongoing research efforts on ultraspectral instruments that can produce observations at thousands of spectral bands. While these remote sensing technology developments hold a great promise for new findings in the area of Earth and space science, they present many challenges. These include the need for faster processing of such increased data volumes, and methods for data reduction. Dimension Reduction is a spectral transformation, which is used widely in remote sensing, is the Principal Components Analysis (PCA). In light of the growing number of spectral channels of modern instruments, the paper reports on the development of a parallel PCA and its implementation on two Beowulf cluster configurations, on with fast Ethernet switch and the other is with a Myrinet interconnection.
Author
Remote Sensing; Principal Components Analysis; Parallel Processing (Computers); Computer Systems Programs; Spectral Bands; Cluster Analysis

20040008553 Naval Research Lab., Stennis Space Center, MS
Digital Mapping Charting and Geodesy analysis Program (DMAP) Review of Technical Initiatives for FY03
Breckenridge, John L.; Shaw, Kevin B.; Mesick, Hillary C.; Wilson, Ruth A.; McCreedy, Frank P.; Nov. 10, 2003; 45 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418700; NRL/MR/7440-03-8716; No Copyright; Avail: CASI; A03, Hardcopy

The Naval DMAP serves as a technical representative for the Oceanographer of the Navy, NO96 to address significant issues relevant to the Navy's use and development of digital Mapping, Charting & Geodesy (MC&G) data. These efforts may include: (1) Technical Evaluations, (2) Advanced Techniques/Demonstrations, (3) Final quality control for Digital Nautical Chart (DNC) data, and (4) MC&G standards Development. This report describes the extent of FY03 efforts relevant to each of these major DMAP tasks.
DTIC
Digital Techniques; Mapping; Geodesy; Maps

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*.

20040004083 South Carolina Univ., Columbia, SC
Strategy for Active Power Sharing in a Fuel-Cell- Powered Charging Station for Advanced Technology Batteries
Jiang, Zhenhua; Dougal, Roger A.; Jan. 2003; 7 pp.; In English
Contract(s)/Grant(s): N00014-00-1-0368; N00014-00-1-0131
Report No.(s): AD-A418519; No Copyright; Avail: CASI; A02, Hardcopy

This paper presents a novel real-time strategy for active power sharing in a fuel-cell-powered charging station for advanced technology batteries. This control scheme can adjust the charging currents according to the estimated state-of-charge which is obtained by estimating the battery open- circuit voltage with current correction and linearly fitting between the open-circuit voltage and the state-of-charge. Both DC and pulse current charging strategies are investigated to coordinate the active power distribution among batteries. The DC charging controller is designed and implemented in MATLAB/Simulink for both system simulation and experimental tests. Simulation and experimental results are also given.
DTIC
Storage Batteries; Fuel Cells; Pulse Charging; Open Circuit Voltage

20040005906 Texas Univ., Arlington, TX, USA
Shock Formation and Energy Dissipation of Slow Magnetosonic Waves in Coronal Plumes
Cuntz, M.; Suess, S. T.; [2003]; 1 pp.; In English; 12th Cambridge Workshop on Cool Stars, Stellar Systems and The Sun, 30 Jul. - 3 Aug. 2001, Boulder, CO, USA; No Copyright; Avail: Other Sources; Abstract Only

We study the shock formation and energy dissipation of slow magnetosonic waves in coronal plumes. The wave parameters and the spreading function of the plumes as well as the base magnetic field strength are given by empirical constraints mostly from SOHO/UVCS. Our models show that shock formation occurs at low coronal heights, i.e., within 1.3 bun, depending on the model parameters. In addition, following analytical estimates, we show that scale height of energy dissipation by the shocks ranges between 0.15 and 0.45 Rsun. This implies that shock heating by slow magnetosonic waves is relevant at most heights, even though this type of waves is apparently not a solely operating energy supply mechanism.
Author
Shock Heating; Magnetoacoustic Waves; Coronas; Energy of Formation; Magnetic Flux; Energy Dissipation

45
ENVIRONMENT POLLUTION

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

20040004214 Environmental Protection Agency, Research Triangle Park, NC
Advances in Emissions Modeling of Airborne Substances
Pierce, T.; Benjey, W.; Ching, J.; Gillette, D.; Gilliland, A.; Mar. 24, 2003; 14 pp.
Report No.(s): PB2004-100991; EPA/600/A-03/200; No Copyright; Avail: CASI; A03, Hardcopy

The U.S. Environmental Protection Agency's Atmospheric Modeling Division is engaged in a number of research projects that are leading to advances in emissions modeling of airborne substances. Two of these projects, air quality forecast modeling and global climate change modeling, are presented in other papers at this conference. This paper briefly highlights the advances in the following areas: (1) Ammonia emissions - development and application of an inversion technique for refining seasonal and annual estimates of ammonia; (2) Biogenic emissions - development and integration of the third generation of the Biogenic Emissions Inventory System (BEIS3); (3) Fugitive dust emissions - development and testing of geographical databases and a dynamic algorithm for making episodic estimates of wind blown fugitive dust; (4) Sea salt emissions - development of an algorithm for estimating emissions originating from oceans; (5) SMOKE - support and refinements to the Sparse Matrix Operational Kernel Emissions (SMOKE) modeling system; and (6) Wildlife and prescribed burn emissions - collaboration with the National Park Service on development of the Community Smoke Emissions Model (CSEM).
NTIS
Air Quality; Emission; Air Pollution; Pollution Control

20040004215 National Oceanic and Atmospheric Administration, Research Triangle Park, NC, USA
Wind-Tunnel Simulations to Assess Dispersion Around the World Trade Center
Snyder, W.; Heist, D.; Perry, S.; Thompson, R.; Lawson, R.; 2003; 12 pp.
Report No.(s): PB2004-100992; EPA/600/A-03/199; No Copyright; Avail: CASI; A03, Hardcopy

A wind tunnel study was conducted of dispersion from the site of the destroyed World Trade Center in New York City. A scale model of lower Manhattan, including a scaled representation of the rubble pile was constructed. The first phases of the study involved smoke visualization and measurements of flow patterns with winds from the west; the second phase involved measurements of dispersion patterns resulting from tracer releases from the rubble pile.
NTIS
Wind Tunnel Tests; Contaminants; Atmospheric Composition

20040004275 Office of Air Quality Planning and Standards, Research Triangle Park, NC
Technical Support Document for the Prevention of Significant Deterioration (PSD) and Nonattainment Area New Source Review (NSR): Reconsideration
Oct. 2003; 158 pp.
Report No.(s): PB2004-101423; EPA/456/R-03/005; No Copyright; Avail: CASI; A08, Hardcopy

On December 31, 2002 and March 10, 2003, Environmental Protection Agency (EPA) revised regulations governing the major New Source Review (NSR) programs mandated by parts C and D of title I of the Clean Air Act (CAA or Act). Following these actions, the Administrator received a number of petitions for reconsideration. On July 30, 2003, EPA announced its reconsideration of certain issues arising from the final rules of December 31, 2002. We subsequently made two regulatory clarifications in response to our request for reconsideration and denied reconsideration on all remaining issues. This document contains (1) a summary of comments received on the issues for which we granted reconsideration and our responses to these comments, and (2) a summary of petition issues for which we are not granting reconsideration, and our rationale for denying reconsideration.
NTIS
Air Pollution; Environmental Quality

20040004277 National Inst. for Occupational Safety and Health, Morgantown, WV, USA
Industrial Hygiene Survey of Respirable Crystalline Silica Dust Exposure in the Ready-Mixed Concrete Industry
Godby, M.; Sep. 15, 1995; 18 pp.
Report No.(s): PB2004-101466; No Copyright; Avail: CASI; A03, Hardcopy

As part of the U.S. Department of Health and Human Services initiative, 'Health People 2000,' the National Institute for Occupational Safety and Health (NIOSH) is investigating respirable crystalline silica exposure in industries where silica is a constituent material. Ready-mix concrete was identified as an industry to investigate because of the potential for respirable crystalline silica exposure from the silica sand which comprises 10%-20% of concrete. The Occupational Safety and Health Administration's Integrated Management Information System (OSHA's IMIS) listed 64 instances of personal and/or area sampling for respirable silica dust at ready-mixed concrete plants (SIC' 3273) between September 1980 and December 1993. Fourteen (22%) were listed as measuring above the OSHA Permissible Exposure Limit (PEL) for respirable crystalline silica. The exposures measured ranged up to 7 times the PEL.
NTIS
Concretes; Crystallinity; Industrial Safety; Surveys; Silicon Dioxide

20040004353 Environmental Protection Agency, Research Triangle Park, NC, ManTech Environmental Technology, Inc., Research Triangle Park, NC, USA
Status of Semi-Continuous Monitoring Instrumentation for Gases and Water-Soluble Particle Components Needed for Diagnostic Testing of Ambient Air Quality
McClenny, W. A.; Kronmiller, K.; Oliver, K.; Jacumin, H. H.; Daughtrey, E. H.; Sep. 2002; 60 pp.; In English
Report No.(s): PB2004-100894; EPA/600/R-02/072; No Copyright; Avail: CASI; A04, Hardcopy

This status report documents the effort by the National Exposure Research Laboratory (NERL), Office of Research and Development (ORD) of the U.S. Environmental Protection Agency (U.S. EPA) to provide methods of measurement, including calibration procedures that meet the requirements for diagnostic testing of models describing atmospheric photochemistry. These requirements include a measurement uncertainty of plus or minus 0.2 ppbv (plus or minus 0.1 for NO2) at 1.0 ppvb (or equivalent for particles) for compounds mentioned here as specified by scientists in the AMD, NERL. New developments

for monitors of NO2, HCHO, H2O2, HNO3, HONO, NH3, VOCS (including n-aldehydes), particulate nitrate, particulate sulfate, and particulate ammonium are discussed in the report. Descriptions of instrument design and measurement principle for NO2, HCHO, and water soluble gases and particulate matter are presented. Results from the 2002 Tampa, PA BRACE study, the 2001 Philadelphia, PA NE-O3PS study, and the 1999 Nashville, TN SOS field study are also shown. Of particular note are the preliminary results of field monitoring of NO2 in the BRACE field study with systems using new commercial photolytic converters for NO2 to NO conversion followed by chemiluminescence's detection.
NTIS
Air Pollution; Pollution Monitoring; Air Quality; Diagnosis; Photochemical Reactions

20040005805 Environmental Protection Agency, Research Triangle Park, NC, USA
Establishment of a Community Modeling and Analysis Support Mechanism
Benjey, W. G.; Imhoff, R. E.; 2003; 14 pp.
Report No.(s): PB2004-101305; EPA/600/A-03/045; No Copyright; Avail: CASI; A03, Hardcopy

During the fall of 2001, a Cooperative Research Agreement between the U.S. Environmental Protection Agency and MCNC began a Community Modeling and Analysis System (CMAS) center. The CMAS will foster development, distribution, and use of the Models-3/CMAQ (Community Multiscale Air Quality) air quality modeling system. The CMAS is hosted by MCNCs Environmental Modeling Center in Research Triangle Park, North Carolina. The objectives of the CMAS are to (1) serve as a bridge between members of the Models-3/CMAQ modeling community, (2) encourage the growth of the user community, (3) serve as an information clearinghouse for model applications, emission modeling methods and data, (4) provide education about the models and their uses, (5) maximize the scientific content and performance value of the Models-3/CMAQ system by encouraging the expansion of the contributing developer community and taking advantage of multiple incremental contributions, and (6) provide computer and skill resources to the Models-3/CMAQ modeling community benefitting from economies of scale. Support and development work includes both emission modeling (through the Sparse Matrix Operator Kernel Emission system) and the CMAQ chemistry-transport modeling components. As a community modeling support center, the CMAS is open to all interested participants. The center is organized into five functional parts: (1) Administration, (2) Outreach, (3) Application Support, (4) Software Development, and (5) Modeling Research. The model code accepted and released as a part of Models-3/CMAQ will be open and shared with all. The External Advisory Committee, governing the CMAS policies and priorities, is a technically knowledgeable group including representatives of state and regional agencies, EPA, industry, consultants, academic institutions, and foreign users.
NTIS
Air Quality; Models; Communities

20040005842
Monitoring Methods Adaptable to Vapor Intrusion Monitoring: USEPA Compendium Methods TO-15, TO-15 Supplement (Draft), and TO-17
McClenny, W. A.; Oilver, K. D.; Jacumin, H. H.; Daughtrey, E. H.; Jun. 2003; 12 pp.; In English
Report No.(s): PB2004-100893; EPA/600A-03/179; No Copyright; Avail: CASI; A03, Hardcopy

USEPA ambient air monitoring methods for volatile organic compounds using specially-prepared canisters and solid absorbents are directly adaptable to monitoring for vapors in the indoor environment. The draft Method TO-15 Supplement, an extension of the USEPA Method TO-15, highlights the lowering of VOC detection limits to single digit parts-per-trillion by volume (PPTV) concentrations using canister-based sampling along with analysis by bench top GC/MS. Diffusive sampling onto absorbent-filled sampling tubes similar to those described in TO-17 is being evaluated for sampling periods of 24 hours and less. Initial results indicate a linearity of response at the 2 parts-per-billion by volume (PPBV) level and excellent duplicate runs.
NTIS
Indoor Air Pollution; Pollution Monitoring; Air Sampling

20040006363 East Carolina Univ., Greenville, NC, USA
Evaluating the Effect of Bottom Trawls in Pamlico River, North Carolina
Corbett, D. Reide; West, Terry; Clough, Lisa; Frank, James; Calfee, Worth; [2003]; 76 pp.; In English
Contract(s)/Grant(s): NAG13-02034; No Copyright; Avail: CASI; A05, Hardcopy

The objective of this study is to evaluate and quantify the amount of sediment resuspension on shallow estuarine systems, with specific comparisons between natural and trawling-induced events. This aids in the assessment of water quality and

sediment processes on a specific coastal system of North Carolina, providing a basis for future studies on other shallow estuarine ecosystems. Categorizing these sediment processes into distinct individual units (e.g. natural vs. anthropogenic) is an important component toward fully realizing proper management of our coastal habitats. Heavy trawling activity along North Carolina s coast is one of the major obstacles in management plans. Therefore, it is imperative to quantify the effects of trawling to gain a more specific understanding of the human impact on estuaries.
Derived from text
Evaluation; Sediments; Water Quality; Habitats

20040008308 National Oceanic and Atmospheric Administration, Camp Springs, MD, USA
Attenuation of Solar UV Radiation by Aerosols During Air Pollution Episodes
Kondragunta, S.; Udelhofen, P. M.; Schere, K. L.; Roselle, S. J.; 2003; 6 pp.; In English; Sponsored by Environmental Protection Agency, Research Triangle Park, NC. National Exposure Research Lab
Report No.(s): PB2004-100986; EPA/600/A-03/040; No Copyright; Avail: CASI; A02, Hardcopy

Recent studies show that absorption and scattering by aerosols during air pollution episode decreases the amount of radiation reaching the surface. To examine the role played by column ozone and aerosols in perturbing the solar radiation reaching the surface, the authors analyzed four years of spectrally resolved UV radiation measured by Brewer spectrophotometer at Gaithersburg, MD. The authors present observations of aerosol optical depth and column ozone (from ground based sun photometers and satellites) and ground measurements of spectrally resolved UV flux. The authors will compare the observed and computed effects of aerosols on surface UV flux and discuss the implications.
NTIS
Air Pollution; Aerosols; Optical Thickness

20040008309 Environmental Protection Agency, Research Triangle Park, NC
Emission Processing for an Air Quality Forecasting Model
Pouliot, G.; Pierce, T.; 2003; 12 pp.
Report No.(s): PB2004-100987; EPA/600/A-03/197; No Copyright; Avail: CASI; A03, Hardcopy

The creation of emission data for an air quality forecasting model requires the efficient and accurate estimation of temporal and spatial variations in emission sources of ozone precursors. To achieve this goal, the existing emission inventory preparation and processing systems need to be streamlined and modified. The critical emission precursor pollutants for ozone are volatile organic compounds (VOCs), nitric oxides (NOx), and carbon monoxide (CO). The spatial variability and temporal behavior of these compounds are influenced both by meteorological conditions and by anthropogenic activities. The key complexities in the simulation of the temporal and spatial variations of these compounds are the biogenic sources, on-road mobile sources, and major fossil-fuel point sources. The processing of the emission for biogenic sources can be streamlined by linking the preparation of meteorological output fields for the air quality chemistry model with the calculation of biogenic emissions. The processing of temperature-dependent emissions for mobile sources can be streamlined by using the MOBILE5B (or MOBILE6) model to create simple temperature regressions to apply to normalized emission data prior to the actual forecast. The temperature/emission relationship can then be used in a very efficient calculation for the actual emission calculation. Finally, the processing of point source emission from major power plants can be streamlined by using historical CEM (Continuous Emission Monitoring) data to create temperature/emission relationships that can be used to estimate current power plant emission in an air quality forecast model. This streamlined approach will be compared in this paper to the emission processing method used in a non-operational environment.
NTIS
Air Quality; Forecasting; Contaminants; Emission; Environment Models

20040008313 Environmental Protection Agency, Research Triangle Park, NC
Application of a Microscale Emission Factor Model for Particulate Matter (MicroFacPM) to Calculate Vehicle Generated Contribution of PM(sub 2.5) Emissions
Singh, R. B.; Huber, A. H.; Braddock, J. N.; Jun. 2002; 22 pp.
Report No.(s): PB2004-101306; EPA/600/A-03/054; No Copyright; Avail: CASI; A03, Hardcopy

The USA Environmental Protection Agency's (EPA) National Exposure Research Laboratory is developing improved methods for modeling the source through the air pathway to human exposure in significant microenvironments of exposure. As a part of this project, the authors developed a microscale emission factor model for predicting real-world real-time motor vehicle particulate matter PM(sub 10) and PM(sub 2.5)(MicroFacPM) emissions, which uses available information on the

vehicle fleet composition. This paper presents the use of MicroFacPM to calculate the contribution of PM(sub 2.5) per vehicle class, age-wise, gasoline, diesel, brake wear and tire wear sources. The contribution of emission factors is presented for two scenarios: first the Tuscarora Mountain Tunnel, on the Pennsylvania Turnpike, PA and second for Capital Boulevard, in Raleigh, NC.
NTIS
Exhaust Gases; Exhaust Emission; Contaminants; Mathematical Models

20040008314 Environmental Protection Agency, Research Triangle Park, NC
Neighborhood Scale Modeling of PM(sub 2.5) and Air Toxics Concentration Distributions to Drive Human Exposure Models
Ching, J.; Lacser, A.; Otte, T. L.; Herwehe, J.; Byun, D.; 2003; 5 pp.
Report No.(s): PB2004-101309; EPA/600/A-03/051; No Copyright; Avail: CASI; A01, Hardcopy

Air quality (AQ) simulation models provide a basis for implementing the National Ambient Air Quality Standards (NAAQS) and are a tool for performing risk-based assessments and for developing environmental management strategies. Fine particulate matter (PM (sub)2,5), its constituents and size and number distribution, as well as airborne toxic pollutants (air toxins) have characteristically different degrees of spatial and temporal variability especially in urban areas and in different geographical-climatic regimes. In this study, we explore the specific role of AQ models as a means to drive human exposure models and to address situations in which pollutants exhibit high spatial and temporal variability. We seek a capability to capture the resolved-scale concentration fields and to provide measures of sub-grid-scale variability in concentration distributions that impact human exposures.
NTIS
Air Quality; Public Health; Contaminants; Environment Management

20040008318 Environmental Protection Agency, Research Triangle Park, NC
Application of a Microscale Emission Factor Model for Particulate Matter (MicroFacPM) in Conjunction with CALINE4 Model
Singh, R. B.; Huber, A. H.; Jun. 2002; 20 pp.; In English; Proceedings of the Annual Conference (95th) of the AandWMA, Baltimore, MD, June 2002
Report No.(s): PB2004-101302; EPA/600/A-03/042; No Copyright; Avail: CASI; A03, Hardcopy

The USA Environmental Protection Agency's (EPA) National Exposure Research Laboratory is developing improved methods for modeling the pollutant sources through the air pathway to human exposure in significant microenvironments of exposure. As a part of this project, the authors developed MicroFacPM, a microscale emission factor model for predicting real-world real-time motor vehicle particulate matter (PM(sub 10)) and (PM(sub 2.5)) emissions. MicroFacPM uses available information on the vehicle fleet composition. The main input variables required are the characterization of on-road vehicle fleet, time and day of the year, ambient temperature, relative humidity and percentage of smoking vehicles. Using the fleet information, MicroFacPM estimates a Composite Emission Factor (milligrams per mile). This paper presents the use of MicroFacPM to calculate the contribution of PM(sub 2.5) from motor vehicle sources along an example roadway as input to a roadway air dispersion model. The contribution of PM(sub 2.5) is presented per vehicle class (light, heavy duty), vehicle age, fuel type (gasoline, diesel), brake wear and tire wear sources.
NTIS
Particulates; Air Pollution; Exhaust Emission; Pollution Transport

20040008322 Bolt, Beranek, and Newman, Inc., Cambridge, MA, USA
Hybrid Active/Passive Exhaust Nosie Control System (APECS) for Locomotives
Remington, S. J.; Knight, S.; Hanna, D.; Rowley, C.; Dec. 2002; 136 pp.; In English
Report No.(s): PB2004-101501; No Copyright; Avail: CASI; A07, Hardcopy

This report documents the analysis and development of an Active/Passive Exhaust Noise Control System (APECS) for railroad passenger locomotives that could provide at least 10 dBA noise reduction. Based on preliminary analyses and tests on actual locomotives in 1995 and 1996, a combination active roof-mounted system and a passive exhaust silencer were designed. The roof-mounted system consisted of ten enclosures, each with 2 12-inch speakers as actuators; eight microphones mounted on the roof as control sensors; a cabinet containing the controller and other electronics; a passive exhaust silencer specially designed for this system; and other components. As active liner system was also considered instead of the roof-mounted system; however, the latter was chosen since it could be built with commercially available and less costly

components. This design was installed and tested on a locomotive in 1999. The tests included measurements of noise reduction performance and an inspection for any physical degradation of the system.
NTIS
Locomotives; Exhaust Systems; Noise (Sound); Noise Reduction

20040008422 Environmental Protection Agency, Research Triangle Park, NC
Photochemical and Aerosol Modeling with the CMAQ Plume-in-Grid Approach
Godowitch, J. M.; 2003; 5 pp.
Report No.(s): PB2004-101307; No Copyright; Avail: CASI; A01, Hardcopy

The Plume-in-Grid (PinG) module, and integral component of the Community Multiscale Air Quality (CMAQ) modeling system, has been extended to include the simulation of aerosol species and particulates concurrently with gas-phase photochemical species. The aerosol module already employed in the CMAQ/Chemical Transport Model (CCTM) was adapted and incorporated into the PinG algorithm, which also provides compatibility between the plume and CCTM Eulerian grid models during simulation. Test simulations were performed on a group of major point sources with tall stacks exhibiting a range of NOx and SOx emission rates situated in the Nashville, TN region. Due to the linkage between gaseous species and aerosols, various test simulations were performed with different combinations of chemical mechanisms and chemical solvers to investigate the impact on aerosol formation. Results using the Carbon Bond IV (CB-IV) chemical mechanism and the Gear chemical solver in the simulation with aerosol modeling are described. Differences in fine sulfate aerosol concentrations were found among the point sources with lower sulfate aerosol concentrations generated in the plumes of the highest NOx point sources.
NTIS
Computerized Simulation; Photochemical Reactions; Diffusion Theory

20040008432 Swedish Defence Research Establishment, Stockholm, Sweden
Quarterly Report on Measurements of Radionuclides in Ground Level Air in Sweden. Fourth Quarter 2002
Soederstroem, C.; Arntsing, R.; Lindh, K.; Vintersved, I.; Feb. 2003; 12 pp.; In English
Report No.(s): PB2004-101751; FOI-R-08001-SE; Copyright; Avail: National Technical Information Service (NTIS)

Filtering of ground level air is performed weekly at seven different locations in Sweden: Kiruna, Umea, Gavle, Ursvik, Grindsjon, Visby and Ljungbyhed. The filters are compressed and the contents of different radionuclides are measured by gamma spectroscopy. Precipitation is also collected at four of the stations: Kiruna, Gavle, Ursvik, and Ljungbyhed, the samples are ashes and the contents of radionuclides measured. The levels of (sup 7)Be and (sup 137)Cs in air and deposition are presented for the different stations. Other anthropogenic radionuclides detected, if any, are also presented.
NTIS
Radioactive Isotopes; Surface Layers; Air Pollution; Measurement

20040008435 Netherlands Energy Research Foundation, Petten
Fuel Characterisation and Test Methods for Biomass Co-firing
Korbee, R.; Boersma, A. R.; Cieplik, M. K.; Heere, P. G. T.; Slort, D. J.; Oct. 2003; In English
Report No.(s): PB2004-102058; ECN-C-03-057; Copyright; Avail: National Technical Information Service (NTIS)

This report describes the work and results of the ECN contribution to the European project BioFlam. In total sixteen participants, consisting of Electricity Producers and R&D organizations from Germany, UK, Netherlands, Italy, Poland, Greece and Portugal participated in the BioFlam project. The project includes full-scale and lab-scale experiments, and extended dissemination as well as direct industrial application. The project can be seen as a service platform to all other EU projects on alternative fuels. Within the overall project, ECN developed a number of fuel characaterization and test methods to evaluate specific properties and behavior of secondary fuels for co-firing with coal. Methods were developed to characterize fuel particle size and shape distribution, fuel mineral size distribution, fuel reactivity and burnout, fly ash quality with regard to utilization and ash deposition.
NTIS
Fuels; Biomass Energy Production; Combustion

20040008506
Influence of Kinetic Energy Sources and Internal Obstructions on Room Air Conditioning Strategy, Efficiency of Ventilation and Room Velocity Conditions
Hagstroem, K.; 2003; In English
Report No.(s): PB2004-100441; REPT-A4; Copyright; Avail: National Technical Information Service (NTIS)

There is a variety of different methods consulting engineers use to design room system, room air diffusion, such as assumption of perfect mixing, design methods employing the empirical relations determined through research, air jet theory and computational fluid dynamics (CFD) codes. The most common design methods based on air jet theory allows only for the prediction of extreme values of air velocities and air temperatures in the occupied zone. However, the results of most analytical and experimental studies has been received from tests in empty rooms and do not reflect the influence of the obstructions or other kinetic energy sources on the room conditions, air distribution and ventilation efficiency. The objectives of the study have been to investigate the influence of different factors on the room air conditions, airflow pattern and efficiency of ventilation and to utilize the collected information to improve current design practices.
NTIS
Air Conditioning; Buildings; Kinetics; Ventilation

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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*.

20040004079 Department of the Navy, Washington, DC
Asymmetric Tow System for Multiple Linear Seismic Arrays
Gieseke, Thomas J., Inventor; Jul. 24, 2003; 15 pp.; In English
Patent Info.: Filed 24 Jul. 2003; US-Patent-Appl-SN-10627103
Report No.(s): AD-D020098; No Copyright; Avail: Other Sources

An asymmetric towing system for towing multiple linear arrays includes a tow platform and a single composite tow cable extending from the tow platform and having the multiple linear arrays connected both mechanically and electrically thereto. The composite tow cable is shaped by a hard streamlined casing and houses a load-bearing cable for mechanical connection to each array and plural individual array connections for establishing electrical communication between each array and the tow platform. A single depressor is connected to a distal end of the composite cable for spreading the composite cable in a substantially lateral direction from and to one side of the tow platform.
DTIC
Asymmetry; Linear Arrays; Seismic Waves; Platforms

20040004251 Computational Physics, Inc., Norwood, MA, USA
PRISM 1.7e Algorithm Description
Daniell, Robert E., Jr; Jun. 19, 2002; 102 pp.; In English
Contract(s)/Grant(s): F19628-99-C-0068; Proj-DTRA
Report No.(s): AD-A418515; AFRL-VS-TR-2002-1677; No Copyright; Avail: CASI; A06, Hardcopy

This report describes the PRISM 1.7e algorithm for data assimilation and near real time global ionospheric specification. It also describes the basis for PRISM climatology, including descriptions of the three physical models which were parametrized to produce it, the parameterization method itself, as well as the semi-analytic representation used to produce a compact representation of the climatology. It includes appendices containing the I/O specification for PRISM and internal memoranda describing the changes for each version from 1.5 through 1.7e.
DTIC
Ionospheres; Climatology; Assimilation

20040004300 NASA Langley Research Center, Hampton, VA, USA
Aerosol Models for the CALIPSO Lidar Inversion Algorithms
Omar, Ali H.; Winker, David M.; Won, Jae-Gwang; [2003]; 12 pp.; In English; 2003 SPIE Remote Sensing of Clouds and the Atmosphere VIII, 8-12 Sep. 2003, Barcelona, Spain
Contract(s)/Grant(s): 259-40-01-10; Copyright; Avail: CASI; A03, Hardcopy

We use measurements and models to develop aerosol models for use in the inversion algorithms for the Cloud Aerosol Lidar and Imager Pathfinder Spaceborne Observations (CALIPSO). Radiance measurements and inversions of the AErosol RObotic NETwork (AERONET1, 2) are used to group global atmospheric aerosols using optical and microphysical parameters. This study uses more than 105 records of radiance measurements, aerosol size distributions, and complex refractive indices to generate the optical properties of the aerosol at more 200 sites worldwide. These properties together with

the radiance measurements are then classified using classical clustering methods to group the sites according to the type of aerosol with the greatest frequency of occurrence at each site. Six significant clusters are identified: desert dust, biomass burning, urban industrial pollution, rural background, marine, and dirty pollution. Three of these are used in the CALIPSO aerosol models to characterize desert dust, biomass burning, and polluted continental aerosols. The CALIPSO aerosol model also uses the coarse mode of desert dust and the fine mode of biomass burning to build a polluted dust model. For marine aerosol, the CALIPSO aerosol model uses measurements from the SEAS experiment 3. In addition to categorizing the aerosol types, the cluster analysis provides all the column optical and microphysical properties for each cluster.
Author
Aerosols; Algorithms; Atmospheric Models; Optical Radar; Clouds (Meteorology); Satellite Observation

20040005827 Computational Physics, Inc., Norwood, MA, USA
Prism Validation and Applications
Daniell, Robert E., Jr; May 2003; 44 pp.; In English
Contract(s)/Grant(s): F19628-99-C-0068; Proj-DTRA
Report No.(s): AD-A418509; AFRL-VS-TR-2003-1566; No Copyright; Avail: CASI; A03, Hardcopy

This report describes PRISM related work performed in two broad areas: Validation and Applications. The Validation effort involved (1) validating the PRISM topside profile shape using Millstone Hill Incoherent Scatter Radar data, (2) participating in the validation of the HF Propagation code (which includes PRISM) in OpSend, and (3) the initial work on validating PRISM's boundary determination algorithms using DMSP data and tomographic reconstructions from various tomography groups. The Application development effort also involved three separate projects: (1) the development of IREP for calculating ionospheric range and elevation corrections and pulse dispersion from data driven PRISM output in near real time and implementing a demonstration version on an AFRL computer, (2) the initial development of IRDT, an ionospheric radar design tool based on PIM ionospheric climatology, and (3) the development of software to facilitate the use of PRISM for transionospheric range delay and Doppler shift calculations.
DTIC
Proving; Incoherent Scatter Radar; Radar Data; Computer Design

20040005916 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
Retrieval Studies with LIDORT
Bhartia, P. K., Technical Monitor; Spurr, Robert J. D.; Chance, K. V.; November 2003; 8 pp.; In English
Contract(s)/Grant(s): NAG5-12317; No Copyright; Avail: CASI; A02, Hardcopy

This short program of LIDORT-based research in atmospheric trace gas retrieval was conducted over the 1 year period 01 July 2002 to 30 June 2003. After consultation with the NASA reporting officer, the first of the two original proposal activities (development of a direct-fitting total O3 column retrieval algorithm with operational capability for GOME data) was replaced by other tasks. The three activities addressed were: (1) Sensitivity studies for column and profile retrieval of NO2 distributions from a new generation of multi-axis ground-based spectrometers; (2) use of the LIDORT-RRS model to determine the effect of inelastic rotational Raman scattering at SBUV wavelengths; (3) an examination of ozone profile weighting functions in the presence of optically thick tropospheric clouds.
Author
Atmospheric Chemistry; Algorithms; Nitrogen Dioxide; Solar Backscatter UV Spectrometer; Oxygen Isotopes

47
METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification.

20040004369 NASA Stennis Space Center, Bay Saint Louis, MS, USA
Evolution of Oceanic Precipitation Anomalies During El Nino Southern Oscillation (ENSO) Events of the Last Two Decades
Yuan, Jinchun; Miller, Richard; August 25, 2001; 16 pp.; In English
Report No.(s): NASA/SE-2001-08-00050-SSC; No Copyright; Avail: CASI

The Global Precipitation Climatology Program (GPCP) recently released monthly global precipitation data that allowed an analysis of oceanic precipitation anomalies before, during, and after El Nino Southern Oscillation (ENSO) events of the last two decades. During each ENSO event, a major positive precipitation anomaly was observed in the Central and Eastern

Equatorial Pacific, while a major negative precipitation anomaly was observed in the Western Equatorial Pacific and Eastern Equatorial Indian Ocean. These precipitation anomalies co-varied strongly with sea surface temperature of the eastern equatorial Pacific, and may therefore be a good indicator of ENSO events. The precipitation anomaly pattern of 1997-98 differs significantly from previous ENSO events and calls certain aspects of current theories on ENSO into question.
Author
El Nino; Anomalies; Precipitation (Meteorology); Southern Oscillation; Marine Meteorology

20040008273
Continued Development of an Integrated Sounding System in Support of the DOE/ARM Experimental Program: Final Report for FY 1999, 2000, and 2001 Activities
Westwater, E. R.; Ham, Y.; Leuskiy, V.; 2003; In English
Report No.(s): DE2003-793846; No Copyright; Avail: National Technical Information Service (NTIS)

The basic goals of the research are to develop and test algorithms and deploy instruments that improve measurements of atmospheric quantities relevant to radiative transfer and climate research. Primary among these atmospheric variables are integrated amounts of water vapor and cloud liquid, as well as profiles of temperature, water vapor and cloud liquid. A primary thrust of this research is to combine data from instruments available to ARM to maximize their importance in radiative transfer and climate research. To gather data relevant to these studies, participation in field experiments, especially intensive operating periods, as well as the subsequent analysis and dissemination of collected data, is of primary importance. Examples of relevant experiments include several Water Vapor Intensive Operating Periods at the Southern Great Plains Cloud And Radiation Testbed site, experiments in the Tropical Western Pacific such as PROBE and Nauru'99, and experiments at the North Slope of Alaska/Adjacent Arctic Ocean site.
NTIS
Atmospheric Radiation; Radiometers; Algorithms; Acoustics

20040008280 Oregon State Univ., Corvallis, OR, USA
Studies of MGS TES and MPF MET Data
Barnes, Jeff R.; December 29, 2003; 16 pp.; In English
Contract(s)/Grant(s): NAG5-9771
Report No.(s): NS109A; No Copyright; Avail: CASI; A03, Hardcopy

The work supported by this grant was divided into two broad areas: (1) mesoscale modeling of atmospheric circulations and analyses of Pathfinder, Viking, and other Mars data, and (2) analyses of MGS TES temperature data. The mesoscale modeling began with the development of a suitable Mars mesoscale model based upon the terrestrial MM5 model, which was then applied to the simulation of the meteorological observations at the Pathfinder and Viking Lander 1 sites during northern summer. This extended study served a dual purpose: to validate the new mesoscale model with the best of the available in-situ data, and to use the model to aid in the interpretation of the surface meteorological data.
Author
Mars Global Surveyor; Mesoscale Phenomena; Spectrometers; Thermal Emission; Atmospheric General Circulation Models; Data Acquisition

20040008302 Maryland Univ., College Park, MD, USA
Water Vapor and its Isotopic Composition in the Upper Troposphere and Stratosphere
Dessler, A. E.; Sherwood, S. C.; [2003]; 1 pp.; In English; EGS-AGU-EUG Joint Assembly 2003, 6-11 Apr. 2003, Nice, France; No Copyright; Avail: Other Sources; Abstract Only

Any theory of water vapor in the tropical tropopause layer (TTL) must explain both the abundance and isotopic composition of water there. We have previously presented a model of the TTL that simulated the abundance of water vapor as well as the details of the vertical profile. That model included the effects of 'overshooting convection', which injects dry air directly into the TTL. Here, we present results for the model after modifying it to include water's stable isotope HDO. The model is capable of accurately simulating the recently observed, nearly uniform HDO depletion (delta D) in the TTL. We find that lofted ice is necessary to accurately simulate the profile of delta D in the TTL, as has been suggested previously. We also find that vertical mixing due to overshooting convection plays an important role in maintaining the observed profile. Finally, any theory of lofted ice requires a complementary source of dry air in the TTL; without that, the TTL will rapidly saturate and the lofted ice will not evaporate.
Author
Water Vapor; Atmospheric Moisture; Isotope Ratios; Troposphere; Stratosphere; Atmospheric Models

20040008382 Stockholm Univ., Sweden

Potential of Gome Data in the Oxygen A-Band for Aerosol Remote Sensing

Petelina, S.; Murtagh, D.; Rodhe, H.; Jun. 2003; 38 pp.

Report No.(s): PB2004-100933; AP-41; No Copyright; Avail: CASI; A03, Hardcopy

According to the authors' study, relatively high ground albedo over the land contributes a lot to the measured signal, which does not allow the separation of atmospheric scattering from the surface reflection. At the same time, albedo over the ocean is a very small and relatively well known, which makes it possible to retrieve the AOD vertical distribution. For the retrieval the Optimal Estimation Method (Rodgers, 1976) is chosen. MODTRAN, HITRAN-96 and Voigt databases are used to calculate the forward model with very high line-by-line resolution. Analysis of the kernel matrices together with the retrieval results from the synthetic and measured spectra showed that the accurate retrieval (within 10-15% of error) might be achieved with only two aerosol vertical layers when the boundary between them not lower than 5 km above the surface.

NTIS

Remote Sensing; Aerosols

20040008406 Maryland Univ. Baltimore County, Catonsville, MD, USA

A Study of Uncertainties for MODIS Cloud Retrievals of Optical Thickness and Effective Radius

Platnick, Steven; Pincus, Robert; December 2002; 11 pp.; In English

Contract(s)/Grant(s): NAG5-6996; No Copyright; Avail: CASI; A03, Hardcopy

The investigation spanned four linked components as summarized in section III, each relating to some aspect of uncertainty assessment in the retrieval of cloud optical and microphysical properties using solar reflectance algorithms such as the MODIS operational cloud product (product IDS MOD06, MDY06 for Terra and Aqua, respectively). As discussed, three of these components have been fully completed (items (l), (2), and (3) while item (4) has been partially completed. These efforts have resulted in peer-reviewed publications and/or information delivered to the MODIS P.I. (M. D. King) for inclusion in the cloud product Quality Assessment (QA) output, a portion of the product output used, in part, for retrieval error assignments. This final report begins with a synopsis of the proposed investigation (section III) followed by a summary of work performed up through the last report including updates (section IV). Section V describes new activities. Publications from the efforts are listed in section VI. Figures (available in powerpoint format) are found in section VII.

Derived from text

Cloud Physics; Optical Thickness; Radii; MODIS (Radiometry); Earth Observing System (Eos); Imaging Spectrometers

20040008424 Environmental Protection Agency, Research Triangle Park, NC, Israel Inst. for Biological Research, Ness-Ziona, Israel

Implementation of an Urban Canopy Parameterization for Fine-Scale Simulations

Otte, T. L.; Lacser, A.; 2003; 5 pp.; In English

Report No.(s): PB2004-101312; EPA/600/A-03/048; No Copyright; Avail: CASI; A01, Hardcopy

The Pennsylvania State University/National Center for Atmospheric Research Mesoscale Model (MM5) has been modified to include an urban canopy parameterization (UCF) for fine-scale urban simulations (approx. -km horizontal grid spacing). The UCF accounts for drag exerted by urban structures, the enhancement of turbulent kinetic energy (TKE) especially near the tops of the buildings, and the modification of the energy budget within the urban canopy (i.e., from the surface to the tops of buildings). This UCF is applied to grid cells in MM5 that have a non-zero fraction of urban land use. This refinement of MM5 is targeted to enable the Community Multiscale Air Quality (CMAQ) Modeling System to capture the details of pollutant spatial distributions in urban areas.

NTIS

Atmospheric Models; Cities; Kinetic Energy

20040008543 State Agricultural Univ., Wageningen, Netherlands

Development of a Stochastic Model of Rainfall for Radar Hydrology

Uijlenhoet, R.; 1999; 66 pp.

Report No.(s): PB2004-101230; Copyright; Avail: National Technical Information Service (NTIS)

This is the Final Report to the European Commission of the research I carried out as a Marie Curie Postdoctural Fellow at the Institut National Polytechnique de Grenoble (INPG) in Grenoble, France. The research described in this report deals with the development of a stochastic model of rainfall for radar hydrology. The project has been carried out between 1 May 1997 and 30 April 1999 within the Equipe Hydrometeorologie of the Laboratoire d'etude des Transferts en Hydrologie et

Environement (LTHE). The scientist in charge of the project was Dr. Jean-Dominique Creutin, vice-director of LTHE and former head of the Equipe Hydrometeorologie.
NTIS
Models; Hydrology; Rain

48
OCEANOGRAPHY

Includes the physical, chemical and biological aspects of oceans and seas; ocean dynamics; and marine resources. For related information see also *43 Earth Resources and Remote Sensing*.

20040005852 NASA Stennis Space Center, Bay Saint Louis, MS, USA
Mapping CDOM Concentration in Waters Influenced by the Mississippi River Plume
Miller, Richard L.; DelCastillo, Carlos E.; Powell, Rodney T.; DSa, Eurico; Spiering, Bruce; May 1, 2002; 2 pp.; In English; Oceans 2002 MTS/IEEE, 29-31 Oct. 2002, Biloxi, MS, USA
Report No.(s): NASA/SE-2002-04-00035-SSC; Copyright; Avail: Other Sources; Abstract Only

Colored dissolved organic matter (CDOM) is often an important component of the organic carbon pool in river-dominated coastal margins. CDOM directly influences remote sensing applications through its strong absorption in the UV and blue regions of the spectrum. This effect can complicate the use of chlorophyll a retrieval algorithms and phytoplankton production models that are based on remotely sensed ocean color. As freshwater input is the principle source of CDOM in coastal margins, CDOM distribution can often be described by conservative mixing with open ocean waters and may serve as an optical tracer of riverine water. Hence, there is considerable interest in the ability to accurately measure and map CDOM concentrations as well as understand the processes that govern the optical properties and distribution of CDOM in coastal environments. We are examining CDOM dynamics in the waters influenced by the Mississippi River plume. Our program incorporates discrete samples, flow-through measurements, and remote sensing. CDOM absorption spectra of discrete samples are measured at sea using a portable, multiple pathlength waveguide system. A SAFire multi-spectral fluorescence meter provides spectral characterization of CDOM (fluorescence and absorption) using a ship flow-through system for continuous surface mapping. In situ reflectance spectra are obtained by a hand held spectroradiometer. Remotely sensed images are obtained from the SeaWiFS and CRIS (Coastal Research Imaging Spectrometer) instruments. We describe here the instruments used, sampling protocols employed, and the relationships derived between in situ measurements and remotely sensed data for this optically complex environment.
Author
Dissolved Organic Matter; Mississippi River (Us); Coastal Water; Sea-Viewing Wide Field-of-View Sensor; Waveguides; Imaging Spectrometers; Spectroradiometers

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*.

