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Langley Research Center

Scientific and Technical
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NASA STI Program ... in Profile

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

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

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

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

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

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

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

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

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

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

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

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

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

- Write to:
  NASA STI Help Desk
  NASA Center for AeroSpace Information
  7121 Standard Drive
  Hanover, MD 21076-1320

Introduction

Scientific and Technical Aerospace Reports (*STAR*) is an online information resource listing citations and abstracts of NASA and 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.

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

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

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

NASA STI Availability Information

NASA Center for AeroSpace Information (CASI)

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

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

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

National Technical Information Service (NTIS)

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

The Federal Depository Library Program (FDLP)

The U.S. Congress established the **Federal Depository Library Program** (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

Personal Author Index

SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

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01
AERONAUTICS (GENERAL)

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

20060009170 National Renewable Energy Lab., Golden, CO USA
FAST User's Guide. (Updated August 2005)
Jonkman, J. M.; Buhl, M. L.; January 2005; 148 pp.; In English
Report No.(s): DE2005-15020796; NREL/TP-500-38230; No Copyright; Avail.: National Technical Information Service (NTIS)

The FAST (Fatigue, Aerodynamics, Structures, and Turbulence) Code is a comprehensive aeroelastic simulator capable of predicting both the extreme and fatigue loads of two- and three-bladed horizontal-axis wind turbines . This document covers the features of FAST and outlines its operating procedures.
NTIS
Aerodynamics; Aeroelasticity; Simulation

03
AIR TRANSPORTATION AND SAFETY

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

20060009134 Metropolitan Transportation Commission, Oakland, CA, USA
Airport Activity and Noise Trends, October 1993
Oct. 1993; 68 pp.; In English
Report No.(s): PB2006-103525; No Copyright; Avail.: CASI: A04, Hardcopy

This report is published by the Metropolitan Transportation Commission (MTC) to provide information concerning local Bay Area airport activity and airport noise trends. The airport activity data are obtained from published airline schedules and from the monthly airport activity reports. Information relating to airport noise trends is obtained from the airports and includes data from each airport's noise monitoring system.
NTIS
Air Traffic; Air Transportation; Airports; Charts; Transportation; Trends

20060009484 Hughes Technical Center, Atlantic City International Airport, NJ, USA
Examination of Possible Technologies for the Detection of Human Stowaways in Air Cargo Containers
Klock, B. A.; Jun. 2005; 102 pp.; In English
Contract(s)/Grant(s): DTFACT-03-C-00042
Report No.(s): PB2006-101612; No Copyright; Avail.: CASI: A06, Hardcopy

A number of vendors, tools, and technologies with the potential to aid in the detection of stowaways in air cargo containers have been investigated. Many of the systems examined hold promise in this area. The Transportation Security Administration's (TSA's) decision of which of these to implement should take into account a number of factors, including performance (effectiveness), ease of use, price, and utility. This includes a determination of how a given solution integrates with TSA's

overall plan for the screening of air cargo, including detection of human stowaways, conventional weapons, nuclear, chemical, and radiological weapons, and other potential threats. The primary goal of this study is to identify the technology or combination of technologies that will provide the best possible rate of detection, while minimizing 'false positives. The secondary consideration is to identify how to do this as inexpensively as possible, without compromising the primary goal.
NTIS
Air Cargo; Security; Detection

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.

20060009124 Federal Aviation Administration, Washington, DC, USA
How We Made the First Flight
Wright, O.; January 2004; 28 pp.; In English
Report No.(s): PB2006-103586; No Copyright; Avail.: CASI: A03, Hardcopy

Aviation is on the cutting edge of technology. The story of the progress and growth of aviation is the story of technological advance. What the Wright brothers started with the first 120 -foot flight on December 17, 1903 has led to space flight and in the process, changed life on earth forever.
NTIS
Histories; Flight; Aeronautics; Technology Utilization

20060009923 Government Accountability Office, Washington, DC, USA
Joint Strike Fighter: Management of the Technology Transfer Process
Mar. 2006; 26 pp.; In English
Report No.(s): PB2006-107506; GAO-06-364; No Copyright; Avail.: CASI: A03, Hardcopy

The Joint Strike Fighter (JSF) program is the Department of Defense's (DOD) largest international cooperative effort to develop and produce a major weapon system. Due to the breadth of international participation, the number of export authorizations needed to share information with partner governments, solicit bids from suppliers, and execute contracts is expected to far exceed past transfers of advanced military technology. In July 2003, GAO reported that managing these transfers and partner expectations while avoiding delays has been a key challenge and recommended that industrial planning tools be developed and used to anticipate time frames for national disclosure and technology transfer decisions. This report examines DOD's response to this recommendation and identifies the practices DOD is using to expedite license processing and avoid program delays. Agencies have taken four key actions to expedite the processing of licenses for transferring technology to partner countries and foreign suppliers. Each of these practices is intended to anticipate time frames needed for the processing of licenses or avoid delays to the JSF program schedule. In response to GAO's 2003 recommendation, the JSF Program Office instructed the prime contractor to develop an international industrial plan that identifies the type of license needed to transfer certain technologies to foreign industry. The contractor's plan provides mechanisms for anticipating 'need' dates for submitting license applications and for identifying and addressing potential issues related to the releasability of classified information, technologies, or systems. In addition to the contractor's plan, DOD has developed guidance calling for industrial planning tools in all programs with significant international involvement. Agencies involved in the JSF program are expediting the processing of license applications by dedicating staff to the JSF licensing process, providing consultation to applicants on draft licenses, administering a prescreening process for the transfer of low technology and nonsensitive items, and allowing addendums to be attached to license applications. The JSF prime contractor and agency officials have used options available to them under the International Traffic in Arms Regulations, such as Global Project Authorization (GPA) and an exemption used in obtaining foreign contractor bids and proposals, to help facilitate the export control process and avoid program delays. While GPA is designed to approve exports within 5 days, its use has been limited. Due to the early involvement of international partners in the design phase of the program, decisions related to the releasability of classified information, technologies, or systems to partner countries have been addressed as they arise throughout the development of the system.
NTIS
Management Systems; Technology Transfer