20040004196 National Central Univ., Chung-Li, Taiwan, Province of China
Feedforward Artificial Neural Networks for Nutrient Removal Simulation in a Multiple Stage Enhanced Biological Nutrient Removal Process
Chou, Yu-Jan; Ouyang, Chiao-Fuei; Kuo, Wei-Liang; Journal of the Chinese Institute of Engineers, Volume 26, No. 2; March 2003, pp. 211-219; In English; See also 20040004187
Contract(s)/Grant(s): NSC-90-2211-E-008-019; Copyright; Avail: Other Sources

Serial artificial neural networks (ANNs) describing different metabolic behaviors of autotrophic and heterotrophic microorganisms were employed to simulate dynamic characteristics of nutrient removal in a multiple stage enhanced biological nutrient removal (EBNR) process. In the sludge cultivation phase, the applied ranges of total chemical oxygen demand (COD,), total phosphorus (T-P) and total nitrogen (T-N) concentration in synthetic wastewater were 100.0 approximately 300.0, 1.7 approximately 5.0 and 13.3 approximately 40.0 mg/L, respectively. Empirical results indicated effluent nutrient concentrations of T-N and T-P were less than 8.1 mg/L and O.5 mg/L when a three step-feeding mode was applied, and water quality data was collected to train and pre-test the ANNs. Further simulation was finished when the

step-feeding ratio was Ql:Q2:Q3= 0.8:0.2:0.0 (recycling sludge ratio= 0.25). Statistical coefficients of correlation between simulated and experimental values were 0.58, 0.95, 0.89, and 0.90 for soluble COD (COD,), phosphate (P04-P), ammonia-nitrogen (NH3-N) and nitratehitrite (NO(x) - N), respectively. Due to low root mean squared error and high correlation coefficient between simulated and experimental data, artificial intelligence technology offered an alternative approach to simulating nutrient removal in an EBNR system.
Author
Artificial Intelligence; Neural Nets; Metabolism; Microorganisms; Dynamic Characteristics; Removal; Cultivation

20040004233 New Mexico Univ., Albuquerque, NM, USA
Demonstration that a mRNA Binding Protein is Responsible for GADD45 mRNA destabilization
Abcouwer, Steve P.; May 2003; 11 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0574
Report No.(s): AD-A418512; No Copyright; Avail: CASI; A03, Hardcopy

We are studying the post-transcriptional control of expression of the p53-inducible antiproliferative gene known as Growth Arrest and DNA Damage induced gene 45 (GADD45) Using regions of the GADD45 mRNA 3'-untranslated region (UTR) in KNA gel shift assays, we have observed that glutamine causes distinct changes in RBP activities in cytoplasmic and nuclear protein extracts. KNA-affinity columns were used to enrich extracts for RBPs binding to the distal region of GADD45 3'-UTR. Eluded proteins were subjected to Western blotting, to detect specific RBPs, as well as proteomic analysis. Data suggest that the distal region of the GADD45 3'- UTR is bound by the destabilizing RBP known as Au-binding factor 1 (AUFl) . Western blotting demonstrated that AUFl is present in extracts from both glutamine-fed and glutamine- starved cells. However, when cytoplasmic extracts from glutamine-starved cells are subjected to RNA-affinity purification, the AUFl does not bind to the distal GADD45 3'- UTR region. These results suggest that the effect of glutamine deprivation on GADD45 mRNA stability is orchestrated by AUFl binding, either through inhibition of AUFl RNA binding activity or through competitive inhibition by another RBP. Regions of GADD45 mKNA are now being tested for the ability to confer glutamine-mediated instability to fusion mRNAs.
DTIC
Proteins; Genes; Cancer

20040004354 California Univ., Santa Cruz, CA
Functional Disruption of Netrin-1 Guidance Cue Leads to Disruption in Mammary Gland Development and Increased Tumor Incidence
Hinck, Lindsay; Jul. 2003; 17 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0336
Report No.(s): AD-A418357; No Copyright; Avail: CASI; A03, Hardcopy

Netrin-1 and its receptors play an essential role patterning the nervous system by guiding neurons and axons to their targets. To explore whether netrin-1 organizes non- neural tissues, we examined its role in mammary gland morphogenesis. We hypothesized that netrin-1 regulates cell interactions during mammary gland development and that loss of this activity plays a role in mammary tumor formation. During this funding period, we discovered that netrin-1 is expressed in mammary gland prelumenal cells and its receptor, neogenin, in a complementary pattern in adjacent cap cells of terminal end buds. We discovered that loss of either gene results in disorganized terminal end buds characterized by exaggerated subcapsular spaces, breaks in basal lamina, dissociated cap cells and an increased influx of cap cells into the prelumenal compartment. Cell aggregation assays demonstrate that neogenin mediates netrin-1 dependent cell clustering. Thus netrin-1 appears to act locally through neogenin to stabilize the multipotent progenitor (cap) cell layer during mammary gland development. Our results suggest that netrin- 1 and its receptor neogenin provide an adhesive rather than guidance function during non-neural organogenesis.
DTIC
Cancer; Tumors

20040004371 Air Force Occupational Measurement Center, Randolph AFB, TX
Occupational Survey Report, AFSC 4T0X1, Medical Laboratory
Berrios, Luis A.; Oct. 28, 2002; 46 pp.; In English
Report No.(s): AD-A418508; No Copyright; Avail: CASI; A03, Hardcopy

This survey was initiated to obtain data to: 1)evaluate current classification and training documents, and to 2) support promotion test development.
DTIC
Education; Medical Personnel; Personnel Development

20040004373 Bowling Green State Univ., OH
Exploration of the Regulation of Breast Cancer by the Angiotensin II receptor AT2
Pulakat, Lakshmi; May 2003; 11 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0485
Report No.(s): AD-A418511; No Copyright; Avail: CASI; A03, Hardcopy

Overexpression of ErbB2 and ErbB3 receptors, members of the ErbB receptor family, are correlated to the transformation of breast, ovarian and many other cell types into malignant tumors. This involvement of the ErbB receptor family in the control of cell proliferation and its role in human malignancies has led to intense studies of these receptors and their regulatory mechanisms. The ErbB family is consisted of four homologous members, the EGFR or ErbBl, ErbB2, ErbB3 and ErbB4, and these molecules can homodimerize or heterodimerize and activate growth-promoting signaling in response to binding of a number of structurally similar growth factors. This situation makes regulation of growth-promoting signaling by ErbB family receptors in cancer very complex. Identification of a mechanism to regulate growth-promoting cell signaling by these receptors may lead to the development of effective treatments to inhibit tumor growth in breast and ovarian cancer types that show ErbB2 and ErbB3 receptor overexpression.
DTIC
Cancer; Molecules; Peptides

20040004378 Oregon Health Sciences Univ., Portland, OR
HER-2/neu Shedding and Oncogenesis
Clinton, Gail M.; Jul. 2003; 10 pp.; In English
Contract(s)/Grant(s): DAMD17-99-1-9346
Report No.(s): AD-A418557; No Copyright; Avail: CASI; A02, Hardcopy

The HER-2/neu extracellular domain (ECD) is shed from breast carcinoma cells in culture and is found at elevated levels in sera of patients with metastatic breast cancer where it may predict recurrence. Our studies show that an N-terminally truncated HER-2/neu product, p95, is produced when the ECD is shed, that p95 has kinase activity, and is expressed to a greater extent in breast cancer patients with lymph node metastasis. Purpose. The objective of this proposal is to directly test the hypothesis that shedding of the extracellular domain of HER-2/neu, which creates the truncated p95 kinase, promotes oncogenesis. Scope. The effect of shedding to oncogenesis will be examined by further characterizing the control of shedding and genetically altering shedding activity to test the impact on tumorigenesis and oncogenesis. Results: We have developed and characterized several strategies for generation of mutants of pl85HER-2 to alter shedding and have investigated approaches to modulate shedding by treatment with exogenous effectors. We have been unsuccessful in development of mutants that specifically alter shedding, but that do not affect other receptor activities. These mutant proteins either are unstable or have altered kinase activity. We conclude that juxtamembrane mutants are problematic for examining the function of shedding on receptor- mediated tumorigenesis. Efforts to use approaches that employ chemical inhibitors and activators of shedding to examine the impact on transformation and tumorigenesis have not yielded interpretable results that distinguish the effects on receptor activity versus receptor shedding. Moreover, these modulators, alone, appeared to affect cell behavior. We conclude that modulation of shedding cannot be clearly separated from direct effects on the activity of the receptor itself or from secondary effects on the cells.
DTIC
Enzymes; Enzyme Activity; Lymphatic System; Metastasis; Modulators

20040005823 Ministry of Defence, New Delhi, India
Defence Science Journal, Volume 53, No. 1
Jan. 2003; 119 pp.; In English
Report No.(s): AD-A418504; X5-X5; No Copyright; Avail: CASI; A06, Hardcopy

No abstract available
Politics; Information Systems

20040005846 Naval Submarine Medical Research Lab., Groton, CT

A Clinical Test of the Computer-Supported Treatment and Consultation for Emotional Crisis Program (CATCEC)

Ryack, Bernard L.; Noddin, Ernest M.; Stetson, Douglas M.; Luria, S. M.; Feb. 2, 1992; 14 pp.; In English

Report No.(s): AD-A418601; NSMRL-1177; No Copyright; Avail: CASI; A03, Hardcopy

This study investigated the ability of a computer program to diagnose patients for emergency treatment of emotional crises. Civilian and military personnel who had not been trained in clinical psychology or psychiatry interviewed 60 patients at the psychiatry department of a Naval hospital using a structured interview form. The results were entered into the Computer supported Assessment and Treatment Consultation for Emotional Crises (CATCEC) program. CATCEC and the clinicians agreed on 22 of the 30 cases (73%) for which both gave appropriate diagnosis. The remaining 30 patients seen at the clinic did not have any psychiatric problem and would not have required any psychiatric intervention at sea. They were, therefore, not appropriate for inclusion in the study. This study investigated the ability of a computer program to diagnose patients for emergency treatment of emotional crises. Civilian and military personnel who had not been trained in clinical psychology or psychiatry interviewed 60 patients at the psychiatry department of a Naval hospital using a structured interview form. The results were entered into the Computer supported Assessment and Treatment Consultation for Emotional Crises (CATCEC) program. CATCEC and the clinicians agreed on 22 of the 30 cases (73%) for which both gave appropriate diagnosis. The remaining 30 patients seen at the clinic did not have any psychiatric problem and would not have required any psychiatric intervention at sea. They were, therefore, not appropriate for inclusion in the study.

DTIC

Clinical Medicine; Diagnosis; Computer Programs

20040005859 Georgetown Univ., Washington, DC, USA

Combined MD/PH D and PH D Training Program in Breast Cancer Prevention

Dickson, Robert B.; Jul. 2003; 9 pp.; In English

Contract(s)/Grant(s): DAMD17-99-1-9198

Report No.(s): AD-A418614; No Copyright; Avail: CASI; A02, Hardcopy

The goal of this training program is to significantly extend our existing, highly successful interdisciplinary Doctoral Training Program in Tumor Biology with a new track which integrates genetics, molecular epidemiology, and prevention of breast cancer. This new track offers both MD/PhD and PhD training opportunities, and integrates new faculty from the Lombardi Cancer Center Programs in Cancer Prevention and Control, and Cancer Genetics. The program is enriched by new courses, as well as practical research experience. This programmatic initiative makes use of the existing organizational structure of the interdisciplinary doctoral Training Program in Tumor Biology and incorporates a multi-disciplinary faculty who are devoted to research and education in breast cancer. We have successfully completed our fourth year of the program and recruited our fifth incoming class.

DTIC

Cancer; Education; Tumors; Epidemiology

20040005875 Alabama Univ., Birmingham, AL

UAB-Community Breast Cancer Network

LoBuglio, Albert; Jul. 2003; 19 pp.; In English

Contract(s)/Grant(s): DAMD17-00-1-0120

Report No.(s): AD-A418380; No Copyright; Avail: CASI; A03, Hardcopy

The UAB Clinical Trial Network was aimed at forming a collaborative linkage between the UAB Comprehensive Cancer Center, community-based oncology practices and pharmaceutical sponsors, in order to provide access to high priority novel clinical trials to women with breast cancer within the community. Year 03 was dedicated to review of the Network activity by both the internal and external advisory board, which recommended modification of Network administrative and regulatory oversight activity. A thorough re-orientation and re-training of the research department at Georgia Cancer Specialists (GCS) was performed as part of a Corrective Action Plan following protocol adherence and compliance deficiencies noted during an FDA audit of a non- Network protocol. As a result, initiation of all new trials and patient accrual was voluntarily halted at GCS for 6 months, and then restarted in 2003 following successful passage of both an internal as well as external audit. Four Network breast cancer clinical trials active in Y02 completed accrual and have been closed. Total accrual from the Network sites was 49 for these trials . Following restart of patient accrual at GCS, two Network breast cancer trials were re-initiated and have accrued a total of 18 patients to date. Additional trials await initiation. Two clinical sites in Alabama have been added

to our Network and activation of breast cancer trials at these sites is planned. We have received approval for a no- cost extension of funding into Year 04.
DTIC
Cancer; Mammary Glands; Clinical Medicine; Computer Networks

20040005882 NASA Marshall Space Flight Center, Huntsville, AL, USA
Spirochaeta Americana sp. nov., a New Haloalkaliphilic, Obligately Anaerobic Spirochaete Isolated from Soda Mono Lake in California
Hoover, Richard B.; Pikuta, Elena V.; Bej, Asim K.; Marsic, Damien; Whitman, William B.; Tang, Jane; Krader, Paul; International Journal of Systematic and Evolutionary Microbiology; November 8, 2002; Volume 53, pp. 815-821; In English
Report No.(s): DOI-10.1099/ijs.0.02535-0; Copyright; Avail: Other Sources

A novel, obligately anaerobic, mesophilic, haloalkaliphilic spirochaete, strain ASpG1(sup T), was isolated from sediments of the alkaline, hypersaline Mono Lake in California, USA. Cells of the Gram- negative strain were motile and spirochaete-shaped with sizes of 0(central dot)2 - 0(central dot)22 x 8-18 microns. Growth of the strain was observed between 10 and 44 C (optimum 37 C), in 2 - 12% (w/v) NaCl (optimum 3% NaCl) and between pH 8 and 10(central dot)5 (optimum pH 9(central dot)5). The novel strain was strictly alkaliphilic, required high concentrations of carbonates in the medium and was capable of utilizing D-glucose, fructose, maltose, sucrose, starch and D-mannitol. End products of glucose fermentation were H2, acetate, ethanol and formate. Strain ASpG1(sup T) was resistant to kanamycin and rifampicin, but sensitive to gentamicin, tetracycline and chloramphenicol. The G + C content of its DNA was 58(central dot)5 mol%. DNA-DNA hybridization analysis of strain ASpG1(sup T) with its most closely related species, Spirochaeta alkalica Z-7491(sup T), revealed a hybridization value of only 48.7 %. On the basis of its physiological and molecular properties, strain ASpG1(sup T) appears to represent a novel species of the genus Spirochaeta, for which the name Spirochaeta americana is proposed (type strain ASpG1(sup T) = ATCC BAA-392(sup T) = DSM 14872(sup T)).
Author
Deoxyribonucleic Acid; Mesophiles; Physiology; Sediments; Tetracyclines

20040006469 Texas Univ., Austin, TX, USA
Prevention of Radiation-Induced Breast Cancer by Amifostine
Weil, Michael M.; Jun. 2003; 7 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0460
Report No.(s): AD-A418558; No Copyright; Avail: CASI; A02, Hardcopy

Exposure to ionizing radiation at doses used in cancer radiotherapy and diagnostic radiology can increase breast cancer risk in women less than 45 years of age. Amifostine is a currently used cytoprotective agent. In addition to its cytoprotective effect, amifostine has been reported to inhibit radiation-induced mutagenesis in cultured cells and to protect against radiation-induced tumorigenesis in rodent model systems. This project is a pre-clinical study designed to determine if amifostine might be effective in preventing breast cancer initiation by medical exposures to ionizing radiation. The experiments will determine if amifostine is protective in a murine model of breast cancer initiation and, if so, determine the optimum dose, route and timing for its administration. The first year's objective was to test a high dose of amifostine administered I.P. prior to irradiation for reduction of ductal dysplasia in an outgrowth assay. In the first year 412 mammary fat pads were transplanted with mammary epithelial cells from irradiated donors. Of these, 306 have been harvested and examined as whole mounts. No dysplasias have been seen, but due to the low outgrowth frequency no conclusions can be drawn yet on the effectiveness of amifostine.
DTIC
Radiation Effects; Cells (Biology); Cancer

20040006474 Nebraska Univ., Omaha, NE, USA
Role of DNA Methylation in Altering Gene Expression During the Early Stages of Human Breast Cancer Progression in the MCF10AT Xenograft Model
Christman, Judith K.; Apr. 2003; 15 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0505
Report No.(s): AD-A418564; No Copyright; Avail: CASI; A03, Hardcopy

We hypothesize that a simple, interpretable pattern can be derived by following changes in breast cells from a single individual as they undergo progression from normal appearing ductular forms to the appearance of carcinoma- in-situ and

invasive cancer. We proposed to 1) Collect enough microdissected tissue representative of each of the morphologically different stages of early breast cancer progression in the MCF10AT model to obtain RNA for microarray analysis of gene expression and PCR-amplification of DNA for analysis of global and gene specific CpG island methylation. 2) Compare the methylation patterns of candidate genes in these tissues with those of MCF10A, MCF10AT and MCF10DCIS . com. cells in culture. 3) Prepare a CpG island methylation profile and a gene expression profile for each of the tissue types and cell lines. This year we completed examination of DNA methylation in 15 CpG islands in genes whose silencing by methylation has been linked to cancer development using MCF-7 and MCF10A cells and 6 cell lines in the MCF10AT model. The results of this analysis have been coupled with gene expression data and validate our methods. We have also collected sufficient tumor tissue from xenografts to carry out analysis of methylation status in xenografts during progression.
DTIC
Cancer; Gene Expression; Genes

20040006477 North Carolina Univ., Chapel Hill, NC, USA
Comparison of Image Quality Among Variations in Specimen Tissue Compression and Fluid Immersion for Diffraction Enhanced Imaging
Parham, Christopher A.; Jun. 2003; 15 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0523
Report No.(s): AD-A418566; No Copyright; Avail: CASI; A03, Hardcopy

Significant improvements have been made in mammography over the past two decades; however, all current existing radiographic systems rely on x-ray absorption to define the differences between normal and abnormal tissues. Given the complexity of imaging breast tissue, there are characteristics and findings that are difficult to interpret or missed entirely by conventional methods. A new radiographic imaging method, Diffraction Enhanced Imaging (DEI), has been proposed to extend the capabilities of the current standard and increase detection of occult disease. This study is designed to compare the fine structural detail provided by DEI under several tissue preparation conditions. The preparation variables include the pressure used to compress the tissues and the use of air-filled versus water-filled containers for imaging. Our hypothesis is that compression pressure will have no significant effect upon the imaging of fine structural detail. This could reduce the need for breast compression which is a uniformly unpleasant component of conventional mammography. The tissue compression plates have been built and several images have been obtained at Brookhaven National Laboratory characterizing various disease conditions. Tissue specimens will continue to be collected, imaged, and processed for use in an upcoming reader study to determine the effects of compression on visualization.
DTIC
Mammary Glands; Cancer; Hypotheses; Compressibility Effects

20040006478 Human Gene Therapy Research Inst., Des Moines, IA, USA
Alpha(1,3) Galactosyltransferase Gene Therapy for Breast Cancer
Link, Charles J., Jr; Jul. 2003; 77 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-00-1-0292
Report No.(s): AD-A418562; No Copyright; Avail: CASI; A05, Hardcopy

Alpha(1,3)galactosyl epitopes (alpha Gal) expressed on membrane glycoproteins and glycolipids are the major target of the human hyperacute rejection response observed when organs are transplanted from nonprimate donor species. Expression of the alpha(1,3)galactosyltransferase gene ALPHA(1,3)GT by breast cancer cells will lead to their direct in vivo destruction by anti-alpha Gal antibodies and complement, and boost the immune response to other tumor antigens. In vitro transduction of MCF-7, and T47D human breast cancer cells with an HSV amplicon vector resulted in expression of the suicide gene as detected by specific binding of labeled IB-4 isolectin. Transduced breast cancer cells were susceptible to antibody and complement-mediated cyolysis as demonstrated in serum killing as says with 50% human serum. The a(1,3)GT knockout mouse is analogous to humans in terms of expression of alpha Gal epitopes. A syngeneic murine breast cancer cell line form a(1,3)GT knockout mice has been produced by chemical induction (BR340) that is being used to demonstrate protective immunity when cells are ex vivo transduced and implanted into alpha Gal stimulated knockout mice.
DTIC
Cancer; Tumors; In Vitro Methods and Tests; Immune Systems; Antigens

20040006479 Mount Sinai Hospital, Toronto, Ontario, Canada

Cloning and Characterization of Expanded CAG- Repeat Containing Sequence(s): Identification of Candidate Breast Cancer Gene(s)

Ozcelik, Hilmi; Jun. 2003; 13 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-02-1-0499

Report No.(s): AD-A418567; No Copyright; Avail: CASI; A03, Hardcopy

Genetic factors have been shown to influence the risk of developing breast cancer. To date only two breast cancer predisposition genes, BRCA1 and BRCA2, have been identified. A wide spectrum of BRCA mutations has been found in breast cancer families. However, in the majority of breast cancer cases BRCA1 or BRCA2 mutations were not detected, suggesting the presence of other breast cancer predisposition genes. Trinucleotide repeats are present widely in human genome. Expansions of some trinucleotide repeats have been recognized to be the cause of several genetic disorders. In a previous study we have utilized the Repeat Expanded Detection (RED) method to investigate the distribution of (CAG) repeats in a sample of 212 breast cancer and 196 normal population controls and in 20 breast cancer mother-daughter pairs.

DTIC

Cancer; Cloning (Biology); Genes

20040006512 Naval Submarine Medical Research Lab., Groton, CT

Lenticular Opacities and the Evaluation of Personnel for the Naval Nuclear Propulsion Program

Albert, Philip R.; Aug. 1974; 34 pp.; In English

Report No.(s): AD-A418621; NSMRL-790; No Copyright; Avail: CASI; A03, Hardcopy

Pertinent aspects of lens anatomy, embryology, and physiology are reviewed. Types of cataracts are described and classified as to etiology. The pathophysiology of radiation cataracts is discussed and data regarding dose levels needed to produce such cataracts is presented. The requirements for satisfactory screening for lenticular opacities and for their further evaluation is discussed in light of results achieved at the Nuclear Power Schools. Medicolegal ramifications are discussed and compensation cases reviewed. Recommendations are made concerning acceptable examining protocols, administrative processing, disqualification criteria, and approaches to minimizing adverse, unwarranted legal decisions.

DTIC

Cataracts; Etiology; Lenticular Bodies

20040008147 Texas Univ., Houston, TX, USA

Liposomal Sphingolipids to Target Breast Adenocarcinoma Apoptosis

Klostergaard, Jim; Jun. 2003; 10 pp.; In English

Contract(s)/Grant(s): DAMD17-99-1-9265

Report No.(s): AD-A418571; No Copyright; Avail: CASI; A02, Hardcopy

We have observed that certain sphingolipids (e.g., dimethyl-sphingosine: DMSP) induce apoptosis in vitro in tumor cells despite the over-expression of HER-2/neu and other resistance mechanisms relevant to breast cancer. In these studies, we translated formulation and toxicity studies of liposomal-DMSP (L-DMSP) to proof-of-principle efficacy studies in the nude mouse/human HER-2/neu over-expressing MDA-MD-361 breast adenocarcinoma model. In the first tier efficacy experiments, mice were treated with a multiple-dose MTD regimen of L-DMSP administered i.v. beginning either one-week after - tumor implantation or when tumors grew to 4-5 mm diameter. Early treatment caused a delay in or reduced subsequent tumor growth, but was rarely curative; the tumor growth curve was suggestive of stasis. Treatment initiated at the later timepoint was also efficacious, but less so; the response appeared to be primarily very brief stasis, with slight growth occurring through treatment, followed by a slower growth rate than for controls. In the second tier efficacy experiments using the later timepoint only, the effect of PEG in the liposomal formulation was evaluated, and the i.p. and i.v. routes of administration were compared. The PEG formulation appeared superior to the non-PEG, and the i.p. route did not prove efficacious.

DTIC

Apoptosis; Cancer; Implantation

20040008148 Texas Univ. Health Science Center, San Antonio, TX, USA

Beta III Tubulin, Disulfide Bonds and Drug Resistance: A Novel Approach to the Treatment of Breast Cancer

Chaudhuri, Asish R.; Jun. 2003; 21 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0585

Report No.(s): AD-A418572; No Copyright; Avail: CASI; A03, Hardcopy

Tubulin, a potential target for chemotherapy, plays an important role in different cellular functions including mitosis and cell division. Tubulin consists of mainly alpha and beta subunits: each subunit exists in several isoforms. The distribution and expression of beta- isoforms differ from tissue to tissue: beta(II) and beta(IV) are ubiquitously expressed while beta(III) expression is restricted to neurons and cancer cells. Moreover, alpha beta (III) has least affinity for anti-tubulin drugs. In this study, we correlated the expression and structural stability of beta(III)-tubulin in response to oxidative stress in cancer and drug resistant cells.
DTIC
Cancer; Structural Stability; Mitosis; Bonding

20040008149 Fox Chase Cancer Center, Philadelphia, PA, USA
Estrogens and Breast Cancer
Russo, Jose; Jul. 2003; 60 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0247
Report No.(s): AD-A418573; No Copyright; Avail: CASI; A04, Hardcopy

In the present work we demonstrate that estradiol and its metabolites mainly 4-OH estradiol are able to induce transformation phenotypes in the human breast epithelial cells (HBEC) MCF-1OF. MCF1OF cells is ER-alpha negative, although, they ER-beta positive that could indicate that the response of the cells to growth and form colonies in agar methocel could be mediated by this receptor. However, the Invasion phenotype is not modified when the cells are treated in presence of tamoxifen or ICI, suggesting that other pathways may be involved. With the data presently available the direct effect of 4-OH-E2 support the concept that metabolic activation of estrogens mediated by various cytochrome P45O complexes, generating through this pathway reactive intermediates that elicit direct genotoxic effects leading to transformation. This assumption was confirmed when we found that all the transformation phenotypes induced by 4-OH-E2 were not abrogated when this compound was used in presence of the pure antiestrogenic ICI. We have detected loss of heterozygosity (LOH) in ch13q12.2-12.3 (D13S893) and in ch17q21.1 that has been reported in primary breast cancer, that the changes are similar to those induced by the chemical carcinogen (BP) and that the genomic changes were not abrogated by antiestrogens.
DTIC
Estrogens; Cancer; Carcinogens

20040008155 Georgetown Univ., Washington, DC, USA
Ribozyme Targeting the Novel Fusion Junction of EGFRvIII in Breast Cancer
Tang, Careen K.; Jul. 2003; 25 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-99-1-9206
Report No.(s): AD-A418630; No Copyright; Avail: CASI; A03, Hardcopy

EGFRvIII is a tumor specific, ligand-independent, constitutively activated variant of the epidermal growth factor receptor. We have detected high frequency of EGFRvIII expression in breast cancer. We also detected high frequency of co-expression of wt-EGFR with EGFRvIII mRNA in the same invasive breast carcinoma. Expression of EGFRvIII by ribozyme revealed down-regulation of EGFRvIII expression and reduced the tumorigenicity in athymic nude mice. These results suggest that EGFRvIII plays a significant role in breast cancer cell proliferation.
DTIC
Epidermis; Cancer; Proteins

20040008156 MacCallum (Peter) Cancer Inst., Melbourne, Australia
Breast Tumor/Stromal Cell Interactions in Bone
Pouliot, Normand; Anderson, Robin L.; Jul. 2003; 29 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0371
Report No.(s): AD-A418631; No Copyright; Avail: CASI; A03, Hardcopy

We are investigating interactions between breast cancer and bone stromal cells and their role in regulating metastasis of breast tumor cells to bone and osteoclast development using an orthotopic mouse model. Results from in vivo experiments indicate that PTHrP is an important factor regulating tumor growth but is not required for specific metastasis of breast tumors to bone. In vitro co-culture of bone stromal and tumor cells leads to up-regulation of RANKL and down-regulation of OPG, a response likely to contribute to the establishment of breast metastases in bone and to increases in bone resorption. The expression of RANKL and OPG in vivo is being investigated using our orthotopic model and immunohistochemistry. The expression of MMP9 significantly increases in these co-cultures and its expression in vivo following tumor cell injection into

the mammary gland appears to be most prominent at sites of bone resorption and the bone stroma-breast metastasis interface. Thus, both tumor and stromal-derived MMP9 are likely to contribute to metastatic development and accompanying osteolysis. This is being investigated further using MMP9 null mice and RNAi technology. Work investigating osteoclast requirement in tumor-mediated osteolysis using in vivo administration of OPG, beta 3, integrin peptidomimetics, and/or beta 3 integrin and M-CSF null mice is ongoing.
DTIC
Cancer; Bone Demineralization; In Vitro Methods and Tests; Metastasis

20040008299 Minnesota Univ., Minneapolis, MN
Differential Roles of Insulin Receptor Substrate-1 and -2 (IRS-1, IRS-2) in Insulin-Like Growth Factor Signaling in Breast Cancer Cells
Byron, Sara A.; Jun. 2003; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0494
Report No.(s): AD-A418361; No Copyright; Avail: CASI; A02, Hardcopy

Signaling of insulin-like growth factor-I (IGF-I) through the type I insulin-like growth factor receptor (IGF-IR) has been shown to regulate breast cancer cell proliferation, survival and metastasis in vitro. Recent evidence indicates insulin receptor substrate-1 and -2 (IRS-1 and IRS-2), the primary signaling molecules utilized by the IGF-IR, may mediate distinct IGF-I effects. To investigate the specific functional roles of the IRS species in mediating IGF action, we utilized the T47D-Y and T47D-YA breast cancer cell lines, which lack both IRS-1 and IRS-2 expression yet express a functional IGF-IR, to generate cell lines that independently express IRS-1 or IRS-2. T47D-Y and T47D-YA breast cancer cells were stably transfected with either human IRS-1 or IRS-2 cDNA, screened for IRS expression and activation by immunoblotting, and analyzed for IGF responsiveness in proliferation and motility assays.
DTIC
Mammary Glands; Cancer; Insulin; Cells (Biology); Histochemical Analysis; Immunology; Substrates

20040008316 California Univ., Davis, CA
Analysis of Keratin Filament Assembly/Disassembly and Structure Following Modification by Sulfur Mustard Analogs
Hess, John F.; Jul. 2003; 24 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0664
Report No.(s): AD-A418634; No Copyright; Avail: CASI; A03, Hardcopy

Characterization of vimentin intermediate filament (IF) structure by site directed spin labeling (SDSL) and electron paramagnetic resonance (EPR) has produced new data concerning the All arrangement of molecules in intact filaments. In the All alignement, rod 1B of a dimer is aligned with rod 1B of a second dimer. Our EPR data identify vimentin position 190 as the midpoint of overlap between dimers in the A11 arrangement. In conjunction with previously published data, we have thus identified contact surfaces between individual amino acids of rod 1B and rod 2B, involved in assembly of IFs. Analysis of keratin filament assembly and disassembly following treatment with the vesicant analogs 2-chloroethyl ethyl sulfide (CEES) and mechlorethamine (MEC) has been performed with 2 keratin pairs, one bacterially produced and one isolated from bovine tissue. Experiments with bacterially produced keratin 8 and 18 show that Intermediate Filaments assembled in vitro and subsequently treated with CEES and MEC are severely altered. The normal filament network is destroyed, replaced by aggregates of material with an irregular appearance. Experiments with k5 and k14 isolated from bovine tissue reveal the same results; CEES and MEC treatment destroy the smooth filamentous appearance of normal IFs and result in large aggregates.
DTIC
Keratins; Sulfur; Chemical Warfare; Skin (Anatomy)

20040008393 Georgetown Univ., Washington, DC, USA
Molecular Mechanisms of Estrogen and Antiestrogen Resistance
Clarke, Robert R.; Jul. 2003; 67 pp.; In English
Contract(s)/Grant(s): DAMD17-99-1-9191
Report No.(s): AD-A418636; No Copyright; Avail: CASI; A04, Hardcopy

This is an Academic (Career Development) Award. Consistent with this award, the PI continues to '. appraise critically the state of the science in a particular aspect of breast cancer research and to forge new avenues of investigation. ' In this application, the studies are focused on antiestrogen resistance. With respect to the career development aspects, several original studies and reviews relevant to this application have been published, others have been submitted for publication. We continue

to apply state-of- the- art technologies to addressing resistance, including the development of novel approaches to data mining and analysis. The studies of interferon regulatory factor-1 (IRF-1) continue. We have now completed the initial studies of the IRF-1 dominant negative IRF-1 construct. Immunohistologic methods for correlative studies on human breast tissues for nucleophosmin, NFxB, IRF-1 and X-box binding protein -1 (hXBP- 1) have been completed on an initial study population. Several applications for funding arising directly from these studies have been submitted to NIH and DOD.
DTIC
Estrogens; Cancer; Molecular Structure; Molecular Theory

20040008394 Wayne State Univ., Detroit, MI
Use of ErbB-2 Mimotopes for Breast Cancer Immunotherapy
Rosenspire, Allen J.; Ziemba, Stamatina E.; Jul. 2003; 12 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0667
Report No.(s): AD-A418637; No Copyright; Avail: CASI; A03, Hardcopy

Recently a new drug (Herceptin) has been shown to be effective in the treatment of breast cancer, and has been approved for use. Herceptin is essentially a humanized mouse monoclonal antibody that binds to ErbB-2, a membrane growth factor receptor tyrosine kinase that is over expressed in 25- 30% of patients with breast cancer. Herceptin prevents targeted cells from proliferating. Our goal is to induce the body to produce its own antibodies to ErbB-2, which hopefully like Herceptin will target breast cancer cells and then prevent them from growing. The specific purpose of this proposal was to test the use of phage particle mimetopes of ErbB-2, which when injected into mice, would induce the animals to make antibody against ErbB-2. Accordingly, we developed a phage selection protocol, and subsequently collected several M13 phage clones displaying high affinity binding to Herceptin. The selected clones were then used as immunogens to immunize Balb/c mice. At least two of these clones produced antibody responses that appear to be specific to ErbB-2 expressed on SKVO-3 cells. We have concluded that these mimotope phage clones are candidate immunogens for active immunotherapy trials in Balb/c mice with transplanted ErbB-2-positive tumors.
DTIC
Cancer; Immune Systems; Antibodies

20040008396 Wayne State Univ., Detroit, MI
Lymphedema Prophylaxis Utilizing Perioperative Education
Kosir, Mary A.; Sep. 2003; 39 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-00-1-0495
Report No.(s): AD-A418638; No Copyright; Avail: CASI; A03, Hardcopy

The purpose is to evaluate perioperative training for lymphedema assessment and protection. The hypothesis is that structured perioperative training in lymphedema protection will decrease lymphedema, the episodes of infection, the time to detection of lymphedema and improve the QOL in patients undergoing axillary dissection and/or radiation therapy for breast cancer as compared to a control group. The specific questions (scope)are 1) what is the incidence of lymphedema and infection during the first three years after surgery among breast cancer patients who received perioperative training in lymphedema protection as compared to a control group? 2) What are the differences in the measured QOL among breast cancer patients during the first three years after surgery that received perioperative education in lymphedema protection as compared to a control group? 3) What are the retention of information on lymphedema protection, and the compliance with are precautions among breast cancer patients who received perioperative lymphedema training as compared to a control group? Major Findings: During the first 33 months of enrollment, the incidence of lymphedema was 49.6% overall. This includes acute and chronic lymphedema. The incidence in African American and Hispanic breast cancer survivors was higher than nonminority subjects. Significance: The lymphedema rate observed overall thus far, and including acute and chronic lymphedema, is greater than reported in the literature. This may shift established practice in lymphedema prevention and detection for breast cancer survivors. A manuscript has reported a comparison of different methods of measuring lymphedema to our 'standard'. A grant application has been submitted based upon the finding of increased lymphedema in minority subjects. Further analyses and statistics are delayed due to the power outage and computer problems with viruses and worms.
DTIC
Cancer; Accident Prevention; Radiation Therapy

20040008398 Temple Univ., Philadelphia, PA
GADD45 Family of Genes in Breast Cancer
Liebermann, Dan; Jul. 2003; 11 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0575
Report No.(s): AD-A418639; No Copyright; Avail: CASI; A03, Hardcopy

The overall theme of the proposed research is to examine whether deficiency in the Growth Arrest & DNA Damage (Gadd)45 family of genes (Gadd45a & Gadd45b), playing important roles in controlling cell division and response of cells to anti-cancer agents, contributes to breast carcinogenesis. To this end, a multifaceted research plan takes advantage of established models of breast cancer prone mice (Balb/c, MMTV-ras, MMTV-c-myc) that are being crossed with mouse strains deficient for Gadd45a or Gadd45a/b to generate breast cancer prone mouse strains deficient for Gadd45 genes. Such mouse strains will provide attractive animal models to assess how deficiency in Gadd45 genes promotes breast carcinogenesis under different experimental settings (i.e. with or without hormone stimulation, irradiation or the chemical carcinogen DMBA).
DTIC
Cancer; Carcinogens; Irradiation; Hormones

20040008400
Identification of Structural Domains of ESX Required for Breast Cell Transformation
Gutierrez-Hartmann, Arthur; Jun. 2003; 71 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0476
Report No.(s): AD-A418640; No Copyright; Avail: CASI; A04, Hardcopy

ESX encodes an Ets family transcription factor gene that is potentially important in breast cancer because the ESX genomic region (chromosome 1q32.l) is amplified in 50% of early breast cancers and ESX mRNA is over-expressed in human breast ductal carcinoma in situ (DCIS). However, the precise molecular mechanism by which ESX mediates breast cell transformation remains unknown. We have now completed the key milestones originally proposed. Specifically, we have demonstrated that stable expression of HA-tagged or GFP-tagged ESX transforms the human, non-transformed MCF-12A cell line (which fails to express endogenous ESX). Moreover, we have documented that the subcellular localization of Esx is cytoplasmic, and that it is this subcellular localization that is required for transformation. Indeed, nuclear localization appears to mediate apoptosis. We have excluded the key transcriptional motifs as being required for transformation, and have mapped the transforming Esx subdomain to a small, acidic region. Taken together, these data reveal that Esx is not functioning as a transcription factor to transform MCF-12A mammary cells, but rather that ESX functions primarily via cytoplasmic mechanisms. Finally, we demonstrate that endogenous Esx protein is localized in the cytoplasm in human breast cancer specimens. In summary, these are extremely novel results and challenge dogma that Ets factors must always function in the nucleus as transcription regulators.
DTIC
Cancer; Apoptosis; Chromosomes

20040008403 Pennsylvania Univ., Philadelphia, PA
Assisting Survivors in Meeting Challenges at the End of Treatment: A problem-solving Approach
Palmer, Steven C.; Aug. 2003; 29 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0599
Report No.(s): AD-A418641; No Copyright; Avail: CASI; A03, Hardcopy

Cancer survivorship begins at diagnosis and continues beyond treatment. Although attention has been paid to psychosocial issues at diagnosis and active treatment, less has been paid to the end of active treatment when survivors face rising role expectations, fears of relapse, and the need to confront appearance and relationship change. This project focuses on increasing coping skills among breast cancer survivors at the end of active treatment. We will implement a skills-focused, problem-solving intervention (PSI), and evaluate its effects relative to routine care. The PSI is brief, non-stigmatizing, and disseminated in a single, four- hour group intervention. It focuses on building skills for problem definition, alternative generation, decision making, and solution implementation and evaluation. It also incorporates telephone follow-up at two-and four-weeks after the intervention to allow patients to discuss difficulties and receive additional instruction. This enhances the initial contact without increasing burden, allowing continued intervention with a geographically dispersed population. If effective, this intervention will point toward inexpensive and acceptable interventions that allow cancer survivors to define and ameliorate their own psychosocial stressors. This project is awaiting final approval by the Department of Defense prior to accruing participants.
DTIC
Cancer; Diagnosis; Education

20040008404 McMaster Univ., Hamilton, Ontario

Identification and Characterization of PEA3 Ets Subfamily Target Genes in Human Mammary Epithelial Cells

Hassell, John A.; May 2003; 13 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-02-1-0480

Report No.(s): AD-A418642; No Copyright; Avail: CASI; A03, Hardcopy

The human ETS gene family comprises 27 individual members and encodes sequence specific DNA binding proteins that regulate transcription. PEA3 is the founding member of a subfamily of ETS genes, which also include ER81 and ERM. PEA3 is overexpressed in 76% of all human breast tumors and in 93% of the HER2-positive subclass of such tumors. PEA3 is also overexpressed in most human breast tumor cell lines by comparison to non-transformed immortalized human mammary epithelial cells. Furthermore, PEA3 transcripts are elevated in the mammary tumors of three different breast cancer prone transgenic mouse strains and inhibition of the function of PEA3 (and ER81 and ERM) in mammary epithelial cells abrogates mammary oncogenesis induced by Her2. These findings imply that PEA3 and its subfamily members are required for mammary oncogenesis by regulating the expression of genes whose products play cardinal roles in breast cancer. Our objective is to identify PEA3 regulated genes in human mammary tumor cells; such genes may encode diagnostic and prognostic markers and molecular targets for drug discovery. To this end we constructed and characterized recombinant human adenoviruses encoding PEA3 or dominant-negative PEA3 and assessed their capacity to infect and regulated expression of cellular genes in untransformed and transformed human mammary epithelial cells.

DTIC

Epithelium; Cells (Biology)

20040008410 Naval Submarine Medical Research Lab., Groton, CT

Morphological Features Accompanying Neural Differentiation of Neuroblastoma (N-2A) Induced by Media Serum Availability

Rossi, John, III.; Messier, Arthur A.; Heyder, Elly; Jul. 24, 1989; 23 pp.; In English

Report No.(s): AD-A418643; NSMRL-1140; No Copyright; Avail: CASI; A03, Hardcopy

Previous studies have demonstrated that cultured cloned cells extend neurites after exposure to media supplemented with reduced concentration of serum. The present experiment on cloned neuroblastoma cells (Neuro-2a) corroborates and extends the past studies. N2A cells were cultivated in media containing 10% fetal bovine serum (FBS). After 24 hrs the cells were subcultivated into media containing either 10%, 5%, or 1% FBS; or media containing 10%, 5%, or 1% NU-SERUM V (NSV). The cells were morphologically characterized after 24, 48, 72 and 96 hours incubation. Reduced media serum concentrations increased the proportion of neurally differentiated cells, increased the overall neurite yield, increased the length of the neurites, increased the number of varicosities on the neurites, and increased the number of potentially interactive sites where varicosities on neurites from different cells overlapped or abutted. For all measures, NSV supplementation was found to reliably induce more neuritogenesis than for equal concentrations of FBS. The present experiment suggested that morphological features suitable for long term neurophysiological investigation could be induced by incubation in media containing either 1% NSV or 1% FBS.

DTIC

Cells (Biology); Neurophysiology

20040008412 Massachusetts General Hospital, Boston, MA

Herpes Virus Therapy of Prostate Cancer

Martuza, Robert L.; Aug. 2003; 10 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-98-1-8490

Report No.(s): AD-A418644; No Copyright; Avail: CASI; A02, Hardcopy

To improve the efficacy of intravenous administration of herpes vectors for metastatic prostate cancer we conducted experiments in the Tramp model system using clinically applicable agents that have been previously shown to transiently inactivate complement activity and demonstrate that dextran sulfate was effective in enhancing the tumor inhibitory activity of G207 efficiently infects human endothelial cells (HUVEC) at a low MOI 0.01 and kills >80% if cells by day 3.

DTIC

Cancer; Prostate Gland; Viruses

20040008413 Mount Sinai School of Medicine, New York, NY

Immune Surveillance, Cytokines and Breast Cancer Risk: Genetic and Psychological Influences in African American Women

Bovbjerg, Dana H.; Aug. 2003; 6 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0501

Report No.(s): AD-A418645; No Copyright; Avail: CASI; A02, Hardcopy

Breast cancer cells are known to bear determinants that would allow tumor specific immune responses. However, initiation and amplification of such immune responses are critically dependent upon the balance in Th1 and TH2 cytokine profiles. This molecular epidemiological study evaluates the impact that variability in cytokine profiles, (inferred from functional polymorphisms in cytokine genes), may have on breast cancer risk among urban African-American women. In the first phase of the study, DNA collected and approved for additional study as part of a previously funded Case-Control investigation (n=1600) will be assessed for cytokine polymorphisms. Because cytokine profiles are also known to be affected by environmental factors, particularly levels of stress, this study also evaluates the relative contribution of genotype and stress influences using data collected for that purpose from a sub-sample of healthy Controls (n=400) recruited from the 'graduates' of the larger study. Results will allow evaluation of the possibility that deficits in cytokine responses due to genetic or environmental factors may contribute to breast cancer risk. Based on these findings, women at risk for breast cancer because of polymorphisms in genes important to effective immune surveillance could be targeted for innovative prevention strategies including stress reduction and immune modulators.

DTIC

Cancer; Mammary Glands; Epidemiology; Genetics

20040008415

Optical Transillumination Spectroscopy of Breast Tissue to Determine the Cancer Risk in Pre and Post-Menopausal Women

Lilge, Lothar D.; Aug. 2003; 120 pp.; In English

Contract(s)/Grant(s): DAMD17-00-1-0393

Report No.(s): AD-A418646; No Copyright; Avail: CASI; A06, Hardcopy

Cancer risk assessment is becoming an important tool in determining an individual's screening and surveillance needs in order to maximize the probability of early cancer detection, or to initiate interventions. We investigated the use of optical transillumination spectroscopy as a physical measurement to quantify breast cancer risk, using breast tissue density resulting form standard mammography as comparator. By using only non-ionizing radiation, optical transillumination spectroscopy can be applied to women of all ages and frequently. Here, we established the sensitivity and specificity of identifying the parenchymal tissue density in women without radiological lesions, as an indirect measure of breast cancer risk. Parenchymal density pattern and optical transillumination spectroscopy quantifies physical parameters of the breast. Using visible/near infrared light the tissue chromophore compositions and morphology is interrogated. We measured spectra for 4 quadrants in each breast and using principle component analysis were able to achieve a sensitivity and specificity of > 0.97 each, demonstrating that optical transillumination will provide at least the same odds ratio for breast cancer risk as mammographic densities. Future work will focus on establishing a direct link with risk, so as to determine the true odds ration towards breast cancer, and on the feasibility to monitor risk changes in individuals undergoing intervention strategies.