20060009925 Government Accountability Office, Washington, DC, USA
Joint Strike Fighter: DOD Plans to Enter Production Before Testing Demonstrates Acceptable Performance
Mar. 2006; 44 pp.; In English
Report No.(s): PB2006-107505; GAO-06-356; No Copyright; Avail.: CASI: A03, Hardcopy

The Joint Strike Fighter (JSF) is DOD's most expensive aircraft program. The program represents 90 percent of the remaining planned investment for recapitalizing DOD's aging tactical aircraft fleet. GAO is required by law to review the program annually for 5 years, beginning in fiscal year 2005. This is our second report and GAO assessed the program's acquisition approach--in terms of capturing knowledge for key investment decisions--and identified an alternative to improve outcomes. DOD is investing heavily in procuring JSF aircraft before flight testing proves it will perform as expected. For example, the JSF program plans to produce 424 low-rate initial production aircraft, at a total estimated cost of more than $49 billion, by 2013--the same time at which the program plans to complete initial operational testing. Producing aircraft before testing demonstrates the design is mature increases the likelihood of design changes that will lead to cost growth, schedule delays, and performance problems. Because the program will lack key design and testing knowledge, DOD plans to use cost reimbursement contracts to procure early production aircraft. This type of contract places a substantially greater cost risk on DOD and the taxpayers. Confidence that investment decisions will deliver expected capability within cost and schedule goals increases as testing proves the JSF will work as expected. At the same time, the JSF program has not adopted an evolutionary approach to acquiring the aircraft--despite DOD policy that prefers such an approach. Instead, the JSF program has contracted to develop and deliver the aircraft's full capability in a single-step, 12-year development program--a daunting task given the need to incorporate the technological advances that, according to DOD, represent a quantum leap in capability. DOD's buying power has already been reduced. Since initial estimates, program acquisition unit costs have increased by 28 percent, or $23 million. Development costs have increased 84 percent, planned purchases have decreased by 535 aircraft, and the completion of development has slipped 5 years, delaying delivery of capabilities to the warfighter. With more than 90 percent of the JSF investment remaining, DOD officials have the opportunity to adopt a knowledge-based and evolutionary acquisition strategy that would maximize DOD's return on its investment. The acquisition approach used for the F-16 fighter, the Air Force's JSF predecessor, could provide a model for delivering JSF capabilities to the warfighter sooner and recapitalizing tactical aircraft forces more quickly while lowering risk. The F-16 program successfully evolved capabilities over the span of about 30 years, with an initial capability delivered to the warfighter about 4 years after development started.
NTIS
Procurement; Military Operations; Military Technology

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.

20060009942 Rolls Royce Corp., Indianapolis, IN, USA
NPSS Multidisciplinary Integration and Analysis
Hall, Edward J.; Rasche, Joseph; Simons, Todd A.; Hoyniak, Daniel; March 2006; 187 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAS3-98003; WBS 22-302-15-20; WBS 22-714-09-12
Report No.(s): NASA/CR-2006-213890; E-15261; No Copyright; Avail.: CASI: A09, Hardcopy

The objective of this task was to enhance the capability of the Numerical Propulsion System Simulation (NPSS) by expanding its reach into the high-fidelity multidisciplinary analysis area. This task investigated numerical techniques to convert between cold static to hot running geometry of compressor blades. Numerical calculations of blade deformations were iteratively done with high fidelity flow simulations together with high fidelity structural analysis of the compressor blade. The flow simulations were performed with the Advanced Ducted Propfan Analysis (ADPAC) code, while structural analyses were performed with the ANSYS code. High fidelity analyses were used to evaluate the effects on performance of: variations in tip clearance, uncertainty in manufacturing tolerance, variable inlet guide vane scheduling, and the effects of rotational speed on the hot running geometry of the compressor blades.
Author
Turbomachinery; Computational Fluid Dynamics; Structural Analysis; Prop-Fan Technology; Compressor Blades; Guide Vanes; Iteration

20060009979 Siemens Westinghouse Power Corp., Orlando, FL, USA

On-Line Thermal Barrier Coating Monitoring for Real-Time Failure Protection and Life Maximization. (Semi-Annual Report, October 2004-March 2005)

LeMieux, D. H.; Apr. 2005; 26 pp.; In English

Report No.(s): DE2005-860801; No Copyright; Avail.: National Technical Information Service (NTIS)

Under the sponsorship of the U. S. Department of Energy's National Energy Laboratory, Siemens Westinghouse Power Corporation proposes a four year program titled, 'On-Line Thermal Barrier Coating (TBC) Monitor for Real-Time Failure Protection and Life Maximization,' to develop, build and install the first generation of an on-line TBC monitoring system for use on land-based advanced gas turbines (AGT). Federal deregulation in electric power generation has accelerated power plant owner's demand for improved reliability availability maintainability (RAM) of the land-based advanced gas turbines. As a result, firing temperatures have been increased substantially in the advanced turbine engines, and the TBCs have been developed for maximum protection and life of all critical engine components operating at these higher temperatures. Losing TBC protection can therefore accelerate the degradation of substrate components materials and eventually lead to a premature failure of critical component and costly unscheduled power outages. This program seeks to substantially improve the operating life of high cost gas turbine components using TBC; thereby, lowering the cost of maintenance leading to lower cost of electricity. Siemens Westinghouse Power Corporation has teamed with Indigo Systems, a supplier of state-of-the-art infrared camera systems, and Wayne State University, a leading research organization in the field of infrared non-destructive examination (NDE), to complete the program.

NTIS

Failure; Gas Turbines; On-Line Systems; Protection; Real Time Operation; Thermal Control Coatings

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.

20060009038 NASA Langley Research Center, Hampton, VA, USA

Non-linear controls influence functions in an aircraft dynamics simulator

Guerreiro, Nelson M.; Hubbard, James E., Jr.; Motter, Mark A.; [2006]; 14 pp.; In English; SPIE 13th Annual International Symposium Smart Structures and Materials, 26 Feb. - 2 Mar. 2006, San Diego, CA, USA; Original contains black and white illustrations

Contract(s)/Grant(s): 23-090-20-ZC; Copyright; Avail.: CASI: A03, Hardcopy

In the development and testing of novel structural and controls concepts, such as morphing aircraft wings, appropriate models are needed for proper system characterization. In most instances, available system models do not provide the required additional degrees of freedom for morphing structures but may be modified to some extent to achieve a compatible system. The objective of this study is to apply wind tunnel data collected for an Unmanned Air Vehicle (UAV), that implements trailing edge morphing, to create a non-linear dynamics simulator, using well defined rigid body equations of motion, where the aircraft stability derivatives change with control deflection. An analysis of this wind tunnel data, using data extraction algorithms, was performed to determine the reference aerodynamic force and moment coefficients for the aircraft. Further, non-linear influence functions were obtained for each of the aircraft s control surfaces, including the sixteen trailing edge flap segments. These non-linear controls influence functions are applied to the aircraft dynamics to produce deflection-dependent aircraft stability derivatives in a non-linear dynamics simulator. Time domain analysis of the aircraft motion, trajectory, and state histories can be performed using these nonlinear dynamics and may be visualized using a 3-dimensional aircraft model. Linear system models can be extracted to facilitate frequency domain analysis of the system and for control law development. The results of this study are useful in similar projects where trailing edge morphing is employed and will be instrumental in the University of Maryland s continuing study of active wing load control.

Author

Aerodynamic Forces; Aircraft Control; Simulators; Dynamic Tests; Wing Loading; Structural Design; Trailing Edge Flaps; Control Surfaces

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)*.

20060009102 National Renewable Energy Lab., Golden, CO USA
Comparison between Field Data and NASA Ames Wind Tunnel Data
Corbus, D.; Nov. 2005; 20 pp.; In English
Report No.(s): DE2005-860391; NREL/TP-500-38285; No Copyright; Avail.: National Technical Information Service (NTIS)

The objective of this analysis is to compare the measured data from the NASA Ames wind tunnel experiment to those collected in the field at the National Wind Technology Center (NWTC) with the same turbine configuration. The results of this analysis provide insight into what measurements can be made in the field as opposed to wind tunnel testing.
NTIS
Wind Tunnel Tests; Wind Tunnels; Windpower Utilization

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*.

20060009006 NASA Marshall Space Flight Center, Huntsville, AL, USA
AXISYMMETRIC, THROTTLEABLE NON-GIMBALLED ROCKET ENGINE
Sackheim, Robert L., Inventor; Hutt, John J., Inventor; Anderson, William E., Inventor; Dressler, Gordon A., Inventor; November 15, 2005; 9 pp.; In English
Patent Info.: Filed 11 Mar. 2003; US-Patent-6,964,154; US-Patent-Appl-390253; NASA-Case-MSF-31689; No Copyright; Avail.: CASI: A02, Hardcopy

A rocket engine assembly is provided for a vertically launched rocket vehicle. A rocket engine housing of the assembly includes two or more combustion chambers each including an outlet end defining a sonic throat area. A propellant supply for the combustion chambers includes a throttling injector, associated with each of the combustion chambers and located opposite to sonic throat area, which injects the propellant into the associated combustion chamber. A modulator, which may form part of the injector, and which is controlled by a controller, modulates the flow rate of the propellant to the combustion chambers so that the chambers provide a vectorable net thrust. An expansion nozzle or body located downstream of the throat area provides expansion of the combustion gases produced by the combustion chambers so as to increase the net thrust.
Official Gazette of the U.S. Patent and Trademark Office
Rocket Engines; Throttling; Symmetry

20060009921 Government Accountability Office, Washington, DC, USA
Unmanned Aircraft Systems: New DOD Programs Can Learn from Past Efforts to Craft Better and Less Risky Acquisition Strategies
Mar. 2006; 46 pp.; In English
Report No.(s): PB2006-107509; GAO-06-447; No Copyright; Avail.: CASI: A03, Hardcopy

Through 2011, the Department of Defense (DOD) plans to spend $20 billion to significantly increase its inventory of unmanned aircraft systems, which are providing new intelligence, surveillance, reconnaissance, and strike capabilities to U.S. combat forces--including those in Iraq and Afghanistan. Despite their success on the battlefield, DOD's unmanned aircraft programs have experienced cost and schedule overruns and performance shortfalls. Given the sizable planned investment in these systems, GAO was asked to review DOD's three largest unmanned aircraft programs in terms of cost. Specifically, GAO assessed the Global Hawk and Predator programs' acquisition strategies and identified lessons from these two programs that can be applied to the Joint Unmanned Combat Air Systems (J-UCAS) program, the next generation of unmanned aircraft.
NTIS
Pilotless Aircraft; Unmanned Spacecraft

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*.

20060009022 NASA Johnson Space Center, Houston, TX, USA
Crew Restraint Design for the International Space Station
Norris, Lena; Holden, Kritina; Whitmore, Mihriban; [2006]; 2 pp.; In English; Space 2004 Conference and Exposition, 28-30 Sep. 2004, San Diego, CA, USA
Contract(s)/Grant(s): NAS9-02078; No Copyright; Avail.: Other Sources; Abstract Only

With permanent human presence onboard the International Space Station (ISS), crews will be living and working in microgravity, dealing with the challenges of a weightless environment. In addition, the confined nature of the spacecraft environment results in ergonomic challenges such as limited visibility and access to the activity areas, as well as prolonged periods of unnatural postures. Without optimum restraints, crewmembers may be handicapped for performing some of the on-orbit tasks. Currently, many of the tasks on ISS are performed with the crew restrained merely by hooking their arms or toes around handrails to steady themselves. This is adequate for some tasks, but not all. There have been some reports of discomfort/calluses on the top of the toes. In addition, this type of restraint is simply insufficient for tasks that require a large degree of stability. Glovebox design is a good example of a confined workstation concept requiring stability for successful use. They are widely used in industry, university, and government laboratories, as well as in the space environment, and are known to cause postural limitations and visual restrictions. Although there are numerous guidelines pertaining to ventilation, seals, and glove attachment, most of the data have been gathered in a 1-g environment, or are from studies that were conducted prior to the early 1980 s. Little is known about how best to restrain a crewmember using a glovebox in microgravity. Another ISS task that requires special consideration with respect to restraints is robotic teleoperation. The Robot Systems Technology Branch at the NASA Johnson Space Center is developing a humanoid robot astronaut, or Robonaut. It is being designed to perform extravehicular activities (EVAs) in the hazardous environment of space. An astronaut located inside the ISS will remotely operate Robonaut through a telepresence control system. Essentially, the robot mimics every move the operator makes. This requires the operator to be stable enough to prevent inadvertent movements, while allowing the flexibility to accomplish the controlled movements of the robot. Some type of special purpose restraint will be required to operate Robonaut and similar devices.
Derived from text
International Space Station; Crews; Teleoperators; Robotics; Constraints; Aerospace Environments; Man Machine Systems; Stability; Weightlessness