DTIC

Cancer; Assessments; Detection

20040008417 Ibex Healthdata Systems, Rosemont, IL, USA, Johns Hopkins Univ., Baltimore, MD, USA

Intelligent Medical Systems for Aerospace Emergency Medical Services

Epler, John; Zimmer, Gary; January 13, 2004; 6 pp.; In English

Contract(s)/Grant(s): NAS2-03101; STTR-00.00-0000; No Copyright; Avail: CASI; A02, Hardcopy

The purpose of this project is to develop a portable, hands free device for emergency medical decision support to be used in remote or confined settings by non-physician providers. Phase I of the project will entail the development of a voice-activated device that will utilize an intelligent algorithm to provide guidance in establishing an airway in an emergency situation. The interactive, hands free software will process requests for assistance based on verbal prompts and algorithmic decision-making. The device will allow the CMO to attend to the patient while receiving verbal instruction. The software will also feature graphic representations where it is felt helpful in aiding in procedures. We will also develop a training program to orient users to the algorithmic approach, the use of the hardware and specific procedural considerations. We will validate the efficacy of this mode of technology application by testing in the Johns Hopkins Department of Emergency Medicine. Phase

I of the project will focus on the validation of the proposed algorithm, testing and validation of the decision making tool and modifications of medical equipment. In Phase 11, we will produce the first generation software for hands-free, interactive medical decision making for use in acute care environments.
Author
Medical Equipment; Medical Services; Technology Utilization; Verbal Communication

20040008419
Statistical Analysis of Multivariate Interval- Censored Data in Breast Cancer Follow-Up Studies
Wong, George Y.; Jul. 2003; 67 pp.; In English
Contract(s)/Grant(s): DAMD17-99-1-9390
Report No.(s): AD-A418647; No Copyright; Avail: CASI; A04, Hardcopy

The overall objective of our research proposal is nonparametric inference of the joint survival function S(x1, .. ., xd) =Pr(X1 > x1, ..., Xd > xd) of d (>= 2) correlated time- to-event variables X1, ..., Xd, each of which is subject to interval censoring. The standard estimator of S is the generalized maximum likelihood estimator (GMLE) S. However, S cannot be expressed in a closed-form expression and its statistical properties have not been studied in the multivariate case. The technical objectives of this pioneer methodological research proposal are to develop asymptotic generalized maximal likelihood (GML) inference of S and to derive efficient computational algorithms for the GML procedure. In our fourth and final year of research, we have implemented a computer software for asymptotic inference of GMLE p of the correlation coefficient p between a pair of the X' variables. When the censoring distribution is continuous, we have numerically established p is not asymptotically normal and we have implemented a bootstrap method for obtaining interval estimator of p. Thus in our four years of research, we have successfully completed the tasks we proposed. The results will be useful to breast cancer researchers pursuing chemoprevention intervention trials involving multiple surrogate endpoint biomarkers, and genetic epidemiologists conducting studies on familial aggregation of breast cancer and related cancers.
DTIC
Cancer; Computer Programs; Genetics

20040008428 Meharry Medical Coll., Nashville, TN
The Role of Dioxin Receptor in Mammary Development and Carcinogenesis
Eltom, Sakina E.; Jun. 2003; 18 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0483
Report No.(s): AD-A418648; No Copyright; Avail: CASI; A03, Hardcopy

The aromatic hydrocarbon (or dioxin) receptor (AhR) which is a ligand-activated basic helix- loop-helix (bHLH) transcription factor, mediates the toxic responses of dioxin. The research in this proposal is testing the hypothesis that the dioxin receptor (AhR) plays a central role in regulating the mammary epithelial network during the gland development, as well as regulating major events in mammary carcinogenesis. Following on preliminary observation of the dramatic upregulation of this receptor in advanced human breast carcinoma (HBc) cell lines, we proposed to address the question of whether the AhR overexpression alone is sufficient for transforming normal mammary epithelia, and whether it is causally associated transformation, using two genetic approaches. The AhR expression will be blocked in high tumorigenic HBC cell lines by siRNA technology to demonstrate a direct role of the AhR in modifying the progression of metastasis. To directly address the effect of increased expression of AhR, the human AhR cDNA will be stably transfected and over-expressed in a normal mammary epithelia and in non-tumorigenic human breast cell line. The development of metastatic phenotypes in the AhR-transformed lines will be assayed as their ability for anchorage-independent growth in soft agar media and for inducing tumors in nude mouse.
DTIC
Toxicity; Hydrocarbons; Mammary Glands

20040008430 National Academy of Sciences - National Research Council, Washington, DC, USA
Emerging Microbial Threats to Health in the 21st Century
Smolinski, Mark S.; Hamburg, Margaret A.; Lederberg, Joshua; Mar. 2003; 7 pp.; In English
Contract(s)/Grant(s): DAMD17-01-2-0040
Report No.(s): AD-A418649; No Copyright; Avail: CASI; A02, Hardcopy

In 2001, an Institute of Medicine committee was charged to identify, review, and assess the current state of knowledge and policy responses pertaining to emerging microbial threats to health. Re-visiting the 1992 Institute of Medicine report,

Emerging Infections: Microbial Threats to Health in the USA, the committee re-examined factors in emergence including: human demographics and behavior; microbial adaptation and change; technology and industry; economic development and land use; international travel and commerce; and breakdown of public health measures. Previously unrecognized factors were identified and evaluated for their impact on the emergence of infectious diseases. The committee assessed the capacity of the USA to respond to emerging microbial threats by identifying recommendations for domestic and international public health actions to strengthen the detection, response and prevention of emerging microbial threats.
DTIC
Health; Infectious Diseases

20040008438 Mount Sinai School of Medicine, New York, NY
Reversal of Mitochondrial Damage Caused by Environmental Neurotoxins
Gluck, Martin R.; Oct. 2002; 18 pp.; In English
Contract(s)/Grant(s): DAMD17-98-1-8624
Report No.(s): AD-A418651; No Copyright; Avail: CASI; A03, Hardcopy

Dr G. Cohen: The original intent of the grant, as proposed by the principle investigator, Dr. 0. Cohen, was to examine the ability of monoamine oxidase-associated substrates such as dopamine and tyramine to inhibit mitochondrial respiration. The studies entailed initially characterizing the ability of the two substrates to inhibit respiration in brain mitochondria, and to subsequently identify and characterize the underlying biochemical mechanisms responsible for the inhibition. Dr. Cohen proposed the possibility that monoamine oxidase (MAO)-derived production of hydrogen peroxide could hypothetically lead to oxidative damage within the mitochondria, and induce mitochondrial dysfunction. In one publication he reported that the inhibition of mitochondrial respiration by MAO substrates was associated with significant increases in levels of glutathione-protein-mixed disulfides, and that covalent modification of protein thiols by glutathione could inactivate critical thiol-dependent proteins within the electron transport chain (Cohen and Kessler, 1999).
DTIC
Mitochondria; Oxidase; Biochemistry

20040008440 Pennsylvania Univ., Philadelphia, PA
Detection of Breast Microcalcifications Under Ultrasound Using Power Doppler and Acoustic Resonance Imaging
Weinstein, Susan P.; Jul. 2003; 31 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-00-1-0406
Report No.(s): AD-A418652; No Copyright; Avail: CASI; A03, Hardcopy

Intraductal breast carcinoma (DCIS) represents approximately one third of mammographically detected breast carcinoma. Currently, DCIS and benign breast micorcalcifications can only be reliably be evaluated utilizing x-ray mammography. Our goal with our current project was to utilize breast sonography coupled with the technique of acoustic resonance to image and evaluate the breast micorcalcifications in patients prior to biopsy. We have been successful in visualizing the calcifications utilizing sonography coupled with acoustic resonance. Our analysis, however, shows no statistically significant difference in resonance peaks between malignant and benign types of calcifications.
DTIC
Cancer; Imaging Techniques; Ultrasonics

20040008445 NASA Stennis Space Center, Bay Saint Louis, MS, USA
Earth Science Applications Briefing Package
Davis, Bruce; October 09, 2001; 18 pp.; In English
Report No.(s): SE-2001-10-00058-SSC; No Copyright; Avail: CASI; A03, Hardcopy

An overview of the Earth Science Enterprise program is given. The mission is to enhance the near term socioeconomic benefit of NASA'S earth science investment.
CASI
Earth Sciences; NASA Programs

20040008459 Emory Univ., Atlanta, GA
Accelerated Tumor Cell Death by Angiogenic Modifiers
Chung, Leland W.; Aug. 2003; 29 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-00-1-0526
Report No.(s): AD-A418654; No Copyright; Avail: CASI; A03, Hardcopy

Because of the potential synergistic interaction between an anti-angiogenic aminosterol, squalamine, and other angiogenic modifiers such as vascular endothelial growth factor (vEGF) and cytokines that may be released during intermittent androgen withdrawal therapy, we tested extensiviely the interaction between soualamine and VECF for an enhanced cytotoxicity to human prostate cancer cells in vitro and xenografts tumor models in vivo. While in vitro synergistic interaction was demonstrated specifically in human prostate cancer cell lines containing a functional androgen receptor, we encountered difficulty in demonstrating such synergism in vivo for the reason that severe toxicity was noted when VEGF was delivered as an Ad-CMv-TK vector. For this reason, we explored the other possible synergistic interaction between squalamine and castration. Results and Discussion: Squalamine is highly synergistic to castration-induced endothelial destruction when applied at the time of castration. We noted VEGF receptor, flt-l and integrin profile (e.g. a6%4) can predict soualamine response. Prostate cancer cells lacking the expression of these markers may be less responsive to the synergistic ineraction between squalamine and castration. We are currently assessing the possible interaction between squalamine and VEGF and soualamine and androgen status of the cell culture and in animals subjected to castration to evaluate if synergism may exist particularly against the growth of endothelial cells. 14. SUBJECT TERMS 15. NUMBER of PA GES VECF, squalamine, androgen 29
DTIC
Cancer; Cardiovascular System; Cells (Biology)

20040008481 Pennsylvania Univ., Philadelphia, PA
A Search for Mutations that Affect Susceptibility to Breast Cancer
Gasser, David L.; Jul. 2003; 16 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0398
Report No.(s): AD-A418657; No Copyright; Avail: CASI; A03, Hardcopy

The purpose of this project was to search for mutations that affect susceptibility to breast cancer by screening the progeny of specially-bred mice. The male parent in each case had been treated with ethylnitrosourea (ENU) in the hope of inducing mutations. The female parent was homozygous for the c-neu oncogene under the control of the mouse mammary tumor virus (MMTV) promoter. In previous experiments, female mice that carry the MMTV-neu gene expressed a very high frequency of breast cancer after pregnancy and lactation, which are known to activate the MMTV- neu oncogene. After screening the progeny of 68 treated males, no mutations that affect breast cancer were identified, although mutations that affected other organ systems occurred. However, the major finding of the study was related to one of the control strains. The MN-lO strain carries the MMTV-neu oncogene on the BALB background and had previously demonstrated fairly high susceptibility to breast cancer at our institution. In the current project, its breast cancer rate was very low, and we believe this can be attributed to changes in animal care conditions that occurred since the previous work. The significance of this study was the identification of an ideal mouse model for studying environmental effects on spontaneous mammary tumors.
DTIC
Mutations; Cancer; Viruses; Oncogenes

20040008486 University of Southern California, Los Angeles, CA
Plant Estrogens: Effects on Cell Cycle Progression in Breast Cancer Cells
Cadenas, Enrique; Jun. 2003; 71 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-99-1-9375
Report No.(s): AD-A418662; No Copyright; Avail: CASI; A04, Hardcopy

Epidemiological studies suggest that consumption of soy phytoestrgoens, such as genistein, is associated with a decrease risk of breast cancer. Genistein has been shown to exert chemopreventive and antiproliferative in animal models of cancer and breast cancer cells respectively. Accumulating evidence suggest that genistein is oxidatively metabolized by the cytochrome P45O (CYP45O) family of enzymes, and that its metabolism is specific to breast cancer cells but not nontransformed breast epithelial cells. We investigated the cellular association and effects of metabolism of genistein by CYP45O in T47D breast cancer cells and MCFlOA breast epithelial cells. These studies show that genistein exerts distinct effects on cell cycle progression that is due to its preferential cellular uptake and extent of its metabolism in T47D cells but not MCFlOA cells. Few studies describe the cell cycle effects of genistein on nontumorigenic breast epithelial cells. We compared the effects of genistein on cell proliferation, cell cycle progression, cell cycle checkpoints in T47D breast cancer cells and MCFlOA nontumorigenic breast epithelial cells. In T47D breast cancer cells, genistein caused G2 arrest with inhibition of cyclin dependent kinase activity at 25 MicronM or higher with concomitant upregulation of cyclin A and B. Upregulation of cyclin dependent kinase inhibitors, p2l and p27 expressions were not sufficient to inhibit kinase activity. Collectively, these. data show that genistein the mechanism for cell cycle arrest involves deregulation of cdc-2/cyclin B complex or cyclin Bicyclin

B kinase complex through CDK inhibition. In contrast, there was less G2 arrest in MCFlOA nontumorigenic breast epithelial cells with increases in kinase activity.
DTIC
Cancer; Cells (Biology); Cytochromes; Enzyme Activity

20040008488 California Univ., Santa Barbara, CA
Microwave Confocal Detection and Thermal Therapy for Breast Cancer: Adaptive Phased Array System for In-Vitro Mapping/Targeting Telomerase Activity
York, Robert A.; Jul. 2003; 27 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0491
Report No.(s): AD-A418663; No Copyright; Avail: CASI; A03, Hardcopy

Microwave hyperthermia has shown promise in the treatment of malignant breast tumors with minimal side effects due to the use of non-ionizing radiation. However the full potential has yet to be realized due to technological limitations. This project aimed to improve this technology in two areas. The first area of research is developing biocompatible vectors with high microwave absorbing and scattering materials. These would enhance in-vivo localization of target cells, where the activity of specific markers is present. The second area of research seeks to optimize the microwave energy delivery system, studying the efficiency of pulsed/continuous energy deposition for frequency from 30 MHz to 3 GHz, where the hyperthermia has shown best therapeutic results therapy and detection systems are designed. In these two years of research only part of the first issue was addressed, identifying and measuring biocompatible materials that would enhance the absorption and/or the scattering of microwave photons in water based inhomogeneous medium. The first year was dedicated to deepening our understanding of dipolar polarization and conduction mechanisms, which determine the efficiency of microwave heating. A measurement system was then established and a series of measurements was taken on water-soluble conductive polymers. The first measurements on conductive polymers showed promising results, while the water isotopes didn't show the desired absorbing behavior in the liquid state. Future research work could be aimed to better understand their absorption mechanism as well as to include these materials in liposomes and optimize the external delivery system.
DTIC
Microwaves; In Vitro Methods and Tests; Phased Arrays

20040008491 Naval Submarine Medical Research Lab., Groton, CT
Transthoracic Impedance Cardiography: A Survey
Saklad, James; Apr. 1974; 32 pp.; In English
Report No.(s): AD-A418664; NSMRL-803; No Copyright; Avail: CASI; A03, Hardcopy

In the past decade noninvasive, nontraumatic methods of monitoring parameters of physiological function have been investigated with increasing interest. Of the various parameters of cardiac function, only blood pressure and the electrical activity of the myocardium have tradionally been accessible noninvasively, and only the latter in a continuous fashion. Several invasive methods exist for measurement of myocardial contractility, cardiac output, the degree of heart failure, etc., and a few for watching some of these factors noninvasively, but not, in general, non- invasively, conveniently, comfortably, and continuously. Monitoring the changing thoracic electrical impedance is a technique which satisfies all these criteria. Some of the theory of biological impedance change is discussed, and some of the drawbacks are pointed out. A survey of the literature of the last decade is presented, illustrating the fact that many investigators have consistently obtained good correlation with 'standard' invasive techniques of measurement, while others have had variable results. Some of the unexplored areas in this field are discussed and directions for future research suggested.
DTIC
Cardiography; Cardiac Output; Electrical Impedance; Heart Function

20040008499 West Virginia Univ., Morgantown, WV
Randomized Double Blind, Placebo Controlled Trial of Neuroprotective Effects of Epoetin Alfa (Procrit (Trademark)) in Patients Receiving Adjuvant Chemotherapy for Breast Cancer
Abraham, James; Haut, Marc; Gupta, Naresh; Crowell, Edward; Reed, Eddie; Jul. 2003; 6 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0620
Report No.(s): AD-A418635; No Copyright; Avail: CASI; A02, Hardcopy

Cognitive deficits (e.g. problems with memory and concentration) are common during and after adjuvant breast cancer chemotherapy, but the pathophysiology of these phenomena is unknown. Cognitive impairment can, certainly, limit a patient's

quality of life. The treatment of the cognitive dysfunction has not been investigated. 130 water activation using Positron Emission Tomography (PET) scan yields patterns of blood flow to brain regions used in specific cognitive skills. Studies with erythropoietin (EPO) on rat and mouse brains suggest that it protects the brain from ischemia, concussive brain injury, and toxin exposure and enhances cognitive function. We hypothesize that 130 water PET scan along with neuropsychological tests can evaluate the effectiveness of EPO as a treatment for cognitive dysfunction and identify the pathophysiology of cognitive dysfunction in patients receiving. Patients with early stage breast cancer who are candidates for adjuvant chemotherapy will undergo 150 water PET scans at baseline to measure the differences in regional blood flow of the brain during working memory. Specific neuropsychological tests will be done to study the attention, speeded processing, memory, and executive functions outside of the scanner. When the patients start treatment with AC they will be randomized into two groups. One group will receive weekly injections with EPO and the other group will receive placebo. PET scans and neuropsychological studies will be repeated in these two groups at the end of 4 cycles of AC. The trial opened to accrual in April 2003 and there are currently two patients enrolled.
DTIC
Cognition; Neurology; Chemotherapy; Disorders; Proteins; Mammary Glands; Cancer

20040008503 Mayo Clinic, Rochester, MN
Benign Breast Disease: Toward Molecular Prediction of Breast Cancer Risk
Hartmann, Lynn C.; Jun. 2003; 35 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0473
Report No.(s): AD-A418667; No Copyright; Avail: CASI; A03, Hardcopy

The purpose of this Center of Excellence is to bring molecular risk prediction for breast cancer into the clinical arena. Our specific aims are to establish a tissue repository from a retrospective cohort of women with benign breast disease (BBD) to identify those who developed breast cancer (cases) and those who did not (controls); to test potential biomarkers of risk in this archival tissue set; and to discover new, potentially relevant biomarkers of risk in fresh and frozen specimens of BBD. We are completing follow-up on a retrospective cohort of 12,000 women with BBD diagnosed at Mayo Clinic between 1967 and 1991. We anticipate identifying approximately 700 cases and we will match appropriate controls to those cases. We have demonstrated excellent participation rates and access to benign tissues from cases and controls. We have information on established risk factors, permitting independent evaluation of the molecular markers. Upon finalization of all Human Subjects issues (approval still pending at Wayne State), we will initiate collection of fresh BBD samples for the discovery phase of our work.
DTIC
Cancer; Diseases; Identifying

20040008511 Georgetown Univ., Washington, DC, USA
CRE Activation in Antiestrogen Resistance
Gomez, Bianca P.; Clarke, Robert; May 2003; 10 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0389
Report No.(s): AD-A418668; No Copyright; Avail: CASI; A02, Hardcopy

The over-expression of the human X-base binding protein (h-XBP-1) and hence elevated levels of CRE transcription activator contributes to the antiestrogen resistance. Preliminary data using Western blot analysis indicates that E2-independent but responsive breast cancer cells that are responsive to antiestrogen showed elevated hXBP- 1 protein level whereas the cell line that is resistant to antiestrogen showed a lower level of hXBP-1 protein expression. Furthermore, a promoter-reporter assay measuring luciferase activity as an indicator of CRE activation showed that cells that are antiestrogen resistant had a four-fold increase in CRE activation when compared to the sensitive cells. HXBP-1 is transcription factor that belongs to the ATF/CRE family of transcription factors and can bind to and activate the CREs (cyclic AMP response elements). It is based on this relationship that the amount of hXBP-1 protein levels could be determined by measuring the level of CRE containing genes. In our experiments by over expressing hXBP-1 using transfection we well convert sensitive cells to resistant cell. On the other hand, cell resistant to antiestrogen will become sensitive by using an antisense oligonucleotide approach. Anchorage dependent as well as anchorage independent growth responses of the respective transformed cells to antiestrogen will also be measured.
DTIC
Physiological Responses; Cyclic Compounds; Resistance; Estrogens; Mammary Glands; Cancer

20040008512 Virginia Univ., Charlottesville, VA

Opening of the Mitochondrial Permeability Transition Pore by Reactive Oxygen Species is a Basic Event in Neurodegeneration

Savory, John; Jul. 2003; 87 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-99-1-9552

Report No.(s): AD-A418669; No Copyright; Avail: CASI; A05, Hardcopy

This addendum concludes the work on the neurotoxicity induced by A% beta which was an extension of our original work involving the administration of aluminum maltolate into rabbit brain. The intracisternal injection of A beta(1-42) induces apoptosis and phosphorylation of tau in the hippocampus of New Zealand white rabbits. These A beta effects correlate with the activation of JNK, ERK, c-jun and c-fos, but not of p38. Treatment with 7 mM lithium inhibits apoptosis, prevents the activation of JNK and c-jun, increases the activation of ERK and c-fos, and does not affect tau.

DTIC

Nervous System; Degeneration; Nerves

20040008518 Oregon Univ., Eugene, OR

Acquisition of a Magnetic Resonance Imaging System for Research on the Neural Basis of Human Cognition

Neville, Helen J.; Sep. 2003; 14 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-01-1-0750

Report No.(s): AD-A418671; No Copyright; Avail: CASI; A03, Hardcopy

From August 15, 2002 through August 14, 2003 the neuroimaging facility housing a 3T MRI unit has been operational; the MRI unit has had one upgrade in software and hardware and this has added significantly to its capabilities. The primary support staff for the fMRI facility have been hired. Several software tools for image display, analysis, registration and file conversion have been developed, expanded and refined in the same time frame. Methods for semi-automated and automated image segmentation based on an unbiased edge detection method (scale-space edge detection) have been developed to the stage of routine, bug-free use. In the future we will utilize high performance computing (parallel processing methods) to reduce the computation time from approximately 40 hours to under 10 minutes for segmentation of the whole human brain. The Neuroinformatics Center (NIC) was successful in obtaining a National Science Foundation-Major Research Instrumentation grant for over $1 million to establish a high performance computing capability for the BBMI research applications during this past year. Several ongoing research projects (described below) continue to characterize the structural and functional properties of the brain systems important in sensory, perceptual and cognitive processing.

DTIC

Imaging Techniques; Magnetic Resonance; Digital Systems

20040008523 Duke Univ., Durham, NC

Treatment Related Cardiac Toxicity in Patients Treated for Breast Cancer

Marks, Lawrence B.; Jun. 2003; 12 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0374

Report No.(s): AD-A418672; No Copyright; Avail: CASI; A03, Hardcopy

To determine the incidence, dose/time-dependence, and functional significance of regional cardiac perfusion abnormalities in patients with left-sided breast cancer treated with radiation therapy (RT) with and without doxorubicin Methods: 126 patients underwent pre-RT single photon emission computed tomography (SPECT) cardiac perfusion imaging. Post RT images were obtained iii 97, 69,42, 30,13 and 8 patients 6, 12, 18, 24, 36 and 48 months post-RT. SPECT perfusion images were registered onto 3-dimensional (3D) RT dose distributions. The volume of heart in the RT field was quantified and the regional RT dose was calculated. Changes in regional and global cardiac function were assessed. Results: Overall, 30% of patients developed dose-dependent RT-induced perfusion defects. The incidence of defects increased with the volumes of heart irradiated, and maybe more prevalent in African Americans (vs. Caucasians) and with chemotherapy (vs. RT alone). Perfusion defects were associated with changes in regional wall motion 20-40% of the time and possibly with the development of chest-pain Conclusions: RT causes dose dependent-cardiac perfusion defects 6-24 months post-RT that appears to be associated with functional changes. The use of chemotherapy and African American race may increase this rate. Long-term follow-up is needed to assess whether these perfusion changes are transient or permanent and to determine if these findings are associated with changes in overall cardiac function and clinical outcome.

DTIC

Cardiovascular System; Cancer; Radiation Therapy

20040008524 Iowa Univ., Iowa City, IA

The Enzyme MnSOD Suppresses Malignant Breast Cell Growth by Preventing HIF-1 Activation

Wang, Min; Beuttner, Garry; May 2003; 17 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0425

Report No.(s): AD-A418673; No Copyright; Avail: CASI; A03, Hardcopy

Hypoxia-inducible factor-l (HIF-l) is an important transcriptional factor that is activated in conditions of decreased oxygen. It mediates cell survival in hypoxia by promoting genes involved in glucose homeostasis, erythropoiesis, and angiogenesis.. Manganese superoxide dismutase (MnSOD) is an important antioxidant enzymes involved in cancer cell growth. Our group has shown both in vitro and in vivo that both tumor growth and vascularization are suppressed with increased MnSOD. We hypothesize that the SOD enzymes and HIF-l are linked and that SOD overexpression in malignant tumors can modulate HIF-l alpha protein levels. To test this hypothesis we exposed MnSOD overexpressing cells to hypoxia and examined HIF-l alpha protein. Our results demonstrated that increase of MnSOD (3-30 fold activity) in breast cancer cells suppressed the accumulation of HIF-l alpha protein under hypoxia in a dose dependent manner. These results suggest that MnSOD regulates HIP-l alpha and that the modulation of HIP-l alpha protein levels may account for the tumor suppressor function of SOD enzyme.

DTIC

Hypoxia; Mammary Glands; Cancer; Enzymes

20040008525 Colorado Univ., Denver, CO

Chemotherapy of Late Stage Breast Cancer Targeted Towards Cell Cycle Regulatory Components

Sclafani, Robert A.; Oct. 2003; 14 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-98-1-8299

Report No.(s): AD-A418679; No Copyright; Avail: CASI; A03, Hardcopy

The original goal was to target cell cycle regulatory components as a potential therapy. The p16 gene is a tumor suppressor and a CDK inhibitor that is inactivated by gene methylation. The drug 5-aza-2'deoxycytidine (5-Aza-CdR), an inhibitor of DNA methylation, was used for re-expression of a repressed p16. Although p16 re-activation occurred and cell growth was inhibited by 5-Aza-CdR, the effect was not specific to cells with a methylated p16 gene. A mouse model was developed and used to test the efficacy of 5-Aza-CdR. The results were not conclusive because of the inherent toxicity of 5-Aza-CdR. A blood test was developed for the detection of p16 methylation and used to show that the number of patients suitable for a 5- Aza-CdR clinical trial was very low (<3%). These results made a clinical trial with 5-Aza-CdR unrealistic. A phase II clinical trial with a second drug, Bryostatin-1, which regulates the p21 CDK inhibitor, was terminated due to dismal accrual rates even after initial success. Progress was made exploring the Cdc7 protein, which regulates the cell cycle and mutagenesis. Cdc7 may represent a new potential target as it was shown to be up-regulated in many breast cancer cell lines.

DTIC

Cancer; Mammary Glands; Chemotherapy

20040008527 Columbia Univ., New York, NY

Model and Expansion Based Methods of Detection of Small Masses in Radiographs of Dense Breasts

Laine, Andrew P.; Jun. 2002; 18 pp.; In English

Contract(s)/Grant(s): DAMD17-99-1-9154

Report No.(s): AD-A418680; No Copyright; Avail: CASI; A03, Hardcopy

This report describes progress made during the second year of study. Our goal is to detect masses in dense mammograms having a diameter less than 1 cm. The idea of this project is to detect subtle masses by tuning the central frequency and width of a basis function used in an overcomplete expansion. By modeling the shape of a mass through this flexibility we hope to detect small and subtle masses in dense breasts and improve the chances of early detection in screening mammography. During this year of the project we focused on an enhancement method to be carried out prior the detection algorithm and have begun to incorporate an expansion based method of detecting masses in digital radiographs. We showed that the method of adaptive multi-scale histogram equalization can be integrated into our existing expansion framework as a preprocessing step to assist detection. This method will be tested using a local database of digital mammograms during the final year of the project.

DTIC

Digital Systems; Radiography; Mammary Glands

20040008530 Texas Univ., Dallas, TX, USA

Characterization of Putative Homeostatic Molecules in Prostate Development and Androgen-Independent Prostate Cancer

Hsieh, Jer-Tsong; Aug. 2003; 38 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-99-1-9002

Report No.(s): AD-A418678; No Copyright; Avail: CASI; A03, Hardcopy

It is believed that androgen independent (A') prostate cancer (PCa) cells behave like the basal cells in prostate gland with malignant phenotype. Basal cells represent a stem cell population of prostate. Therefore, we believe that a genetic imbalance for controlling growth and/or differentiation in basal cell will result in the onset of AIPCa. Our previous studies discover a novel protein- DOC-2 that are associated with normal basal cell of prostate and are often absents in prostate cancer. Most importantly, we identified a novel RAS-GTPase activating protein (i.e., DIP 1/2) interacting with DOC-2 protein. In this project, we have studied the regulation of DIP 1/2 in prostate cancer cells and signal transduction of DOC-2/DIP 1/2 complex during cell differentiation of prostatic epithelium. In summary, we demonstrated that epigenetic control such as DNA methylation and histone acetylation plays an important role in modulating DIP1/2 gene expression in AIPCa. The re-expression of DIP1/2 was able to suppress the growth of PCa cells. Using a three- dimension in vitro tissue culture system, the elevated DIP 1/2 protein and several other genes (such as P-cadherin, prostate- derived factor) correlated with the cell polarization of basal epithelium. Furthermore, DIP 1/2-expressing cells can form glandular tissue in vivo. Thus, DIP 1/2 is a critical factor involved in cell differentiation of prostatic epithelium.

DTIC

Prostate Gland; Cancer; Tissues (Biology)

20040008532 Children's Hospital of Los Angeles, Los Angeles, CA, USA

A Novel Spatially and Temporally Inducible Gene Expression Vector for the Treatment of Metastatic Breast Cancer

T'Ang, Anne; Jul. 2003; 12 pp.; In English

Contract(s)/Grant(s): DAMD17-99-1-9127

Report No.(s): AD-A418682; No Copyright; Avail: CASI; A03, Hardcopy

A major problem in current standard therapy for breast cancer is systemic toxicity. The overall objective of this proposal is to develop a novel strategy to confine and enhance therapeutic gene expression to tumors spatially and temporally with a novel expression vector. To achieve this, a new vector, pBF (breast tumor specific, feed forward) was constructed to selectively enhance the level of cytotoxic agents at breast tumor sites relative to the rest of the body by using a feed-forward reaction based on a combination of tissue specific promoter (cerbB2p) and the tetracycline promoter (tetp) system.

DTIC

Cancer; Toxins and Antitoxins; Tetracyclines

20040008539 Texas Univ., Houston, TX, USA

Calcium-Mediated Apoptosis and Apoptotic Sensitization in Prostate Cancer

Donato, Nicholas J.; Jun. 2003; 10 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-01-1-0070

Report No.(s): AD-A418675; No Copyright; Avail: CASI; A02, Hardcopy

Prostate cancer (PC) cells are highly sensitive to changes in their cytoplasmic calcium and this aspect of their biology must be more thoroughly understood to uncover possible new therapeutic targets for this disease. Our preliminary studies demonstrated that calcium activated two pathways that may contribute to the calcium apoptotic sensitivity of PC cells. Calcium mediated activation of calpain results in direct activation of caspase 7 and the tyrosine phosphatase, PTP1B. To study their direct involvement in apoptosis and signaling, PC cells were transfected with dominant negative caspase 7 and inducible constructs of activated PTP1B B. Dominant negative caspase 7 suppressed activation of endogenous caspase 7 by calcium ionophore, supporting a role for its recruitment into the calcium initiated apoptotic process. Activated PTP1B expression (but not a phosphatase- dead mutant) suppressed PC cell growth and blocked signaling through insulin receptor, HER2 and lL-6. However, EGFR signaling was not affected. These data demonstrate that calcium antagonizes specific signal transduction pathways important in PC cells through activation of PTP1B B. Agents that regulate calcium flux and PTP1B activation in PC cells may be active in suppressing PC cells dependent on these signaling pathways for their growth and survival.

DTIC

Cancer; Genetics; Cytoplasm

20040008540 Burnham Inst., La Jolla, CA
Antibody Microchips to Study Metastasis
Zhang, Yan; Jul. 2003; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0173
Report No.(s): AD-A418683; No Copyright; Avail: CASI; A03, Hardcopy

The hypothesis of my project is that the behavior of an invasive tumor cell is largely determined by a complex collection of numerous proteins on the surface of metastasis cell. I proposed to create a high-density single chain variable fragments (scFvs) antibody chip - that can be employed to compare and quantitate the expression levels of thousands of different plasma membrane proteins on the invasive vs. non-invasive breast carcinoma cell lines. Toward this goal, I have achieved two tasks during this period of award: 1) a -competitive binding condition has been worked out to allow semi-quantification of the amount of antigen bound by individual phage-scFv clone 2) the binding feature of well characterized eight individual phage clones to cell lysate of invasive breast carcinoma MDA-MB-435 cell line provides the initial parameter for the development for a prototype' chip to compare the expression level of a large amount of cell surface proteins by using a 96-well plate format.
DTIC
Mammary Glands; Cancer; Antibodies; Chips; Metastasis

20040008551 Burnham Inst., La Jolla, CA
Microsatellite and Chromosomal Instability in Breast Cancer
Baranovskaya, Svetlana; Jul. 2003; 7 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0174
Report No.(s): AD-A418690; No Copyright; Avail: CASI; A02, Hardcopy

A set of the microsatellite markers spanning 21 Mbp around the epidermal growth factor receptor (EGFR) gene at 7p12 was used to determine possible chromosomal imbalances in breast tumors. Our study has shown that changes in the EGFR gene copy number is a frequent event in breast cancer and occurs in 22% of breast cancer patients. Eight percent of cases analyzed had an amplification& of the EGFR gene containing region. In addition to the gains of the chromosome 7 region, 14% of the cases showed loss of heterozygosity (LOH). The length of the deleted region varied from 2.3 Mbp to the entire chromosome. Therefore, both the amplification and the deletion of the EGFR gene facilitate tumorigenesis in a set of breast tumors that should be reflected in the clinico-pathological parameters of the tumors. This finding has a high importance because epidermal growth factor receptor is a target for some chemotherapy drugs.
DTIC
Mammary Glands; Cancer

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*.

20040008475 Moss Rehabilitation Research Inst., Philadelphia, PA, USA
Assessment and Treatment of Shoulder Dysfunction in Post-Polio and Elderly Populations
Klein, Mary G.; Jul. 2003; 43 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0533
Report No.(s): AD-A418656; No Copyright; Avail: CASI; A03, Hardcopy

The objective of this project was to study the implications of musculoskeletal pain in the lives of polio survivors and older adults with no history of polio, in terms of the effects on functional performance and quality of life, and to determine whether these factors could be significantly improved as the result of a rehabilitation program. Muscle strength, activity, and symptomatology data were collected on 129 polio survivors and 191 adults with no history of polio. polio survivors were more likely to develop musculoskeletal symptoms than strength-matched controls. Musculoskeletal pain, in general, was associated with activity intensity measures in the post-polio population. A scientific model was developed for predicting the presence of shoulder symptoms in polio survivors using logistic regression. Knee extensor strength and weight were identified as risk factors. However, this model could not be generalized to older adults without a history of polio. Exercise and relaxation therapy showed potential as effective treatments for shoulder overuse symptoms. A comparison of sit-stand performance pre-

and post- intervention revealed that shoulder symptom resolution was better correlated with changes in biomechanics than changes in lower extremity strength.
DTIC
Age Factor; Muscles; Biodynamics; Activity (Biology)

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*.

20040004146
Driver Distraction and Crashes: An Assessment of Crash Databases and Review of the Literature
Eby, D. W.; Kostyniuk, L. P.; May 2003; 52 pp.; In English
Report No.(s): PB2004-100498; UMTRI-2003-12; No Copyright; Avail: CASI; A04, Hardcopy

A distracted driver has delayed recognition of information necessary for safe driving because an event in the vehicle or outside of the vehicle has attracted the driver's attention. A distracted driver may be less able to respond appropriately to changing road and traffic conditions leading to an increased likelihood of crash. Development of technology to reduce distraction-related crashes is proceeding, including the development of a workload/distraction management system in the SAfety VEhicle(s) using adaptive interface Technology (SAVE-IT) program. In order to determine the potential benefits of systems such as SAVE-IT, it is necessary to understand the crash scenarios in which driver distraction is a likely contributor. This report has two purposes. The first is to review and assess available crash databases to determine which variables are available, feasible, and appropriate for determining distraction-related crash scenarios. The second purpose is to investigate a variety of other distraction-related scenarios in crash databases and those that may not appear in crash records directly, but, nonetheless, are likely to be related to distraction-related crashes. The crash databases reviewed are: The National Automotive Sampling System General Estimates System; The National Automotive Sampling System Crashworthiness Data System; The Fatality Analysis Reporting System; the Highway Safety Information System; and regional geographic information system databases. The report examines five crash scenarios to determine the relative frequency of distraction-related crashes by crash scenario: single vehicle run off the road; rear-end; intersection/crossing path; lane-change/merge; and head-on. This review also covers a number of distracted-driving scenarios both outside and inside the vehicle including: exterior incidents; looking at scenery; passenger interactions; adjusting entertainment system; listening to music; cellular phone use; use of route-guidance systems; eating/drinking; adjusting vehicle controls; objects moving in the vehicle; and smoking. Also presented is a framework for rank-ordering the relative contribution of these scenarios to distraction-related crash risk.
NTIS
Data Bases; Accidents; Confusion; Vehicles; Crashworthiness

20040008323 Swedish Defence Research Establishment, Stockholm, Sweden
MSI) med Fysiologi (Annual Report 2001 on FOI:s Research on Human Factors and Physiology
Derefeldt, G.; Sep. 2003; 60 pp.; In Swedish
Report No.(s): PB2004-101543; FOI-R-FOI-0355-SE; No Copyright; Avail: CASI; A04, Hardcopy

This report summarizes the research from the fiscal year 2001 within the Swedish Defense Research Agency in the domain of Human Factors and Physiology. The report presents a summing-up of the aim and the direction of the research domain and the national and international development. The results of the research are summarized and the activities in each project are described. The aim of the research is to support the Armed Forces to meet the requirements of complex and difficult environmental conditions and battlefield missions in the 21st century.
NTIS
Research Projects; Human Factors Engineering; Physiology; Armed Forces (Foreign); Human Factors Laboratories

20040008418 Swedish Defence Research Establishment, Linkoeping, Sweden
Human Performance Measurement Methods for the Armored Vehicles Domain
Castor, M.; Naehlinder, S.; Lindstroem, P.; May 2002; 56 pp.; In Swedish
Report No.(s): PB2004-101530; FOI-R-0927-SE; Copyright; Avail: National Technical Information Service (NTIS)

The main battle tank and armored personal carriers of today are to a larger and larger extent equipped with command and control systems, information systems and sophisticated sensors to improve their battle effectiveness. The result is that the crew

is forced to process more and more information during a mission. Great effort must be invested during the design of new information systems so that the main-system interaction process is optimized and information overload avoided. As a part of the Swedish systems development project WSC (Warning and countermeasures system) for armored vehicles researchers from the Man System Interaction Department at FOI have performed human performance measurements on tank crews during 2002 and 2003. The toolbox of measures that have been developed in the research project 'Mental Workload and Performance Measurement' have been developed to support system development, comparisons between simulated and real exercises etc. Earlier research and human performance measurements have primarily been conducted in the aviation domain and have here been modified for use in the armored vehicles domain. Three main types of measure have been tried: subjective ratings, psychophysiological measures and objective performance measures. The methodology is here applied in a 'new' domain and the collected psychophysiological data must be analyzed to see what they mean in the domain of armored vehicles. The results presented in the report are thus to be regarded as examples of the types of results the measures can provide.
NTIS
Tanks (Combat Vehicles); Workloads (Psychophysiology); Human Factors Engineering; Countermeasures; Human Performance

20040008546 National Defence Research Establishment, Umea, Sweden
Effects of Body Armour on Soldier's Physical Load and Performance
Danielsson, U.; Oct. 2002; 32 pp.; In Swedish
Report No.(s): PB2004-101266; FOI-R-0563-SE; Copyright; Avail: National Technical Information Service (NTIS)

This literature survey focuses on the effect of body amour on the soldier's physical and mental strain and performance as well as risk of injury. The ideal body armor covers the entire body surface, has a protection level sufficient to stop high velocity bullets, is light, flexible and disturbs not the human head balance. Such body armor is unrealistic, so far. An important issue is how to design a body armor giving both sufficient protection and wear acceptance; According to the literature a body armor is characterized as: It (a) reduces the risk of injury at hit, (b) if hit the injury might be less serious, (c) has sometimes low wear acceptance, (d) is less flexible if parts are overlapping, (e) results in physical and sometimes mental loads, (f) reinforced with (ceramic) plates increases the load (g) may affect lung ventilation (h) often increases metabolic heat production, (i) often increases human heat load, (j) often increase water consumption, (k) 'ventilation' does not improve thermal comfort, (l) impairs performance of backpack hip belt, (m) impairs movability, (n) may impair the combat effectiveness. Body armor (passive protection) has negative effects on movability and physical endurance (active protection) increase the exposure to enemy fire.
NTIS
Human Performance; Armor; Protection; Human Body; Loads (Forces); Literature

20040008548 National Defence Research Establishment, Umea, Sweden
Position and Work Load in the Field. Human Measurements and Estimations for GPS-Data
Danielsson, U.; Grambo, S.; Apr. 2003; 44 pp.; In Swedish
Report No.(s): PB2004-101279; FOI-R-0683-SE; Copyright; Avail: National Technical Information Service (NTIS)

Basic GPS-technique has been used for estimation of position, transportation speed and gradient. Energy metabolic rate has been calculated from the masses of the individual and of carried burden, speed, and terrain. The metabolic rate of one subject was also measured directly using portable equipment. Comparison between measured and calculated metabolic rate was performed for various terrain: a path with moderate gradients, a flat running track, a hilly walk and motor road with a long slope. Generally the position error of the GPS was within its specification, i.e. plus or minus 15 meters. The terrain affects the accuracy of the GPS obtained position. The accuracy changes with time also. Yet, sufficient accuracy in position can be reached even in dense woods and close to rocks and even among high buildings. The lack of accuracy is more serious to the estimation of speed as a sudden error in position may give an impossible power demand. The gradient of the terrain was measured using the barometer of the GPS-unit. After averaging, its resolution, 1 meter, allowed rather accurate gradient estimations. Measured and calculated metabolic rates coincided fairly well. However, during shorter periods deviations occurred, with the magnitude depending on the dynamics of speed and gradient. Average metabolic rate, for each activity and terrain, differed not more than 3% between the techniques.
NTIS
Workloads (Psychophysiology); Transportation; Global Positioning System; Metabolism; Velocity

55
EXOBIOLOGY

Includes astrobiology; planetary biology; and extraterrestrial life. For the biological effects of aerospace environments on humans see *52 Aerospace Medicine*; on animals and plants see *51 Life Sciences*. For psychological and behavioral effects of aerospace environments see *53 Behavioral Sciences*.

20040004314 NASA Marshall Space Flight Center, Huntsville, AL, USA
Astrobiological Significance of Chemolithoautotrophic Acidophiles
Pikuta, Elena V.; Hoover, Richard B.; [2003]; 1 pp.; In English; International Society for Optical Science and Technology 48th Annual Meeting, 3-8 Aug. 2003, San Diego, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

For more than a century (since Winogradsky discovered lithoautotrophic bacteria) a dilemma in microbiology has concerned life that first inhabited the Earth. Which types of life forms first appeared in the primordial oceans during the earliest geological period on Earth as the primary ancestors of modem biological diversity? How did a metabolism of ancestors evolve: from lithoautotrophic to lithohetherotrophic and organoheterotrophic or from organoheterotrophic to organoautotrophic and lithomixotrophic types? At the present time, it is known that chemolithoheterotrophic and chemolithoautotrophic metabolizing bacteria are wide spread in different ecosystems. On Earth the acidic ecosystems are associated with geysers, volcanic fumaroles, hot springs, deep sea hydrothermal vents, caves, acid mine drainage and other technogenic ecosystems. Bioleaching played a significant role on a global geological scale during the Earth's formation. This important feature of bacteria has been successfully applied in industry. The lithoautotrophs include Bacteria and Archaea belonging to diverse genera containing thermophilic and mesophilic species. In this paper we discuss the lithotrophic microbial acidophiles and present some data with a description of new acidophilic iron- and sulfur- oxidizing bacterium isolated from the Chena Hot Springs in Alaska. We also consider the possible relevance of microbial acidophiles to Venus, Io, and acidic inclusions in glaciers and icy moons.
Author
Acidity; Thermophiles; Exobiology; Bacteria; Oxidation; Iron

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*.

20040004212 University of Central Florida, Orlando, FL, USA
I-4 Corridor Traffic Simulation and Visualization, Phase 1, Report
Radwan, E.; Ramasamy, S.; 2003; In English
Report No.(s): PB2004-100884; No Copyright; Avail: National Technical Information Service (NTIS)

The primary objective of this research project is to develop a procedure for integrating a simulation package (WATSIM) with high fidelity visualization of traffic flow along the I-4 corridor in Orlando, Florida. The objective of Phase1 of this project is to code the I-4 corridor from Kaley Avenue to Lee Road using UNITES and 3D gaming engine tool. In Phase 2, this research project attempts to evaluate the utility of the developed tool for decision-making and public hearings. Other benefits include the study of congestion/choke points and determine the effectiveness of incorporating new technologies for highway improvements such as high speed rails and other ITS deployments.
NTIS
Computerized Simulation; Florida; Traffic; Flow Visualization

20040004257 Education Statistics Services Inst., Washington, DC, USA
Computer and Internet Use by Children and Adolescents in 2001
DeBell, M.; Chapman, C.; Oct. 2003; 72 pp.; In English
Report No.(s): PB2004-101944; NCES-2004-014; No Copyright; Avail: CASI; A04, Hardcopy

This report uses data from the September Computer and Internet Use supplement to the 2001 Current Population Survey to examine the use of computers and the Internet by American children and adolescents between the ages of 5 and 17. The report examines the overall rate of use, the ways in which children and teens use the technologies, where the use occurs (home, school, and other locations), and the relationships of these aspects of computer and Internet use to demographic and socioeconomic characteristics such as children's age and race/ethnicity and their parents' education and family income. All

statistical comparisons in this report were tested for significance at the 95 percent confidence level (p less than .05), and all reported differences are statistically significant, unless otherwise noted.
NTIS
Internets; Personal Computers; Children; Education

20040004258 Federal Communications Commission, Washington, DC
Technical and Operational Issues Impacting the Provision of Wireless Enhanced 911 Services
Hatfield, D. N.; 2003; 58 pp.
Report No.(s): PB2004-101975; No Copyright; Avail: CASI; A04, Hardcopy

The purpose of this report is to convey the results of an independent inquiry into the technical and operational issues affecting the deployment of wireless Enhanced 911 ('E911') services in the USA. The inquiry was carried out by the author on behalf of the Federal Communications Commission over a six month period beginning on April 15, 2002.
NTIS
Communication Networks; Wireless Communication; Emergencies

20040004259 Federal Reserve System, Washington, DC, USA
Future of Retail Electronic Payments Systems: Industry Interviews and Analysis
Harrison, L. D.; Martin, S. S.; Apr. 2003; 40 pp.
Report No.(s): PB2004-101977; FRS/SS-175; No Copyright; Avail: CASI; A03, Hardcopy

During the past decade, consumers, businesses, and governments have continued to increase their use of electronic payments. At the same time, advances in computer processing, telecommunications, and data storage have contributed to a range of payments system innovations. Although only a limited number of these innovations have enjoyed commercial success so far, there has been some movement toward expanding the range of options and techniques for making electronic payments in the USA and increasing the overall efficiency of the payments system.
NTIS
Industries; Technology Utilization; Electronic Commerce

20040004269 Rutherford Appleton Lab., Oxford, UK
Ordering Techniques for Singly Bordered Block Diagonal Forms for Unsymmetric Parallel Sparse Direct Solvers
Hu, Y.; Scott, J. A.; Oct. 03, 2003; 24 pp.
Report No.(s): PB2004-101983; RAL-TR-2003-020; No Copyright; Avail: CASI; A03, Hardcopy

The solution of large sparse linear systems of equations is one of the cornerstones of scientific computation. In many applications is is important to be able to solve these systems as rapidly as possible. One approach for very large problems is to reorder the system matrix to bordered block diagonal form and then to solve the block system in parallel. In this paper, we consider the problem of efficiently ordering unsymmetric systems to singly bordered block diagonal form. Algorithms such as the MONET algorithm of Hu, Maguire and Blake (2000) that depend upon computing a representation of AA(sup T) can be prohibitively expensive when a single (or small number of) matrix factorizations are required. We therefore work with the graph of A(sup T) + A or B + B (sup T, where B is a row permutation of A) and propose new reordering algorithms that use only vertex separators and wide separators of this graph. Numerical experiments demonstrate that our methods are efficient and can produce bordered forms that are competitive with those obtained using MONET.
NTIS
Factorization; Linear Equations; Parallel Processing (Computers); Linear Systems

20040004336 Universidad Autonoma de Madrid, Spain
A Fuchsian Group Proof of the Hyperellipticity of Riemann Surfaces of Genus 2
Fuertes, Yolanda; Gonzalez-Diez, Gabino; Annals of the Finnish Academy of Sciences: Mathematics, Volume 28; 2003, pp. 69-74; In English; See also 20040004332
Contract(s)/Grant(s): CICYT-EX-99-03097348; CICYT-PB96-0036; Copyright; Avail: Other Sources

The fact that compact Riemann surfaces of genus 2 are always hyperelliptic is usually presented as a corollary of the Riemann-Roch theorem. Here we give a proof which involves only the theory of fuchsian groups that uniformize them.
Author
Group Theory; Riemann Manifold; Topology; Elliptic Functions

20040004337 Bonn Univ., Germany

Length Functions and Parameterizations of Teichmueller Space for Surfaces with Cusps

Hamenstaedt, Ursula; Annals of the Finnish Academy of Sciences: Mathematics, Volume 28; 2003, pp. 75-88; In English; See also 20040004332; Copyright; Avail: Other Sources

For g greater than or equal to 0 and m greater than or equal to 1 such that 2g-2+m greater than or equal to 1, let the Teichmuller space of hyperbolic metrics on a surface of genus g with m punctures, and let the partial derivative of the Teichmuller space, be its Thurston boundary. Using geodesic length functions, we construct a homeomorphism of the Teichmuller space union the partial derivative of the Teichmuller space onto a convex finite-sided polyhedron in real number P (sup 6g-6+2m).

Author

Parameterization; Function Space; Convexity; Cusps (Mathematics)

20040004345 International Univ. Bremen, Bremen, Germany

Attracting Dynamics of Exponential Maps

Schleicher, Dierk; Annals of the Finnish Academy of Sciences: Mathematics, Volume 28; 2003, pp. 3-34; In English; See also 20040004332; Copyright; Avail: Other Sources

We give a complete classification of hyperbolic components in the space of iterated exponential maps z right arrow exp(z), and we describe a preferred parametrization of those components. More precisely, we associate to every hyperbolic component of period n a finite symbolic sequence of length n - 1, we show that every such sequence is realized by a hyperbolic component, and the hyperbolic component specified by any such sequence is unique. This leads to a complete classification of all exponential maps with attracting dynamics, which is a fundamental step in the understanding of exponential parameter space.

Author

Parameterization; Exponential Functions; Dynamics; Analysis (Mathematics)

20040004346 Canterbury Univ., Christchurch, New Zealand

A Generalized Nevanlinna Theorem for Supertemperatures

Watson, Neil A.; Annals of the Finnish Academy of Sciences: Mathematics, Volume 28; 2003, pp. 35-54; In English; See also 20040004332; Copyright; Avail: Other Sources

A new proof of Nevanlinna's first fundamental theorem for supertemperatures enables us to generalize the result to cover the case of the mean values of supertemperatures over level surfaces of Green functions generally. Generalizations in another direction are also obtained.

Author

Theorems; High Temperature; Superharmonics; Functions (Mathematics)

20040004347 Joensuu Univ., Finland

Regulated Domains and Bergman Type Projections

Taskinen, Jari; Annals of the Finnish Academy of Sciences: Mathematics, Volume 28; 2003, pp. 55-68; In English; See also 20040004332

Contract(s)/Grant(s): Proj. 38954; Copyright; Avail: Other Sources

We analyze the relations of the geometry of a regulated complex domain OMEGA with the existence of Bergman type projections from L(sup P) (sub omega) (OMEGA) onto the Bergman space A(sup p) (sub omega) (OMEGA). The main technical device is a Muckenhoupt type weight condition. In particular we find bounded Bergman type projections on A(sup p)(OMEGA) even in the case OMEGA has arbitrary inward or outward cusps. As a consequence, A(sup p) (sub omega) (OMEGA) is isomorphic as a Banach space to l(sub p).

Author

Bergman Operator; Analysis (Mathematics); Projective Geometry; Functions (Mathematics)

20040005889 NASA Langley Research Center, Hampton, VA, USA

Strategy-Enhanced Interactive Proving and Arithmetic Simplification for PVS

DiVito, Ben L.; [2003]; 13 pp.; In English; 1st International Workshop on Design and Application of Strategies/Tactics in Higher Order Logics, 8 Sep. 2003, Rome, Italy

Contract(s)/Grant(s): RTA 704-03-50-01; No Copyright; Avail: CASI; A03, Hardcopy

We describe an approach to strategy-based proving for improved interactive deduction in specialized domains. An experimental package of strategies (tactics) and support functions called Manip has been developed for PVS to reduce the tedium of arithmetic manipulation. Included are strategies aimed at algebraic simplification of real-valued expressions. A general deduction architecture is described in which domain-specific strategies, such as those for algebraic manipulation, are supported by more generic features, such as term-access techniques applicable in arbitrary settings. An extended expression language provides access to subterms within a sequent.
Author
Arithmetic; Simplification; Theorem Proving; Approximation

20040006524 National Center for Education Statistics, Washington, DC, USA
Nation's Report Card Mathematics Highlights 2003. Fourth- and Eighth-Graders' Average Mathematics Scores Increase
2003; In English
Report No.(s): PB2004-101946; NCES-2004-451; No Copyright; Avail: National Technical Information Service (NTIS)
Since 1969 the National Assessment of Educational Progress (NAEP) has been an ongoing nationally representative indicator of what American students know and can do in major academic subjects. Over the years, NAEP has measured students' achievement in many subjects, including reading, mathematics, science, writing, U.S. history, geography, civics, and the arts. In 2003, NAEP conducted a national and state assessment in mathematics at grades 4 and 8. NAEP is a project of the National Center for Education Statistics (NCES) within the Institute of Education Sciences of the U.S. Department of Education, and is overseen by the National Assessment Governing Board (NAGB).
NTIS
Education; Mathematics

20040008281 Stanford Linear Accelerator Center, Stanford, CA, USA
Abstract Applets: A Method for Integrating Numerical Problem-Solving into the Undergraduate Physics Curriculum
Peskin, M. E.; Feb. 2003; In English
Report No.(s): DE2003-812625; SLAC-PUB-9616; No Copyright; Avail: National Technical Information Service (NTIS)
In upper-division undergraduate physics courses, it is desirable to give numerical problem-solving exercises integrated naturally into weekly problem sets. I explain a method for doing this that makes use of the built-in class structure of the Java programming language. I also supply a Java class library that can assist instructors in writing programs of this type.
NTIS
Numerical Analysis; Problem Solving; Physics; Education

20040008402 Brandeis Univ., Waltham, MA, USA
High Performance Compression of Science Data
Storer, James A.; Carpentieri, Bruno; Cohn, Martin; August 1994; 35 pp.; In English
Contract(s)/Grant(s): NAS5-32337; USRA-555-11/NASA; No Copyright; Avail: CASI; A03, Hardcopy
Two papers make up the body of this report. One presents a single-pass adaptive vector quantization algorithm that learns a codebook of variable size and shape entries; the authors present experiments on a set of test images showing that with no training or prior knowledge of the data, for a given fidelity, the compression achieved typically equals or exceeds that of the JPEG standard. The second paper addresses motion compensation, one of the most effective techniques used in interframe data compression. A parallel block-matching algorithm for estimating interframe displacement of blocks with minimum error is presented. The algorithm is designed for a simple parallel architecture to process video in real time.
Author
Data Compression; Parallel Processing (Computers); Architecture (Computers); Computer Systems Performance

20040008452 Stanford Linear Accelerator Center, Stanford, CA, USA
3D Image Reconstruction Determination of Pattern Orientation
Blankenbecler, R.; Mar. 13, 2003; 20 pp.; In English
Report No.(s): DE2003-812988; SLAC-PUB-9645; No Copyright; Avail: Department of Energy Information Bridge
The problem of determining the euler angles of a randomly oriented 3-D object from its 2-D Fraunhofer diraction patterns is discussed. This problem arises in the reconstruction of a positive semi-definite 3-D object using oversampling techniques. In such a problem, the data consists of a measured set of magnitudes from 2-D tomographic images of the object at several

unknown orientations. After the orientation angles are determined, the object itself can then be reconstructed by a variety of methods using oversampling, the magnitude data from the 2-D images, physical constraints on the image and then iteration to determine the phases.
NTIS
Image Reconstruction; Three Dimensional Models; Image Analysis; Tomography

20040008454 Stanford Linear Accelerator Center, Stanford, CA, USA
3D Image Reconstruction Hamiltonian Method for Phase Recovery
Blankenbecler, R.; Mar. 13, 2003; 16 pp.; In English
Report No.(s): DE2003-812989; SLAC-PUB-9646; No Copyright; Avail: Department of Energy Information Bridge
The problem of reconstructing a positive semi-definite 3-D image from the measurement of the magnitude of its 2-D fourier transform at a series of orientations is explored. The phase of the fourier transform is not measured. The algorithm developed here utilizes a Hamiltonian, or cost function, that at its minimum provides the solution to the stated problem. The energy function includes both data and physical constraints on the charge distribution or image.
NTIS
Image Reconstruction; Three Dimensional Models; Hamiltonian Functions

20040008463
Monitoring the Digital Divide
Canessa, E.; Cerdeira, H. A.; Matthews, W.; Cottrell, R. L.; May 2003; In English
Report No.(s): DE2003-813037; SLAC-PUB-9730; No Copyright; Avail: National Technical Information Service (NTIS)
It is increasingly important to support the large numbers of scientists working in remote areas and having low-bandwidth access to the Internet. This will continue to be the case for years to come since there is evidence from PingER performance measurements that the, so-called, digital divide is not decreasing. In this work, we review the collaborative work of The Abdus Salam International Center for Theoretical Physics (ICTP) in Trieste a leading organization promoting science dissemination in the developing world- and SLAC in Stanford, to monitor by PingER, Universities and Research Institutions all over the developing world following the recent Recommendations of Trieste to help bridge the digital divide. As a result, PingER's deployment now covers the real-time monitoring of worldwide Internet performance and, in particular, West and Central Africa for the first time. We report on the results from the ICTP sites and quantitatively identify regions with poor performance, identify trends, discuss experiences and future work.
NTIS
Bandwidth; Internets; Remote Regions; Monitors

20040008510 Swedish Defence Research Establishment, Linkoeping
The Gaze-Tracker. Development and Applications
Gustafsson, T.; Carleberg, P.; Feb. 2003; In Swedish
Report No.(s): PB2004-100951; FOI-R-0826-SE; Copyright; Avail: National Technical Information Service (NTIS)
This paper describes the development of a gaze-controlled computer graphics system. The paper discusses the system from a computer science and technical point of view. Gaze-controlled applications, which have been implemented in the system are presented and discussed. The emphasis of the discussion is laid on the application dynamic resolution.
NTIS
Tracking (Position); Computer Graphics; Computer Programs; Display Devices; Target Recognition

20040008516 Swedish Defence Research Establishment, Linkoeping, Sweden
Roek, Vattendimma) i en Komplex Bakgrundsmilijoe (Real Time Simulations of Target Seekers/Trackers and Countermeasures (Multispectral Smoke and Waterfog) in a Complex Background
Wigren, C.; Dec. 2002; In Swedish
Report No.(s): PB2004-100964; FOI-R-0694-SE; Copyright; Avail: National Technical Information Service (NTIS)
Simulations can be used to prepare and evaluate multispectral smoke (e.g. multispectral waterfog) in field trials and to extend the evaluation using a synthetic environment. An adaptation of the models to real time enhances the usability of the models. How such an adaptation can be made is discussed. The discussion is divided into two parts. One part is about real time graphics (which for instance is used when the countermeasure is modeled) and the other part is about image processing in real time (used in models of target tracker). A real time target tracker can be used to model advance algorithms (i.e.

multisensor trackers) and also enables the ability to directly use the signal from the sensor during the field trial.
NTIS
Countermeasures; Targets; Computerized Simulation

20040008521 Linkoeping Univ., Sweden
System Development with User Participation in Theory and Practice: A Case Study Within the Swedish Military
Jonsson, T.; Stenius, J.; Dec. 2002; In Swedish
Report No.(s): PB2004-100966; FOI-R-0657-SE; Copyright; Avail: National Technical Information Service (NTIS)

The report is a case study of a system development project within the Armed Forces which is called Command and Control Combat System for Battalions. The purpose has been to evaluate the project against theories of user-centered design and traditional system development. Several participators in the project have been interviewed as well as one expert in military systems development.
NTIS
Evaluation; Systems Engineering; Command and Control; Defense Program

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*.

20040004082 Carnegie-Mellon Univ., Pittsburgh, PA
A Concurrent Logical Framework I: Judgments and Properties
Watkins, Kevin; Cervesato, Iliano; Pfenning, Frank; Walker, David; May 2003; 41 pp.; In English
Contract(s)/Grant(s): N00173-00-C-2086
Report No.(s): AD-A418517; CMU-CS-02-101; No Copyright; Avail: CASI; A03, Hardcopy

The Concurrent Logical Framework, or CLF, is a new logical framework in which concurrent computations can be represented as monadic objects, for which there is an intrinsic notion of concurrency. It is designed as a conservative extension of the linear logical framework LLF with the synchronous connectives (circle multiply, 1, !, and there exists) of intuitionistic linear logic, encapsulated in a monad. LLF is itself a conservative extension of LF with the asynchronous connectives (logical negation, & and T). The present report, the first of two technical reports describing CLF, presents the frame- work itself and its metatheory. A novel, algorithmic formulation of the underlying type theory concentrating on canonical forms leads to a simple notion of definitional equality for concurrent computations in which the order of independent steps cannot be distinguished. The new formulation of the framework constitutes an original contribution even for the LF fragment. For many additional examples illustrating the use of the framework to specify and reason about object systems of interest, the reader is referred to the companion technical report on applications CPWW02.
DTIC
Synchronism; Canonical Forms; Algorithms

20040004190 National Chiao Tung Univ., Hsinchu, Taiwan, Province of China
A Combination Logic Design for a High Speed IEEE 802.11 MAC Controller
Li, Ren-Zong; Huang, Shang-Pin; Lin, Fu-Shung; Hong, Ming-Tsung; Chen, Po-Ning; Journal of the Chinese Institute of Engineers, Volume 26, No. 2; March 2003, pp. 255-259; In English; See also 20040004187
Contract(s)/Grant(s): NSC-89-E-FA06-2.4; Copyright; Avail: Other Sources

In this paper, we propose a pure combinational logic design for the implementation of IEEE802.11 Medium Access Control (MAC) protocol, in contrast to firmware implementation based on an embedded micro-engine. In order to have a timely response, a Control Frame Handler is also included in our MAC controller. A further improvement for timely manipulation on the time-critical management frames (such as Beacon, ATIM and Probe Response) is subsequently developed in our revised edition. Equipped with a self-developed PCMCIA unit, the functions of our MAC controller have been verified using two Altera EPF 10K-100 ARC240-2 FPGAs in an on-line MAC-to-MAC data exchange fashion. Experimental results show that a pure combinational logic design can easily achieve a baseband-interfacing throughput of over-100 Mbps with a cost-effect gate count of 21702.
Author
Protocol (Computers); Logic Design; Firmware; Controllers; Access Control

20040006506 Naval Postgraduate School, Monterey, CA
Dynamic Channel Allocation
Kaminsky, Andrew D.; Sep. 2003; 211 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418595; No Copyright; Avail: CASI; A10, Hardcopy

Dynamic Channel Allocation (DCA) offers the possibility of capturing unused channel capacity by allocating unused resources between competing network nodes. This can reduce or possibly eliminate channels sitting idle while information awaits transmission. This holds potential for increasing throughput on bandwidth constrained networks. This thesis begins by examining channel allocation techniques currently used. Following this, a solution is proposed that utilizes two types of algorithms to dynamically allocate channels from which a computer simulation is devised. Upon gathering the results, an analysis is conducted and suggestions are given for future work in channel allocation. Chapter II discusses and compares fixed channel allocation with dynamic channel allocation. In addition, some of the algorithms used to achieve channel allocation are explored. This chapter also looks at techniques used, such as inverse multiplexing, time division multiplexed on demand, hybrid channel allocation in wireless networks, and Beowulf Ethernet channel bonding. The background information presented in this chapter gives an indication that channel allocation is still being examined and several implementations are proposed. Chapter III proposes a solution with two scheduling algorithms. One algorithm is a First Come First Serve, which gives all free dynamic channels to the first requesting fixed channel. The other algorithm is a Fair Distribution, which gives a portion of the free dynamic channels to the requesting fixed channels. A computer program is devised that simulates these algorithms, and the methods used in the program classes are described in this chapter. (27 tables, 19 figures, 38 refs.)
DTIC
Wide Area Networks; Allocations; Packet Switching; Time Division Multiplexing

20040008321 Integrated Systems Consultants, USA
TAXI Interface Demultiplexes Proprietarily Formatted Data
Newnan, Bruce G.; Ahiport, Steven F.; September 06, 2001; 3 pp.; In English
Report No.(s): NASA/NP-2001-10-00018-SSC; No Copyright; Avail: CASI; A01, Hardcopy

The 'TAXI Direct-to-Disk' interface is a special purpose interface unit for demultiplexing of data from a Racal Storeplex (or equivalent) multichannel recorder onto one or more hard disks that reside in, and/or are controlled by, a personal computer (PC). The acronym 'TAXI' signifies transparent asynchronous transceiver interface. The TAXI interface was developed for original use in capturing data from instrumentation on a test stand in a NASA rocket testing facility. The installation of the TAXI interface, in conjunction with other modifications, causes the transfer of data to take place in real time, so that the data are immediately available for review during or after the test.
Derived from text
Demultiplexing; Format; Circuits; Signal Processing; Transmitter Receivers; Data Transfer (Computers)

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.

20040004141 Naval Postgraduate School, Monterey, CA
Signal Synthesis With Dynamically-Changed Power Spectral Density in a Software Defined Radio Transmitter
Apostolou, Nikolaos; Sep. 2003; 123 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418531; No Copyright; Avail: CASI; A06, Hardcopy

The objective of this thesis is to synthesize signals with a dynamically change power spectral density, in a SDR transmitter, utilizing the most appropriate channels modulation schemes and transmission rates for communication, based on the noise profile (AWGN plus interferences) of the link in order to achieve performance within some predefined acceptable levels. The objective is obtained by simulation.
DTIC
Computer Programs; Radio Transmitters; Modulation

20040004144 Carnegie-Mellon Univ., Pittsburgh, PA

A Concurrent Logical Framework II: Examples and Applications

Cervesato, Iliano; Pfenning, Frank; Walker, David; Watkins, Kevin; May 2003; 86 pp.; In English

Contract(s)/Grant(s): N00173-00-C-2086; N00014-01-1-0432

Report No.(s): AD-A418538; CMU-CS-02-102-REV; No Copyright; Avail: CASI; A05, Hardcopy

CLF is a new logical framework with an intrinsic notion of concurrency. It is designed as a conservative extension of the linear logical framework LLF with the synchronous connectives (circle multiply, 1 !, and there exists) of intuitionistic linear logic, encapsulated in a monad. LLF is itself a conservative extension of LF with the asynchronous connectives (logical negation, & and T). In this report, the second of two technical reports describing CLF, we illustrate the expressive power of the framework by encoding several different concurrent languages including both the synchronous and asynchronous pi-calculus, an ML-like language with futures, lazy evaluation and concurrency primitives in the style of CML, Petri nets and finally, the security protocol specification language MSR. Throughout the report we assume the reader is already familiar with the formal definition of CLF. For detailed explanation and development of the type theory, please see A Concurrent Logical Framework I: Judgments and Properties WCPW02.

DTIC

Protocol (Computers); Synchronism; Security

20040004148 Naval Postgraduate School, Monterey, CA

Assessing the Potential Value of Semantic Web Technologies in Support of Military Operations

Chance, Samuel G.; Hagenston, Marty G.; Sep. 2003; 289 pp.; In English; Original contains color illustrations

Report No.(s): AD-A418544; No Copyright; Avail: CASI; A13, Hardcopy

Recent military operations have redefined the way modern warfare is waged. In a deliberate effort to achieve and retain information dominance and decision superiority, many innovative technologies have emerged to assist the human war fighter. Unquestionably, these technologies have generated resounding successes on the battlefield, the likes of which have never been seen. With all the success, however, there are still areas for improvement as the potential exists for further reducing already short sensor-to-shooter times. The current World Wide Web (WWW) is largely a human-centric information space where humans exchange and interpret data (2 Berners-Lee, 1 1999). The Semantic Web (SWEB) is not a separate Web, but an extension of the current one in which content is given well-defined meaning, better enabling computers and people to work in cooperation (Berners-Lee et al). The result is the availability of the various backgrounds, experiences, and abilities of the contributing communities through the self-describing content populating the SWEB (2 Berners-Lee, 1999). This thesis assesses current SWEB technologies that promise to make disparate data sources machine interpretable for use in the construction of actionable knowledge with the intent of further reducing sensor-to-shooter times. The adoption of the SWEB will quietly be realized and soon machines will prove to be of greater value to war fighting. When machines are able to interpret and process content before human interaction and analysis begins, their value will be further realized. This off-loading, or delegation, will produce faster sensor-to-shooter times and assist in achieving the speed required to achieve victory on any battlefield.

DTIC

Military Operations; Information Systems

20040004153 Nippon Telegraph and Telephone Public Corp., Japan

Latest Trends of Information Security Technologies

Sakurai, N.; Murata, Y.; Yoshida, Y.; NTT Technical Review, Volume 1, No. 5; August 2003, pp. 100; In English; See also 20040004150; Copyright; Avail: Other Sources

Information security technology has become more and more valued with the advance and development of e-commerce, e-government and the building of Internet-based social infrastructures. This special feature covers the latest research results and technological trends in information security technology to protect systems and digital content from various network threats.

Author

Computer Information Security; Trends

20040004187 National Taiwan Univ. of Science and Technology, Taipei, Taiwan, Province of China

Journal of the Chinese Institute of Engineers, Volume 26, No. 2

Chen, Shun-Tyan, Editor; Chou, Yi-Shyong, Editor; Shiou, Fang-Jung, Editor; Young, Der-Liang, Editor; Chen, Jean-Lien, Editor; Pan, Ching-Tsai, Editor; Chao, Ching-Kong, Editor; Chung, Chung-Ping, Editor; Lee, Liang-Sun, Editor; Chang, Kai, Editor, et al.; March 2003; 134 pp.; In English; See also 20040004188 - 20040004197; Original contains color and black and white illustrations

Report No.(s): ISSN 0253-3839; Copyright; Avail: Other Sources

The following papers were processed from the Journal of the Chinese Institute of Engineers:Evolving Robot Brains and Bodies: An Experimental Investigation; The One-Time Learning Hierarchical CMAC and the Memory Limited CA-CMAC for Image Data Compression; A Software Controlled Pulse Compression Technique Applied to Ultrasonic Non- Destructive Testing; Process Exhaust Duct System Design Using Dynamic Programming Methods; The Steady-State Behavior of the Prandtl-Reuss Material Bifurcated under Nonproportional Circular Strain Paths; Double Ignitions of Ni-AI Combustion Reactions; Measurement and Simulation of Turbulent Flow in a Steep Open-Channel with Smooth Boundary; Feedforward Artificial Neural Networks for Nutrient Removal Simulatipn in a Multiple Stage Enhanced Biological Nutrient Removal Process; Capacitive Micro Pressure Sensors with Underneath Readout Circuit Using a Standard CMOS Process;and A Combination Logic Design for a High Speed IEEE 802.1 1 MAC Controller.

CASI

Computer Programs; Software Engineering

20040004191 Tatung Univ., Taipei, Taiwan, Province of China

The One-Time Learning Hierarchical CMAC and the Memory Limited CA-CMAC for Image Data Compression

Tao, Ted; Lu, Hung-Ching; Hsu, Chau-Yun; Hung, Ta-Hsiung; Journal of the Chinese Institute of Engineers, Volume 26, No. 2; March 2003, pp. 133-145; In English; See also 20040004187

Contract(s)/Grant(s): NSC-90-2213-E-036-010; Copyright; Avail: Other Sources

Two methods to compress transmitted image data are proposed in this paper. The first method is the one-time learning hierarchical CMAC method and the second i s the memory limited CA-CMAC method for image data compression and reconstruction. The one-time learning hierarchical CMAC method is used when a coarse image needs to be sent to the receiver initially and then the image quality is gradually improved at the request of the receiver. But, when the transmitting channel data is limited, the memory limited CA-CMAC method can be used to decrease the bit rate per pixel. Both proposed methods, unlike conventional compression methods, use no filtering technique i n either compression or reconstruction. CMAC networks use a few hypercubes to learn the characteristics of the original image, so image data can be compressed without suffering from blocking effect or boundary effect. One- time learning is good enough for compressing image data, and i t has a high SNK after reconstruction.

Author

Image Reconstruction; Data Compression; Transmission; Compressing

20040004192 National Chung-Cheng Univ., Taiwan, Province of China

A Software Controlled Pulse Compression Technique Applied to Ultrasonic Non- Destructive Testing

Chang, Young-Fo; Journal of the Chinese Institute of Engineers, Volume 26, No. 2; March 2003, pp. 147-153; In English; See also 20040004187; Copyright; Avail: Other Sources

The pulse compression technique, which is widely used in Radar systems, has been successfully used in ultrasonic nondestructive testing (NDT) by hardware methods for real time display of the testing result to improve the signal-to-noise ratio (SNR). This technique transmits a linear frequency modulated signal and compresses the received signal by time delay of a linear frequency function. Therefore, the energy of the signal can be preserved during compression; the narrow output signal will have a large increase in amplitude. In this study, a programmable and flexible software method controlling a simple signal generation hardware system is proposed for the pulse compression technique i n the ultrasonic NDT. A frequency-swept ultrasonic signal under control of a programmable arbitrary function generator is transmitted to scan the specimen. The received signal is cross-correlated with the frequency-swept ultrasonic signal to compress the signal, and the signal buried in the noise can be successfully identified after the cross-correlation. The methods are illustrated by examples.

Author

Computer Programming; Ultrasonic Tests; Nondestructive Tests; Pulse Compression; Signal to Noise Ratios

20040004285 Lockheed Martin Corp., Bay Saint Louis, MS, USA
Software for Refining or Coarsening Computational Grids
Daines, Russell; Woods, Jody; August 27, 2002; 2 pp.; In English
Report No.(s): NASA/NP-2002-10-00035-SSC; No Copyright; Avail: CASI; A01, Hardcopy

A computer program performs calculations for refinement or coarsening of computational grids of the type called 'structured' (signifying that they are geometrically regular and/or are specified by relatively simple algebraic expressions). This program is designed to facilitate analysis of the numerical effects of changing structured grids utilized in computational fluid dynamics (CFD) software. Unlike prior grid-refinement and -coarsening programs, this program is not limited to doubling or halving: the user can specify any refinement or coarsening ratio, which can have a noninteger value. In addition to this ratio, the program accepts, as input, a grid file and the associated restart file, which is basically a file containing the most recent iteration of flow-field variables computed on the grid. The program then refines or coarsens the grid as specified, while maintaining the geometry and the stretching characteristics of the original grid. The program can interpolate from the input restart file to create a restart file for the refined or coarsened grid. The program provides a graphical user interface that facilitates the entry of input data for the grid-generation and restart-interpolation routines.
Author
Computer Programs; Computational Grids; Optimization

20040004372 Carnegie-Mellon Univ., Pittsburgh, PA
A Current Logical Framework: The Propositional Fragment
Watkins, Kevin; Cervesato, Iliano; Pfenning, Frank; Walker, David; Jan. 2003; 20 pp.; In English
Report No.(s): AD-A418510; No Copyright; Avail: CASI; A03, Hardcopy

We present the propositional fragment CLF of the Concurrent Logical Framework (CLF). CLF extends the Linear Logical Framework to allow the natural representation of concurrent computations in an object language. The underlying type theory uses monadic types to segregate values from computations. This separation leads to a tractable notion of definitional equality that identifies computations differing only in the order of execution of independent steps. From a logical point of view our type theory can be seen as a novel combination of lax logic and dual intuitionistic linear logic. An encoding of a small Petri net exemplifies the representation methodology, which can be summarized as 'concurrent computations as monadic expressions'
DTIC
Computer Programming; Coding; Fragments; Petri Nets

20040004376 Naval Postgraduate School, Monterey, CA
Evolving a Simulation Model Product Line Software Architecture from Heterogeneous Model Representations
Greaney, Kevin J.; Sep. 2003; 558 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418550; No Copyright; Avail: CASI; A24, Hardcopy

National- and Department-level decision-makers expect credible Department of Defense models and simulations (M&S) to provide them confidence in the simulation results, especially for mission-critical and high-risk decisions supporting National Security. Many of these large-scale, software-intensive simulation systems were autonomously developed over time, and subject to varying degrees of funding, maintenance, and life-cycle management practices, resulting in heterogeneous model representations and data. Systemic problems with distributed interoperability of these non- trivial simulations in federations' persist, and current techniques, procedures, and tools have not achieved the desired results. The Software Architecture-Based Product Line for simulation model representations, employing Architecture Readiness Levels presented in this dissertation provides an alternative methodology. The proposed four-layered M&S software architecture-based product line model enables the development of model representations supported by readiness levels. Each layer reflects a division of the software architecture-based product line. The layer represents a horizontal slice through the architecture for organizing viewpoints or views at the same level of abstraction while the software architecture-based product line represents a vertical slice. A layer may maintain multiple views and viewpoints of a software architecture-based product line. A Domain Metadata Repository prescribes the interaction between layers. We introduce the Domain Integrated Product Development Team concept.
DTIC
Computerized Simulation; Heterogeneity; Product Development

20040005848 IIT Research Inst., Lanham, MD
Feasibility of Developing a Secure Gateway
Buchanan, George A.; Scheidt, David; Apr. 10, 1992; 141 pp.; In English
Contract(s)/Grant(s): MDA903-90-D-0022
Report No.(s): AD-A418604; No Copyright; Avail: CASI; A07, Hardcopy

The DoD Gateway Information System (DGIS) effort began in the early 1980s to provide a one-stop user-friendly access to many federal and commercial databases. The present effort is to determine the feasibility of developing an intelligent, secure gateway to classified databases, such as the Defense RDT&E Online System (DROLS), and the Air Force's CIRC database, in addition to unclassified databases, such as those already available with DGIS. A secure gateway consists (conceptually) of three major components: a secure operating system, telecommunications, and application software. This report presents the results of a study of the feasibility of developing a secure gateway. Three types of characteristics required for the secure gateway are discussed: functional, security, and technical characteristics. To provide assurance of the technical feasibility of a secure gateway, trusted computing base (TCB) components are mapped to secure gateway features. Then various configuration options for developing a secure gateway are presented. System solutions for developing a secure gateway are then offered, which are followed by estimated component costs for a secure gateway. The cost of three configurations for implementing the secure gateway are offered as system solutions. Last, the certification process for a secure gateway is presented. The certification process of a secure gateway must be determined by the gateway's designated approving authority, i.e., Defense Logistics Agency (DLA) and/or National Security Agency/National Computer Security Center (NSA/NCSC).
DTIC
Computer Programs; Applications Programs (Computers); Computer Information Security; Certification

20040005863 Old Dominion Univ., VA, USA
Boltzmann Transport Code Update: Parallelization and Integrated Design Updates
Heinbockel, J. H.; Nealy, J. E.; DeAngelis, G.; Feldman, G. A.; Chokshi, S.; [2003]; 28 pp.; In English
Contract(s)/Grant(s): NCC1-404; No Copyright; Avail: CASI; A03, Hardcopy

The on going efforts at developing a web site for radiation analysis is expected to result in an increased usage of the High Charge and Energy Transport Code HZETRN. It would be nice to be able to do the requested calculations quickly and efficiently. Therefore the question arose, 'Could the implementation of parallel processing speed up the calculations required?' To answer this question two modifications of the HZETRN computer code were created. The first modification selected the shield material of Al(2219) , then polyethylene and then Al(2219). The modified Fortran code was labeled 1SSTRN.F. The second modification considered the shield material of CO2 and Martian regolith. This modified Fortran code was labeled MARSTRN.F.
Derived from text
Boltzmann Transport Equation; Computer Programs; Websites; Parallel Processing (Computers)

20040006293 Maryland Univ. Baltimore County, Catonsville, MD, USA
Phase Diversity and Space Based Imaging
Lyon, Richard G.; [2000]; 19 pp.; In English
Contract(s)/Grant(s): NAS5-32337; USRA-5555-44; No Copyright; Avail: CASI; A03, Hardcopy

The efforts of this report concentrate on the design, development and application of massively parallel model based, image processing algorithms to deconvolve, reconstruct, or enhance degraded imagery. Algorithms have been developed to deconvolve the optical response function from a noisy or corrupted image or set of images. The algorithms have been applied to Hubble Space Telescope (HST) Faint Object Camera (FOC) imagery, to the Solar and Heliospheric Observatory (SOHO) Large Angle Spectrometric Coronagraph (LASCO) imagery as well as groung based hyperspectral Fabry-Perot etalon 3D data cubes.
Author
Design Analysis; Product Development; Algorithms; Image Processing

20040006300 Wisconsin Univ., Madison, WI, USA
Paradise: A Parallel Information System for EOSDIS
DeWitt, David; [1996]; 7 pp.; In English
Contract(s)/Grant(s): NAG5-7144; No Copyright; Avail: CASI; A02, Hardcopy

The Paradise project was begun-in 1993 in order to explore the application of the parallel and object-oriented database

system technology developed as a part of the Gamma, Exodus. and Shore projects to the design and development of a scaleable, geo-spatial database system for storing both massive spatial and satellite image data sets. Paradise is based on an object-relational data model. In addition to the standard attribute types such as integers, floats, strings and time, Paradise also provides a set of and multimedia data types, designed to facilitate the storage and querying of complex spatial and multimedia data sets. An individual tuple can contain any combination of this rich set of data types. For example, in the EOSDIS context, a tuple might mix terrain and map data for an area along with the latest satellite weather photo of the area. The use of a geo-spatial metaphor simplifies the task of fusing disparate forms of data from multiple data sources including text, image, map, and video data sets.
Author
Object-Oriented Programming; Data Bases; Satellite Imagery; Video Data

20040006337 Bay Area Research Corp., Orinda, CA, USA
[Activities of Bay Area Research Corporation]
[2003]; 7 pp.; In English
Contract(s)/Grant(s): NASW-99017; No Copyright; Avail: CASI; A02, Hardcopy

During the final year of this effort the HALFSHEL code was converted to work on a fast single processor workstation from it s parallel configuration. This was done because NASA Ames NAS facility stopped supporting space science and we no longer had access to parallel computer time. The single processor version of HALFSHEL was upgraded to address low density cells by using a a 3-D SOR solver to solve the equation Delta central dot E = 0. We then upgraded the ionospheric load packages to provide a multiple species load of the ionosphere out to 1.4 Rm. With these new tools we began to perform a series of simulations to address the major topic of this research effort; determining the loss rate of O(sup +) and O2(sup +) from Mars. The simulations used the nominal Parker spiral field and in one case used a field perpendicular to the solar wind flow. The simulations were performed for three different solar EUV fluxes consistent with the different solar evolutionary states believed to exist before today. The 1 EUV case is the nominal flux of today. The 3 EUV flux is called Epoch 2 and has three times the flux of todays. The 6 EUV case is Epoch 3 and has 6 times the EUV flux of today.
Derived from text
Computer Programs; Extreme Ultraviolet Radiation; Parallel Computers; Solar Radiation

20040006359 NASA Langley Research Center, Hampton, VA, USA
Team Software Development for Aerothermodynamic and Aerodynamic Analysis and Design
Alexandrov, N.; Atkins, H. L.; Bibb, K. L.; Biedron, R. T.; Carpenter, M. H.; Gnoffo, P. A.; Hammond, D. P.; Jones, W. T.; Kleb, W. L.; Lee-Rausch, E. M., et al.; November 2003; 50 pp.; In English
Contract(s)/Grant(s): 762-20-21-80
Report No.(s): NASA/TM-2003-212421; L-18296; No Copyright; Avail: CASI; A03, Hardcopy

A collaborative approach to software development is described. The approach employs the agile development techniques: project retrospectives, Scrum status meetings, and elements of Extreme Programming to efficiently develop a cohesive and extensible software suite. The software product under development is a fluid dynamics simulator for performing aerodynamic and aerothermodynamic analysis and design. The functionality of the software product is achieved both through the merging, with substantial rewrite, of separate legacy codes and the authorship of new routines. Examples of rapid implementation of new functionality demonstrate the benefits obtained with this agile software development process. The appendix contains a discussion of coding issues encountered while porting legacy Fortran 77 code to Fortran 95, software design principles, and a Fortran 95 coding standard.
Computer Programs; Software Engineering; Aerothermodynamics

20040006448 Virginia Univ., Charlottesville, VA, USA
High Performance Databases For Scientific Applications
French, James C.; Grimshaw, Andrew S.; March 1997; 18 pp.; In English
Contract(s)/Grant(s): NAS5-32337; USRA-5555-25
Report No.(s): UVA/528481/CS97/101; No Copyright; Avail: CASI; A03, Hardcopy

The goal for this task is to develop an Extensible File System (ELFS). ELFS attacks the problem of the following: 1. Providing high bandwidth performance architectures; 2. Reducing the cognitive burden faced by applications programmers when they attempt to optimize; and 3. Seamlessly managing the proliferation of data formats and architectural differences. The

approach for ELFS solution consists of language and run-time system support that permits the specification on a hierarchy of file classes.
Author
Data Bases; Computer Systems Programs; Parallel Programming; File Maintenance (Computers)

20040006449 Texas Univ., Arlington, TX, USA
Parallel Knowledge Discovery from Large Complex Databases
Cook, Diane J.; Holder, Lawrence B.; [1996]; 8 pp.; In English
Contract(s)/Grant(s): NAS5-32337; USRA-5555-16; No Copyright; Avail: CASI; A02, Hardcopy

NASA is focusing on grand challenge problems in Earth and space sciences. Within these areas of science, new instrumentation will be providing scientists with unprecedented amounts of unprocessed data. Our goal is to design and implement a system that takes raw data as input and efficiently discovers interesting concepts that can target areas for further investigation and can be used to compress the data. Our approach will provide an intelligent parallel data analysis system.
Author
Data Bases; Earth Sciences; Aerospace Sciences; Parallel Processing (Computers)

20040006473 Northrop Grumman Information Technology, Inc., Reston, VA, USA
Joint Battlespace Infosphere (JBI) Core Services Evaluation
Scheiderich, Stephen T.; Aug. 2003; 59 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-00-D-0159; Proj-JBIT
Report No.(s): AD-A418493; AFRL-IF-RS-TR-2003-189; No Copyright; Avail: CASI; A04, Hardcopy

The focus of this work was to provide a methodology and process for evaluating JBI prototypes and providing feedback to the government for iterative development purposes. A methodology was developed and test plans generated for a generic JBI prototype evaluation from a functional point of view. Performance and scalability metrics were also identified as part of this effort. System engineering support (and documents) for the Mercury class of the JBI prototypes was also provided and is documented here.
DTIC
Computer Programs; Feedback; Prototypes

20040006490 Naval Postgraduate School, Monterey, CA
Correlation between Quality Management Metric and People Capability Maturity Model
Dahmann, Franz-Dietmar; Sep. 2003; 105 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418576; No Copyright; Avail: CASI; A06, Hardcopy

The quality of software management in a development project is a major factor in determining the success of a project. The four main areas in which a software project manager can affect the outcome of a project are people management, requirements management, estimation/planning management, and risk management. People management is the management area with the highest influence on project success. In this thesis, a quality management metric (QMM) was evaluated with respect to its conformance with an established people capability maturity model (P-CMM). The survey elements of the QMM were mapped to the processes described in the maturity model. The analysis indicates a high level of conformance of the QMM with the P-CMM. The results of applying the QMM can be used to characterize the quality of software management. Based on the correlation of QMM survey elements to processes of the maturity model, the results can then be used to identify processes that need improvement to increase the likelihood of program success. Future work includes further refining and assessing the QMM. As new models in the field of software development management evolve, the QMM will need to be re-evaluated with respect to these new models. (17 tables, 16 figures, 20 refs.)
DTIC
Software Engineering; Project Management; Management Planning; Success Project

20040006498 Naval Postgraduate School, Monterey, CA
An Open Architecture for Defense Virtual Environment Training Systems
Matthews, Stephen W.; Miller, Kenneth H.; Sep. 2003; 197 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418582; No Copyright; Avail: CASI; A09, Hardcopy