20060009194 NASA Johnson Space Center, Houston, TX, USA
The Vision of Human Spaceflight
Mendell, Wendell; [2005]; 7 pp.; In English
Contract(s)/Grant(s): 090-28-AP; No Copyright; Avail.: CASI: A02, Hardcopy

First, we live in a world where change is the norm, not the exception. The scientific revolution springing from quantum mechanics yielded new understanding of solid state physics leading to stunning advances in computation, communication, and transportation. Two World Wars and one Cold War introduced massive governmental investment in research and development. The unusual pragmatic and classless entrepreneurship of U.S. society promoted commercialization and innovative marketing of new technology. As a result, the 20th Century experienced a constantly accelerating culture of change. Those societies that accepted and embraced the new capabilities dominated commercially and militarily; those that did not fell behind. I remember when there was no color television, when there were no personal computers, when there was no email, when there was no World Wide Web, when there were no cell phones. Now many of us cannot live without these things. Change has become the measure of success. Our children anticipate the future and do not expect it to look like the past. Secondly, our elementary school students are fascinated by dinosaurs, ghosts, and space. Astronauts create excitement. None question that humans will be in space in their future. They see it every week, even every day, in stories on television. To be an astronaut is considered a legitimate ambition. They see space travel to be an adventure just as our grandparents saw exploring Africa or the polar regions to be an adventure into the unknown. Third, we live in a time when our understanding of the space environment makes us realize that the existence of our species is one large impact away from extinction. We understand that our population explosion is changing our home planet in fundamental ways and that wars over terrestrial resources may be less than two generations away. We feel more connected to our space neighborhood than ever before. Many nations of the world are looking

outward toward our Moon in an unprecedented way. A lunar space mission will be launched from somewhere every year for the next decade, at least.
Derived from text
Space Flight; Aerospace Environments; Technology Utilization; Space Missions; Quantum Mechanics

20060009469 NASA Langley Research Center, Hampton, VA, USA
Evaluation Of Risk And Possible Mitigation Schemes For Previously Unidentified Hazards
Linzey, William; McCutchan, Micah; Traskos, Michael; Gilbrech, Richard; Cherney, Robert; Slenski, George; Thomas, Walter, III; January 2006; 28 pp.; In English; 9th Joint FAA/DoD/NASA Conference on Aging Aircraft, 6-9 Mar. 2006, Atlanta, GA, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): 23-104-08-46; Copyright; Avail.: CASI: A03, Hardcopy

This report presents the results of arc track testing conducted to determine if such a transfer of power to un-energized wires is possible and/or likely during an arcing event, and to evaluate an array of protection schemes that may significantly reduce the possibility of such a transfer. The results of these experiments may be useful for determining the level of protection necessary to guard against spurious voltage and current being applied to safety critical circuits. It was not the purpose of these experiments to determine the probability of the initiation of an arc track event only if an initiation did occur could it cause the undesired event: an inadvertent thruster firing. The primary wire insulation used in the Orbiter is aromatic polyimide, or Kapton , a construction known to arc track under certain conditions [3]. Previous Boeing testing has shown that arc tracks can initiate in aromatic polyimide insulated 28 volts direct current (VDC) power circuits using more realistic techniques such as chafing with an aluminum blade (simulating the corner of an avionics box or lip of a wire tray), or vibration of an aluminum plate against a wire bundle [4]. Therefore, an arc initiation technique was chosen that provided a reliable and consistent technique of starting the arc and not a realistic simulation of a scenario on the vehicle. Once an arc is initiated, the current, power and propagation characteristics of the arc depend on the power source, wire gauge and insulation type, circuit protection and series resistance rather than type of initiation. The initiation method employed for these tests was applying an oil and graphite mixture to the ends of a powered twisted pair wire. The flight configuration of the heater circuits, the fuel/oxider (or ox) wire, and the RCS jet solenoid were modeled in the test configuration so that the behavior of these components during an arcing event could be studied. To determine if coil activation would occur with various protection wire schemes, 145 tests were conducted using various fuel/ox wire alternatives (shielded and unshielded) and/or different combinations of polytetrafuloroethylene (PTFE), Mystik tape and convoluted wraps to prevent unwanted coil activation. Test results were evaluated along with other pertinent data and information to develop a mitigation strategy for an inadvertent RCS firing. The SSP evaluated civilian aircraft wiring failures to search for aging trends in assessing the wire-short hazard. Appendix 2 applies Weibull statistical methods to the same data with a similar purpose.
Derived from text
Wiring; Arcs; Circuit Protection; Insulation; Risk; Probability Theory

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*.