This thesis develops a proposed software system that is usable by programmers to create virtual reality training environment applications for military (or other) use in which characters and character animation are necessary. Such

applications are becoming more necessary to fill a gap in military training due to lack of personnel, time, money, and resources, Creation of virtual environment training applications allows military units to augment procedural training in preparation for live or physically simulated training. In the current environment of lesser training and more military requirements, such augmentation will only serve to benefit unit capabilities. While such systems for developing virtual environment applications are commercially available, those systems are costly in both licensing and usage fees. One of the tenets of the system that this thesis develops is that this system will be tree and partially open source, such that programmers can create low cost virtual environment applications for military training, and such that experienced programmers can modify or add to the system in order to improve or enhance its capabilities to meet their needs.
DTIC
Virtual Reality; Low Cost; Education

20040006519 Naval Research Lab., Stennis Space Center, MS
A Procedure to Edit Deep-Towed Navigation Data
Megnin, Charles; Wood, Warren T.; Lindwall, Dennis A.; Gettrust, Joseph F.; Feb. 28, 2003; 37 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418633; NRL/MR-MM/7430--03-8294; No Copyright; Avail: CASI; A03, Hardcopy

While data acquired from deep-towed seismic surveys offer the potential of greatly increased image resolution over the surface-towed approach, accurate positioning constitutes an important challenge which, if not performed accurately, could offset the benefits gained by the proximity between the source and the ocean bottom. We present here a new procedure that optimally determines relay and receiver positions at all times, using the Long Baseline acoustic navigation system. Navigation and seismic data were acquired during the October 2002 Cascadia Margin cruise.
DTIC
Computer Programs; Deep Water; Positioning

20040008152 Naval Postgraduate School, Monterey, CA
Toward XML Representation of NSS Simulation Scenario for Mission Scenario Exchange Capability
Hout, Gary K.; Sep. 2003; 127 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418591; No Copyright; Avail: CASI; A07, Hardcopy

The Naval Simulation System (NSS) is a powerful modeling and analysis tool developed by the Navy for use in performing campaign analysis, naval forces studies, and course of action analysis. NSS has the ability to exchange scenario information, but this capability is limited. The purpose of this research is to develop a more generalized way for NSS to exchange scenario data through customized use of the Extensible Markup Language (XML) family of data-markup language specifications. The driving idea behind the development of markup languages has been to separate the presentation (form) of a document from its content (data). This concept led to the development of XML for defining new languages to structure data. XML-based applications can export the contents of internal structures in such a way that another application can easily import the data that is unique to its own input requirements. The same XML source document can be read by many applications, each of which can transform the data into their unique input requirements, using the XML family of specifications. XML validation capabilities ensure that data files can be error free, eliminating many runtime application problems. NSS is currently developed as an application that accesses information from a proprietary commercial object-oriented database that does not support XML interchange. Extending NSS to become an XML-based application is now possible using an XML schema that represents the NSS database. Because the proprietary NSS codebase is not readily modifiable, such XML scenario import/export is achieved via text-based data file conversions. Development of an NSS XML schema and exemplars opens up a powerful new direction for future work. (3 tables, 19 figures, 19 refs.)
DTIC
Optimization; Object-Oriented Programming; Document Markup Languages; Programming Languages

20040008153 Naval Postgraduate School, Monterey, CA
3D Battlespace Visualization Using Operational Planning Data
Hutton, Claude O., Jr; Sep. 2003; 126 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418592; No Copyright; Avail: CASI; A07, Hardcopy

In modern combat operations today, the display of operational data is still tied to stove-piped and proprietary systems and software. Additionally, combat systems are still using 2D displays of the battlefield to reflect a picture of the battlefield to the warfighter. Stepping away from stove- piped and proprietary systems and reflecting a 3D picture of the battlefield is the

direction that this thesis research explores. Research is conducted to explore technologies needed to provide operational forces with web-based 3D visualizations of operational data. Technologies used in this research are Extensible Mark-up Language (XML), Extensible Stylesheet Language for Transformation (XSLT), JAVA, Extensible 3D Graphics (X3D) and Virtual Reality Modeling Language (VRML). A prototype application is developed that allows for the 3D display of operational data. The research demonstrates how operational data can be stored in a database and accessed through a web-based 3D representation of the area of operation. Data sets used in this prototype include Digital Terrain Elevation Data and operational planning data. Access to the data is provided through a web-based interface. The web-based view of the data provides both 2D and 3D views. This research shows that current open source technology can provide the warfighter with a web-based 3D view of the battlefield. (2 tables, 43 figures, 18 refs.)
DTIC
Computer Programs; Computer Systems Programs; Data Processing; Display Devices; Operational Problems

20040008263 Florida State Univ., Tallahassee, FL, USA
An Investigation of the Flow Physics of Acoustic Liners by Direct Numerical Simulation
Watson, Willie R., Technical Monitor; Tam, Christopher; [2004]; 10 pp.; In English
Contract(s)/Grant(s): NCC1-01026; No Copyright; Avail: CASI; A02, Hardcopy

This report concentrates on reporting the effort and status of work done on three dimensional (3-D) simulation of a multi-hole resonator in an impedance tube. This work is coordinated with a parallel experimental effort to be carried out at the NASA Langley Research Center. The outline of this report is as follows : 1. Preliminary consideration. 2. Computation model. 3. Mesh design and parallel computing. 4. Visualization. 5. Status of computer code development. 1. Preliminary Consideration.
Derived from text
Numerical Analysis; Computer Programs; Parallel Processing (Computers); Fluid Dynamics

20040008303 Carnegie-Mellon Univ., Pittsburgh, PA
Demonstrating the Impact and Benefits of CMMI (Trademark): An Update and Preliminary Results
Goldenson, Dennis R.; Gibson, Diane L.; Oct. 2003; 54 pp.; In English
Contract(s)/Grant(s): F19628-00-C-0003
Report No.(s): AD-A418481; CMU/SEI-2003-SR-009; No Copyright; Avail: CASI; A04, Hardcopy

There is a widespread demand for evidence about the impact and benefits of process improvement based on Capability Maturity Model Integration (CMMI) models. Much has been documented about the practice of CMM-based process improvement and its value for the development and maintenance of software and software intensive systems; however, the existing information is sometimes outdated and there are increasing calls for evidence directly based on CMMI experience. This special report presents selected results from 12 case studies drawn from 11 organizations. While still limited, the case studies provide credible evidence that CMMI- based process improvement can help organizations achieve better project performance and produce higher quality products. The report also describes plans for gathering further evidence from organizations using CMMI models.
DTIC
Software Engineering; Systems Integration; Mathematical Models

20040008362 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Pruning Neural Networks with Distribution Estimation Algorithms
Cantu-Paz, E.; Jan. 15, 2003; 18 pp.; In English
Report No.(s): DE2003-15004416; UCRL-JC-151521; No Copyright; Avail: Department of Energy Information Bridge

This paper describes the application of four evolutionary algorithms to the pruning of neural networks used in classifcation problems. Besides of a simple genetic algorithm (GA), the paper considers three distribution estimation algorithms (DEAs): a compact GA, an extended compact GA, and the Bayesian Optimization Algorithm. The objective is to determine if the DEAs present advantages over the simple GA in terms of accuracy or speed in this problem. The experiments used a feed-forward neural network trained with standard back-propagation and public-domain and artificial data sets. The pruned networks seemed to have better or equal accuracy than the original fully-connected networks. Only in a few cases, pruning resulted in less accurate networks. We found few differences in the accuracy of the networks pruned by the four EAs,

but found important differences in the execution time. The results suggest that a simple GA with a small population might be the best algorithm for pruning networks on the data sets we tested.
NTIS
Algorithms; Classifying; Neural Nets; Evolution (Development)

20040008533 Northrop Grumman Information Technology, Inc., Fairborn, OH, USA
Effects-Based Resource Planner (EBRP): Advanced Demonstration
Vincent, Patrick J.; Stute, Nicholas J.; Mar. 2003; 33 pp.; In English
Contract(s)/Grant(s): F33615-99-D-6001; Proj-1710
Report No.(s): AD-A418709; AFRL-HE-WP-TR-2003-0096; No Copyright; Avail: CASI; A03, Hardcopy

This report documents the results of research activities associated with the design, development, and demonstration of the Effects-Based Resource Planner (EBRP). The overall objectives of the EBRP research effort were to demonstrate how the Cognitive Agent Architecture (Cougaar) could be applied to 1) improve the overall speed and quality of the Master Air Attack Planning (MAAP) process, 2) reduce planning (and re-planning) cycle times associated with the overall MAAP/Air Tasking Order (ATO) development process, 3) improve the confidence in MAAP supportability, and 4) reduce the workload requirements for logistics and mission planners associated with the MAAP planning process.
DTIC
Logistics Management; Software Engineering

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COMPUTER SYSTEMS

Includes computer networks and distributed processing systems. For information systems see *82 Documentation and Information Science*. For computer systems applied to specific applications, see the associated category.

20040004151 Nippon Telegraph and Telephone Public Corp., Musashino, Japan
Operations Systems for Type-X and the MPLS Network
Oshikiri, Kenichi; Honma, Yasushi; Oimatsu, Toshio; Nishizono, Toshihiro; NTT Technical Review, Volume 1, No. 5; August 2003, pp. 63-67; In English; See also 20040004150; Copyright; Avail: Other Sources

One of the keys to maintaining a carrier-class multiprotocol label switching (MPLS) network system is an operations system for designing and managing highly reliable large-scale MPLS paths and achieving a managed network. This article describes the operations system (X-OSS) developed to achieve this goal.
Author
Computer Networks; Switching; Operating Systems (Computers)

20040004157 Nippon Telegraph and Telephone Public Corp., Musashino, Japan
High-capacity, Highly Reliable Core Router Type-X320/80
Matsuoka, Yasuyuki; Kakishita, Takuya; Abe, Shoichi; NTT Technical Review, Volume 1, No. 5; August 2003, pp. 53-57; In English; See also 20040004150; Copyright; Avail: Other Sources

This article presents an overview of our high-capacity router, Type-X320/80, which is suitable for a carrier-grade network, and describes its features. It provides high reliability, excellent quality-of-service control, multiprotocol support, and good cost-performance. It can transfer up to 392/90 million IP packets per second.
Author
Internets; Computer Components; Data Transmission; Packet Transmission; Packet Switching

20040004159 Nippon Telegraph and Telephone Public Corp., Musashino, Japan
MovingFirewall: A Countermeasure against Distributed Denial of Service Attacks
Fuji, Hitoshi; Chen, Eric Y.; Okada, Koichi; Kashiwa, Dai; NTT Technical Review, Volume 1, No. 5; August 2003, pp. 85-88; In English; See also 20040004150; Copyright; Avail: Other Sources

Distributed denial of service (DDoS) attacks have recently attracted a lot of attention because of their potential threat to the Internet community. Conventional countermeasures deployed by end users alone are limited in their ability to secure IP networks from DDoS attacks. This article presents an innovative technology called MovingFirewall, which can be deployed

by network providers to effectively cope with DDoS attacks by mitigating attack floods at multiple upstream nodes near the attacking hosts.
Author
Computer Security; Countermeasures; Firewalls (Computers)

20040004161 Nippon Telegraph and Telephone Public Corp., Japan
Wireless Bridging and Routing Method Employing a Novel Frame Transfer Protocol with Shortcut
Ichikawa, T.; Iizuka, M.; Morikura, M.; Matsue, H.; NTT Technical Review, Volume 1, No. 5; August 2003, pp. 100; In English; See also 20040004150; Copyright; Avail: Other Sources; Abstract Only

This paper presents a new wireless bridging and routing method for ad-hoc networks comprised of wireless bridges and/or wireless routers that comply with IEEE 802.1 I , a global standard for wireless LAN systems. This wireless bridging and routing method uses a novel frame transfer protocol with shortcut (FRASH) that we developed; that users can establish flexible and high speed ad-hoc wireless LANs easily at their offices and houses. This paper clarifies that the proposed bridging and routing method achieves higher throughput and less forwarding delay than the conventional Transparent Bridging Protocol by computer simulations, theoretical analysis, and experiments using a prototype Wireless Bridge and Router device.
Author
Data Transmission; Wireless Communication

20040004163 Nippon Telegraph and Telephone Public Corp., Yokosuka, Japan
Portable Wireless System for Digital Video Transmission
Yoshie, Tomotaka; Maruyama, Hideyuki; Saito, Toshio; NTT Technical Review, Volume 1, No. 5; August 2003, pp. 74-78; In English; See also 20040004150; Copyright; Avail: Other Sources

A portable wireless system that enables digital video transmission in a simple fashion has been developed at NTT Access Network Service Systems Laboratories to provide a temporary TV terminal link between a TV terminal station operated by NTT Communications Corporation and a TV station. This system enables stable digital video transmission even under severe interference conditions. For easier portability, its volume and weight have been decreased compared with portable wireless systems for analog video transmission that NTT developed in the past.
Author
Digital Television; Television Systems; Wireless Communication

20040004175 Nippon Telegraph and Telephone Public Corp., Musashino, Japan
Highly Reliable and Managed MPLS Network Using Type-X Products
Mitsubori, Hidehiko; Nishikido, Jun; Komura, Hisashi; NTT Technical Review, Volume 1, No. 5; August 2003, pp. 48-52; In English; See also 20040004150; Copyright; Avail: Other Sources

NTT Network Service Systems Laboratories have developed a series of products called Type-X that incorporate multi-protocol label switching (MPLS) technology. MPLS is a packet transfer method that is highly compatible with Internet protocol (IP) and traffic engineering. An IP network using Type-X products can achieve high reliability by using MPLS path protection, which restores a data transfer process in a few seconds when a network failure occurs. The Type-X OSS (operations support system), which manages network resources, allows a network to handle various services having various requirements simultaneously.
Author
Internets; Packet Switching; Network Control

20040004176 Nippon Telegraph and Telephone Public Corp., Musashino, Japan
Highly Reliable Edge Router Type-X40
Ihara, Yohji; Murashige, Akira; Kuraya, Etsuji; NTT Technical Review, Volume 1, No. 5; August 2003, pp. 58-62; In English; See also 20040004150; Copyright; Avail: Other Sources

Type-X40 is a highly functional edge router designed to accommodate various types of user networks. One of the Type-X router family, it features high speed, high reliability, and high quality control. It lets network designers build a sophisticated, large-scale, highly reliable MPLS (Multi-Protocol Label Switching) network.
Author
Computer Networks; Computer Components; Packet Switching

20040004182 Nippon Telegraph and Telephone Public Corp., Yokosuka, Japan
Development of Wireless IP Access System (STEP 2) in the 26-GHz Band
Nidaira, Katsutoshi; Baba, Mitsuhiro; Saito, Toshio; NTT Technical Review, Volume 1, No. 5; August 2003, pp. 68-73; In English; See also 20040004150; Copyright; Avail: Other Sources

To provide fast Internet services to areas where it is difficult to lay optical fiber cables for an access network, NTT developed a Wireless IP Access System (WIPAS STEP 1), which is a point-to-multipoint fixed wireless access system using the 26-GHz frequency band that provides a best-effort IP service. WIPAS combines wireless technology with an optical network and complements FTTH (fiber to the home) service. This article describes the second-generation WIPAS called STEP 2, which has twice the transmission rate of STEP 1 while being much more compact. It overviews the concepts and technologies of the STEP 2 system.
Author
Internets; Optical Fibers; Computer Networks; Wireless Communication

20040004183 Nippon Telegraph and Telephone Public Corp., Musashino, Japan
Seamless Service Platform for a Ubiquitous Network Environment
Takasugi, Koichi; Nakamura, Motonori; Kubota, Minoru; NTT Technical Review, Volume 1, No. 5; August 2003, pp. 89-94; In English; See also 20040004150; Copyright; Avail: Other Sources

In the future, many kinds of terminals will collectively form a ubiquitous network environment that is available anytime and anywhere. In this type of network, nodes will often change communication media and network addresses and will be frequently disconnected from the network. Moreover, users will often move and use different terminals and want to enjoy services without interruption even when such changes occur. Our seamless service platform conceals changes in a dynamic network environment by applying an overlay network on top of the transport layer.
Author
Communication Networks; Interruption; Computer Networks

20040004284 George Washington Univ., Washington, DC, USA
High Performance Parallel Architectures
El-Ghazawi, Tarek; Kaewpijit, Sinthop; [1998]; 10 pp.; In English
Contract(s)/Grant(s): NAS5-32337; USRA-5555-028-54; No Copyright; Avail: CASI; A02, Hardcopy

Traditional remote sensing instruments are multispectral, where observations are collected at a few different spectral bands. Recently, many hyperspectral instruments, that can collect observations at hundreds of bands, have been operational. Furthermore, there have been ongoing research efforts on ultraspectral instruments that can produce observations at thousands of spectral bands. While these remote sensing technology developments hold great promise for new findings in the area of Earth and space science, they present many challenges. These include the need for faster processing of such increased data volumes, and methods for data reduction. Dimension Reduction is a spectral transformation, aimed at concentrating the vital information and discarding redundant data. One such transformation, which is widely used in remote sensing, is the Principal Components Analysis (PCA). This report summarizes our progress on the development of a parallel PCA and its implementation on two Beowulf cluster configuration; one with fast Ethernet switch and the other with a Myrinet interconnection. Details of the implementation and performance results, for typical sets of multispectral and hyperspectral NASA remote sensing data, are presented and analyzed based on the algorithm requirements and the underlying machine configuration. It will be shown that the PCA application is quite challenging and hard to scale on Ethernet-based clusters. However, the measurements also show that a high- performance interconnection network, such as Myrinet, better matches the high communication demand of PCA and can lead to a more efficient PCA execution.
Author
Remote Sensing; Principal Components Analysis; Parallel Processing (Computers)

20040005824 South Carolina Univ., Columbia, SC
High Security Information System
Lane, Brendan F.; Johnson, Joseph; Jan. 2002; 23 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0329
Report No.(s): AD-A418505; AFRL-SR-AR-TR-03-0473; No Copyright; Avail: CASI; A03, Hardcopy

The overall focus of the University of South Carolina Critical Infrastructure Protection and Information Assurance Fellowship was in the area of computer security with a concentration in network traffic analysis. The Fellow addressed

problems related to the developing approaches for fast and robust analysis of network traffic based on results obtained in complex system theory. To accomplish the research, it was important to develop and test wavelet technique for time-series analysis which could be naturally extended for the analysis of multidimensional time series. It also was desirable to find methods to speed up the existing time- consuming technique for obtaining characteristic time scales for the given chaotic time series. These requirements were the starting point for defining the set of mathematical problems to be solved.
DTIC
Information Systems; Computer Information Security

20040006453 Naval Postgraduate School, Monterey, CA
Security and Efficiency Concerns With Distributed Collaborative Networking Environments
Felker, Keith A.; Sep. 2003; 117 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418559; No Copyright; Avail: CASI; A06, Hardcopy

The progression of technology is continuous and the technology that drives interpersonal communication is not an exception. Recent technology advancements in the areas of multicast, firewalls, encryption techniques, and bandwidth availability have made the next level of interpersonal communication possible. This thesis answers why collaborative environments are important in today's online productivity. In doing so, it gives the reader a comprehensive background in distributed collaborative environments, answers how collaborative environments are employed in the Department of Defense and industry, details the effects network security has on multicast protocols, and compares collaborative solutions with a focus on security. The thesis ends by providing a recommendation for collaborative solutions to be utilized by NPS/DoD type networks. Efficient multicast collaboration, in the framework of security is a secondary focus of this research. As such, it takes security and firewall concerns into consideration while comparing and contrasting both multicast-based and non-multicast-based collaborative solutions.
DTIC
Security; Protocol (Computers); Bandwidth; Defense Industry

20040006471 University of Southern California, Marina del Rey, CA
X-Bone
Touch, Joseph D.; Aug. 2003; 38 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-98-1-0200; DARPA ORDER G197; Proj-G197
Report No.(s): AD-A418494; AFRL-IF-RS-TR-2003-182; No Copyright; Avail: CASI; A03, Hardcopy

The X-Bone is a system for the rapid, automated deployment and management of overlay networks. It consists of a web interface, a coordinating back-end Overlay Manager, and per-node Resource Daemons that configure interfaces, add routes, set security keys, and arbitrate access. The X-Bone deploys IP overlay networks - virtual topologies of encapsulation tunnels - used for network experiments or for the incremental deployment of new network services. The project developed and implemented this distributed system for deploying and managing overlays as well as the architectural extension of the Internet on which it is based. The system was made available as a FreeBSD port and Linux RPM. The project discovered issues with current operating systems and protocols, which were patched and/or communicated to the relevant standards groups. The project indicated opportunities to integrate the Internet architecture extensions in broader ways, to more completely support virtual networks and concurrent distributed overlays; among these are ways to use multi-layer overlays for fault tolerance, and challenges to the interfaces used to configure and access network configuration parameters. The project demonstrated the utility of automated overlay deployment and the impact of general extensions to virtualize the Internet architecture.
DTIC
Computer Networks; Automatic Control; Management Systems; Unix (Operating System)

20040008305
Experiences and Results from a New High Performance Network and Application Monitoring Toolkit
Cottrell, R. L.; Logg, C.; Mei, I.-H.; Apr. 2003; In English
Report No.(s): DE2003-813033; SLAC-PUB-9641; No Copyright; Avail: National Technical Information Service (NTIS)

Grid Computing capabilities are increasingly needed for scientific research. Groups such as Globus and the Particle Physics Data Grid are developing tools to meet these needs. An additional challenge is the evaluation and fine-tuning of these applications, as well as support for long term monitoring, performance analysis, and troubleshooting. In September 2001, SLAC started the development of a toolkit for studying the available bandwidth as measured by various network sensing tools and comparing that with the bandwidth achievable by various bulk data transfer applications. This study has provided

experience in the challenges of deploying and using the sensor tools and transfer applications, as well as information for fine tuning the applications and analyzing their performance. The results presented in this paper include the deployment challenges, techniques for optimizing the duration of measurements, the impacts of throughput on CPU utilization, optimizing windows and parallel streams, the impact on other users, comparisons of various throughput measurement techniques, patterns of throughput behaviors, forecasting, and comparisons of active and passive measurements. We finish up with possible avenues for future development.
NTIS
Computer Networks; Grid Computing (Computer Networks); Linear Accelerators

20040008310 George Washington Univ., Washington, DC
A Web-Centric Preference Acquisition and Decision Support System Employing Decision Times to express Relative Preferences
Feinstein, Jerald L.; Oct. 31, 2003; 21 pp.; In English
Report No.(s): AD-A418487; No Copyright; Avail: CASI; A03, Hardcopy

This paper presents the general theory and techniques involving a web-centric preference acquisition and decision support system employing decision times to express relative preferences or degrees of confidence with respect to decision alternatives. This is an alternative, neural net-motivated method employing decision times or reaction time metrics and a set of decision analytic techniques for capturing, synthesizing, and analyzing decisions, opinions, confidence, and preferences from subject matter experts as well as from the general population. The paper's first part describes a methodology for transforming the time it takes to make a decision among a number of choices, two-at-a-time, into a set of ratio scaled relative preference or confidence and decision consistency scores using a modified Analytical Hierarchy Process (AHP) approach. The second part describes a method for synthesizing individual results into a group decision metric, and for assessing the stability of a decision, where stability is the propensity of an individual or group to 'change its mind' and defect to alternative choices. In the third part the focus is on the generality of the approach in terms of how this alternative methodology can be used in different application areas. In the concluding part, a live, web-centric decision support environment enabling geographically distant decision makers to collaborate in a distributed environment, employing the methodology, is illustrated by discussing screen shots of the application.
DTIC
Decision Support Systems; World Wide Web; Applications of Mathematics

20040008439 Newcastle-upon-Tyne Univ., Newcastle
Final Version of DSoS Conceptual Model (CSDA1)
Apr. 2003; 128 pp.; In English
Report No.(s): PB2004-102061; CS-TR-782; Copyright; Avail: National Technical Information Service (NTIS)

This document defines the key concepts underlying DSoS. Before coming to their definitions, it is worth emphasising the breadth of systems and issues that the project is addressing. There are different ways of building systems: at one extreme there are green fields projects where a whole system is constructed from scratch; at the other extreme, systems can be constructed mainly from (large) existing systems. It is the objective of the DSoS Project to investigate issues related to the integration of existing complete systems in order to generate a new set of dependable services from the resulting system of systems. Emphasis is put on systems of systems because the latter will typically be non-trivial systems in their own right. This is in distinction to the construction of a system from more-or-less basic components with simple, fixed, interfaces that are fully under the control of the designer of the required system. Clearly, building a system of systems is a recursive idea in that the required system could be a component of a yet larger system.
NTIS
Computer Systems Programs; Computer Systems Design

20040008493 Stanford Linear Accelerator Center, Stanford, CA, USA, Illinois Univ. at Urbana-Champaign, Urbana, IL, USA, Oak Ridge National Lab., TN
Measuring End-to-End Bandwidth with Iperf using Web100
Tirumala, A.; Cottrell, L.; Dunigan, T.; Apr. 2003; 12 pp.; In English
Report No.(s): DE2003-813039; SLAC-PUB-9733; No Copyright; Avail: Department of Energy Information Bridge

End-to-end bandwidth estimation tools like Iperf though fairly accurate are intrusive. In this paper, we describe how with an instrumented TCP stack (Web100), we can estimate the end-to-end bandwidth accurately, while consuming significantly

less network bandwidth and time. We modified Iperf to use Web100 to detect the end of slow-start and estimate the end-to-end bandwidth by measuring the amount of data sent for a short period (1 second) after the slow-start, when the TCP throughput is relatively stable. We obtained bandwidth estimates differing by less than 10% when compared to running Iperf for 20 seconds, and savings in bandwidth estimation time of up to 94% and savings in network traffic of up to 92%.
NTIS
Bandwidth; Communication Networks; Computer Networks

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*.

20040004147 Naval Postgraduate School, Monterey, CA
Realistic Evaluation of Terrain by Intelligent Natural Agents (RETINA)
Burgess, Rene' G.; Sep. 2003; 107 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418540; No Copyright; Avail: CASI; A06, Hardcopy

US Army and Joint constructive simulations require human operators to observe the exercise in progress, conduct analysis of the results, and provide a realistic reports and assessment of the action presented on their screens to the desired training audience. Current software tools provide excellent mathematical assessments (such as center of mass calculations, optimal routes, and sensor ranges) but poor human-like assessment of data (most likely route, probable enemy intention, etc.). This Thesis presents an artificial intelligence architecture specifically designed to reduce that manpower requirement by describing a concept for computer modeling that can produce realistic human-like assessment results. Specific concepts described are approaches for conducting a digital terrain assessment, development of avenues of approach, deployment of templated forces to a specific piece of terrain, and then a method of adjusting the templated force to react to actual sightings and known information. Also included are more detailed discussions and implementation details for use of gas diffusion as a method of analyzing avenues of approach through digital terrain. This approach seems quite promising as a method of modeling human movement tendencies and appears superior to classic path finding or optimal route selection methods.
DTIC
Artificial Intelligence; Gaseous Diffusion; Terrain

20040004188 National Pingtung Univ. Science and Technology, Pingtung, Taiwan, Province of China
Evolving Robot Brains and Bodies: An Experimental Investigation
Lee, Wei-Po; Journal of the Chinese Institute of Engineers, Volume 26, No.2; March 2003, pp. 125-132; In English; See also 20040004187
Contract(s)/Grant(s): NSC-89-2213-E-020-008; Copyright; Avail: Other Sources

In recent years, evolutionary algorithms have been proposed to synthesize robot controllers. However, admittedly, i t is not satisfactory just to evolve the control system, because the performance of the control system depends on other hardware parameters, the robot body plan. In this paper, an evolutionary framework is presented to evolve complete robot systems, including controllers and bodies, to achieve fitness-specified tasks. In order to assess the performance of the developed system, we use i t to evolve controller and body plan together for a robot in a simulated environment to achieve an obstacle avoidance task. Experimental results show the promise of this hybrid evolutionary approach. In addition, the importance of simultaneously evolving controller and morphology is emphasized, and the distribution of body parameters in the morphological space is also studied.
Author
Algorithms; Robots; Controllers

20040006452 George Mason Univ., Fairfax, VA, USA, NASA Goddard Space Flight Center, Greenbelt, MD, USA
EOSCUBE: A Constraint Database System for High-Level Specification and Efficient Generation of EOSDIS Products, Phase 1, Proof-of-Concept
Brodsky, Alexander; Segal, Victor E.; March 15, 1999; 114 pp.; In English
Contract(s)/Grant(s): NAS5-32337; USRA-5555-87-70; No Copyright; Avail: CASI; A06, Hardcopy

The EOSCUBE constraint database system is designed to be a software productivity tool for high-level specification and efficient generation of EOSDIS and other scientific products. These products are typically derived from large volumes of

multidimensional data which are collected via a range of scientific instruments.
Author
Data Bases; Eos Data and Information System; Software Engineering; Specifications

20040006455 Minnesota Univ., Minneapolis, MN, USA
Fast I/O for Massively Parallel Applications
OKeefe, Matthew T.; [1996]; 5 pp.; In English
Contract(s)/Grant(s): NAS5-32337; USRA-5555-23; No Copyright; Avail: CASI; A01, Hardcopy

The two primary goals for this report were the design, contruction and modeling of parallel disk arrays for scientific visualization and animation, and a study of the IO requirements of highly parallel applications. In addition, further work in parallel display systems required to project and animate the very high-resolution frames resulting from our supercomputing simulations in ocean circulation and compressible gas dynamics.
Author
Massively Parallel Processors; Scientific Visualization; Applications Programs (Computers); Arrays; Display Devices; Computer Systems Design; Disks

20040006457 Northwestern Univ., Evanston, IL, USA
Mass Storage Performance Information System
Scheuermann, Peter; [2000]; 11 pp.; In English
Contract(s)/Grant(s): NAS5-32337; USRA-5555-80-64; No Copyright; Avail: CASI; A03, Hardcopy

The purpose of this task is to develop a data warehouse to enable system administrators and their managers to gather information by querying the data logs of the MDSDS. Currently detailed logs capture the activity of the MDSDS internal to the different systems. The elements to be included in the data warehouse are requirements analysis, data cleansing, database design, database population, hardware/software acquisition, data transformation, query and report generation, and data mining.
Author
Information Systems; Computer Systems Design; Data Storage; Computer Systems Performance

64
NUMERICAL ANALYSIS

Includes iteration, differential and difference equations, and numerical approximation.

20040004181 Nippon Telegraph and Telephone Public Corp., Japan
Method for Detecting a Learner's Stalled Situation by Using the Variance of Operation Time Intervals
Nakamura, Y.; Akamatsu, N.; Kuwabara, T.; Tamaki, M.; NTT Technical Review, Volume 1, No. 5; August 2003, pp. 102; In English; See also 20040004150; Copyright; Avail: Other Sources; Abstract Only

Automatically detecting a learner's stalled situation or deadlock in an educational support system using computers is very useful. This paper proposes a method for detecting such a deadlock on the basis of the record of a learner s operations and evaluates it by tests on human subjects. Specifically, it uses the moving variance of the operational time intervals to detect a deadlock. As a result, in about 80% of the practice problems with self-declarations of a deadlock by the subjects, the deadlock could be detected at a point in time prior to the self-declarations. In addition, deadlocks were detected by the proposed method in three cases in which states close to a deadlock had been determined from questions after the completion of the practice problems, even though there were no self-declarations.
Author
Support Systems; Detection; Computers

20040004332 Geophysical Observatory, Helsinki, Finland
Annals of the Finnish Academy of Sciences: Mathematics, Volume 28
Martio, Olli, Editor; Drasin, David, Editor; Gehring, Frederick, Editor; Iwaniec, Tadeusz, Editor; Jutila, Matti, Editor; Keen, Linda, Editor; Kulkarni, Ravi S., Editor; Laine, Ilpo, Editor; Lehto, Olli, Editor; Lindenstrauss, J., et al.; 2003; ISSN 1239-629X; 234 pp.; In English; See also 20040004333 - 20040004348; Copyright; Avail: Other Sources

The following reports are presented: Attracting dynamics of exponential maps; A generalized Nevanlinna theorem for supertemperatures; Regulated domains and Bergman type projections; A Fuchsian group proof of the hyperellipticity of

Riemann surfaces of genus 2; Length functions and parameterizations of Teichmuller space for surfaces with cusps; Continuous dependence on obstacles in double global obstacle problems;Brunn-Minkowski and isoperimetric inequality in the Heisenberg group; A characterization of caloric morphisms between manifolds; Sharp estimates of the curvature of some free boundaries in two dimensions; The hyperbolic metric in a rectangle I1;Delta-stable Fuchsian groups;Finite representability of the Yang operator; Perturbation theory for nonlinear Dirichlet problems; The maximal function on variable L(sup p) spaces; Mobius Modulus of ring domanin in R-bar(sup eta); and Growth of entire A-subharmonic finctions.
CASI
Theorems; Functions (Mathematics)

20040004340 State Univ. of New York, Stony Brook, NY, USA
Delta-stable Fuchsian Groups
Bishop, Christopher J.; Annals of the Finnish Academy of Sciences: Mathematics, Volume 28; 2003, pp. 153-167; In English; See also 20040004332
Contract(s)/Grant(s): NSF DMS-01-03626; Copyright; Avail: Other Sources

We call a Fuchsian group, G , delta-stable if delta(G prime) = dim(A(G prime)) for every quasi- Fuchsian deformation G prime of G . It is well known that every finitely generated Fuchsian group has this property. We give examples of infinitely generated Fuchsian groups for which it holds and others for which it fails.
Author
Theorems; Euclidean Geometry

20040004343 Hiroshima Inst. of Tech., Japan
Perturbation Theory for Nonlinear Dirichlet Problems
Maeda, Fumi-Yuki; Ono, Takayori; Annals of the Finnish Academy of Sciences: Mathematics, Volume 28; 2003, pp. 207-222; In English; See also 20040004332; Copyright; Avail: Other Sources

We consider Sobolev-Dirichlet problems as well as Dirichlet problems in the PWB-method for quasi-linear second order elliptic differential equations on a euclidean domain. We discuss boundedness of solutions of these problems and convergence of solutions under perturbation of the 0-th order term.
Author
Dirichlet Problem; Perturbation Theory

20040004348 Trinity Coll., Hartford, CT, USA
The Maximal Function on Variable L(sup p) Spaces
Cruz-Uribe, D.; Fiorenza, A.; Neugebauer, C. J.; Annals of the Finnish Academy of Sciences: Mathematics, Volume 28; 2003, pp. 223-238; In English; See also 20040004332; Copyright; Avail: Other Sources

We give continuity conditions on the exponent function p (z) which are sufficient for the Hardy-Littlewood maximal operator to be bounded on the variable Lebesgue space L(sup p (x))(omega), where Omega is any open subset of R(sup n) . Further, our conditions are necessary on R. Our result extends the recent work of Pick and Rdiitka [20], Diening [3] and Nekvinda 1191. We also show that under much weaker assumptions on p (z) , the maximal operator satisfies a weak-type modular inequality.
Author
Inequalities; Function Space

20040005915 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
A Global, Multi-Waveband Model for the Zodiacal Cloud
Grogan, Keith; Dermott, Stanley F.; Kehoe, Thomas J. J.; November 15, 2003; 8 pp.; In English
Contract(s)/Grant(s): NAG5-9280; No Copyright; Avail: CASI; A02, Hardcopy

This recently completed three-year project was undertaken by the PI at the University of Florida, NASA Goddard and JPL, and by the Co-I and Collaborator at the University of Florida. The funding was used to support a continuation of research conducted at the University of Florida over the last decade which focuses on the dynamics of dust particles in the interplanetary environment. The main objectives of this proposal were: To produce improved dynamical models of the zodiacal cloud by performing numerical simulations of the orbital evolution of asteroidal and cometary dust particles. To provide visualizations of the results using our visualization software package, SIMUL, simulating the viewing geometries of IRAS and COBE and comparing the model results with archived data. To use the results to provide a more accurate model

of the brightness distribution of the zodiacal cloud than existing empirical models. In addition, our dynamical approach can provide insight into fundamental properties of the cloud, including but not limited to the total mass and surface area of dust, the size-frequency distribution of dust, and the relative contributions of asteroidal and cometary material. The model can also be used to provide constraints on trace signals from other sources, such as dust associated with the 'Plutinos' , objects captured in the 2:3 resonance with Neptune.
Derived from text
Dynamic Models; Zodiacal Dust; Clouds; Asteroids; Brightness Distribution

20040006294 Pennsylvania State Univ., University Park, PA, USA
Algorithms for Obstacle Detection for Collision Avoidance Using Infrared Images
Vajaria, Himanshu; Kasturi, Rangachar; Camps, Octavia; December 15, 2003; 64 pp.; In English
Contract(s)/Grant(s): NCC2-1331; No Copyright; Avail: CASI; A04, Hardcopy

The detection of obstacles in the flight path of an aircraft is an important issue. Hundreds of lives are instantaneously lost when aircrafts collide. These collisions generally occur because of poor pilot visibility in bad weather conditions. Infrared imagery provides a solution to the problem since it is possible to detect targets that are occluded behind clouds and fogs. Since aircraft engines emit heat, using infrared imagery they would be detected even behind cloud cover - something that is not possible for a human pilot. The main challenge lies in detecting and tracking targets that are at a large distance from the camera. These targets appear as weak targets and have to be distinguished from the false positives that appear due to clutter and camera noise. The detection has to be carried out in real time and hence there is a limitation on the computational complexity of the methods that are employed. In addition to detecting the target, it has to be tracked to determine its trajectory and evaluate whether it is a threat. Since the camera is mounted on a moving aircraft, the motion of the aircraft itself has to be compensated before determining the motion of a target. This report investigates various algorithms for the detection and tracking of weak targets. The algorithms were chosen such that they had complementary characteristics so that one set of algorithms would detect targets that the other missed and vice-versa. The detected targets are then passed to a Kalman filter for tracking their trajectory.
Author
Algorithms; Collision Avoidance; Obstacle Avoidance

20040006495 Naval Postgraduate School, Monterey, CA
A Decision Support System for the Optimal Design of Base-Motion Isolators
Hernandez, Manuel A.; Sep. 2003; 105 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418579; No Copyright; Avail: CASI; A06, Hardcopy

Transient analysis of large structural systems is a computationally demanding process, which in the past has prevented dynamic redesign and optimization. Large structures, such as buildings or ships, subjected to random base motions use isolators to minimize strain energies, which may cause damage or structural failure. This research focuses on the optimization of isolator parameters in order for structural systems to withstand potentially catastrophic transient vibrations. Many nonlinear hysteretic, viscoelastic, and sliding friction isolators were numerically modeled using the scientific programming language, MATLAB. The existing programs used to solve the Voltera integral formulation for Transient Structural Synthesis (TSS) and the Recursive Block-by-Block (RBB) algorithm were investigated and enhanced to yield greater accuracy and increased computational speed. The final product is a user-friendly Decision Support System (DSS) for use with both civil and military applications. Based on different types of base motions and the inherent dynamics of the structure, this DSS is capable of optimizing isolator parameters to meet a user-specific objective. (11 tables, 80 figures, 25 refs.)
DTIC
Optimization; Decision Support Systems; Random Vibration; Structural Failure; Hysteresis

20040008268 Toledo Univ., OH, USA
Aeroelastic Stability and Response of Rotating Structures
Keith, Theo G., Jr.; Reddy, Tondapu; January 2004; 5 pp.; In English
Contract(s)/Grant(s): NCC3-605; No Copyright; Avail: CASI; A01, Hardcopy

A summary of the work performed under NASA grant is presented. More details can be found in the cited references. This grant led to the development of relatively faster aeroelastic analysis methods for predicting flutter and forced response in fans, compressors, and turbines using computational fluid dynamic (CFD) methods. These methods are based on linearized two- and three-dimensional, unsteady, nonlinear aerodynamic equations. During the period of the grant, aeroelastic analysis that

includes the effects of uncertainties in the design variables has also been developed.
Author
Aeroelasticity; Flutter; Compressors; Nonlinear Equations; Unsteady Aerodynamics

65
STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; time series analysis; and stochastic processes.

20040004068 Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD, USA
Mathematical Limits on Differences Between a Population and a Subpopulation
Crosier, Ronald B.; Aug. 2003; 26 pp.; In English
Report No.(s): AD-A417162; ECBC-TR-337; No Copyright; Avail: CASI; A03, Hardcopy

Civil defense planning requires estimates of the toxicity of chemical warfare agents to the general public, but the current toxicity estimates are for male soldiers. Individual susceptibilities for both the general population and the military subpopulation are modeled by a lognormal distribution. Historical military demographics are used to estimate the size of the subpopulation from which military personnel are drawn. Limits on the median effective dose and the probit slope of a subpopulation are determined as a function of the subpopulation size. The method of converting toxicity estimates is not limited to chemical warfare agents. Further, it may be used to convert toxicity estimates for the general population to toxicity estimates for a subpopulation; for example, the elderly. The modeling of subpopulations is not limited to toxicological applications. Blood lead data from the second National Health and Nutrition Examination Survey are compared to the subpopulation model.
DTIC
Populations; Mathematical Models; Civil Defense

20040006494 Naval Postgraduate School, Monterey, CA
Least Squares and Adaptive Multirate Filtering
Hawes, Anthony H.; Sep. 2003; 65 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418578; No Copyright; Avail: CASI; A04, Hardcopy

This thesis addresses the problem of estimating a random process from two observed signals sampled at different rates. The case in which the low-rate observation has a higher signal-to-noise ratio than the high-rate observation is addressed. Both adaptive and non-adaptive filtering techniques are explored. For the non-adaptive case, a multirate version of the Wiener-Hopf optimal filter is used for estimation. Three forms of the filter are described. It is shown that using both observations with this filter achieves a lower mean- squared error than using either sequence alone. Furthermore, the amount of training data to solve for the filter weights is comparable to that needed when using either sequence alone. For the adaptive case, a multirate version of the LMS adaptive algorithm is developed. Both narrowband and broadband interference are removed using the algorithm in an adaptive noise cancellation scheme. The ability to remove interference at the high rate using observations taken at the low rate without the high-rate observations is demonstrated. (5 tables, 18 figures, 12 refs.)
DTIC
Signal Processing; Least Squares Method; Adaptive Filters; Signal to Noise Ratios

67
THEORETICAL MATHEMATICS

Includes algebra, functional analysis, geometry, topology, set theory, group theory and number theory.

20040004333 Technical Univ. of Lodz, Lodz, Poland
Continuous Dependence on Obstacles in Double Global Obstacle Problems
Olek, Anna; Szczepaniak, Kuba; Annals of the Finnish Academy of Sciences: Mathematics, Volume 28; 2003, pp. 89-97; In English; See also 20040004332; Copyright; Avail: Other Sources

The purpose of this paper is to study convergence (in certain sense) of the solutions u (sub n) of (P (sub n)) providing the sequences of impediments converge to their limits. Such problems are known as ‘varying obstacle problems.’
Derived from text
Limits (Mathematics); Continuity (Mathematics); Convergence; Operators (Mathematics); Problems

20040004334 Cambridge Univ., Cambridge, UK

The Hyperbolic Metric in a Rectangle II

Beardon, Alan F.; Annals of the Finnish Academy of Sciences: Mathematics, Volume 28; 2003, pp. 143-152; In English; See also 20040004332; Copyright; Avail: Other Sources

We obtain precise results on the hyperbolic distance in a rectangle. In particular, we give formulae for the hyperbolic distances along the lines of symmetry of the rectangle.

Author

Functions (Mathematics); Hyperbolic Coordinates; Rectangles; Euclidean Geometry; Metric Space

20040004335 Jyvaskyla Univ., Finland

Growth of Entire A-subharmonic Functions

Kilpelainen, Tero; Zhong, Xiao; Annals of the Finnish Academy of Sciences: Mathematics, Volume 28; 2003, pp. 181-192; In English; See also 20040004332

Contract(s)/Grant(s): Proj. 51947; Proj. 41933; Copyright; Avail: Other Sources

We prove an estimate of the growth of a nonnegative subharmonic function in R(sup n) in terms of the Wolff potential of its Riesz measure. Our estimate can be viewed as a counterpart to Nevanlinna's first fundamental theorem for subharmonic functions in the nonlinear setting. As a consequence, we prove that a nonnegative subharmonic function has the same order as the Wolff potential of its Riesz measure.

Author

Theorems; Entire Functions

20040004338 Bern Univ., Bern, Switzerland

Brunn-Minkowski and Isoperimetric Inequality in the Heisenberg Group

Monti, Roberto; Annals of the Finnish Academy of Sciences: Mathematics, Volume 28; 2003, pp. 99-109; In English; See also 20040004332; Copyright; Avail: Other Sources

We prove that the natural generalization of the Brunn-Minkowski inequality in the Heisenberg group does not hold, because it would imply the isoperimetric property for Carnot-Carathbodory balls, the property they do not have.