20060009191 NASA Johnson Space Center, Houston, TX, USA
Understanding Space Shuttle Structural Dynamics
James, George; [2004]; 11 pp.; In English; Texas Assoc. of Schools of Engineering Tech. Conference, 22 Oct. 2004, League City, TX, USA; No Copyright; Avail.: CASI: A03, Hardcopy

The Space Shuttle consists of a orbiter, external tank, solid rocket boosters, payload, main engines, mobile launch platform and launch pad (Ground Ops). Structural Dynamics - All structures will vibrate at certain frequencies. The dynamics of the Space Shuttle must be understood in order to make sure it can survive, to control it, to make sure that it can perform its mission, and to keep it from aging prematurely. We understand the structural dynamics of the Space Shuttle by modelling, testing and flying it.
Derived from text
Dynamic Structural Analysis; Booster Rocket Engines; Space Shuttles; Space Shuttle Orbiters; Payloads; External Tanks

20060009328 NASA Langley Research Center, Hampton, VA, USA
Asymptotic Parachute Performance Sensitivity
Way, David W.; Powell, Richard W.; Chen, Allen; Steltzner, Adam D.; January 2006; 9 pp.; In English; 2006 IEEE Aerospace Conference, 4-11 Mar. 2006, Big Sky, MT, USA
Contract(s)/Grant(s): 464.02.07.07
Report No.(s): Paper-1465; No Copyright; Avail.: CASI: A02, Hardcopy

In 2010, the Mars Science Laboratory mission will pioneer the next generation of robotic Entry, Descent, and Landing systems by delivering the largest and most capable rover to date to the surface of Mars. In addition to landing more mass than any other mission to Mars, Mars Science Laboratory will also provide scientists with unprecedented access to regions of Mars that have been previously unreachable. By providing an Entry, Descent, and Landing system capable of landing at altitudes as high as 2 km above the reference gravitational equipotential surface, or areoid, as defined by the Mars Orbiting Laser Altimeter program, Mars Science Laboratory will demonstrate sufficient performance to land on 83% of the planet s surface. By contrast, the highest altitude landing to date on Mars has been the Mars Exploration Rover at 1.3 km below the areoid. The coupling of this improved altitude performance with latitude limits as large as 60 degrees off of the equator and a precise delivery to within 10 km of a surface target, will allow the science community to select the Mars Science Laboratory landing site from thousands of scientifically interesting possibilities. In meeting these requirements, Mars Science Laboratory is extending the limits of the Entry, Descent, and Landing technologies qualified by the Mars Viking, Mars Pathfinder, and Mars Exploration Rover missions. Specifically, the drag deceleration provided by a Viking-heritage 16.15 m supersonic Disk-Gap-Band parachute in the thin atmosphere of Mars is insufficient, at the altitudes and ballistic coefficients under consideration by the Mars Science Laboratory project, to maintain necessary altitude performance and timeline margin. This paper defines and discusses the asymptotic parachute performance observed in Monte Carlo simulation and performance analysis and its effect on the Mars Science Laboratory Entry, Descent, and Landing architecture.
Author
Parachutes; Descent; Deceleration; Reliability Analysis; Sensitivity; Landing Aids; Drag; Robotics; Laser Altimeters

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SPACECRAFT INSTRUMENTATION AND ASTRIONICS

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

20060009192 NASA Johnson Space Center, Houston, TX, USA
Issues in Shuttle System Instrumentation
James, George; [2004]; 18 pp.; In English; CANEUS 2004 Conference, 1-5 Nov. 2004, Monterey, CA, USA; No Copyright; Avail.: CASI: A03, Hardcopy

The purose: a) Customer's perspective on Space Shuttle Return to Flight instrumentation; b) Focus on the difficult instrumentation issues; and c) Enable a discussion of new technologies (i.e.- NANO/MEMS/Small Tech) that could enhance Shuttle instrumentation posture. The T-10 Umbilical allows the vehicle instruments to be monitored and recorded prior to each launch and retract during launch.Launch Complex Instrumentation are instruments needed for assessment of Launch Commit Criteria (LCC) Salt-air and launch environments are issues. Instrumentation (Drag-On Instrumentation) can be added as needed to the vehicle for non-flight use. The current Roll-out Fatigue Testing is a primary example.
Derived from text
Flight Instruments; Microelectromechanical Systems; Space Shuttles; Space Transportation System Flights; Launching

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SPACECRAFT PROPULSION AND POWER

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

20060009455 NASA Marshall Space Flight Center, Huntsville, AL, USA
Closed Cycle Magnetohydrodynamic Nuclear Space Power Generation Using Helium/Xenon Working Plasma
Litchford, R. J.; Harada, N.; September 2005; 40 pp.; In English
Report No.(s): NASA/TP-2005-214187; M-1149; Copyright; Avail.: CASI: A03, Hardcopy

A multimegawatt-class nuclear fission powered closed cycle magnetohydrodynamic space power plant using a helium/xenon working gas has been studied, to include a comprehensive system analysis. Total plant efficiency was expected to be 55.2 percent including pre-ionization power. The effects of compressor stage number, regenerator efficiency, and radiation cooler temperature on plant efficiency were investigated. The specific mass of the power generation plant was also examined. System specific mass was estimated to be 3 kg/kWe for a net electrical output power of 1 MWe, 2-3 kg/kWe at 2 MWe, and approx.2 kg/KWe at \g3 MWe. Three phases of research and development plan were proposed: (1) Phase I-proof of principle, (2) Phase II-demonstration of power generation, and (3) Phase III-prototypical closed loop test.
Author
Nuclear Electric Power Generation; Electric Power Plants; Magnetohydrodynamic Generators; Nuclear Fission; Systems Analysis; Regenerators; Feedback Control; Compressor Efficiency

20060009471 NASA Glenn Research Center, Cleveland, OH, USA
Carbon-Carbon Recuperators in Closed-Brayton-Cycle Space Power Systems
Barrett, Michael J.; Johnson, Paul K.; Naples, Andrew G.; February 2006; 16 pp.; In English; Second International Energy Conversion Engineering Conference, 16-19 Aug. 2004, Providence, RI, USA
Contract(s)/Grant(s): 22-973-80-10
Report No.(s): NASA/TM-2006-213302; E-14749; AIAA Paper 2004-5652; Copyright; Avail.: CASI: A03, Hardcopy
The feasibility of using carbon-carbon (C-C) recuperators in conceptual closed-Brayton-cycle space power conversion systems was assessed. Recuperator performance expectations were forecast based on notional thermodynamic cycle state values for potential planetary missions. Resulting thermal performance, mass and volume for plate-fin C-C recuperators were estimated and quantitatively compared with values for conventional offset-strip-fin metallic designs. Mass savings of 30 to 60 percent were projected for C-C recuperators with effectiveness greater than 0.9 and thermal loads from 25 to 1400 kWt. The smaller thermal loads corresponded with lower mass savings; however, 60 percent savings were forecast for all loads above 300 kWt. System-related material challenges and compatibility issues were also discussed.
Author
Brayton Cycle; Closed Cycles; Nuclear Electric Power Generation; Thermodynamic Cycles; Temperature Effects; Spacecraft Power Supplies; Satellite Solar Energy Conversion; Regenerators