Author

Inequalities; Theorem Proving; Isoperimetric Problem; Minkowski Space

20040004339 Royal Inst. of Tech., Stockholm, Sweden

Sharp Estimates of the Curvature of Some Free Boundaries in Two Dimensions

Gustafsson, Bjoern; Sakai, Makoto; Annals of the Finnish Academy of Sciences: Mathematics, Volume 28; 2003, pp. 123-142; In English; See also 20040004332; Copyright; Avail: Other Sources

We prove that the Cauchy transform of a positive measure on the interval (- 1, l) proper subset real number in the complex plane maps the exterior of the unit disc onto a domain OMEGA proper subset complex number which can be written as a union of discs centered on the real axis. This is applied to the obstacle problem, partial balayage, quadrature domains and Hele-Shaw flow moving boundary problems, and we obtain sharp estimates of the curvature of free boundaries appearing in such problems.

Author

Curvature; Dimensions; Transformations (Mathematics); Boundary Value Problems

20040004341 Universidad de Oviedo, Spain

Finite Representability of the Yang Operator

Martinez-Abejon, Antonio; Pello, Javier; Annals of the Finnish Academy of Sciences: Mathematics, Volume 28; 2003, pp. 169-180; In English; See also 20040004332

Contract(s)/Grant(s): DGICYT-BFM2001-1147; Copyright; Avail: Other Sources

We study the finite representability of the operator T(sup co): X(sup**)/X to Y(sup**)/Y in T : X to Y and its consequences in operator semigroup and operator ideal theory. The results obtained involve a delicate study of the second conjugate T sup**).

Author

Operators (Mathematics); Conjugates

20040004342 Michigan Univ., Ann Arbor, MI, USA
Moebius modulus of ring domains in R-bar(sup eta)
Ibragimov, Zair; Annals of the Finnish Academy of Sciences: Mathematics, Volume 28; 2003, pp. 193-206; In English; See also 20040004332; Copyright; Avail: Other Sources

we define the Mobius modulus of rings. Our main result is Theorem 3.8 which gives a solution to Teichmuller's extrema1 problem for the Mobius modulus. As a corollary to Theorem 3.8 we settle the conjecture of Vuorinen. We will then establish a relationship between the usual and the Mobius moduli of rings and compute the Mobius modulus of Grotzsch and Teichmuller rings.
Derived from text
Theorems; Functions (Mathematics)

20040004344 Osaka City Univ., Japan
A Characterization of Caloric Morphisms Between Manifolds
Nishio, Masaharu; Shimomura, Katsunori; Annals of the Finnish Academy of Sciences: Mathematics, Volume 28; 2003, pp. 111-122; In English; See also 20040004332; Copyright; Avail: Other Sources

In this paper, we give a characterization of mappings which preserve caloric functions between semi-riemannian manifolds.
Author
Riemann Manifold; Transformations (Mathematics); Harmonic Functions; Conformal Mapping

20040004375 Naval Postgraduate School, Monterey, CA
Predictability of Japan/East Sea (JES) System to Uncertain Initial/Lateral Boundary Conditions and Surface Winds
Fang, Chin-Lung; Sep. 2003; 95 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418549; No Copyright; Avail: CASI; A05, Hardcopy

Numerical ocean modeling usually composes various initial- and boundary-value problems. It integrates hydrodynamic and thermodynamic equations numerically with atmospheric forcing and boundary conditions (lateral and vertical) from initial states of temperature, salinity and velocity. Past observations, historical datasets and climatological datasets of the ocean have contributed greatly to the knowledge of the data fields of initial condition, atmospheric forcing and boundary conditions. Change in either initial or boundary condition leads to a variety of model solutions. It is necessary to specify realistic initial and boundary conditions to achieve better understanding and prediction of the ocean behavior. However, uncertainty often exists in both initial and boundary conditions. Up to now, most studies on ocean predictability have usually been for one particular type of model input uncertainty within the three types of uncertainty (initial conditions, open boundary conditions, atmospheric forcing function). This thesis investigates the response of ocean model to the three types of model input uncertainty simultaneously using Princeton Ocean Model (POM) implemented for the Japan/East Sea (JES).
DTIC
Numerical Analysis; Boundary Value Problems; Ocean Models; Boundary Conditions

70
PHYSICS (GENERAL)

Includes general research topics related to mechanics, kinetics, magnetism, and electrodynamics. For specific areas of physics see *categories 71 through 77*. For related instrumentation see *35 Instrumentation and Photography*; for geophysics, astrophysics, or solar physics see *46 Geophysics, 90 Astrophysics*, or *92 Solar Physics*.

20040004086 Stanford Linear Accelerator Center, Stanford, CA, USA
Study of Time-Dependent CP Asymmetries with Partial Reconstruction of B0 D*(minus or plus) pi(minus or plus)
Jul. 2003; In English
Report No.(s): DE2003-813310; SLAC-PUB-10057; BABAR-CONF-03/015,HEP-EX/0307036; No Copyright; Avail: National Technical Information Service (NTIS)

We present a preliminary measurement of the time-dependent CP asymmetries in decays of neutral B mesons to the final states D(sup asterixk plus or minus pi plus or minus) using approximately 82 million BB events collected by the BABAR experiment at the PEP-II storage ring. Events containing these decays are selected with a partial reconstruction technique, in which only the high momentum pi (plus or minus) and the low momentum pion from the D (sup plus or minus) decay are reconstructed. The flavor of the other B meson in the event is tagged using the information from kaon and lepton candidates.

We measure the time-dependent CP asymmetry A = minus 0.063 plus or minus 0.024 (stat.) plus or minus 0.017 (syst.). We interpret these results in terms of the angles of the unitarity triangle to set a bound on perpendicular line sin(2Beta + lambda)perpendicular line.
NTIS
Asymmetry; Time Dependence; CP Violation; Particle Theory

20040004087 Stanford Linear Accelerator Center, Stanford, CA, USA, Massachusetts Inst. of Tech., Cambridge, MA, USA
Recent Measurements of CP Violation at the B Factories
Sciolla, G.; Jul. 2003; In English
Report No.(s): DE2003-813317; SLAC-PUB-10065; HEP-EX/0307045; No Copyright; Avail: National Technical Information Service (NTIS)

Recent measurements of time dependent CP asymmetries at the B factories have led to substantial progress in our understanding of CP violation. In this article, I review some of these experimental results and discuss their implications in the Standard Model and their sensitivity to New Physics.
NTIS
Asymmetry; CP Violation; Mesons; Standard Model (Particle Physics)

20040004088 Stanford Linear Accelerator Center, Stanford, CA, USA
Measurement of the First and Second Moments of the Hadronic Mass Distribution in Semileptonic B Decays
Jul. 17, 2003; In English
Report No.(s): DE2003-813319; SLAC-PUB-10067; BABAR-CONF-03/013,HEP-EX/0307046; No Copyright; Avail: National Technical Information Service (NTIS)

We report a preliminary measurement of the first and second moments of the hadronic mass distributions in B straight arrow Xclv decays. The measurements are based on Gamma(4S) straight arrow BB events where the hadronic decay of one of the B mesons is fully reconstructed and a charged lepton from the decay of the other B meson is identified. The moments are presented for threshold lepton momenta ranging from 0.9 to 1.6 GeV. From the M(sup 2)(Sub X) moments we determine the non-perturbative Heavy Quark Expansion (HQE) parameters, upside down capital v and Lambda 1. We combine the measured moments M(sup 2)(sub X) with earlier BABAR measurements of the semileptonic branching ratios and B lifetimes and perform a simultaneous fit to the HQE for the moments obtained for different threshold lepton momenta and the semileptonic decay width. This fit results in an improved value for the CKM matrix element perpendicular line Vcb perpendicular line.
NTIS
Hadrons; Leptons; Mass Distribution; Particle Decay

20040004137 Stanford Linear Accelerator Center, Stanford, CA, USA, Stanford Univ., Stanford, CA, USA
D-Sitter Space: Causal Structure, Thermodynamics, and Entropy
Fabinger, M.; Silverstein, E.; 2003; In English
Report No.(s): DE2003-813332; HEP-TH/0304220; SLAC-PUB-9717,SU-ITP-03/08; No Copyright; Avail: National Technical Information Service (NTIS)

We study the entropy of concrete de Sitter flux compactifications and deformations of them containing D-brane domain walls. We determine the relevant causal and thermodynamic properties of these 'D-Sitter' deformations of de Sitter spacetimes. We find a string scale correspondence point at which the entropy localized on the D-branes (and measured by probes sent from an observer in the middle of the bubble) scales the same with large flux quantum numbers as the entropy of the original de Sitter space, and at which Bousso's bound is saturated by the D-brane degrees of freedom (up to order one coeffcients) for an infinite range of times. From the geometry of a static patch of D-Sitter space and from basic relations in flux compactifications, we find support for the possibility of a low energy open string description of the static patch of de Sitter space.
NTIS
Domain Wall; Entropy; Thermodynamics; Quantum Numbers

20040004218 Stanford Linear Accelerator Center, Stanford, CA, USA
Superconducting Wiggler for the LCLS
Carr, R.; Craddock, W.; Emma, P.; Welch, J.; Weisend, J.; Dec. 2002; In English
Report No.(s): DE2003-812620; LCLS-TN-02-2; No Copyright; Avail: National Technical Information Service (NTIS)

A strong wiggler is likely to be required for the LCLS to reduce bunching that would cause beam instabilities due to coherent synchrotron radiation in the second linac bunch compressor. This wiggler will be located in a 3 m straight section immediately upstream from the bunch compressor at SLAC linac sector 24-7, where the e-beam will have an energy of 4.5 GeV. The peak field of the wiggler will have to be at least 5T, so a superconducting device is required. In this technical note, we describe a general design approach, and a specific proposal for this wiggler.
NTIS
Wiggler Magnets; Superconducting Magnets; Coherent Light

20040004221 Stanford Linear Accelerator Center, Stanford, CA, USA
Single-Mode CSR Instability of a Bunched Beam
Heifets, S.; Mar. 2003; In English
Report No.(s): DE2003-812948; SLAC-PUB-9626; No Copyright; Avail: National Technical Information Service (NTIS)
The coherent synchrotron radiation (CSR) instability at the shielding threshold may be driven by a single synchronous mode excited by the beam in the beam pipe. The instability in this case has been analyzed (1) in the coasting beam approximation neglecting synchrotron motion. The later becomes important at large time interval sects the beam dynamics. The single-mode CSR instability of a bunched beam with the synchrotron motion taken into account is described in this paper both in linear and nonlinear regimes. Analysis is relevant to other instabilities where the interaction is dominated by a single mode.
NTIS
Coherent Radiation; Stability; Electron Bunching; Synchrotron Radiation

20040004222 Stanford Linear Accelerator Center, Stanford, CA, USA
Contact Interaction Searches at the Linear Collider: Energy, Luminosity and Positron Polarization Dependencies
Rizzo, T. G.; Mar. 2003; In English
Report No.(s): DE2003-812949; SLAC-PUB-9632; No Copyright; Avail: National Technical Information Service (NTIS)
Many types of new physics can lead to contact interaction-like modifications in e(sup+)e(sup -) processes below direct production threshold. This report summarizes a survey of contact interaction search reaches at the Linear Collider as functions of energy, luminosity and positron polarization. The various tradeoffs between these quantities in such searches are examined in detail.
NTIS
Luminosity; Positrons; Linear Polarization; Particle Accelerators

20040004242 Stanford Linear Accelerator Center, Stanford, CA, USA
Future Synchrotron Radiation Sources
Winick, H.; Jul. 2003; In English
Report No.(s): DE2003-813270; SLAC-PUB-10006; No Copyright; Avail: National Technical Information Service (NTIS)
Sources of synchrotron radiation (also called synchrotron light) and their associated research facilities have experienced a spectacular growth in number, performance, and breadth of application in the past two to three decades.
NTIS
Synchrotron Radiation; Radiation Sources

20040004311 Helsinki Univ. of Technology, Espoo
Helsinki University of Technology Laboratory of Physics Activity Report 2001. Laboratory of Physics and COMP
2003; In English
Report No.(s): PB2004-100440; Copyright; Avail: National Technical Information Service (NTIS)
Areas of current activity semiconductor materials, structures and processing, surface sciences, nanomaterials and confined quantum structures, magnetism, statistical physics and complex systems, and biophysics. The laboratory is host to COMP, the research unit in computational condensed matter and complex materials. COMP has been designated a National Center of Excellence in Research by the Academy of Finland for the years 2000-2005.
NTIS
Physics; Universities; Research Projects; Laboratories

20040005881 Wisconsin Univ., Madison, WI, USA
Fundamental Studies for High Temperature Superconductor Conductor Technology
Larbalestier, David C.; Nov. 2002; 7 pp.; In English
Contract(s)/Grant(s): F49620-00-1-0091; F49620-97-1-0308
Report No.(s): AD-A418367; AFRL-SR-AR-TR-03-0357; No Copyright; Avail: CASI; A02, Hardcopy

There is strong Air Force interest in compact, airborne, high-power generators and klystron/gyrotron/magnetron magnets for radar applications. Both applications need superconducting magnets but, to be practical, superconducting magnets must be made with high temperature superconductors (HTS) capable of being refrigerated by robust cryocoolers at temperatures near liquid nitrogen (77K). The pacing element for all such applications is the conductor from which such magnets can be made. The material of choice for this conductor is YBa2CU3O7-x, made in the form of a multilayer tape as a Coated Conductor. This report proposal describes research carried out in support of this effort from 1999-2002. Our global thrusts were to understand the ultimate critical current potential of YBCO in coated conductor form. To this end we performed the following work under this contract: 1. Studies of current limiting mechanisms in Coated Conductor samples., 2. Studies of the microstructure of buffer and YBCO layers of Coated Conductors, 3. Analysis of the influence of obstructions to current flow and local dissipation, and 4. Facility development in support of our research program.
DTIC
High Temperature Superconductors; Technology Utilization; Superconducting Magnets

20040006461 Naval Postgraduate School, Monterey, CA
Design, Construction, and Testing of a Hysteresis Controlled Inverter for Paralleling
Fillmore, Paul F.; Sep. 2003; 89 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418560; No Copyright; Avail: CASI; A05, Hardcopy

The U. S. Navy is pursuing an all electric ship that will require enormous amounts of power for applications such as electric propulsion. Reliability and redundancy in the electronics are imperative, since failure of a critical system could leave a ship stranded and vulnerable. A parallel inverter drive topology has been proposed to provide reliability and redundancy through load sharing. The parallel architecture enables some functionality in the event that one of the inverters fails. This thesis explores paralleling current-mode inverters of different power levels and fidelities. A 50-kVA, three-phase hysteresis controlled inverter is designed built and tested at low power. The inverter is then tested in parallel with a low frequency, bulk inverter to demonstrate current sharing capability.
DTIC
Hysteresis; Parallel Processing (Computers); Inverters; Component Reliability

20040008275
Present Status of Inclusive Rare B Decays
Hurth, T.; Jan. 2003; In English
Report No.(s): DE2003-812602; CERN-TH/2002-264; No Copyright; Avail: National Technical Information Service (NTIS)

No abstract available
Beta Particles; Particle Decay; Supersymmetry

20040008278 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA, Stanford Linear Accelerator Center, Stanford, CA, USA
Collider Tests of the Little Higgs Model
Burdman, G.; Perelstein, M.; Pierce, A.; Dec. 16, 2002; In English
Report No.(s): DE2003-812604; LBNL-51881; No Copyright; Avail: National Technical Information Service (NTIS)

The little Higgs model provides an alternative to traditional candidates for new physics at the TeV scale. The new heavy gauge bosons predicted by this model should be observable at the Large Hadron Collider (LHC). We discuss how the LHC experiments could test the little Higgs model by studying the production and decay of these particles.
NTIS
Higgs Bosons; Particle Theory; Standard Model (Particle Physics)

20040008283 Harvard Univ., Cambridge, MA, USA, Stanford Univ., Stanford, CA, USA, Stanford Linear Accelerator Center, Stanford, CA, USA

Instanton Counting and Chern-Simons Theory

Iqbal, A.; Kashani-Poor, A.-K.; Jan. 2003; In English

Report No.(s): DE2003-812626; SLAC-PUB-9623; HUTP-02/A064,SU-ITP 02/48; No Copyright; Avail: National Technical Information Service (NTIS)

The instanton partition function of N = 2, D = 4 SU(2) gauge theory is obtained by taking the field theory limit of the topological open string partition function, given by a Chern-Simons theory, of a VCY3-fold.

NTIS

Counting; Instantons; Topology; Field Theory (Algebra)

20040008284 Stanford Linear Accelerator Center, Stanford, CA, USA

Beam Dynamics of the Interaction Region Solenoid in a Linear Collider Due to a Crossing Angle

Tenenbaum, P.; Irwin, J.; Raubenheimer, T. O.; Aug. 2003; In English

Report No.(s): DE2003-812629; SLAC-PUB-9631; No Copyright; Avail: National Technical Information Service (NTIS)

Future linear colliders may require a nonzero crossing angle between the two beams at the interaction point. This requirement in turn implies that the beams will pass through the strong interaction region (IR) solenoid with an angle, and thus that the component of the solenoidal field perpendicular to the beam trajectory is nonzero. The interaction of the beam and the solenoidal field in the presence of a crossing angle will cause optical eects not observed for beams passing through the solenoid on-axis; these eects include dispersion, deflection of the beam, and synchrotron radiation eects. For a purely solenoidal field, the optical eects which are relevant to luminosity exactly cancel at the IP when the influence of the solenoids fringe field is taken into account. Beam size growth due to synchrotron radiation in the solenoid is proportional to the fifth power of the product of the solenoidal field, the length of the solenoid, and the crossing angle. Examples based on proposed linear collider detector solenoid configurations are presented.

NTIS

Beam Interactions; Solenoids; Crossings; Linearity

20040008289 Fermi National Accelerator Lab., Batavia, IL, USA

B Physics in CDF

Fiori, I.; Aug. 2003; In English

Report No.(s): DE2003-812791; FERMILAB-CONF-02/152-E; No Copyright; Avail: National Technical Information Service (NTIS)

The upgraded CDF detector is now collecting data with the aim of integrating 2 fb-1 by year 2006. The pursued B physics program is very appealing. CDF will provide measurements of various CP violating and B mixing parameters which both complement and extend B-factories measurements. In addition there is a variety of spectroscopy measurements on Bs and heavier hadrons which are currently accessible only at the Tevatron. In this talk we give a description of the new CDF tools available for B physics, we discuss the preliminary results obtained with the first 70 pb-1 of data, and we highlight Run II B physics prospects.

NTIS

Detectors; Particle Accelerators; Data Acquisition

20040008291

Physics and Applications of High Brightness Beams: Working Group C Summary on Applications to FELS

Nuhn, H. D.; Mar. 2003; In English

Report No.(s): DE2003-812968; SLAC-PUB-9682; No Copyright; Avail: National Technical Information Service (NTIS)

Working group C,'Application to FELs,' of the Joint ICFA Advanced Accelerator and Beam Dynamics Workshop on July 1-6, 2002 in Chia Laguna, Sardinia, Italy addressed a total of nine topics. This summary will discuss the topics that were addressed in the stand-alone sessions, including Start-To-End Simulations, SASE Experiment, PERSEO, 'Optics Free' FEL Oscillators, and VISA II.

NTIS

Conferences; Free Electron Lasers

20040008292

International Linear Collider Technical Review Committee: Second Report, 2003

Feb. 2003; In English

Report No.(s): DE2003-812979; SLAC-R-606; No Copyright; Avail: National Technical Information Service (NTIS)

This Executive Summary gives a short outline of the genesis of the report, the charge given to the committee, and its organization. It then presents a brief description of four electron-positron linear collider designs at hand. The methodology used to assess these designs is described in some detail. The assessments are followed by a list of R&D tasks recommended by the committee for the next few years. The tasks are ranked according to certain speci.c criteria. The summary concludes with a few remarks outlining upcoming developments that may guide ICFA and the HEP community in their future plans to promote and execute an international project.

NTIS

International Cooperation; Design Analysis; Linear Accelerators

20040008296

Impact of the Wiggler Coherent Synchrotron Radiation Impedance on the Beam Instability

Wu, J.; Stupakov, G. V.; Raubenheimer, T. O.; Huang, Z.; May 2003; In English

Report No.(s): DE2003-813032; SLAC-PUB-9629; No Copyright; Avail: National Technical Information Service (NTIS)

Coherent Synchrotron Radiation (CSR) can play an important role by not only increasing the energy spread and emittance of a beam, but also leading to a potential instability. Previous studies of the CSR induced longitudinal instability were carried out for the CSR impedance due to dipole magnets. However, many storage rings include long wigglers where a large fraction of the synchrotron radiation is emitted. This includes high-luminosity factories such as DAPHNE, PEP-II, KEK-B, and CESR-C as well as the damping rings of future linear colliders. In this paper, the instability due to the CSR impedance from a wiggler is studied assuming a large wiggler parameter K. The primary consideration is a low frequency microwave-like instability, which arises near the pipe cut-o. frequency. Detailed results are presented on the growth rate and threshold for the damping rings of several linear collider designs. Finally, the optimization of the relative fraction of damping due to the wiggler systems is discussed for the damping rings.

NTIS

Synchrotron Radiation; Impedance; Stability; Wiggler Magnets

20040008306

Multi-Dimensional Free-Electron Laser Simulation Codes: A Comparison Study

Biedron, S. G.; Chae, Y. C.; Dejus, R. J.; Faatz, B.; Freund, H. P.; Apr. 2003; In English; This document is color dependent and/or in landscape layout. It is currently available on CD-ROM and paper only. CD-ROM containing 8 page document. Presented at 21st International Conference on Free Electron Laser and 6th FEL Applications Workshop (FEL99). Hamburg, Germany, 23-28 August 1999. Prepared in cooperation with Stanford Linear Accelerator Center, CA

Report No.(s): DE2003-813036; SLAC-PUB-9729; No Copyright; Avail: National Technical Information Service (NTIS)

A self-amplified spontaneous emission (SASE) free-electron laser (FEL) is under construction at the Advanced Photon Source (APS). Five FEL simulation codes were used in the design phase: GENESIS, GINGER, MEDUSA, RON, and TDA3D. Initial comparisons between each of these independent formulations show good agreement for the parameters of the APS SASE FEL.

NTIS

Free Electron Lasers; Photons; Spontaneous Emission

20040008366 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA

Nuclear Structure Studies with Geanie at the LANSCE/WNR Facility

Fotiades, N.; Nelson, R. O.; Devlin, M.; Becker, J. A.; Garrett, P. E.; Aug. 01, 2003; 14 pp.; In English

Report No.(s): DE2003-15004433; UCRL-JC-154784; No Copyright; Avail: Department of Energy Information Bridge

Recent results pertaining to nuclear structure from neutron-induced reactions on (90)Zr, (193)Ir, (196)Pt and (238)U are presented. The data were taken using the GEANIE spectrometer comprised of 26 high-purity Ge detectors with 20 BGO escape-suppression shields. The broad-spectrum pulsed neutron source of the Los Alamos Neutron Science Center's WNR facility provided neutrons in the energy range from 0.6 to 200 MeV. The time-of-flight technique was used to determine the incident neutron energies. Results from shell model calculations for (90)Zr and from IBM-2 calculations for (196)Pt are

generally in good agreement with the observed spectrum of excited states.
NTIS
Isotopes; Nuclear Structure; Neutron Sources; Detectors

20040008367
Atmospheric Neutrinos Can Make Beauty Strange
Harnik, R.; Larson, D. T.; Murayama, H.; Pierce, A.; Dec. 12, 2002; In English
Report No.(s): DE2003-812605; UCB-PTH-02/59; No Copyright; Avail: National Technical Information Service (NTIS)

The large observed mixing angle in atmospheric neutrinos, coupled with Grand Unification, motivates the search for a large mixing between right-handed strange and bottom quarks. Such mixing does not appear in the standard CKM phenomenology, but may induce significant b yields s transitions through gluino diagrams. Working in the mass eigenbasis, we show quantitatively that an O(1) effect on CP violation in B(sup 0)(sub d) yeilds piKS is possible due to a large mixing between s(sub R) and b(sub R), while still satisfying constraints from b yields sgamma.
NTIS
Neutrinos; Detectors; Atmospheric Entry

20040008371 Stanford Linear Accelerator Center, Stanford, CA, USA, National Lab. for High Energy Physics, Ibaraki, Japan
Compendium of Scientific Linacs
Clendenin, J.; Rinolfi, L.; Takata, K.; Warner, D. J.; Nov. 1996; 42 pp.; In English
Report No.(s): DE2003-813264; SLAC-R-627; No Copyright; Avail: Department of Energy Information Bridge

The International Committee supported the proposal of the Chairman of the XVIII International Linac Conference to issue a new Compendium of linear accelerators. The last one was published in 1976. The Local Organizing Committee of Linac96 decided to set up a sub-committee for this purpose. Contrary to the catalogues of the High Energy Accelerators which compile accelerators with energies above 1 GeV, we have not defined a specific limit in energy. Microtrons and cyclotrons are not in this compendium. Also data from thousands of medical and industrial linacs has not been collected. Therefore, only scientific linacs are listed in the present compendium. Each linac found in this research and involved in a physics context was considered. It could be used, for example, either as an injector for high energy accelerators, or in nuclear physics, materials physics, free electron lasers or synchrotron light machines. Linear accelerators are developed in three continents only: America, Asia, and Europe. This geographical distribution is kept as a basis. The compendium contains the parameters and status of scientific linacs. Most of these linacs are operational. However, many facilities under construction or design studies are also included. A special mention has been made at the end for the studies of future linear colliders.
NTIS
Electron Accelerators; Linear Accelerators; Microtrons; Structural Design

20040008373 Stanford Linear Accelerator Center, Stanford, CA, USA
Presentations from the 2nd ORION Workshop
Noble, R.; Siemann, R.; May 2003; 12 pp.; In English
Report No.(s): DE2003-813265; SLAC-WP-026; No Copyright; Avail: Department of Energy Information Bridge

ORION will be a dedicated user facility available for experimental research in plasma and laser acceleration of particles, beam-plasma physics, ultra-short pulse electron and radiation sources, and potentially laboratory astrophysics. It will bring together a diverse collection of researchers motivated to solve some of the most complex and fascinating problems in these fields. The ORION Facility will be based on the Next Linear Collider Test Accelerator (NLCTA), an existing accelerator at SLAC capable of producing 60 to 350 MeV electron beams. The NLCTA will be augmented with a new photoinjector source, two experimental halls, extraction beamlines, a user laser room, and a data acquisition area. Facility construction is anticipated to start in October 2003, and first beam for experiments is planned for 2005. Program: Plenary Session - Working Group 1: Beam-Plasma Physics; Working Group 2: Laser Acceleration; Working Group 3: Laboratory Astrophysics; Working Group 4: Particle and Radiation Sources; Workshop Closing Session; and Working Group Summary Reports.
NTIS
Data Acquisition; Electron Radiation; Linear Accelerators

20040008374 Saclay Research Centre, Gif-sur-Yvette, France
BaBar: A New Detector for Studying CP Violation in the B System
Aleksan, R.; 1995; 16 pp.; In English
Report No.(s): DE2003-813260; SLAC-PUB-9995; DAPNIA/SPP 95-18; No Copyright; Avail: Department of Energy Information Bridge

A new detector for investigating the CP violation mechanism in the B meson system is being built and is scheduled to take data at PEP II, the asymmetric B Factory in construction at SLAC, at the end of this century. Is main characteristics are briefly overviewed in this paper. Its sensitivity for measuring CP violation in some selected B decays is also discussed, underlining the great potential of this detector to accomplish a comprehensive study of this phenomenon.
NTIS
Detectors; CP Violation; Mesons

20040008376, Indiana Univ., Bloomington, IN, USA, Fermi National Accelerator Lab., Batavia, IL, USA, Brookhaven National Lab., Upton, NY
Experimental Determination of the Hamiltonian for Synchrotron Motion with RF Phase Modulation
Huang, H.; Ball, M.; Brabson, B.; Budnick, J.; Caussyn, D. D.; 2003; 34 pp.; In English
Report No.(s): DE2003-813301; No Copyright; Avail: Department of Energy Information Bridge

Synchrotron motion with rf phase modulation was studied experimentally. Poincare maps in the resonant precessing frame were obtained from the experimental data and compared with the tori of the resonant Hamiltonian. The experimental data revealed island structure in longitudinal phase space. Experimental results for synchrotron motion excited by phase modulation at the third harmonic of the synchrotron frequency are also reported.
NTIS
Synchrotrons; Phase Modulation

20040008414 Stanford Linear Accelerator Center, Stanford, CA, USA
Theorems on Estimating Perturbative Coefficients in Quantum Field Theory and Statistical Physics
Samuel, M. A.; Druger, S. D.; 2003; 44 pp.; In English
Report No.(s): DE2003-813278; SLAC-PUB-10022; No Copyright; Avail: Department of Energy Information Bridge

We present rigorous proofs for several theorems on using Pade approximants to estimate coefficients in Perturbative Quantum Field Theory and Statistical Physics. As a result, we find new trigonometric and other identities where the estimates based on this approach are exact. We discuss hypergeometric functions, as well as series from both Perturbative Quantum Field Theory and Statistical Physics.
NTIS
Mathematical Logic; Quantum Theory; Pade Approximation

20040008446 Stanford Linear Accelerator Center, Stanford, CA, USA, McGill Univ., Montreal, Quebec, Canada, Cambridge Univ., Cambridge, UK
Low-Energy Brane-World Effective Actions and Partial Supersymmetry Breaking
Burgees, C. P.; Filotas, E.; Klein, M.; Quevedo, F.; Mar. 2003; 34 pp.; In English
Report No.(s): DE2003-812946; SLAC-PUB-9511; No Copyright; Avail: Department of Energy Information Bridge

As part of a programme for the general study of the low-energy implications of supersymmetry breaking in brane-world scenarios, we study the nonlinear realization of supersymmetry which occurs when breaking N = 2 to N = 1 supergravity. We consider three explicit realizations of this supersymmetry breaking pattern, which correspond to breaking by one brane, by one antibrane or by two (or more) parallel branes. We derive the minimal field content, the effective action and supersymmetry transformation rules for the resulting N = 1 theory perturbatively in powers of K = 1/MPlanck. We show that the way the massive gravitino and spin-1 fields assemble into N = 1 multiplets implies the existence of direct brane-brane contact interactions at order O(K). This result is contrary to the O(K2) predicted by the sequestering scenario but in agreement with recent work of Anisimov et al. Our low-energy approach is model independent and is a first step towards determining the low-energy implications of more realistic brane models which completely break all supersymmetries.
NTIS
Mathematical Models; Spinor Groups; Supersymmetry

20040008447 Stanford Linear Accelerator Center, Stanford, CA, USA, Cornell Univ., Ithaca, NY, USA
Factorization and Sudakov Resummation in Leptonic Radiative B. Decay
Bosch, S. W.; Hill, R. J.; Lange, B. O.; Neubert, M.; Jan. 16, 2003; 26 pp.; In English
Report No.(s): DE2003-812947; SLAC-PUB-9625; No Copyright; Avail: Department of Energy Information Bridge

Soft-collinear effective theory is used to prove factorization of the B(yields)(gamma)l(nu) decay amplitude at leading power in(Lambda)/m(sub b), including a demonstration of the absence of non-valence Fock states and of the finiteness of the convolution integral in the factorization formula. Large logarithms entering the hard-scattering kernel are resummed by performing a two-step perturbative matching onto the low-energy effective theory, and by solving evolution equations derived from the renormalization properties of the leading-order B-meson light-cone distribution amplitude. As a byproduct, the evolution equation for heavy-collinear current operators in soft-collinear effective theory is derived.
NTIS
Decay; Factorization; Collinearity; By-Products; Leptons; Convolution Integrals

20040008448 Stanford Linear Accelerator Center, Stanford, CA, USA
Automatic Alignment of X-Ray Beams
Anderson, Z. R.; Aug. 16, 2002; 24 pp.; In English
Report No.(s): DE2003-812944; SLAC-PUB-9385; No Copyright; Avail: Department of Energy Information Bridge

Protein crystals and other biological samples diffract weakly in X-rays. It is therefore important that the X-ray beam be very stable. Cubic smoothing splines were fit to ion chamber counts versus the vertical position of the sample. The extrema, inflection points about the maximum, and other information about the spline were calculated to determine whether the data corresponded to a beam profile. The algorithm developed here correctly identified the absence of a beam profile in all data gathered over the course of a year from four beam lines at the Stanford Synchrotron Radiation Laboratory. This algorithm is effective and can be adapted to other beam lines.
NTIS
Crystallography; Proteins; X Rays; Beamforming

20040008449 Stanford Linear Accelerator Center, Stanford, CA, USA
Physics and Applications of High Brightness Beams: Working Group a Summary on High Brightness Beam Production
Schmerge, J. F.; Mar. 2003; 22 pp.; In English
Report No.(s): DE2003-812966; SLAC-PUB-9680; No Copyright; Avail: Department of Energy Information Bridge

Working group A was devoted to high brightness beam production and characterization. The presentations and discussions could be categorized as cathode physics, new photoinjector designs, computational modeling of high brightness beams, and new experimental methods and results. Several novel injector and cathode designs were presented. However, a standard 1.5 cell rf photoinjector is still the most common source for high brightness beams. New experimental results and techniques were presented and thoroughly discussed. The brightest beam produced in a rf photoinjector published at the time of the workshop is approximately 2 1014 A/(m-rad)2 at Sumitomo Heavy Industries in Japan with 1 nC of charge, a 9 ps FWHM long laser pulse and a normalized transverse emittance of 1.2 micrometers. The emittance was achieved by utilizing a temporally flat laser pulse which decreased the emittance by an estimated factor of 2 from the beam produced with a Gaussian pulse shape with an identical pulse length.
NTIS
Beamforming; Electron Beams; Brightness; Utilization

20040008450 Stanford Linear Accelerator Center, Stanford, CA, USA
6D Phase Space Measurements at the SLAC Gun Test Facility
Schmerge, J. F.; Bolton, P. R.; Clendenin, J. E.; Dowell, D. H.; Gierman, S. M.; Mar. 2003; 14 pp.; In English
Report No.(s): DE2003-812967; SLAC-PUB-9681; LCLS-TN-03-01; No Copyright; Avail: Department of Energy Information Bridge

Proposed fourth generation light sources using SASE FELs to generate short pulse, coherent X-rays require demonstration of high brightness electron sources. The Gun Test Facility (GTF) at SLAC was built to test high brightness sources for the proposed Linac Coherent Light Source at SLAC. The GTF is composed of an S-band photocathode rf gun with a Cu cathode, emittance compensating solenoid, single 3 m SLAC linac section and e-beam diagnostic section with a UV drive laser system. The longitudinal emittance exiting the gun has been determined by measuring the energy spectrum downstream of the linac as a function of the linac phase. The e-beam pulse width, correlated and uncorrelated energy spread at the linac entrance have

been fit to the measured energy spectra using a least square error fitting routine. The fit yields a pulse width of 2.9 ps FWHM for a 4.3 ps FWHM laser pulse width and 2% rms correlated energy spread with 0.07% rms uncorrelated energy spread. The correlated energy spread is enhanced in the linac to allow slice emittance measurements by conducting a quadrupole scan in a dispersive section. The normalized slice emittance has been measured to be as low as 2 mm-mrad for beams with peak currents up to 150 A (300 pC with a laser pulse length of 1.8 ps) while the full projected emittance is 3 mm-mrad.
NTIS
Emittance; Electron Beams; Light Sources; Measurement

20040008451 Stanford Linear Accelerator Center, Stanford, CA, USA
Optical Properties of the DIRC Fused Silica Cherenkov Radiator
Cohen-Tanugi, J.; Convery, M.; Ratcliff, B.; Sarazin, X.; Schwiening, J.; Feb. 02, 2001; 30 pp.; In English
Report No.(s): DE2003-812983; SLAC-PUB-9038; No Copyright; Avail: Department of Energy Information Bridge
The DIRC detector is successfully operating as the hadronic particle identification system for the BaBar experiment at SLAC. The production of its Cherenkov radiator required much effort in practice, both in manufacture and conception, which in turn required a large number of R&D measurements. One of the major outcomes of this R&D work was an understanding of methods to select radiation hard and optically uniform fused silica material. Others included measurement of the wavelength dependency of the internal reflection coefficient, and its sensitivity to the surface pollution, selection of the radiator support, selection of good optical glue, etc. This note summarizes the optical R&D test results.
NTIS
Radiators; Optical Properties; Research Facilities; Linear Accelerators

20040008453 Fermi National Accelerator Lab., Batavia, IL, USA, Hawaii Univ., Honolulu, HI, USA
Survey Data of Booster Magnet Misalignments
Ohnuma, S.; Jul. 31, 2003; 12 pp.; In English
Report No.(s): DE2003-812925; FERMILAB-TM-2223; No Copyright; Avail: Department of Energy Information Bridge
As a part of the ongoing Booster improvement project, all the available data on Booster magnets are collected and tabulated. Data include not only the survey Results available at present (July 2003) but the magnet moves as well. The Main purpose of this exercise is not to provide a basis for the future magnet moves. Rather, the goal is to present the present knowledge on where magnets are and Incorporate it into, for example, the MAD lattice file so that one can see the impact of misaligned magnets on the closed orbit in the absence of any corrections.
NTIS
Boosters; Magnets; Surveys; Misalignment

20040008456 Stanford Linear Accelerator Center, Stanford, CA, USA
Protein Structure: Alignment using Mean Field Techniques and Measurement of Isolated Individual Molecules
Blankenbecler, R.; Mar. 13, 2003; 20 pp.; In English
Report No.(s): DE2003-812990; SLAC-PUB-9662; No Copyright; Avail: Department of Energy Information Bridge
First, this talk will briefly review the importance of protein structure from a physics point of view. Then Mean Field Techniques used in detector track fitting algorithms will be applied to the comparison of protein structures. The practical importance of such comparisons will be discussed. Second, the possibility of measuring the charge structure of 'single' isolated molecules using the proposed SLAC Free Electron Laser will be outlined. This involves the development of an algorithm that determines the orientation of each of the many targeted identical molecules, constructs the 3-D transform from the many 2-D patterns, and finally performs an inverse fourier transform when only the magnitude of the transform is known, since the phase is not measurable.
NTIS
Fourier Transformation; Molecular Structure; Proteins

20040008461
String Theory on Parallelizable PP-Waves
Sadri, D.; Sheikh-Jabbari, M. M.; 2003; 46 pp.; In English
Report No.(s): DE2003-813034; SLAC-PUB-9713; No Copyright; Avail: Department of Energy Information Bridge
The most general parallelizable pp-wave backgrounds which are non-dilatonic solutions in the NS-NS sector of type IIA and IIB string theories are considered. We demonstrate that parallelizable pp-wave backgrounds are necessarily homogeneous

plane-waves, and that a large class of homogeneous plane-waves are parallelizable, stating the necessary conditions. Such plane-waves can be classi.ed according to the number of preserved supersymmetries. In type IIA, these include backgrounds preserving 16, 18, 20, 22 and 24 supercharges, while in the IIB case they preserve 16, 20, 24 or 28 supercharges. An intriguing property of parallelizable pp-wave backgrounds is that the bosonic part of these solutions are invariant under T-duality, while the number of supercharges might change under T-duality. Due to their a exactness, they provide interesting backgrounds for studying string theory. Quantization of string modes, their compactification and behaviour under T-duality are studied. In addition, we consider BPS Dp-branes, and show that these Dp-branes can be classified in terms of the locations of their world volumes with respect to the background H-field.
NTIS
String Theory; Measurement; Field Theory (Algebra)

20040008462
BaBar Software Architecture and Infrastructure
Cosmo, G.; Jan. 15, 1999; 10 pp.; In English
Report No.(s): DE2003-813035; SLAC-PUB-9728; No Copyright; Avail: Department of Energy Information Bridge
The BaBar experiment has in place since 1995 a software release system (SRT Software Release Tools) based on CVS (Concurrent Version System) which is in common for all the software developed for the experiment, online or offline, simulation or reconstruction. A software release is a snapshot of all BaBar code (online, offline, utilities, scripts, makefiles, etc.) This set of code is tested to work together, and is indexed by a release number (e.g., 6.8.2) so a user can refer to a particular release and get reproducible results. A release will involve particular versions of packages. A package generally consists of a set of code for a particular task, together with a GNU makefile, scripts and documentation. All BaBar software is maintained in AFS (Andrew File System) directories, so the code is accessible worldwide within the Collaboration. The combination SRT, CVS, AFS, has demonstrated to be a valid, p owerful and efficient way of organizing the software infrastructure of a modern HEP experiment with collaborating Institutes distributed worldwide, both in a development and production phase.
NTIS
Radiation Detectors; Software Engineering; Architecture (Computers); Computer Programs

20040008464 Maryland Univ., College Park, MD, USA, Stanford Linear Accelerator Center, Stanford, CA, USA
Spin Structure Functions of the Proton and Deuteron from SLAC Experiments E155 and E155X
King, P. M.; 2002; In English
Report No.(s): DE2003-813046; SLAC-PUB-9741; No Copyright; Avail: National Technical Information Service (NTIS)
No abstract available
Protons; Deuterons

20040008465 Stanford Linear Accelerator Center, Stanford, CA, USA
Limit on the Two-Photon Production of the Glueball Candidate functions of J (2220) at CLEO
2003; 14 pp.; In English
Report No.(s): DE2003-813091; SLAC-PUB-9794; No Copyright; Avail: Department of Energy Information Bridge
We use the CLEO detector at the Cornell e(+)e(-) storage ring, CESR, to search for the two-photon production of the glueball candidate fJ (2220) in its decay to KsKs. We present a restrictive upper limit on the product of the two-photon partial width and the KsKs branching fraction. We use this limit to calculate a lower limit on the stickiness, which is a measure of the two-gluon coupling relative to the two-photon coupling. This limit on stickiness indicates that the fJ (2220) has substantial glueball content.
NTIS
Photons; Gluons; Production

20040008467 Stanford Linear Accelerator Center, Stanford, CA, USA
Experimental Test of Lepton Universality in tau Decay
2003; In English
Report No.(s): DE2003-813124; SLAC-PUB-9839; No Copyright; Avail: National Technical Information Service (NTIS)
No abstract available
Decay; Particles; Experimentation; Performance Tests; Leptons

20040008470 Stanford Linear Accelerator Center, Stanford, CA, USA, Case Western Reserve Univ., Cleveland, OH, USA, Duke Univ., Durham, NC, USA, Fermi National Accelerator Lab., Batavia, IL, USA

Analysis of Charged-Particle/Photon Correlations in Hadronic Multiparticle Production

Brooks, T. C.; Convery, M. E.; DelSignore, K. W.; Jenkins, T. L.; Kangas, E.; 2003; 40 pp.; In English

Report No.(s): DE2003-813143; SLAC-PUB-9865; HEP-PH/9609375; No Copyright; Avail: Department of Energy Information Bridge

In order to analyze data on joint charged-particle/photon distributions from an experimental search (T-864, MiniMax) for disoriented chiral condensate (DCC) at the Fermilab Tevatron collider, we have identified robust observables, ratios of normalized bivariate factorial moments, with many desirable properties. These include insensitivity to many efficiency corrections and the details of the modeling of the primary pion production, and sensitivity to the production of DCC, as opposed to the generic, binomial-distribution partition of pions into charged and neutral species. The relevant formalism is developed and tested in Monte-Carlo simulations of the MiniMax experimental conditions.

NTIS

Proton-Antiproton Interactions; Hadrons; Particle Accelerators; Photons; Charged Particles

20040008471 Stanford Linear Accelerator Center, Stanford, CA, USA

Bunch Compressor Beamlines for the TESLA and S-Band Linear Colliders

Emma, P.; 2003; 26 pp.; In English

Report No.(s): DE2003-813176; SLAC-PUB-10013; DESY-TESLA-95-17; No Copyright; Avail: Department of Energy Information Bridge

A detailed design for a single stage beam bunch length compressor for both the TESLA and the S-Band Linear Collider (SBLC) is presented. Compression is achieved by introducing an energy-position correlation along the bunch with an rf section at zero-crossing phase followed by a short bending section with energy dependent path length (momentum compaction). The motivation for a wiggler design is presented and many of the critical single bunch tolerances are evaluated. A solenoid based spin rotator is included in the design and transverse emittance tuning elements, diagnostics and tuning methods are described. Bunch length limitations due to second order momentum compaction and sinusoidal rf shape are discussed with options for compensation. Finally, the disadvantages of bunch compression using a 180' arc are discussed.

NTIS

Compressors; Design Analysis; Beams (Radiation); Linear Accelerators

20040008472 Stanford Linear Accelerator Center, Stanford, CA, USA

Tau Lepton Physics at a Tau-Charm Factory

Perl, M. L.; 2003; 30 pp.; In English

Report No.(s): DE2003-813177; SLAC-PUB-10014; No Copyright; Avail: Department of Energy Information Bridge

A two-day workshop, 'The Tau-Charm Factory in the Era of B-factories and CESR,' was held at SLAC in August, 1994. This paper summarizes the important research on the tau lepton which could be done at a tau-charm factory in the next decade. It is based on the presentations by the speakers and on the discussions by participants, as well as on published papers.

NTIS

Industrial Plants; Leptons; Particles

20040008476 Stanford Linear Accelerator Center, Stanford, CA, USA, Istituto Nazionale di Fisica Nucleare, Rome, Italy, Princeton Univ., NJ, USA, Colorado Univ., Denver, CO, USA

New BaBar Data Reconstruction Control System

Ceseracciu, A.; Piemontese, M.; Tehrani, F. S.; Elmer, P.; Johnson, D.; May 2003; 14 pp.; In English

Report No.(s): DE2003-813186; SLAC-PUB-9873; No Copyright; Avail: Department of Energy Information Bridge

The BaBar experiment is characterized by extremely high luminosity, a complex detector, and a huge data volume, with increasing requirements each year. To fulfill these requirements a new control system has been designed and developed for the offline data reconstruction system. The new control system described in this paper provides the performance and flexibility needed to manage a large number of small computing farms, and takes full benefit of OO design. The infrastructure is well isolated from the processing layer, it is generic and flexible, based on a light framework providing message passing and cooperative multitasking. The system is actively distributed, enforces the separation between different processing tiers by using different naming domains, and glues them together by dedicated brokers. It provides a powerful Finite State Machine framework to describe custom processing models in a simple regular language. This paper describes this new control system,

currently in use at SLAC and Padova on approximately 450 CPUs organized in 12 farms.
NTIS
Luminosity; Experimentation; Design Analysis; Active Control

20040008479 Stanford Linear Accelerator Center, Stanford, CA, USA, Tennessee Univ., Knoxville, TN, USA
Freezing of Moduli by N=2 Dyons
Kallosh, R.; Shmakova, M.; Wong, W. K.; 2003; 28 pp.; In English
Report No.(s): DE2003-813188; SLAC-PUB-9875; No Copyright; Avail: Department of Energy Information Bridge

In N=2 ungauged supergravity we have found the most general double-extreme dyonic black holes with arbitrary number n(sub v) of constant vector multiplets and n(sub h) of constant hypermultiplets. They are double-extreme: (1) supersymmetric with coinciding horizons, (2) the mass for a given set of quantized charges is extremal. The spacetime is of the Reissner-Nordstrom form and the vector multiplet moduli depend on dyon charges. As an example we display n(sub v) complex moduli as functions of 2(sub n(v) + 1) electric and magnetic charges in a model related to a classical Calabi-Yau moduli space. A specific case includes the complex S, T, U moduli depending on 4 electric and 4 magnetic charges of 4 U(1) gauge groups.
NTIS
Energy Levels; Freezing; Supergravity; Supersymmetry

20040008480 Stanford Linear Accelerator Center, Stanford, CA, USA
Brane-Anti-Brane Democracy
Kallosh, R.; Rajaraman, A.; May 03, 2003; 16 pp.; In English
Report No.(s): DE2003-813206; SLAC-PUB-9920; No Copyright; Avail: Department of Energy Information Bridge

We suggest a duality invariant formula for the entropy and temperature of nonextreme black holes in supersymmetric string theory. The entropy is given in terms of the duality invariant parameter of the deviation from extremality and 56 SU(8) covariant central charges. It interpolates between the entropies of Schwarzschild solution and extremal solutions with various amount of unbroken supersymmetries and therefore serves for classification of black holes in supersymmetric string theories. We introduce the second auxiliary 56 via E(7) symmetric constraint. The symmetric and antisymmetric combinations of these two multiplets are related via moduli to the corresponding two fundamental representations of E(7): brane and anti-brane numbers. Using the CPT as well as C symmetry of the entropy formula and duality one can explain the mysterious simplicity of the non-extreme black hole area formula in terms of branes and anti-branes.
NTIS
Supersymmetry; String Theory; Field Theory (Algebra)

20040008483 Stanford Linear Accelerator Center, Stanford, CA, USA, Maryland Univ., College Park, MD, USA
General Approach for Calculating Coupling Impedances of Small Discontinuities
Kurennoy, S. S.; Gluckstern, R. L.; 2003; 14 pp.; In English
Report No.(s): DE2003-813240; SLAC-PUB-9963; No Copyright; Avail: Department of Energy Information Bridge

A general theory of the beam interaction with small discontinuities of the vacuum chamber is developed taking into account the reaction of radiated waves back on the discontinuity. The reactive impedance calculated earlier is reproduced as the first order, and the resistive one as the second order of a perturbation theory based on this general approach. The theory also gives, in a very natural way, the results for the trapped modes due to small discontinuities obtained earlier by a different method.
NTIS
Impedance; Couplings; Electrical Resistance; Beam Interactions

20040008484, Rutherford Appleton Lab., Chilton
BaBar Computing Model
Geddes, N.; Apr. 1997; 12 pp.; In English
Report No.(s): DE2003-813241; SLAC-PUB-9964; No Copyright; Avail: Department of Energy Information Bridge

The BaBar experiment, currently being constructed at SLAC, will study CP violation in the B meson system at the Stanford Linear Accelerator Centers PEP-II accelerator. Due to the rarity of the CP violating decays these studies require large event samples. A large fraction of the data collected will require detailed analysis to isolate the small signal samples. The

BaBar collaboration is geographically widespread and we have developed a computing model to accommodate this far flung expertise.
NTIS
Models; Computation; Experimentation; CP Violation

20040008494 Stanford Linear Accelerator Center, Stanford, CA, USA
Flavor Constraints on Split Fermion Models
Lillie, B.; Hewett, J. A. L.; Jun. 2003; 34 pp.; In English
Report No.(s): DE2003-813269; SLAC-PUB-10005; No Copyright; Avail: Department of Energy Information Bridge
We examine the contributions to rare processes that arise in models where the Standard Model fermions are localized at distinct points in compact extra dimensions. Tree-level flavor changing neutral current interactions for the Kaluza-Klein (KK) gauge field excitations are induced in such models, and hence strong constraints are thought to exist on the size of the additional dimensions. We find a general parameterization of the model which does not depend on any specific fermion geography and show that typical values of the parameters can reproduce the fermion hierarchy pattern. Using this parameterization, we reexamine the contributions to neutral meson mixing, rare meson decays, and single top-quark production in e+e- collisions. We find that is it possible to evade the stringent bounds for natural regions of the parameters, while retaining finite separations between the fermion fields and without introducing a new hierarchy. The resulting limits on the size of the compact dimension can be as low as TeV-1.
NTIS
Fermions; Constraints; Standardization

20040008498 Stanford Linear Accelerator Center, Stanford, CA, USA
Generalized Parton Distributions in Terms of Light-Cone Wave Functions
Hwang, D. S.; Jun. 2003; 10 pp.; In English
Report No.(s): DE2003-813277; SLAC-PUB-10021; No Copyright; Avail: Department of Energy Information Bridge
The matrix elements of local operators such as electromagnetic current, energy momentum tensor, angular momentum, and generalized parton distributions have exact representations in terms of light-cone Fock state wavefunctions of bound states such as hadrons. We present formulae which express the form factors and the generalized parton distributions in terms of the light-cone wavefunctions.
NTIS
Angular Momentum; Partons

20040008502 Stanford Linear Accelerator Center, Stanford, CA, USA, Superconducting Super Collider Lab., Waxahachie, TX, USA
23-GEV/C Beam Transfer and Absorber Lines for the Superconducting Super Collider
Mao, N.; McGill, J.; Gerig, R.; Brown, K.; 2003; 18 pp.; In English
Report No.(s): DE2003-813285; SLAC-PUB-10029; No Copyright; Avail: Department of Energy Information Bridge
The beam optics of the 12-Ge V/c proton beam transfer line between the Low Energy Booster (LEB) and the Medium Energy Booster (MEB) at the Superconducting Super Collider is presented. The beam is extracted from the LEB vertically and is injected into the MEB through a vertical Lamberston magnet and a horizontal kicker. The beamline has high flexibility for amplitude and dispersion function matching. Effects of various errors in the transfer line are studied, and a beam position correction scheme is proposed. The beam optics of the 12-Ge V/c absorber line transporting the beam from the LEB to an absorber during the LEB commissioning is also presented.
NTIS
Superconducting Super Collider; Particle Diffusion; Beams (Radiation)

20040008505, Institute of Nuclear Physics, Cracow, Poland
Higgs Effects in Top Quark Pair Production
Harlander, R.; Jezabek, M.; Kuehn, J. H.; 2003; 12 pp.; In English
Report No.(s): DE2003-813247; SLAC-PUB-9973; HEP-PH/9506292; No Copyright; Avail: Department of Energy Information Bridge

Top quark production in pp and e+e- collisions is enhanced by the exchange of a Higgs boson. The enhancement factors are calculated in the threshold region using the Greens function method.
NTIS
Higgs Bosons; Quarks; Particle Production; Augmentation

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ACOUSTICS

Includes sound generation, transmission, and attenuation. For noise pollution see *45 Environment Pollution*. For aircraft noise see also *02 Aerodynamics* and *07 Aircraft Propulsion and Power*.

20040004171 Nippon Telegraph and Telephone Public Corp., Japan
Acoustic Nonlinear Effect on Auricular Cartilage Vibrated with Amplitude-Modulated Ultrasound
Okamoto, M.; Miyoshi, M.; Watanabe, Y.; NTT Technical Review, Volume 1, No. 5; August 2003, pp. 101; In English; See also 20040004150; Copyright; Avail: Other Sources; Abstract Only

When an ultrasound vibration that has been amplitude-modulated by audible sound is transmitted to an auricular cartilage such as the tragus, an audible sound is heard. To study this phenomenon, we measured the nonlinear effect using a piece of a pig's auricular cartilage and an acceleration sensor, and found that self-demodulation occurred in the cartilage. We also measured the sound pressure level using an acoustic coupler that simulated our earphone placed on the tragus. The results show that audible sound was generated in the coupler's air chamber. However, the most important factor was audible vibration from the cartilage produced by self-demodulation in the cartilage. Therefore, we think that the sound perceived by our earphone is also generated in our auricular cartilage.
Author
Cartilage; Nonlinearity; Ultrasonics; Vibration; Amplitude Modulation; Acoustics

20040005804 Swedish Defence Research Establishment, Stockholm, Sweden
Analysis of LFM Pulses Received by a Hydrophone Array in Shallow Water
Thoren, P.; Mar. 2003; In English
Report No.(s): PB2004-101287; FOI-R-0755-SE; No Copyright; Avail: National Technical Information Service (NTIS)

This report presents an analysis of linear FM pulses (chirps) collected by a vertical 8-hydrophone receiver array in shallow water in the Stockholm archipelago in May 2001. The water depth at the trial site varied from 28 to 42 m, and the pulses were sent from an omnidirectional source at ranges 50 to 700 m from the receiver array. The purpose of the experiment was to (I) identify multiple arrivals in the data and estimate the arrival times, using pulse compression techniques by replica correlation. (II) identify the propagation paths of the observed arrivals using sound propagation modeling by ray theory. (III) if possible, estimate reflection coefficients at the sea bed from bottom-reflected arrivals as a compliment of previous analyses with other techniques at the site. In section 2 the experiment is outline briefly. The methods of modeling and data analysis are described in section 3. Results are presented in section 4 and conclusions in section 5.
NTIS
Underwater Acoustics; Sound Propagation

20040005817 Illinois Inst. of Tech., Chicago, IL
Robust Locally Optimum Detection in Auto-Regressive Noise
Banys, Michael R.; Ucci, Donald R.; Aug. 2003; 154 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-98-C-0032; Proj-4519
Report No.(s): AD-A418500; AFRL-IF-RS-TR-2003-183; No Copyright; Avail: CASI; A08, Hardcopy

This report represents the culmination of a study focusing on more extensive characterizations of a robust autoregressive locally optimum (ARLO) detector for spread spectrum signals operating in a variety of noise environments. The signal is modeled as corrupted by both Gaussian and Non- Gaussian noise as representative of many interference environments. The normal linear correlator is sub-optimum, as is a fixed non-linearity. The ARLO algorithm, in contrast, uses an adaptive nonlinearity that utilizes probability density function (PDF) estimation techniques to alleviate the need for a priori knowledge of the channel noise characteristics. The ARLO algorithm uses PDF estimation techniques for Independent Identically Distributed (IID) noise samples as the input sequence to the AR model is lID. The goal and results of this effort described

herein is to further characterize performance improvements using a more efficient C (rather than MatLab) program.
DTIC
Detectors; Noise Measurement; Channel Noise

20040005865 Washington Univ., Seattle, WA, USA
[Signal Processing Suite Design]
Sahr, John D.; Mir, Hasan; Morabito, Andrew; Grossman, Matthew; November 05, 2003; 2 pp.; In English
Contract(s)/Grant(s): NAG5-5294; No Copyright; Avail: CASI; A01, Hardcopy

Our role in this project was to participate in the design of the signal processing suite to analyze plasma density measurements on board a small constellation (3 or 4) satellites in Low Earth Orbit. As we are new to space craft experiments, one of the challenges was to simply gain understanding of the quantity of data which would flow from the satellites, and possibly to interact with the design teams in generating optimal sampling patterns. For example, as the fleet of satellites were intended to fly through the same volume of space (displaced slightly in time and space), the bulk plasma structure should be common among the spacecraft. Therefore, an optimal, limited bandwidth data downlink would take advantage of this commonality. Also, motivated by techniques in ionospheric radar, we hoped to investigate the possibility of employing aperiodic sampling in order to gain access to a wider spatial spectrum without suffering aliasing in k-space.
Author
Signal Processing; Design Analysis; Plasma Density; Density Measurement

20040005897 NASA Glenn Research Center, Cleveland, OH, USA
The Noise of a Forward Swept Fan
Dittmar, James H.; Elliott, David M.; Fite, E. Brian; November 2003; 32 pp.; In English
Contract(s)/Grant(s): WBS 22-781-30-11
Report No.(s): NASA/TM-2003-212208; E-13811; No Copyright; Avail: CASI; A03, Hardcopy

A forward swept fan, designated the Quiet High Speed Fan (QHSF), was tested in the NASA Glenn 9-by 15-foot Low Speed Wind Tunnel to investigate its noise reduction relative to a baseline fan of the same aerodynamic performance. The objective of the Quiet High Speed Fan was a 6 decibel reduction in the Effective Perceived Noise relative to the baseline fan at the takeoff condition. The intent of the Quiet High Speed Fan design was to provide both a multiple pure tone noise reduction from the forward sweep of the fan rotor and a rotor-stator interaction blade passing tone noise reduction from a leaned stator. The tunnel noise data indicted that the Quiet High Speed Fan was quieter than the baseline fan for a significant portion of the operating line and was 6 dB quieter near the takeoff condition. Although reductions in the multiple pure tones were observed, the vast majority of the EPNdB reduction was a result of the reduction in the blade passing tone and its harmonics. The baseline fan's blade passing tone was dominated by the rotor-strut interaction mechanism. The observed blade passing tone reduction could be the result of either the redesign of the Quiet High Speed Fan Rotor or the redesigned stator. The exact cause of this rotor-strut noise reduction, whether from the rotor or stator redesign, was not discernable from this experiment.
Author
Aerodynamic Noise; Low Speed Wind Tunnels; Fan Blades; Aircraft Design; Aeroacoustics

20040006312 Volpe National Transportation Systems Center, Cambridge, MA, USA, NASA Langley Research Center, Hampton, VA, USA
Sound Generation by Aircraft Wake Vortices
Hardin, Jay C.; Wang, Frank Y.; December 2003; 28 pp.; In English
Contract(s)/Grant(s): 23-137-30-10; Proj. IAA-1-600
Report No.(s): NASA/CR-2003-212674; No Copyright; Avail: CASI; A03, Hardcopy

This report provides an extensive analysis of potential wake vortex noise sources that might be utilized to aid in their tracking. Several possible mechanisms of aircraft vortex sound generation are examined on the basis of discrete vortex dynamic models and characteristic acoustic signatures calculated by application of vortex sound theory. It is shown that the most robust mechanisms result in very low frequency infrasound. An instability of the vortex core structure is discussed and shown to be a possible mechanism for generating higher frequency sound bordering the audible frequency range. However, the frequencies produced are still low and cannot explain the reasonably high-pitched sound that has occasionally been

observed experimentally. Since the robust mechanisms appear to generate only very low frequency sound, infrasonic tracking of the vortices may be warranted.
Author
Aircraft Wakes; Sound Waves; Vortices; Tracking (Position)

20040006467 Naval Postgraduate School, Monterey, CA
Model-Data Comparison of Shallow Water Acoustic Reverberation in the East China Sea
Hill, Robert M.; Sep. 2003; 89 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418561; No Copyright; Avail: CASI; A05, Hardcopy

In this thesis, the Monterey-Miami Parabolic Equation (MMPE) model is used to generate predictions from numerical analysis of the reverberation loss structure and peak vertical correlation structure generated by the water/bottom interface, the bottom/sub-bottom interface, and the bottom volume for a shallow water environment. These predictions are then compared to the peak vertical correlation analysis of recorded data collected in an actual shallow water environment similar to the modeled environment. This experimental data was recorded by a 32-element vertical line array (VLA) that recorded the reverberant return generated by charges detonated over the continental shelf in the East China Sea as part of ASIAEX. A comparison is made between predictions and recorded data by analyzing trends in peak vertical correlation with decreasing bandwidth. The influences of interface roughness, bottom volume perturbations, and water volume turbulence on peak vertical correlation is also determined.
DTIC
Reverberation; Vertical Distribution; Surface Roughness; Mathematical Models; Perturbation

20040006496 Naval Postgraduate School, Monterey, CA
'Follow the Leader' Tracking by Autonomous Underwater Vehicles (AUVs) Using Acoustic Communications and Ranging
Kucik, Daniel P.; Sep. 2003; 208 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418580; No Copyright; Avail: CASI; A10, Hardcopy

With advances in computer and sensor technologies, autonomous underwater vehicles (AUVs) are now capable of reaching a level of independent action once thought impossible. Through the use of cooperative behaviors it is possible to further increase their autonomy by allowing multiple operating AUVs to simultaneously coordinate their activities to improve the efficiency and effectiveness of the overall system. This thesis research defines the algorithms and rules needed to perform 'follow the leader' cooperative behaviors during AUV rendezvous. This is a low-level first step towards more sophisticated cooperative behaviors, such as swarming or new forms of obstacle/trap avoidance. The approach taken here differs from previous research in that it does not rely on beacons or locator sensors, but instead uses ranging and intention information shared between the vehicles using acoustic communications. Several tools and algorithms are presented to support the future development of cooperative behaviors. In particular, a previously developed 3D virtual world simulator that utilizes dynamics-based vehicle models has been enhanced to support multiple simultaneously operating vehicles. Finally, a procedural algorithm is shown to correct the relative navigation errors between two vehicles through the use of vehicle-to-vehicle communications and ranging information obtained via acoustic modems. (3 tables, 69 figures, 55 refs.)
DTIC
Robotics; Underwater Vehicles; Sound Ranging; Sound Transmission

20040008485 Naval Submarine Medical Research Lab., Groton, CT
Sonar Headphone Selection for Optimum Performance: An Overview
Russotti, Joseph S.; Jun. 27, 1995; 30 pp.; In English
Report No.(s): AD-A418658; NSMRL-1197; No Copyright; Avail: CASI; A03, Hardcopy

Real-time auditory detection and aural analysis capability of passive broadband sonar systems needs improvement. A weak link in these systems is the use of communications-bandwidth low-fidelity headsets. Unfortunately, no procedure for headphone (earphone element inside headshell) frequency response measurement exists in military headset specifications. An accurate technique for headphone calibration was devised which provides the earphone element with an acoustic load similar to the one provided by a human wearer. Using this technique, headphone measurement data on commercially available headphones was collected and compared to the current sonar headsets. The advantages and disadvantages of open and sealed circumaural headsets and recent developments in noise canceling headsets are discussed, along with the possibility of reducing

noise levels in sonar spaces to permit use of higher fidelity headphone designs.
DTIC
Earphones; Auditory Perception; Sonar; Noise Intensity

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*.

20040004155 Nippon Telegraph and Telephone Public Corp., Japan
Structural Stability of the Ge/Si(113)-2 x 2 Surface
Nakamura, J.; Zhang, Z.; Sumitomo, K.; Omi, H.; Ogino, T.; Natori, A.; NTT Technical Review, Volume 1, No. 5; August 2003, pp. 102; In English; See also 20040004150; Copyright; Avail: Other Sources

We have investigated the atomic structure and electronic states for the Ge/Si (113)-2 x 2 surface using first-principles total energy calculations. We have found that the model made up of alternating [l l0]-oriented rows of rebonded atoms and tilted pentamers of five atoms with an interstitial atom has the lowest surface energy of the models employed. Furthermore, the local density of states calculated for this surface provides a satisfactory description of recent scanning tunneling microscope images.
Author
Atomic Structure; Electron States; Silicon; Structural Stability; Surface Energy

20040004186 Nippon Telegraph and Telephone Public Corp., Japan
Electronic Structure of Single-walled Carbon Nanotubes Encapsulating Potassium
Suzuki, S.; Maeda, F.; Wananabe, Y.; Ogino, T.; NTT Technical Review, Volume 1, No. 5; August 2003, pp. 100; In English; See also 20040004150; Copyright; Avail: Other Sources; Abstract Only

Electronic structural change of single-walled carbon nanotubes induced by potassium encapsulation was studied by photoemission spectroscopy. The potassium encapsulation caused a shift of the overall valence-band spectrum toward the higher binding-energy side by about 0.5 eV, which is basically understood by the simple rigid band shift model. However, the spectral intensity increase observed near the Fermi level was much larger than that expected by assuming the simple R* band filling, indicating that, in addition to the R* band, a part of the density of states initially located in the unoccupied states dips below the Fermi level by the potassium encapsulation. The result is qualitatively consistent with a recent band-structure calculation, which predicted that the nearly free-electron state hybridized with the K 4s state crosses the Fermi level. The potassium encapsulation also decreased the work function by 1.4 eV.
Author
Carbon Nanotubes; Electronic Structure

20040005849 Materials Research Society, Warrendale, PA
Three-Dimensional Nanoengineered Assemblies
Orlando, Thomas M.; Merhari, Lhadi; Taylor, David P.; Ikuta, Koji; Jan. 2003; 293 pp.; In English
Contract(s)/Grant(s): F49620-03-1-0106
Report No.(s): AD-A418609; No Copyright; Avail: CASI; A13, Hardcopy

Advances in nanoscale materials processing are taking place at a rapid pace via myriad paths, including lithography, production of nanoparticle assemblies, surface manipulation and many others. Several of the new techniques create structures that are three-dimensional or quasi three- dimensional. Even smaller structures intended to be two- dimensional have a more‘ three-dimensional geometry as their two-dimensional feature size and layer thickness become similar. The properties of these denser assemblies are driving different applications in electronics (single electron devices), optics (photonic crystals and switches) and elsewhere. Since insights from one area of research can be crucial to the developments and advances in other areas, the symposium on ’Three-Dimensional Nanoengineered Assemblies‘ provided the venue for a productive scientific and technical exchange. - - Symposium H, ’Three-Dimensional Nanoengineered Assemblies,‘ held December 1-5 at the 2002 MRS Fall Meeting in Boston, Massachusetts, brought together researchers from a wide range of fields. The symposium included much work that was ’not quite truly 3D‘ and ’3D but not quite on the nanoscale,‘ and the conference topic was not focused in a particular area of research, but on a goal that is being pursued by many groups approaching from diverse directions. The result was a symposium in which common overarching themes emerged from presentations in widely separated research areas. More than 100 abstracts were submitted and there were 29 invited talks covering work that spanned a remarkable number of

topics. The symposium was generally well attended and there was good feedback about the overall quality of the presentations. The symposium addressed fundamental studies, technological advances and novel approaches to developing and processing three-dimensional nanoscale assemblies.
DTIC
Nanofabrication; Nanostructure

20040005860 Princeton Univ., NJ, USA
Long Time Scale of Molecular Dynamics Phenomena
Rabitz, Herschel; Nov. 2003; 5 pp.; In English
Contract(s)/Grant(s): DAAD19-00-1-0475
Report No.(s): AD-A418615; ARO-41571.2-CH; No Copyright; Avail: CASI; A01, Hardcopy

An optimal reduced space method for capturing the low-frequency motion in a classical molecular dynamics calculations is presented. This technique provides a systematic means for carrying out reduced-dimensional calculations in an effective set of reduced coordinates. The method prescribes an optimal reduced subspace linear transformation for the low frequency motion. The method is illustrated with a dynamics calculation for a model system, where the original six-dimensional space is reduced to two (three) dimensions, depending on the desired frequency cutoff value.
DTIC
Molecular Dynamics; Linear Transformations; Low Frequencies

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*.

20040004273 Technical Research Centre of Finland, Espoo, Finland
Reactor Physics Calculations in the Nordic Countries. Proceedings of the 11th Nordic Reactor Physics Meeting held in Helsinki, Finland on April 9-10, 2003
Hoeglund, R.; 2003; In English
Report No.(s): PB2004-101992; VTT-SYMPOSIUM-230; No Copyright; Avail: National Technical Information Service (NTIS)

The eleventh biennial meeting on reactor physics calculations in the Nordic countries was arranged by VTT Processes in Otaniemi, Espoo and on board Tallink's m/s Romantika on April 9-10, 2003. 18 technical papers on very different subjects in the field of reactor physics were presented by the 46 participants of 8 nationalities representing 13 organizations in 6 countries: research establishments, technical universities, utilities, consultants and suppliers. Thus, some participants from outside the Nordic countries were also present this time. Additionally, VTT's activities in the nuclear field and the 'Finland-5' project were described.
NTIS
Conferences; Reactor Physics

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*.

20040004078 Naval Undersea Warfare Center, Newport, RI
Optical Fiber Coupler
Antonelli, Lynn T., Inventor; Aug. 19, 2003; 16 pp.; In English
Patent Info.: Filed 18 Aug. 2003; US-Patent-Appl-SN-10644549
Report No.(s): AD-D020097; No Copyright; Avail: Other Sources

Optical fiber coupler for coupling fiber optic elements includes a first fiber optic element extending in a first direction to position a free end thereof in a selected zone, and a second fiber optic element extending into the selected zone from an

opposite direction to position a free end of the second fiber optic element in the zone confronting the first fiber optic element free end. A cured optical grade epoxy resin body defines the zone and envelopes the free ends of the fiber optic elements, to effect physical and optical connection between the first and second fiber optic elements. Once cured, the housing material is removed leaving the completed coupler device. The free ends of the fiber optic elements are in close proximity, or in the case of coupling from one strand to a plurality of strands, in enough of a spaced relation, to permit required light diffusion.
DTIC
Couplers; Optical Fibers; Optical Waveguides

20040004178 Nippon Telegraph and Telephone Public Corp., Japan
Fast Restoration on Network Control Plane Established through Photonic MPLS Routers
Shimano, K.; Sahara, A.; Noguchi, K.; Koga, M.; Takigawa, Y.; Sato, K.; NTT Technical Review, Volume 1, No. 5; August 2003, pp. 101; In English; See also 20040004150; Copyright; Avail: Other Sources

This paper describes the requirements for fault recovery on photonic networks and proposes a fast restoration scheme for recovering optical networks. The proposed scheme is a type of pre-assignment restoration. The features of the scheme are that it is suitable for multi-recovery classes aimed at fine control of the optical paths and that it establishes harmonization between restoration control and distributed network control such as in IP networks. The scheme is implemented on Photonic multi protocol label switching (MPLS) routers. A restoration demonstration was performed and recovery was achieved within 500 ms in the optical layer.
Author
Distributed Parameter Systems; Optical Switching; Network Control; Active Control; Optical Paths

20040004179 Nippon Telegraph and Telephone Public Corp., Japan
Liquid Crystal Polarization Controller Arrays on Planar Waveguide Circuits
Hirabayashi, K.; Amano, C.; NTT Technical Review, Volume 1, No. 5; August 2003, pp. 101; In English; See also 20040004150; Copyright; Avail: Other Sources; Abstract Only

We have formed simple polarization-controller arrays by inserting liquid crystal (LC) in trenches cut across planar lightwave circuits (PLCs). We fabricated LC layers for use as polarization controllers on PLCs in two ways; in one, the ultra-thin layer of LC is held in a cell that is inserted into a trench on the PLC while in the other, the trench is directly filled with the LC. The ultra-thin LC cell can change the phase of 1-55-microns light from 0 to 3 pi while the LC filling can change the phase of light at the same wavelength from 0 to 12 pi below 5 Vrms. Two former parallel-aligned ultra-thin LC cells, where the directions of alignment of the liquid crystals are rotated by 45deg relative to each other, are capable of converting light with an arbitrary input polarization to TE or TM polarization. Ultra-thin cells of twisted nematic LC can switch the polarization between TE and TM modes with an extinction ratio of -15 dB. The array we fabricated had a pitch of 1 mm and S elements, but an array with more than 100 elements and a pitch below 125 microns will easily be possible by using finely patterned transparent electrodes. We have also applied our techniques to the fabrication of LC-based variable optical attenuators (VOA) on the PLC.
Author
Liquid Crystals; Polarization; Controllers; Attenuators; Transparence

20040004294 NASA Langley Research Center, Hampton, VA, USA
Simultaneous Temperature and Strain Sensing for Cryogenic Applications Using Dual-Wavelength Fiber Bragg Gratings
Wu, Meng-Chou; Prosser, William H.; [2003]; 6 pp.; In English; International Symposium on Optical Science and Technology, 3-8 Aug. 2003, San Diego, CA, USA
Contract(s)/Grant(s): 23-762-60-61; No Copyright; Avail: CASI; A02, Hardcopy

A new technique has been developed for sensing both temperature and strain simultaneously by using dual-wavelength fiber-optic Bragg gratings. Two Bragg gratings with different wavelengths were inscribed at the same location in an optical fiber to form a sensor. By measuring the wavelength shifts that resulted from the fiber being subjected to different temperatures and strains, the wavelength-dependent thermo-optic coefficients and photoelastic coefficients of the fiber were determined. This enables the simultaneous measurement of temperature and strain. In this study, measurements were made over the temperature range from room temperature down to about 10 K, addressing much of the low temperature range of cryogenic tanks. A structure transition of the optical fiber during the temperature change was found. This transition caused splitting of the waveforms characterizing the Bragg gratings, and the determination of wavelength shifts was consequently complicated.

The effectiveness and sensitivities of these measurements in different temperature ranges are also discussed.
Author
Bragg Gratings; Cryogenics; Detection; Fiber Optics; Optical Fibers; Strain Measurement; Temperature Measurement

20040005888 NASA Langley Research Center, Hampton, VA, USA
Theory of Fiber Optical Bragg Grating: Revisited
Tai, H.; [2003]; 8 pp.; In English; The International Symposium on Optical Science and Technology, 3-8 Aug. 2003, San Diego, CA, USA
Contract(s)/Grant(s): RTA 721-21-55-01; No Copyright; Avail: CASI; A02, Hardcopy

The reflected signature of an optical fiber Bragg grating is analyzed using the transfer function method. This approach is capable to cast all relevant quantities into proper places and provides a better physical understanding. The relationship between reflected signal, number of periods, index of refraction, and reflected wave phase is elucidated. The condition for which the maximum reflectivity is achieved is fully examined. We also have derived an expression to predict the reflectivity minima accurately when the reflected wave is detuned. Furthermore, using the segmented potential approach, this model can handle arbitrary index of refraction profiles and compare the strength of optical reflectivity of different profiles. The condition of a non-uniform grating is also addressed.
Author
Bragg Gratings; Optical Fibers; Reflected Waves; Reflectance; Mathematical Models

20040005905 Lawrence Livermore National Lab., Livermore, CA, USA
Optical Applications of NANO-Laminates
Barbee, Troy W., Jr.; [2003]; 1 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

To enable a new class of optical structures that are ultra-lightweight, dimensionally stable, resistant to environmental effects, have low cost and are fast to manufacture.
Author
Optical Properties; Stability; Environment Effects

20040005907 Schafer Corp., Albuquerque, NM, USA
SLMS(Trademark) Athermal Technology for UV and Cryogenic Applications
Goodman, William A.; Jacoby, William A.; [2003]; 1 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

SLMS (Trademark) Technology with an areal density of 5-10 kg/square meter has demonstrated exceptional figure accuracy (as low as 0.005 waves rms HeNe) and surface finish (less than 3 Angstroms rms) for Ultraviolet and Extreme Ultraviolet Imaging Applications, with dimensional stability of approx. 6 nm rms from 300 K to 27 K for Cryogenic Tests performed at NASA MSFC XRCF. This talk describes results of Phase I and Phase II SBIR work for both NASA and the Air Force.
Author
Cryogenics; Imaging Techniques; Surface Finishing

20040006508 Naval Submarine Medical Research Lab., Groton, CT
Perception of Temporal Order of Flashing Lights as a Navigation AID
Luria, S. M.; Jan. 4, 1990; 21 pp.; In English
Report No.(s): AD-A418598; NSMRL-1155; No Copyright; Avail: CASI; A03, Hardcopy

A set of lights flashing either simultaneously or sequentially was tested for effectiveness as a navigation beacon. The temporal interval between sequential flashes required for the perception of non-simultaneity averaged about 10 msec. The change in temporal interval required to see a difference increased as the initial temporal interval increased; it averaged about 18 msec when the lights were initially simultaneous to about 26 msec when the initial temporal interval was 33 msec. The temporal interval between the flashing lights required to perceive non-simultaneity appeared to increase when the lights were very dim and appeared to decrease when the viewing distance increased, although neither change reached statistical significance.
DTIC
Navigation Aids; Beacons

75
PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

20040004220 Princeton Univ., NJ
High Speed Imaging of Edge Turbulence in NSTX
Zweben, S. J.; Maqueda, R.; Stotler, D. P.; Keesee, A.; Boedo, J.; Mar. 2003; In English
Report No.(s): DE2003-812921; PPPL-3795; No Copyright; Avail: National Technical Information Service (NTIS)

The 2-D radial vs. poloidal structure and motion of edge turbulence in NSTX were measured by using high-speed imaging of the visible light emission from a localized neutral gas puff. Edge turbulence images are shown and analyzed for Ohmic, L-mode and H-mode plasma conditions. Typical edge turbulence poloidal correlation lengths as measured using this technique are approximately 4 plus or minus 1 cm and autocorrelation times are 40 plus or minus 20 microsec in all three regimes. The relative fluctuation level is typically smaller in H-mode than in Lmode, and transitions from H- to L-mode and can occur remarkably quickly (approximately 30 microsec). The 2-D images often show localized regions of strong light emission which move both poloidally and radially through the observed region at a typical speed of approximately 10(sup 5)cm/sec, and sometimes show spatially coherent modes.
NTIS
Plasma Physics; Turbulence

76
SOLID-STATE PHYSICS

Includes condensed matter physics, crystallography, and superconductivity. For related information see also *33 Electronics and Electrical Engineering*; and *36 Lasers and Masers*.

20040008279 Stanford Linear Accelerator Center, Stanford, CA, USA
Experimental Study of RF Pulsed Heating on Oxygen Free Electronic Copper
Feb. 2003; In English
Report No.(s): DE2003-812622; SLAC-PUB-9155; No Copyright; Avail: National Technical Information Service (NTIS)

When the thermal stresses induced by RF pulsed heating are larger than the elastic limit, microcracks and surface roughening will occur due to cyclic fatigue. Therefore, pulsed heating limits the maximum surface magnetic field and through it the maximum achievable accelerating gradient. An experiment using circularly cylindrical cavities operating in the mode at a resonant frequency of 11.424 GHz was designed to study pulsed heating on Oxygen Free Electronic (OFE) copper. An X-band klystron delivered up to 10 MW to the cavities in 1.5 pulses at 60 Hz repetition rate. One run was executed at a temperature rise of 120 K for the pulses. Cracks at grain boundaries, slip bands and cracks associated with these slip bands were observed. The second run consisted of the pulses with the temperature rise of 82 K, and cracks at grain boundaries and slip bands were seen. Additional information can be derived from the power-coupling iris, and we conclude that a pulsed temperature rise of 250 K for several million pulses leads to destruction of copper. These results can be applied to any mode of any OFE copper cavity.
NTIS
Copper; Oxygen; Radio Frequencies; Pulse Heating; Electron States

20040008369
Brane-Localized Kinetic Terms in the Randall-Sundrum Model
Davoudiasl, H.; Hewett, J. L.; Rizzo, T. G.; Dec. 2002; In English
Report No.(s): DE2003-812607; SLAC-PUB-9614; No Copyright; Avail: National Technical Information Service (NTIS)

We examine the effects of boundary kinetic terms in the Randall-Sundrum model with gauge fields in the bulk. We derive the resulting gauge Kaluza-Klein (KK) state wave functions and their corresponding masses, as well as the KK gauge field couplings to boundary fermions, and find that they are modified in the presence of the boundary terms. In particular, for natural choices of the parameters, these fermionic couplings can be substantially suppressed compared to those in the conventional Randall- Sundrum scenario. This results in a significant relaxation of the bound on the lightest gauge KK mass obtained from precision electroweak data; we demonstrate that this bound can be as low as m(sub 1) greater than5 TeV. Due to the relationship between the lightest gauge KK state and the electroweak scale in this model, this weakened constraint allows for

the electroweak scale to be near a TeV in this minimal extension of the Randall-Sundrum model with bulk gauge fields, as opposed to the conventional scenario.
NTIS
Kinetics; Boundaries; Electroweak Interactions (Field Theory)

20040008409 Stanford Linear Accelerator Center, Stanford, CA, USA
Nanoscale Phase Separation in Fe(sub 3)O(sub 4)(111) Films on Sapphire(001) Grown by Oxygen-Plasma-Assisted Molecular Beam Expitaxy
Farrow, R. F. C.; Jun. 2003; 46 pp.; In English
Report No.(s): DE2003-813273; SLAC-PUB-10009; No Copyright; Avail: Department of Energy Information Bridge
We report a phase instability in oxygen-plasma-assisted molecular beam epitaxy of magnetite films on sapphire substrates. Under a wide range of growth conditions, magnetite films phase separate, on a nanometer length scale, into magnetite and metallic Fe, which is attributed to formation of the thermodynamically unstable phase in the initial stages of growth.
NTIS
Magnetite; Epitaxy

20040008515 Rutherford Appleton Lab., Oxford, UK
Carbon Polymorphs Workshop. Held at Oxford, England on February 25-26, 2002
Hannon, A. C.; Bennington, S. M.; Sep. 2002; 264 pp.; In English
Report No.(s): PB2004-100960; RAL-CONF-2002-001; Copyright; Avail: National Technical Information Service (NTIS)
On February 25 and 26, 2002, a scientific workshop on Carbon Polymorphs was held at the CLRC's Rutherford Appleton Laboratory. This was the first meeting to be held under the auspices of the Center for Materials Physics and Chemistry. Forty participants from within the CLRC and from all over the world attended the workshop. Carbon polymorphs were chosen to be the subject of the inaugural meeting of the CMPC because this is currently an exciting and fast-moving field in the study of materials. Because this is such a dynamic topic, the authors considered that it would be worthwhile to put this booklet together as soon as possible after the workshop.
NTIS
Carbon; Polymorphism; Conferences

20040008520 Stockholm Univ., Sweden
Kramers Kronig Analysis in Electron Energy Loss Spectroscopy
Borglund, N.; Csillag, S.; Jan. 2002; 34 pp.
Report No.(s): PB2004-100934; USIP-2002-01; No Copyright; Avail: CASI; A03, Hardcopy
Kramers Kronig analysis extracts information about the dielectric function from the low loss part of the electron energy loss spectrum. Problems with poor energy resolution are encountered when performing the Kramers Kronig analysis on energy loss data acquisited in an electron microscope. The sensitivity of the analysis is demonstrated using the Lorentz Drude model. Results from Electron Energy Loss Spectroscopy (EELS) measurements on carbon nitride are given and discussed.
NTIS
Electron Spectroscopy; Dielectric Properties

20040008552 Air Force Research Lab., Wright-Patterson AFB, OH
Development of Low Cost (Sr,Ca)3Al2O6 Dielectrics for Bi2Sr2CaCu2O8+delta Applications
Haugan, Timothy; Wong-Ng, Winnie; Cook, Lawrence P.; Geyer, Richard G.; Brown, Henrietta J.; Oct. 2003; 6 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418698; AFRL-PR-WP-TP-2003-206; No Copyright; Avail: CASI; A02, Hardcopy
Aspects of the development of low-cost (Sr, Ca)3Al2O6 dialectics for Bi2Sr2CaCu2O8+δ superconductor applications were investigated. A tie-line phase equilibrium relationship between Bi2Sr2CaCu2O8+δ and Sr2CaAl2O6 compositions was observed at 860 C. When the Bi-2212 and (Sr, Ca)3Al2O6 solid-solution compositions were changed slightly, the tie-line relationship was not preserved, and a new phase was observed to form with composition ^ BiSr1.5Ca0. 5Al2Ox. Composites of (0 to 24) volume fraction % Sr2CaAl2O6 + Bi2Sr2CaCu2O8+δ equilibrated at 860 C slightly reduced the Tc (by 2 K to 4 K) and superconducting volume percentage of the 2212 phase.
DTIC
Low Cost; Superconductors (Materials); Dielectric Properties

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*.