20060009491 NASA Glenn Research Center, Cleveland, OH, USA
Extended Operation of Stirling Convertors in a Thermal Vacuum Environment
Oriti, Salvatore M.; February 2006; 14 pp.; In English; Third International Energy Conversion Engineering Conference, 15-18 Aug. 2005, San Francisco, CA, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 972-20-01
Report No.(s): NASA/TM-2006-213984; AIAA Paper 2005-5747; E-15306; No Copyright; Avail.: CASI: A03, Hardcopy
A 110 watt Stirling Radioisotope Generator (SRG110) is being developed for potential use on future NASA exploration missions. The development effort is being performed by Lockheed Martin under contract to the Department of Energy (DOE). Infinia, Corp. supplies the free-piston Stirling power convertors, and NASA Glenn Research Center (GRC) provides support to the effort in a range of technologies. This generator features higher efficiency and specific power compared to alternatives. One potential application for the generator would entail significant cruise time in the vacuum of deep space. A test has been initiated at GRC to demonstrate functionality of the Stirling convertors in a thermal vacuum environment. The test article resembles the configuration of the SRG110, however the requirement for low mass was not considered. This test demonstrates the operation of the Stirling convertors in the thermal vacuum environment, simulating deep space, over an extended period of operation. The status of the test as well as the data gathered will be presented in this paper.
Author
Stirling Cycle; Thermal Environments; Vacuum

20060009996 Texas Univ., Austin, TX, USA
Railplug Ignition System for Enhanced Engine Performance and Reduced Maintenance. (Final Report, September 30, 2001-December 31, 2004)
Ezekoye, D. K.; Hall, M.; Matthews, R.; January 2005; 134 pp.; In English
Report No.(s): DE2005-860176; No Copyright; Avail.: National Technical Information Service (NTIS)
This Final Technical Report discusses the progress that was made on the experimental and numerical tasks over the duration of this project. The primary objectives of the project were to (1) develop an improved understanding of the spark

ignition process, and (2) develop the railplug as an improved ignitor for large bore stationary natural gas engines. We performed fundamental experiments on the physical processes occurring during spark ignition and used the results from these experiments to aid our development of the most complete model of the spark ignition process ever devised. The elements in this model include 1) the dynamic response of the ignition circuit, 2) a chemical kinetics mechanism that is suitable for the reactions that occur in the plasma, 3) conventional flame propagation kinetics, and 4) a multi-dimensional formulation so that bulk flow through the spark gap can be incorporated. Fundamental experiments, engine experiments, and modeling tasks were used to help develop the railplug as a new ignitor for large bore natural gas engines.
NTIS
Ignition Systems; Maintenance

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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*.

20060009051 Arkansas Univ., Little Rock, AR, USA
Artificial Intelligence modeling of materials' bulk chemical and physical properties
Darsey, Jerry A.; Mitchell, Neil C.; Buzatu, D. A.; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2005 USA Cambridge); [2005]; 7 pp.; In English; See also 20060009039; Original contains black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Energies of the atomic and molecular orbitals belonging to one and two atom systems from the 4th and 5th periods of the periodic table, have been calculated using ab-initio quantum mechanical calculations. The energies of selected occupied and unoccupied orbitals surrounding the highest occupied and lowest unoccupied orbitals (HOMOs and LUMOs) of each system were selected and used as input for an artificial neural network (ANN). Using the ANN, correlations between orbital parameters and selected chemical and physical properties of bulk materials composed of these elements have been established. Using these correlations, the materials bulk properties have been predicted. The Q(sup 2) correlation for the single atom predictions of 1st ionization potential, melting point, and boiling point were 0.3589, 0.4599, and 0.1798 respectively. The corresponding Q(sup 2) correlations using orbital parameters describing two atom systems increased the capability to predict the experimental properties to the respective values of 0.8551, 0.8207, and 0.7877. The accuracy in predicting materials' bulk properties was increased up to 4 fold by using two atoms instead of one.
Author
Artificial Intelligence; Neural Nets; Chemical Properties; Predictions; Quantum Mechanics; Correlation

20060009143 Lawrence Livermore National Lab., Livermore, CA USA
Mechanical Properties of ALCA Plus (TRADE MARK) Cast Aluminum Amplifier Top Plates
Biltoft, P.; Gourdin, W. H.; Sanchez, R. J.; Shen, T. H.; Jun. 27, 2002; 26 pp.; In English
Report No.(s): DE2005-15013571; UCRL-IR-149018; No Copyright; Avail.: Department of Energy Information Bridge
No abstract available
Aluminum; Casting; Mechanical Properties; Metal Plates

20060009159 Pacific Northwest National Lab., Richland, WA, USA
Ultraselective Sorbents. Task 2: Molecularly Imprinted Polymers (MIPs)/Stabilized Antibody Fragments (STABs) Final Report--Fiscal Year (FY) 2005
Harvey, S. D.; Sep. 2005; 54 pp.; In English
Report No.(s): DE2005-860003; PNNL-15361; No Copyright; Avail.: Department of Energy Information Bridge

The goal of this research is to develop highly selective sorbents that allow collection of a relatively pure analyte fraction during the sampling step. The high fraction purity allows development of simplified field-portable instrumentation that is capable of high integrity analysis at trace concentrations. Our FY 2005 research emphasized two molecularly imprinted polymer (MIP) areas. The first activities completed studies of MIPs specific toward volatile signatures, whereas the second developed MIPs toward nonvolatile signatures. Our previous work demonstrated highly selective MIP-based capture of targeted volatile signatures from complex samples with near quantitative recovery. Additional FY 2005 studies demonstrated

the expected sorbent cross reactivity and verified superior matrix discrimination on MIPs compared to traditional normal-phase sorbents. This work was published in Journal of Separation Science in May 2005 (included as an appendix in this report). The second area of research synthesized and characterized MIPs specific toward nonvolatile half-acid phosphate or methylphosphonate ester signature compounds. These sorbents form the core of a MIP-based trace enrichment instrument described in our FY 2004 Final Report. FY 2005 studies definitively verified these MIPs selectively captured their targets relative to a nonimprinted control sorbent. Extensive cross reactivity studies were also conducted with chemically related compounds. Encouraging results demonstrated high affinity and selectivity of these MIPs; a result that suggests these sorbents will be highly effective in the MIP-based trace enrichment system. Matrix discrimination capabilities of the MIPs should be tested before characterizing the trace enrichment system. Recommendations for future research that addresses MIP studies for both volatile and nonvolatile signatures is provided.
NTIS
Antibodies; Fragments; Sorbents

20060009299 NASA Kennedy Space Center, Cocoa Beach, FL, USA
CORROSION PREVENTION of COLD ROLLED STEEL USING WATER DISPERSIBLE LIGNOSULFONIC ACID DOPED POLYANILINE
Viswanathan, Tito, Inventor; December 06, 2005; 9 pp.; In English
Patent Info.: Filed 11 Jul. 2001; US-Patent-6,972,098; US-Patent-Appl-SN-903260; US-Patent-Appl-217493; NASA-Case-KSC-122191; No Copyright; Avail.: CASI: A02, Hardcopy

The invention provides coatings useful for preventing corrosion of metals. The coatings comprise a film-forming resin and conductive polymers comprising linearly conjugated pi-systems and residues of sulfonated lignin or a sulfonated polyflavonoid or derivatives of sulfonated lignin or a sulfonated polyflavonoid. The invention also provides a latex formulation of the coatings, and articles of manufacture comprising a metal substrate and a coating in contact with the metal substrate.
Official Gazette of the U.S. Patent and Trademark Office
Corrosion Prevention; Metal Coatings; Resins; Doped Crystals; Steels; Cold Rolling

20060009948 Georgia Univ., Athens, GA, USA
Process Design for the Biocatalysis of Value Added Chemicals from Carbon Dioxide. Annual Technical Progress Report. August 1, 2004 thru July 31, 2005
Eiteman, M. A.; Nov. 2005; 22 pp.; In English
Report No.(s): DE2005-861206; No Copyright; Avail.: Department of Energy Information Bridge

This report describes results toward developing a process to sequester CO2 centered on the enzyme pyruvate carboxylase. The process involves the use of bacteria to convert CO2 and glucose as a co-substrate and generates succinic acid as a commodity chemical product. The first phase of this research has focused on strain development and on process development. Progress in strain development has been made in three areas. The gene encoding for alcohol dehydrogenase has been knocked out of the bacteria, and thereby eliminating the synthesis of the by-product ethanol. The gene for glucokinase has been overexpressed in the production strain with the goal of faster utilization of glucose (and hence CO2). Efforts have continued toward integrating pyruvate carboxylase gene (pyc) onto the E. coli chromosome. Progress in process development has come in conducting several dozen fermentation experiments to find a defined medium that would be successful for the growth of the bacteria, while permitting a high rate of CO2 utilization in a subsequent prolonged production phase. Using this defined medium, the strains that continue to be constructed are being compared for CO2 utilization, so that we may understand the factors that govern the biological sequestration process.
NTIS
Carbon Dioxide; Bacteria; Carboxylic Acids; Enzymes; Glucose

20060009954 TDA Research, Inc., Wheat Ridge, CO, USA
Test of TDA's Direct Oxidation Process for Sulfur Recovery. (Final Report, March 13, 2001-February 29, 2004)
Srinivas, G.; Huzyk, S.; Gebhard, S. C.; Peeples, E.; January 2005; 30 pp.; In English
Report No.(s): DE2005-859449; No Copyright; Avail.: National Technical Information Service (NTIS)

This project was a Phase III pilot plant test of TDA's gas sweetening process done under realistic conditions. TDA Research Inc successfully completed the test at Whiting Petroleum's Sable San Andreas Gas Plant. The feed was approximately 228,000 standard cubic feet per day (SCFD) of gas that contained approximately 60 vol% CO(sub 2), 20 vol% CH(sub 4) and 10 vol% C(sub 3)+ and higher hydrocarbons. The feed was associated gas from CO(sub 2) flooding operations

carried out on Whiting's oil wells. The gas is collected and piped to the Sable gas plant where it is normally flared. We sited our pilot plant in line with the flare so that we could remove the hydrogen sulfide (H(sub 2)S) prior to flaring. The average H(sub 2)S concentration in the gas during the field test was 7341 ppm. The selectivity of our process for converting H(sub 2)S into elemental sulfur was essentially 100% and the catalyst converted 90% of the H(sub 2)S into sulfur and water (the remaining 10% of the H(sub 2)S passed through unconverted). Importantly, no catalyst deactivation was observed for over the course of the 1000+ hour test. Minimal (ca. 10-15 ppm) of SO(sub 2) was formed during the test. Approximately 3.6 tons of elemental sulfur was recovered from a total inlet of 3.9 tons of sulfur (as H(sub 2)S). The total amount of SO(sub 2) released from the plant (taking into account flaring of the unconverted 10% H(sub 2)S) was 0.86 tons. This amount of SO(sub 2) is much lower than the normal 8 tons that would have been emitted if all of the H(sub 2)S were flared over the time of the pilot plant test. The pilot plant was simple to operate and required much less operator intervention than is typical for a new unit being commissioned. Our operator (Mr. Eugene Peeples) has more than 30 years of experience operating commercial scale liquid redox sulfur recovery processes and in his opinion, TDA's Direct Oxidation pilot plant is easier to operate than liquid systems. The ease of use and low capital and operating costs of TDA's Direct Oxidation process makes it an attractive technology to be used where traditional sulfur recovery technologies are too expensive (e.g. small to medium sized plants). Currently, TDA's direct oxidation process has been exclusively licensed to SulfaTreat, and is being offered commercially under the trade name SulfaTreat-DO(registered trademark). We anticipate that the first plant will be installed in 2005.
NTIS
Oxidation; Sulfur; Oxidation-Reduction Reactions