20040004229 Stanford Linear Accelerator Center, Stanford, CA, USA
Radiation Safety Considerations for Design of the SPEAR3 Storage Ring
Rokni, S. H.; Liu, J. C.; Feb. 2003; In English
Report No.(s): DE2003-812951; SLAC-PUB-9651; No Copyright; Avail: National Technical Information Service (NTIS)

The SPEAR3 storage ring at the Stanford Synchrotron Radiation Laboratory (SSRL) is an upgrade of the existing SPEAR2 ring to a 3rd-generation storage ring with beam parameters of 3 GeV of electron beam energy, 18 nm-radian emittance and up to 500 mA of circulating current. While the existing injector will not be changed, the 234-m-circumference SPEAR2 ring components will be completely replaced with new components including C-shaped dipoles. The concrete shielding walls are to remain unchanged. This restriction, when considered in conjunction with the significant increase in the current and loss of self-shielding in the dipole magnets, requires careful study of the SPEAR3 shielding. This paper describes the methodology used for calculating the required shielding in a generic method. The criteria used for the design of shielding and beam loss estimates for various modes of beam operation are also presented.
NTIS
Radiation Protection; Ring Structures; Synchrotron Radiation

20040004230 Colorado Univ., Boulder, CO, Stanford Linear Accelerator Center, Stanford, CA, USA
Measurements of Rare B Decays at BaBaR
Bloom, P. C.; Mar. 2003; In English
Report No.(s): DE2003-812955; SLAC-PUB-9664; No Copyright; Avail: National Technical Information Service (NTIS)

We present the results of searches for rare B meson decays. The measurements use all or part of a data sample of about 88 million upsilon(4S) --> BB decays collected between 1999 and 2002 with the BABAR detector at the PEP-II asymmetric energy B Factory at the Stanford Linear Accelerator Center. We study a variety of decays dominated by electromagnetic, electroweak and gluonic penguin transitions, and report measurements of branching fractions.
NTIS
Mesons; Particle Decay

20040004231 Stanford Linear Accelerator Center, Stanford, CA, USA, California Inst. of Tech., Pasadena, CA
Results and Interpretations of the Spin Structure Experiments at SLAC
Kolomensky, Y.; Aug. 1997; In English
Report No.(s): DE2003-813139; SLAC-PUB-9860; No Copyright; Avail: National Technical Information Service (NTIS)

In the recent experiments E154 and E155 at SLAC the spin-dependent structure functions g(sub 1((sup n), g(sub 1)(sup p)), and g(sub 1)(sup d) of the neutron, proton, and deuteron were measured by scattering longitudinally polarized 48:3 GeV electrons off longitudinally polarized targets. We report on the measurement of g(sub 1)(sup n) by E154, and on the preliminary results on g(sub 1)(sup 0) from E155. The SLAC results provide the most precise determination to date of the polarized structure functions. We observe relatively large values of g(sub 1)(sup n) at low x that call into question the reliability of data extrapolation to x -> 0. Such divergent behavior disagrees with predictions of the conventional Regge theory, but is qualitatively explained by perturbative QCD. We perform a Next-to-Leading Order perturbative QCD analysis of the world data on the nucleon spin-dependent structure functions. Using the parameterizations of the helicity-dependent parton distributions obtained in the analysis, we evolve the data to Q(sup 2)= 5 GeV(sup 2), determine the first moments of the polarized structure functions of the proton and neutron, and find agreement with the Bjorken sum rule.
NTIS
Linear Accelerators; Particle Spin; Particle Accelerators

20040004235 Stanford Linear Accelerator Center, Stanford, CA, USA, California Univ., Santa Cruz, CA, USA, South Carolina Univ., Columbia, SC, USA, Massachusetts Univ., Amherst, MA, USA
Using Geant4 in the BaBar Simulation
Wright, D. H.; Aston, D.; Kocian, M. L.; Marsiske, H.; Lockman, W. S.; Mar. 2003; In English
Report No.(s): DE2003-813141; SLAC-PUB-9862; No Copyright; Avail: National Technical Information Service (NTIS)

BABAR was the first large experiment to incorporate Geant4 into its detector simulation. Since July 2001, 1. 5 x 10(sup 9) BABAR events have been produced using this simulation. In a typical e(sup+)e(sup -)(yields)(Upsilon) (4s)(yields) B(sup 0)(bar B)(sup 0) event, between 30 and 60 tracks are produced in the generator and propagated through the detector, using decay, electromagnetic and hadronic processes provided by the Geant4 toolkit. The material model of the detector is very detailed and a special particle transportation module was developed so that minute features (on the few micron scale) would be sampled in the propagation without sacrificing performance. The propagation phase for such an event requires 5 CPU seconds on an 866 MHz processor. Execution speeds for other BABAR event types will also be presented. Validation of simulated events with BABAR data is ongoing, and results of Monte Carlo/data comparisons will be shown. A discussion of the design of the simulation code, how the Geant4 toolkit is used, and ongoing efforts to improve the agreement between data and Monte Carlo will also be presented.
NTIS
Computerized Simulation; Particle Decay

20040004236 Stanford Linear Accelerator Center, Stanford, CA, USA
Theory and Observations of Microbunching Instability in Electron Machines
Stupakov, G.; May 2003; In English
Report No.(s): DE2003-813151; SLAC-PUB-9880; No Copyright; Avail: National Technical Information Service (NTIS)

For not very short bunches, the coherent synchrotron radiation (CSR) is usually suppressed by the shielding effect of the conducting walls of the vacuum chamber. However an initial density fluctuation in the beam with a characterlistic length much shorter than the bunch length can radiate coherently. If the radiation reaction force drives growth of the initial fluctuation, one can expect an instability which leads to micro-bunching of the beam and increased coherent radiation at short wavelengths. It has recently been realized that such an instability can play an important role in electron/positron rings where it often manifests itself as a bursting of radiation in the range of hundreds of gigahertz or terahertz. This instability can also be a source of an undesirable emittance growth in bunch compressors used in the next generation short-wavelength FELs. In this paper, we review progress in theoretical studies and numerical simulations of the microbunching instability and show connection of the theory to recent observations in electron machines.
NTIS
Electrons; Coherent Radiation; Synchrotron Radiation; Electron Bunching

20040004237 Stanford Linear Accelerator Center, Stanford, CA, USA
Transition Radiation Wakefields for a Beam Passing Through a Metallic Foil
Bane, K. L. F.; Stupakov, G.; Jun. 2003; In English
Report No.(s): DE2003-813182; SLAC-PUB-9726; No Copyright; Avail: National Technical Information Service (NTIS)

A proposal for the LCLS has been made to generate a shorter light pulse by placing a spoiler foil in the middle of a compressor chicane: The foil has a small slot, which selects out the small fraction of particles passing through it ('target particles') to lase (1), (2). In this report, using the method of field matching, we obtain longitudinal and transverse impedances and wakefields for several models of the proposed LCLS spoiler foil. Our models have no slot. We consider the model of a pencil beam, and of a cylindrically symmetric, bi-Gaussian beam that is wider than it is long. Thirdly, we generate a Green function that allows us to consider asymmetric beams also. For target particles of the tilted, tri-Gaussian beam that is found at the LCLS spoiler location we obtain approximate analytical formulas and numerical results for wakefield kicks in the three directions. We find that the kicks, after correction using a simple dipole and quadrupole, are all within tolerances.
NTIS
Emittance; Metal Foils; Electron Beams

20040004238 Stanford Linear Accelerator Center, Stanford, CA, USA, California Univ., Davis, CA, USA, European Organization for Nuclear Research, Geneva, Switzerland
Higgs Boson Discovery and Properties
Gunion, J. F.; Poggioli, L.; Van Kooten, R.; Kao, C.; Rowson, P.; 1996; In English
Report No.(s): DE2003-813203; SLAC-PUB-9917; HEP-PH/9703330; No Copyright; Avail: National Technical Information Service (NTIS)

We outline issues examined and progress made by the Light Higgs Snowmass 1996 working group regarding discovering Higgs bosons and measuring their detailed properties. We focused primarily on what could be learned at LEP2, the Tevatron

(after upgrade), the LHC, a next linear e(sup+)e(sup -) collider and a(mu)(sup+)(mu)(sup -) collider.
NTIS
Higgs Bosons; Accelerators

20040004239 Stanford Linear Accelerator Center, Stanford, CA, USA, Oregon Univ., Eugene, OR, USA
Recent Electroweak Results from SLC/SLD
Frey, R. E.; Apr. 1997; In English
Report No.(s): DE2003-813212; SLAC-PUB-9930; No Copyright; Avail: National Technical Information Service (NTIS)

Key electroweak measurements performed by the SLD collaboration at the SLC are described and recent results given. The left-right cross-section asymmetry, A(sub LR), has been updated to include the 1996 data. It remains the single most precise measurement of sin(sup 2)(theta)(sub W)(sup eff), and it is compared to the LEP results. The polarized differential cross section for b-quarks is measured and is used to perform a unique direct measurement of the parity violation parameter for b quarks, A(sub b). The excellent capability to perform secondary vertexing at SLC with CCD-based vertex detectors is described, including first physics results with the new detector VXD3. The vertexing is used to full advantage to make a highly pure B tag to measure the fraction of hadronic Z(sup 0) decays going to b quarks, R(sub b). The vertexing, in combination with electron-beam polarization, is used to measure B(sub d)(sup 0) mixing. The prospects for making a B(sub s)(sup 0) mixing measurement are excellent given good SLC performance in the upcoming SLC run(s).
NTIS
Linear Accelerators; Electroweak Interactions (Field Theory)

20040004241 Stanford Linear Accelerator Center, Stanford, CA, USA
More Transverse Polarization Signatures of Extra Dimensions at Linear Colliders
Rizzo, T. G.; Jun. 2003; In English
Report No.(s): DE2003-813267; SLAC-PUB-10001; No Copyright; Avail: National Technical Information Service (NTIS)

Polarization of both electron and positron beams at a future linear collider (LC) allows for the measurement of transverse polarization asymmetries. These asymmetries have been shown to be particularly sensitive to graviton or other spin-2, s-channel exchanges in the process e(sup+)e(sup--)(yields) f(bar f) (F(ne) e) which allows for a doubling of the usual search reach. A question then arises as to whether other e(sup+)e(sup -) processes also show comparable sensitivity. Here we extend our previous analysis to the set of final states e(sup+)e(sup -), W(sup+)W(sup -), 2(gamma) and 2Z as well as to the Moeller scattering process e(sup -)e(sup -). We demonstrate that these reactions yield transverse polarization asymmetries which are somewhat less sensitive to graviton exchange than are those obtained in our earlier analysis for e(sup+)e(sup -)(yields) f(bar f).
NTIS
Linear Accelerators; Polarization

20040004253 Stanford Linear Accelerator Center, Stanford, CA, USA, European Organization for Nuclear Research, Geneva, Switzerland, Academy of Sciences (USSR), Novosibirsk, USSR
Geant4 Hadronic Verification Suite for the Cascade Energy Range
Ivanchenko, V.; Folger, G.; Wellisch, J. P.; Koi, T.; Wright, D. H.; Jun. 2003; In English
Report No.(s): DE2003-813275; SLAC-PUB-10017; No Copyright; Avail: National Technical Information Service (NTIS)

A Geant4 hadronic process verification suite has been designed to test and optimize Geant4 hadronic models in the cascade energy range. It focuses on quantities relevant to the LHC radiation environment and spallation source targets. The general structure of the suite is presented, including the user interface, stages of verification, management of experimental data, event generation, and comparison of results to data. Verification results for the newly released Binary cascade and Bertini cascade models are presented.
NTIS
Hadrons; Cascades

20040004255 Rutgers Univ., New Brunswick, NJ, USA
QCD at SLD
Plano, R. J.; Jul. 1995; In English
Report No.(s): DE2003-813292; No Copyright; Avail: National Technical Information Service (NTIS)

This talk reviews seven SLD papers, which provide useful, unique, and precise contributions to our understanding of

hadron production in the decay of Z(sup 0)'s produced in e(sup+)e(sup -) collisions. The data were gathered by the SLAC Large Detector (SLD) at the SLAC Linear Collider (SLC). This accelerator/detector is able to compete with LEP in many studies, in spite of smaller statistics, due to systematic advantages including a tiny and stable interaction region combined with a precise high-resolution vertex detector, excellent particle identification, and a highly polarized electron beam. The papers include studies of: factorial and cumulant moments; charged multiplicities produced by b, c, and uds quarks; rapidity gaps; orientations and energy partitions of three-jet events; jet handedness; triple-product correlation in polarized Z(sup 0) decays to three jets; and(pi)(sup (+-)), K(sup(+-)), p, K(sup 0), and(Lambda) production in Z(sup 0) decays. Comparisons are made to LEP results where appropriate.
NTIS
Linear Accelerators; Quantum Chromodynamics; Hadrons; Particle Collisions

20040004256 Institute for Advanced Study, Princeton, NJ, USA, Stanford Linear Accelerator Center, Stanford, CA, USA
Brane Localized Curvature for Warped Gravitons
Davoundiasl, H.; Hewett, J. L.; Rizzo, T. G.; May 2003; In English
Report No.(s): DE2003-813334; HEP-PH/0305086; SLAC-PUB-9734; No Copyright; Avail: National Technical Information Service (NTIS)

We study the effects of including brane localized curvature terms in the Randall-Sundrum (RS) model of the hierarchy. This leads to the existence of brane localized kinetic terms for the graviton. Such terms can be induced by brane and bulk quantum effects as well as Higgs-curvature mixing on the brane. We derive the modified spectrum of Kaluza-Klein (KK) gravitons and their couplings to 4-dimensional fields in the presence of these terms. We find that the masses and couplings of the KK gravitons have considerable dependence on the size of the brane localized terms; the weak-scale phenomenology of the model is consequently modified . In particular, the weak-scale spin-2 graviton resonances which generically appear in the RS model may be significantly lighter than previously assumed. However, they may avoid detection as their widths may be too narrow to be observable at colliders. In the contact interaction limit, for a certain range of parameters, the experimental reach for the scale of the theory is independent of the size of the boundary terms.
NTIS
Linear Accelerators; Gravitons; Curvature

20040004352 Stanford Linear Accelerator Center, Stanford, CA, USA
Combination of Preliminary Electroweak Measurements and Constraints on the Standard Model
Dec. 02, 1997; In English
Report No.(s): DE2003-813338; SLAC-PUB-9828; CERN-PPE/97-154; No Copyright; Avail: National Technical Information Service (NTIS)

This note presents a combination of published and preliminary electroweak results from the four LEP collaborations and the SLD collaboration which were prepared for the 1997 summer conferences. Averages are derived for hadronic and leptonic cross-sections, the leptonic forward- backward asymmetries, the gamma polarisation asymmetries, the bb and cc partial widths and forward- backward asymmetries and the qq charge asymmetry. The major changes with respect to results presented last year are updated results of ALR from SLD, and the inclusion of the first direct measurements of the W mass and triple-gauge-boson couplings performed at LEP. The results are compared with precise electroweak measurements from other experiments. The parameters of the Standard Model are evaluated, first using the combined LEP electroweak measurements, and then using the full set of electroweak results.
NTIS
Electroweak Interactions (Field Theory); Standard Model (Particle Physics)

20040008288
Resonance-Continuum Interference in the Di-Photon Higgs Signal at the LHC
Dixon, L.; Siu, M. S.; Feb. 2003; In English
Report No.(s): DE2003-812641; HEP-PH/0302233; No Copyright; Avail: National Technical Information Service (NTIS)

The Higgs boson is the lone undetected elementary particle of the Standard Model (SM), and the only scalar. In the SM, it accounts for the masses of the W and Z bosons, quarks and charged leptons, and its properties are completely fixed by its mass. Its detection, and measurement of its properties, are among the prime goals of the Fermilab Tevatron and the CERN Large Hadron Collider (LHC).
NTIS
Photons; Higgs Bosons

20040008368 Stanford Linear Accelerator Center, Stanford, CA, USA
Supersymmetry: the Next Spectroscopy
Peskin, M. E.; Dec. 2002; In English
Report No.(s): DE2003-812606; SLAC-PUB-9613; No Copyright; Avail: National Technical Information Service (NTIS)
I describe the picture by which super symmetry-the possible symmetry of Nature that converts fermions to bosons and vice versa-accounts for the next stage of physics beyond the Standard Model. I then survey the future experimental program implied by this theory, in which the spectrum of particles associated with super symmetry will be determined with precision.
NTIS
Spectroscopy; Supersymmetry

20040008375 Stanford Linear Accelerator Center, Stanford, CA, USA, Superconducting Super Collider Lab., Dallas, TX, USA
Orbit Correction System for the SSC Interaction Regions
Nosochkov, Y.; Pilat, F.; 2003; 14 pp.; In English
Report No.(s): DE2003-813296; SLAC-PUB-10041; No Copyright; Avail: Department of Energy Information Bridge
Luminosity and performance of the colliding beam machine depend on how well the orbits of the counter rotating beams are controlled in the Interaction Regions (IRs). Two main requirements for the orbit correction in the IRs are: correction of the orbit perturbations caused by magnetic and alignment errors. It could be done in a similar way as in the rest of the machine (global correction); and provision of the specific crossing orbit conditions at the Interaction Point (IP) and continuous control on the beam positions at the IP (local correction). In this paper we review the design of the orbit correction for the Superconducting Super Collider (SCC) interaction regions, and discuss the principles of the local orbit correction at the IP.
NTIS
Orbits; Superconducting Super Collider

20040008457 Stanford Linear Accelerator Center, Stanford, CA, USA
Light-Front Quantization of Gauge Theories
Brodsky, S. J.; Mar. 2003; 22 pp.; In English
Report No.(s): DE2003-812973; SLAC-PUB-9689; No Copyright; Avail: Department of Energy Information Bridge
Light-front wavefunctions provide a frame-independent representation of hadrons in terms of their physical quark and gluon degrees of freedom. The light-front Hamiltonian formalism provides new nonperturbative methods for obtaining the QCD spectrum and eigensolutions, including resolvant methods, variational techniques, and discretized light-front quantization. A new method for quantizing gauge theories in light-cone gauge using Dirac brackets to implement constraints is presented. In the case of the electroweak theory, this method of light-front quantization leads to a unitary and renormalizable theory of massive gauge particles, automatically incorporating the Lorentz and 't Hooft conditions as well as the Goldstone boson equivalence theorem. Spontaneous symmetry breaking is represented by the appearance of zero modes of the Higgs field leaving the light-front vacuum equal to the perturbative vacuum. I also discuss an 'event amplitude generator' for automatically computing renormalized amplitudes in perturbation theory. The importance of final-state interactions for the interpretation of diffraction, shadowing, and single-spin asymmetries in inclusive reactions such as deep inelastic lepton-hadron scattering is emphasized.
NTIS
Quantum Chromodynamics; Perturbation Theory

20040008458
First Observations of a Fast Beam-Ion Instability
2003; 12 pp.; In English
Report No.(s): DE2003-813029; SLAC-PUB-7409; No Copyright; Avail: Department of Energy Information Bridge
We report the results of experiments on a fast beam-ion instability at the Advanced Light Source (ALS). This ion instability, which can arise even when the ions are not trapped over multiple beam passages, will likely be important for many future accelerators. In our experiments, we filled the ALS storage ring with helium gas, raising the pressure approximately two orders of magnitude above the nominal value. With gaps in the bunch train large enough to avoid conventional (multi-turn) ion trapping, we observed a factor of 2-3 increase in the vertical beam size along with coherent beam oscillations. The single-pass nature of this instability was demonstrated.
NTIS
Ionic Collisions; Linear Accelerators; Storage Rings (Particle Accelerators); Stability

81
ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20040006295 Aviation Week and Space Technology, New York, NY, USA
Solidifying Safety
Covault, Craig; Aviation Week and Space Technology; November 3, 2003, pp. 27-30; In English; Copyright; Avail: Other Sources

Contents include the following: 1. Solidifying Safety: NASA s new safety organization spools up, as the 1SS program grapples with long-term risk. 2. Earth to Orbit O'Keefe telling skeptical lawmakers Orbital Space Plan (OSP) will cover exploration vision. China's rapid pace.
CASI
Solidification; Safety; Risk

82
DOCUMENTATION AND INFORMATION SCIENCE

Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography. For computer program documentation see *61 Computer Programming and Software*.

20040004234 Army Communications-Electronics Command, Fort Monmouth, NJ, USA
Fusion-Based Knowledge for the Objective Force
Powell, Gerald M.; Broome, Barbara; Aug. 14, 2002; 19 pp.; In English; Original contains color illustrations
Report No.(s): AD-A418513; No Copyright; Avail: CASI; A03, Hardcopy

In sum, the volume and nature of information reported to analysts and decision-makers exceeds their capabilities to process it in a manner that satisfies the time- constraints and level of situational understanding desired for planning and acting within the adversaries decision cycle. The overall objective of this science and technology project is to develop an advanced knowledge generation and explanation capability (automated decision-support) for answering war fighting commanders' critical intelligence requirements in a timely manner. The scope of the project will address particular requirements and issues associated with intelligence analysis and decision-making conducted at the U.S. Army Division level today, as well as the Army's Future Combat System's Unit of Employment and Unit of Action. Clearly, the problems addressed by this project intersect with many of the critical problems characterizing the war against terrorism as well. This paper characterized the nature of the problems and challenges currently faced by Army analysts and the decision-makers they support. It identified issues and requirements associated with these problems and described our planned technical approach including: the technologies we plan to explore and how they may be utilized (e.g., ontologies, Bayesian belief networks, rule-based systems, and knowledge discovery); an initial candidate system architecture; metrics and methods for system evaluation; and the central role of cognitive engineering in our approach to human-computer system design. We also identified a number of key projects directly related to this one both within DARPA and the U.S. armed services that we believe provide an excellent opportunity for cross-fertilization and synergy.
DTIC
Information Systems; Decision Support Systems

20040004240 Stanford Linear Accelerator Center, Stanford, CA, USA
Operational Aspects of Dealing with the Large BaBar Data Set
Azemoon, T.; Hasan, A.; Kroeger, W.; Trunov, A.; Jun. 2003; In English
Report No.(s): DE2003-813245; SLAC-PUB-9970; No Copyright; Avail: National Technical Information Service (NTIS)

To date, the BaBar experiment has stored over 0.7PB of data in an Objectivity/DB database. Approximately half this data-set comprises simulated data of which more than 70% has been produced at more than 20 collaborating institutes outside of SLAC. The operational aspects of managing such a large data set and providing access to the physicists in a timely manner is a challenging and complex problem. We describe the operational aspects of managing such a large distributed data-set as well as importing and exporting data from geographically spread BaBar collaborators. We also describe problems common to dealing with such large datasets.
NTIS
Data Base Management Systems; Radiation Detectors

20040004328 National Science Foundation, Arlington, VA, Library of Congress, Washington, DC, USA
It's About Time: Research Challenges in Digital Archiving and Long-Term Preservation
Aug. 2003; 56 pp.; In English
Report No.(s): PB2004-101457; No Copyright; Avail: CASI; A04, Hardcopy

One of the marvels of the information technology revolution is the continuous improvement in computer memory and storage performance and their simultaneous drop in cost. Thanks to what has been called 'silicon scaling' the processing power of a 1980s vintage mainframe computer now fits on miniscule silicon chips that can be embedded in any number of capture devices from complex remote sensors to consumer digital cameras. Digital storage devices and media have benefitted from similar performance improvements and cost declines. Large organizations routinely add terabytes of storage capacity, and more and more individuals can afford laptop and desktop computers with tens of gigabytes of storage. One might suspect that archiving and preserving digital information would become easier and cheaper as a consequence of these improvements. But from a long-term preservation perspective, there is a dark side to the rapid growth in digital information. The technologies, strategies, methodologies, and resources needed to manage digital information for the long term have not kept pace with innovations in the creation and capture of digital information.
NTIS
Digital Systems; Data Storage; Information Systems; Information Retrieval; Digital Techniques; Data Retrieval

20040008536 Swedish Defence Research Establishment, Stockholm, Sweden
Information Warfare in FoRMA: Documentation from War Games 2001
Kindvall, G.; Nordstrand, E.; Feb. 2003; 54 pp.; In Swedish
Report No.(s): PB2004-101280; FOI-R-0810-SE; Copyright; Avail: National Technical Information Service (NTIS)

During 2001 the information warfare (IW) group within the FoRMA project carried out two war games-one focusing on an armed attack on Sweden ('Roslagen') and one on Swedish participation in an international peace support operation ('Kaukasus'). The report gives a general overview of the two scenarios. Within these scenarios a number of situations were analyzed. In the first war game ('Roslagen') the focus was mainly on CNO (computer network operations) on a tactical level. The purpose of the second war game was to analyze what units and components within the information warfare field that needed to be in place in the area of operations or in the vicinity and which resources that could be at home and used on a 'reach-back basis'. The focus in the second war game was on CNO, electronic warfare and psychological operations (psyop). Other IW components such as physical destruction of command and control resources and deception, are just mentioned. The report presents conclusions from the different situations as well as summarized conclusions from the two war games.
NTIS
Electronic Warfare; Warfare; Computerized Simulation

83
ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

20040006298 Cayuga County Community Coll., Auburn, NY, USA
Preserving the Finger Lakes for the Future: A Prototype Decision Support System for Water Resource Management, Open Space, and Agricultural Protection
Brower, Robert; December 2003; 11 pp.; In English
Contract(s)/Grant(s): NAG13-02059; No Copyright; Avail: CASI; A03, Hardcopy

As described herein, this project has progressed well, with the initiation or completion of a number of program facets at programmatic, technical, and inter-agency levels. The concept of the Virtual Management Operations Center has taken shape, grown, and has been well received by parties from a wide variety of agencies and organizations in the Finger Lakes region and beyond. As it has evolved in design and functionality, and to better illustrate its current focus for this project, it has been given the expanded name of Watershed Virtual Management Operations Center (W-VMOC). It offers the advanced, compelling functionality of interactive 3D visualization interfaced with 2D mapping, all accessed via Internet or virtually any kind of distributed computer network. This strong foundation will allow the development of a Decision Support System (DSS) with anticipated enhanced functionality to be applied to the myriad issues involved in the wise management of the Finger Lakes region.
Derived from text
Decision Support Systems; Lakes; Protection; Resources Management; Water Resources; Watersheds

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*.

20040005902 Atmospheric and Environmental Research, Inc., Lexington, MA, USA
Two-Dimensional Transport Studies for the Composition and Structure of the Io Plasma Torus
Smyth, William H.; December 29, 2003; 24 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): NASW-02036; NASW-02003
Report No.(s): P-1037; No Copyright; Avail: CASI; A03, Hardcopy

The overall objective of this project is to investigate the roles of local and spatially extended plasma sources created by Io, plasma torus chemistry, and plasma convective and diffusive transport in producing the long-lived S(+), S(++) and O(+) radial ribbon structures of the plasma torus, their System III longitude and local-time asymmetries, their energy sources and their possible time variability. To accomplish this objective, two-dimensional [radial (L) and System III longitude] plasma transport equations for the flux-tube plasma content and energy content will be solved that include the convective motions for both the east-west electric field and co-rotational velocity-lag profile near Io s orbit, radial diffusion, and the spacetime dependent flux-tube production and loss created by both neutral-plasma and plasma-ion reaction chemistry in the plasma torus. For neutral-plasma chemistry, the project will for the first time undertake the calculation of realistic three-dimensional, spatially-extended, and time-varying contributions to the flux-tube ion-production and loss that are produced by Io's corona and extended neutral clouds. The unknown two-dimensional spatial nature of diffusion in the plasma transport will be isolated and better defined in the investigation by the collective consideration of the foregoing different physical processes. For energy transport, the energy flow from hot pickup ions (and a new electron source) to thermal ions and electrons will be included in investigating the System III longitude and local-time temperature asymmetries in the plasma torus. The research is central to the scope of the NASA Sun-Earth Connection Roadmap in Quest II Campaign 4 'Comparative Planetary Space Environments' by addressing key questions for understanding the magnetosphere of planets with high rotation rates and large internal plasma sources and, in addition, is of considerable importance to the NASA Solar System Exploration Science Theme. In this regard, Jupiter is the most extreme example with its rapid rotation and with its inner Galilean satellite Io providing the dominant plasma source for the magnetosphere.
Derived from text
Plasma Heating; Io; Electron Sources; Energy Transfer; Toroidal Plasmas; Galilean Satellites

89
ASTRONOMY

Includes observations of celestial bodies; astronomical instruments and techniques; radio, gamma-ray, x-ray, ultraviolet, and infrared astronomy; and astrometry.

20040004085 Mission Research Corp., Nashua, NH
CBSKY4: Reference Manual
Noah, Paul V.; Noah, Meg A.; Feb. 2001; 88 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F19628-93-C-0028; Proj-S321
Report No.(s): AD-A418520; AFRL-VS-HA-TR-2001-1576; No Copyright; Avail: CASI; A05, Hardcopy

The CBSKY4 component to the Celestial Background Scene Descriptor (CBSD) provides positions and fluxes for over 10,000 cataloged stars and stars produced by a statistical number density (logN-logS). Wavelength coverage is from 2 to 30 micrometers plus the Johnson BVJHK bands, the COBE/DIRBE 2. 4micrometers band, IRAS 12 and 25micrometers, TD1A 1565 A, FAUST 1660 A, and the Apollo 165201' 1400 A band. Spectral energy distributions of all stars are provided through 87 spectral templates. The model provides images over the entire sky and rectangular or gnomonic projection images of narrower fields of view. Output files give statistics in the scene. The user provides the time, look angles, band parameters (predefined band, response function, or an upper and lower limit), and image size requirements. This document is a users guide to the CBSKY4 model.
DTIC
Catalogs (Publications); Indexes (Documentation); Manuals

20040004136 Stanford Linear Accelerator Center, Stanford, CA, USA, Rome Univ., Rome, International School for Advanced Studies, Trieste, Italy

Search for Dark Matter with GLAST

Morselli, A.; Cesarini, A.; Fucito, F.; Lionetto, A.; Nov. 2002; In English

Report No.(s): DE2003-813324; SLAC-PUB-10077; No Copyright; Avail: National Technical Information Service (NTIS)

The detection of exotic cosmic rays due to pair annihilation of dark matter particles in the Milky Way halo is a viable techniques to search for supersymmetric dark matter candidates. The study of the spectrum of gamma-rays, antiprotons and positrons offers good possibilities to perform this search in a significant portion of the Minimal Supersymmetric Standard Model parameter space. In particular the EGRET team have seen a convincing signal for a strong excess of emission from the Galactic center that has no simple explanation with standard processes. We will review the limits achievable with the experiment GLAST taking into accounts the LEP results and we will compare this method with the antiproton and positrons experiments.

NTIS

Dark Matter; Particle Theory; Milky Way Galaxy; Gamma Ray Astronomy

20040004217 Durham Univ., UK, Harvard-Smithsonian Center for Astrophysics, Cambridge, MA, USA, Stanford Linear Accelerator Center, Stanford, CA, USA

Simultaneous Chandra and RXTE Observations of the Nearby Bright Seyfert 2 Galaxy NGC 4945

Done, C.; Madejski, G. M.; Zycki, P. T.; Greenhill, L. J.; Jan. 2003; In English

Report No.(s): DE2003-812617; SLAC-PUB-9637; No Copyright; Avail: National Technical Information Service (NTIS)

We analyze recent simultaneous Chandra/RXTE observations of the Seyfert 2 galaxy NGC 4945. The unprecedented spatial resolution of Chandra means we are able to separate the spectra of the nucleus starburst and superwind regions, while the RXTE data extend the spectrum to higher energies.

NTIS

Seyfert Galaxies; X Ray Astronomy

20040005922 Karlova Univ., Prague, Czechoslovakia

Structure of the Outer Cusp and Sources of the Cusp Precipitation during Intervals of a Horizontal IMF

Nemecek, Z.; Safrankova, J.; Prech, L.; Simunek, J.; Sauvaud, J.-A.; Fedorov, A.; Stenuit, H.; Fuselier, S. A.; Savin, S.; Zelenyi, L., et al.; Journal of Geophysical Research; 2003; ISSN 0148-0227, pp. 1-24; In English

Contract(s)/Grant(s): NAG5-9071; GACR-205/02/0947; KUGA-191/02; MSM Proj. 1132000004; Copyright; Avail: Other Sources

The cusp represents a place where the magnetosheath plasma can directly penetrate into the magnetosphere. Since the main transport processes are connected with merging of the interplanetary and magnetospheric field lines, the interplanetary magnetic field (IMF) Orientation plays a decisive role in the formation of the high-altitude cusp. The importance of the sign of the IMF Bz component for this process was suggested about 40 years ago and later it was documented by many experimental investigations. However, situations when IMF Bz is the major IMF component are rather rare. The structure of the cusp during periods of a small IMF BZ is generally unknown, probably due to the fully 3-D nature of the interaction. The present case study reveals the importance of horizontal IMF components on the global magnetospheric configuration as well as on small-scale processes at the cusp-magnetosheath interface. We have used simultaneous measurements of several spacecraft (ISTP program) operating in different regions of interplanetary space and two closely spaced satellites (INTERBALL-1/MAGION- 4) crossing the cusp-magnetosheath boundary to show the connection between the short- and large-scale phenomena. In the northern hemisphere, observations suggest a presence of two spots of cusp-like precipitation supplied by reconnection occurring simultaneously in both hemispheres. A source of this bifurcation is the positive IMF By component further enhanced by the field draping in the magnetosheath. This magnetic field component shifts the entry point far away from the local noon but in opposite sense in either hemisphere.

Author

Cusps (Landforms); Precipitation (Meteorology); Interplanetary Magnetic Fields; Magnetosheath

20040008251 Smithsonian Astrophysical Observatory, Cambridge, MA, USA

Precise Laboratory Measurement of LINR Frequencies Useful to Studies of Star and Planet Formation

Myers, Philip C.; January 2004; 3 pp.; In English

Contract(s)/Grant(s): NAG5-11784; No Copyright; Avail: CASI; A01, Hardcopy

In March 2002, we began a program in laboratory spectroscopy to provide accurate molecular line frequencies essential to studies of the motions and abundances in star-froming dense cores and planet-forming circumstellar disks. The CN radical is one of the most important tracers of dynamical motions in protoplanetary disks around low mass pre-main sequence stars. The millimeter-wave spectrum of CN consists of rotational transitions every 113 GHz which are split into many resolved hyperfine components. Very narrow and fairly bright lines of SiO in the ground vibrational state have been observed in regions where protostellar outflows interact with the cold ambient gas. In support of future astronomical observations in these regions, 10 successive rotational lines in the ground vibrational state of Si0 between 86 and 500 GHz, and two lines near 800 GHz were measured in the laboratory to an accuracy of a few kHz. A negative glow discharge spectrometer that will allow the determination of accurate line frequencies of molecular ions has been constructed. We are presently modifying the method for cooling the magnetic field enhanced (negative glow) discharge cell to 77 K.
Author
Star Formation; Planetary Evolution; Stellar Mass; Protoplanetary Disks; Molecular Ions; Frequency Measurement; Cold Gas

90
ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

20040004219 Fermi National Accelerator Lab., Batavia, IL, USA
Radiation Load to the SNAP CCD
Mokhov, N. V.; Rakhno, I. L.; Striganov, S. I.; Peterson, T. J.; Sep. 2003; In English
Report No.(s): DE2003-812842; FERMILAB-TM-2221; No Copyright; Avail: National Technical Information Service (NTIS)
Results of an express Monte Carlo analysis with the MARS14 code of radiation load to the CCD optical detectors in the Supernova Acceleration Project (SNAP) mission presented for realistic radiation environment over the satellite orbit.
NTIS
Supernovae; Satellite Orbits; Acceleration; CCD Cameras

20040004254 Stanford Linear Accelerator Center, Stanford, CA, USA
Observational Bounds on Cosmic Doomsday
Kallosh, R.; Jul. 2003; In English
Report No.(s): DE2003-813287; SLAC-PUB-10032; No Copyright; Avail: National Technical Information Service (NTIS)
Recently it was found, in a broad class of models, that the dark energy density may change its sign during the evolution of the universe. This may lead to a global collapse of the universe within the time t(sub c)(approx) 10(sup 10)-10(sup 11) years. Our goal is to find what bounds on the future lifetime of the universe can be placed by the next generation of cosmological observations. As an example, we investigate the simplest model of dark energy with a linear potential V((phi))= V(sub 0)(1+(alpha)(phi)). This model can describe the present stage of acceleration of the universe if(alpha) is small enough. However, eventually the field (phi) rolls down, V((phi)) becomes negative, and the universe collapses. The existing observational data indicate that the universe described by this model will collapse not earlier than t(sub c)(approx underline equal) 10 billion years from the present moment. We show that the data from SNAP and Planck satellites may extend the bound on the 'doomsday' time to tc 40 billion years at the 95% confidence level.
NTIS
Universe; Cosmology; Galactic Evolution

20040004350 Illinois Univ., IL, USA
NGC7009: Testing the Wind-Wind Interaction Formation of Planetary Nebulae
Chu, You-Hua; Gruendl, Robert; Guerrero, Martin; September 09, 2003; 1 pp.; In English
Contract(s)/Grant(s): NAG5-10042; No Copyright; Avail: CASI; A01, Hardcopy
We have successfully obtained the XMM-Newton observations of NGC 7009. X-ray emission is detected from the interior of NGC 7009, and it is definite resolved, indicating a plasma emission. We have carried out both a spatial analysis and a spectral analysis. The spatial analysis is limited by the angular resolution of the telescope. It is possible to confirm the existence of diffuse emission from hot gas, but the detailed distribution of the hot gas and the amount of stellar emission cannot be determined. The spectral analysis shows that the plasma temperature is only about 2 x 10(exp 6) K. This is the coolest PN interior ever detected. A mixing of shocked fast stellar wind and the cool nebular material is needed. The results of our analysis

have been reported in a paper published in the Astronomy and Astrophysics Letters, as given below.
Derived from text
Planetary Nebulae; Spectrum Analysis; Emission Spectra; X Rays

20040005899 Illinois Univ., IL, USA
Hot Gas in Planetary Nebulae
Gruendl, Robert A.; Chu, You-Hua; Guerrero, Martin; September 10, 2003; 1 pp.; In English
Contract(s)/Grant(s): NAG5-10182; No Copyright; Avail: CASI; A01, Hardcopy

It was successfully obtained the FUSE spectra of all targets awarded. The analysis of the spectra has been a complex task due to the superposition of the P-Cygni profile from the wind of the central star and absorption components from low ionization and molecular species in the nebular shell. In six of the eight targets there are narrow O VI absorption components that may arise from the interface layer between the hot (l0(exp 6) K) interior gas and the surrounding warm (l0(exp 4) K) dense nebular shell. To better determine whether these narrow O VI absorption lines arise from the interface region we have obtained ground-based high-dispersion spectroscopic observations of the central star and nebula to pin-point the precise line-of-sight velocity of the nebular emission lines. The comparison between these optical spectra with the far-UV spectra obtained with FUSE is complete. The analysis shows that in most cases the narrow O VI absorption components have velocities slightly redshifted from the emission lines which arise from the approaching side of the nebular shell. Preliminary results have been published in two papers.
Derived from text
High Temperature Gases; Planetary Nebulae; Emission Spectra; Line Spectra; Molecular Gases

20040005900 Illinois Univ., USA
X-ray Emission in the Large Magellanic Cloud
Chu, You-Hua; Snowden, Steve; Gruendl, Robert; Points, Sean; September 09, 2003; 2 pp.; In English
Contract(s)/Grant(s): NAG5-8104; No Copyright; Avail: CASI; A01, Hardcopy

All HRI images of the LMC was mosaicked. The HRI mosaic has been presented in various meetings. We have identified point and diffuse X-ray sources and analyzing their X-ray properties. The HRI mosaic has been included in papers studying individual interstellar features as well as large-scale distribution of hot gas. The results have been published in several papers.
Author
X Ray Sources; Emission; Magellanic Clouds

20040006299 Aerospace Corp., Los Angeles, CA, USA
Radiation Belt Electron Dynamics: Modeling Atmospheric Losses
Selesnick, R. S.; December 18, 2003; 25 pp.; In English
Contract(s)/Grant(s): NAG5-12766; No Copyright; Avail: CASI; A03, Hardcopy

The first year of work on this project has been completed. This report provides a summary of the progress made and the plan for the coming year. Also included with this report is a preprint of an article that was accepted for publication in Journal of Geophysical Research and describes in detail most of the results from the first year of effort. The goal for the first year was to develop a radiation belt electron model for fitting to data from the SAMPEX and Polar satellites that would provide an empirical description of the electron losses into the upper atmosphere. This was largely accomplished according to the original plan (with one exception being that, for reasons described below, the inclusion of the loss cone electrons in the model was deferred). The main concerns at the start were to accurately represent the balance between pitch angle diffusion and eastward drift that determines the dominant features of the low altitude data, and then to accurately convert the model into simulated data based on the characteristics of the particular electron detectors. Considerable effort was devoted to achieving these ends. Once the model was providing accurate results it was applied to data sets selected from appropriate periods in 1997, 1998, and 1999. For each interval of -30 to 60 days, the model parameters were calculated daily, thus providing good short and long term temporal resolution, and for a range of radial locations from L = 2.7 to 3.9. .
Derived from text
Radiation Belts; Models; Electrons; Upper Atmosphere; Electron Counters

20040008287, California Univ., Davis, CA, USA
WMAPping Out Neutrinos Masses
Pierce, A.; Murayama, H.; Feb. 2003; In English
Report No.(s): DE2003-812638; UCB-PTH-03/03; HEP-PH/0302131; No Copyright; Avail: National Technical Information Service (NTIS)

Recent data from from the Wilkinson Microwave Anisotropy Probe (WMAP) place important bounds on the neutrino sector. The precise determination of the baryon number in the universe puts a strong constraint on the number of relativistic species during Big-Bang Nucleosynthesis. WMAP data, when combined with the 2dF Galaxy Redshift Survey (2dFGRS), also directly constrain the absolute mass scale of neutrinos. These results con.ict with a neutrino oscillation interpretation of the result from the Liquid Scintillator Neutrino Detector (LSND) over the entire favored mixing region. We also note that the Heidelberg-Moscow evidence for neutrinoless double beta decay is only consistent with the WMAP+2dFGRS data for the largest values of the nuclear matrix element.
NTIS
Microwave Anisotropy Probe; Anisotropy; Neutrinos

20040008294
Black Holes in Active Galactic Nuclei
Madejski, G.; Mar. 2003; In English
Report No.(s): DE2003-812998; SLAC-PUB-9702; No Copyright; Avail: National Technical Information Service (NTIS)
The most viable scenario for modeling of active galactic nuclei includes a supermassive black hole (with the mass of 10(sup 6)-10(sup 9) Solar masses) accreting the galaxian matter from its vicinity. The release of the gravitational energy of the infalling matter is ultimately responsible for the large radiative output of those objects, and in some cases, for formation and acceleration of powerful relativistic jets. This paper outlines our current understanding of the structure of AGN, and summarizes the observational evidence for black holes in those objects.
NTIS
Black Holes (Astronomy); Active Galactic Nuclei

20040008474 Stanford Linear Accelerator Center, Stanford, CA, USA, Naval Research Lab., Washington, DC, USA
X-Ray Bursts in Neutron Star and Black Hole Binaries from USA and RXTE Data: Detections and Upper Limits
Tournear, D.; Raffauf, E.; Bloom, E. D.; Giebels, B.; Godfrey, G.; Jun. 2003; 28 pp.; In English
Report No.(s): DE2003-813180; SLAC-PUB-9649; No Copyright; Avail: Department of Energy Information Bridge
Narayan and Heyl have developed a theoretical framework to convert suitable upper limits on type I X-ray bursts from accreting black hole candidates (BHCs) into evidence for an event horizon. However, no appropriate observational limit exists in the literature. In this paper we survey 2101.2 ks of data from the Unconventional Stellar Aspect (USA) X-ray timing experiment and 5142 ks of data from the Rossi X-ray Timing Explorer (RXTE) experiment to obtain a formal constraint of this type. 1122 ks of neutron star data yield a population averaged mean burst rate of 1.69 x 10(exp -5) bursts/s while 6081 ks of BHC data yield a 95% confidence level upper limit of 4.9 x 10(exp -7) bursts/s). This is the first published limit of this type for Black Hole Candidates.
NTIS
Gamma Ray Bursts; Black Holes (Astronomy); X Ray Binaries

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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*.

20040004081 Stanford Linear Accelerator Center, CA, USA, Naval Research Lab., Washington, DC, USA, NASA Ames Research Center, Moffett Field, CA, USA
Long-Term X-Ray Variability of Circinus X-1
Saz Parkinson, P. M.; Tournear, D. M.; Bloom, E. D.; Focke, W. B.; Reilly, K. T.; Mar. 2003; In English
Report No.(s): DE2003-812964; SLAC-PUB-9678; No Copyright; Avail: National Technical Information Service (NTIS)
We present an analysis of long term X-ray monitoring observations of Circinus X-1 (Cir X-1) made with four different instruments: Vela 5B, Ariel V ASM, Ginga ASM, and RXTE ASM, over the course of more than 30 years. We use Lomb-Scargle periodograms to search for the approx. 16.5 day orbital period of Cir X-1 in each of these data sets and from this derive a new orbital ephemeris based solely on X-ray measurements, which we compare to the previous ephemerides obtained from radio observations. We also use the Phase Dispersion Minimization (PDM) technique, as well as FFT analysis, to verify the periods obtained from periodograms. We obtain dynamic periodograms (both Lomb-Scargle and PDM) of Cir X-1

during the RXTE era, showing the period evolution of Cir X-1, and also displaying some unexplained discrete jumps in the location of the peak power.
NTIS
X Ray Astronomy; Variability; Astronomical Satellites

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SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots. For related information see *93 Space Radiation*.

20040006296 California Univ., Los Angeles, CA, USA
Dayside Proton Aurora: Comparisons between Global MHD Simulations and Image Observations
Berchem, J.; Fuselier, S. A.; Petrinec, S.; Frey, H. U.; Burch, J. L.; Space Science Reviews; 2003, pp. 1-36; In English
Contract(s)/Grant(s): NAS5-96020; NAG5-9071; SWRI Proj. 5760
Report No.(s): IGPP-UCLA-Publ-5760; Copyright; Avail: CASI; A03, Hardcopy

The IMAGE mission provides a unique opportunity to evaluate the accuracy of current global models of the solar wind interaction with the Earth's magnetosphere. In particular, images of proton auroras from the Far Ultraviolet Instrument (FUV) onboard the IMAGE spacecraft are well suited to support investigations of the response of the Earth's magnetosphere to interplanetary disturbances. Accordingly, we have modeled two events that occurred on June 8 and July 28, 2000, using plasma and magnetic field parameters measured upstream of the bow shock as input to three-dimensional magnetohydrodynamic (MHD) simulations. This paper begins with a discussion of images of proton auroras from the FUV SI-12 instrument in comparison with the simulation results. The comparison showed a very good agreement between intensifications in the auroral emissions measured by FUV SI-12 and the enhancement of plasma flows into the dayside ionosphere predicted by the global simulations. Subsequently, the IMAGE observations are analyzed in the context of the dayside magnetosphere's topological changes in magnetic field and plasma flows inferred from the simulation results. Finding include that the global dynamics of the auroral proton precipitation patterns observed by IMAGE are consistent with magnetic field reconnection occurring as a continuous process while the iMF changes in direction and the solar wind dynamic pressure varies. The global simulations also indicate that some of the transient patterns observed by IMAGE are consistent with sporadic reconnection processes. Global merging patterns found in the simulations agree with the antiparallel merging model. though locally component merging might broaden the merging region, especially in the region where shocked solar wind discontinuities first reach the magnetopause. Finally, the simulations predict the accretion of plasma near the bow shock in the regions threaded by newly open field lines on which plasma flows into the dayside ionosphere are enhanced. Overall the results of these initial comparisons between global MHD simulation results and IMAGE observations emphasize the interplay between reconnection and dynamic pressure processes at the dayside magnetopause. as well as the intricate connection between the bow shock and the auroral region.
Author
Magnetohydrodynamics; Solar Wind; Magnetospheres; Plasma Interactions; Magnetic Field Reconnection

99
GENERAL

Includes aeronautical, astronautical, and space science related histories, biographies, and pertinent reports too broad for categorization; histories or broad overviews of NASA programs such as Apollo, Gemini, and Mercury spacecraft, Earth Resources Technology Satellite (ERTS), and Skylab; NASA appropriations hearings.

20040008547 Swedish Defence Research Establishment, Stockholm, Sweden
Particle Estimation, Basic Theory: An Introduction
Wirkander, S. L.; Jun. 2002; 32 pp.
Report No.(s): PB2004-101268; FOI-R-0473-SE; Copyright; Avail: National Technical Information Service (NTIS)

In the project 'Jamming of Navigation Systems' different combinations of inertial and GPS-based navigation systems are investigated. A topic of special interest in this connection is the so-called tightly coupled integration of the two types of systems. One reason for this is its importance as a prerequisite for the introduction of electrically steerable antennas, by means of which external disturbances can be efficiently suppressed, thereby increasing the robustness of the navigation system. However, the tightly coupled integration gives rise to nonlinear estimation problems. For this reason a Monte Carlo-based

estimator called ‘Particle Filter’ has been investigated in an earlier report and found to give a better performance in certain respects. It does not, as opposed to the Kalman estimator, require that the system noise is Gaussian in order to work optimally. This report consists of a derivation of the Particle Filter algorithm.
NTIS
Algorithms; Monte Carlo Method

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