20060009971 Lawrence Livermore National Lab., Livermore, CA USA
Nanostructured Energetic Materials with Sol-Gel-Chemistry
Gash, A.; Satcher, J.; Simpson, R.; Clapsaddle, B.; Nov. 20, 2003; 26 pp.; In English
Report No.(s): DE2005-15013809; UCRL-PROC-201119; No Copyright; Avail.: National Technical Information Service (NTIS)

The utilization of nanomaterials in the synthesis and processing of energetic materials (i.e., pyrotechnics, explosives, and propellants) is a relatively new area of science and technology. Previous energetic nanomaterials have displayed new and potentially beneficial properties, relative to their conventional analogs. Unfortunately some of the energetic nanomaterials are difficult and or expensive to produce. At LLNL we are studying the application of sol-gel chemical methodology to the synthesis of energetic nanomaterials components and their formulation into energetic nanocomposites. Here sol-gel synthesis and formulation techniques are used to prepare Fe(sub 2)O(sub 3)/Al pyrotechnic nanocomposites. The preliminary characterization of their thermal properties and the degree of mixing between fuel and oxidizer phases is contrasted with that of a conventional pyrotechnic mixture.
NTIS
Explosives; Sol-Gel Processes

20060009982 Advanced Ceramics Research, Inc., Tucson, AZ, USA
Fibrous Monolith Wear Resistant Components for the Mining Industry. Final Report. Reporting Period 2/23/01 to 2/28/05
Knittel, K. L.; May 09, 2005; 178 pp.; In English
Report No.(s): DE2005-860994; No Copyright; Avail.: National Technical Information Service (NTIS)

This program addresses the mining industry's need for improved components for wear resistance. The cost/performance ratio drives the application of components and materials used in mining applications. The mining industry traditionally had little use for advanced wear resistant materials due to their high cost relative to their improved durability. The goal of this program is to offer advanced wear resistant materials, in the form of fibrous monolith composites, which will overcome the cost/performance barrier traditionally associated with advanced materials and significantly increase the wear life of targeted components. Materials systems that exhibit promise as a crosscutting technology where resistance to wear is important will also be developed. Research will be performed on other applications, such as metal cutting tools, as crosscutting technologies are developed and translated into other industries. The program is a collaborative effort of component manufacturers, end users, a national laboratory, and universities. The program will target three particular wear components which offer a broad cross-section of wear conditions and environments encountered in the mining industry. These components are: (1) drill bit inserts used for drilling blast holes and oil and gas wells, (2) dozer teeth used in a variety of earth-moving equipment, and (3) hydro cyclone apex cones, used in cyclone separators for sizing of crushed ore. As the program progresses these target items will be evaluated for appropriateness to the goals of the program. The program team will design fibrous monolith structures or coatings into existing components. The program team members will fabricate, inspect, and test the components

in real operating environments. Team members will also develop process workbooks for fabricating fibrous monoliths, non-destructive evaluation of components, and modeling of composite/component behavior under typical stress and wear conditions. This body of knowledge will be used as a basis for future work.
NTIS
Mining; Wear Resistance

20060009984 Kentucky Univ., Lexington, KY, USA
Technology for the Recovery of Fuel and Adsorbent Carbons from Coal Burning Utility Ash Ponds and Landfills. (Final Report, July 1, 2001-July 31, 2005)
January 2005; 72 pp.; In English
Report No.(s): DE2005-860884; No Copyright; Avail.: National Technical Information Service (NTIS)

The overall objective of this project was to conduct proof-of-concept (POC) scale testing of the Fuel Float(TM) technology, a technology developed to recover high quality fuel from utility ash ponds and landfills. This testing was conducted at a utility site at feed rate of 2-5 tons/hr and sufficient unburned carbon was recovered to conduct evaluations for utilizing the unburned carbon as a supplemental fuel. In addition, the process recovers lightweight aggregate from bottom ash, which was evaluated for use in lightweight concrete blocks. Commercialization of the Fuel Float(TM) technology will greatly mitigate current ash disposal pressure by creating additional space in existing ponds, eliminating the cost and environmental liabilities associated with construction of new disposal facilities. The Fuel Float(TM) technology incorporates hydraulic classification, froth flotation and spiral concentration. The ash is first classified into fine and coarse size fractions by hydraulic classification. Carbon and lightweight aggregate are recovered from the coarse size fraction by gravity concentration while carbon is recovered from the fine size fraction by froth flotation. Both carbon streams are dewatered to produce a high-quality supplemental fuel that can be fired in a utility boiler. The test site for this project was WKE's Coleman Station located in Hawesville, KY, a 521 MW facility burning bituminous coal and utilizing a sluicing system to store combustion ash on site. It is estimated that the active ponds encompass 180 acres and contain approximately 1.8M tons of ash. The current ash disposal practice at Coleman is to co-mingle bottom ash, pulverizer rejects and fly ash. With this type of ash disposal practice, the ponds contain a mixture of particle size, density and chemistry. It was therefore imperative to obtain a better understanding of the materials in the pond in order to assess the amount of ash available, the amount of recoverable material and most importantly, where to focus recovery activities.
NTIS
Adsorbents; Ashes; Carbon; Coal; Combustion; Fuels; Landfills; Ponds

20060009985 Missouri Univ., Rolla, MO, USA
Refractory for Black Liquor Gasifiers. (Report for October 1, 2002-September 31, 2005)
Headrick, W. L.; Liang, X.; Oct. 2005; 220 pp.; In English
Report No.(s): DE2005-860874; No Copyright; Avail.: National Technical Information Service (NTIS)

The University of Missouri-Rolla will identify materials that will permit the safe, reliable and economical operation of combined cycle gasifiers by the pulp and paper industry. The primary emphasis of this project will be to resolve the material problems encountered during the operation of low-pressure high-temperature (LPHT) and lowpressure low-temperature (LPLT) gasifiers while simultaneously understanding the materials barriers to the successful demonstration of high-pressure high-temperature (HPHT) black liquor gasifiers. This study will define the chemical, thermal and physical conditions in current and proposed gasifier designs and then modify existing materials and develop new materials to successfully meet the formidable material challenges.
NTIS
Gasification; Refractories; Refractory Materials

20060009986 National Taiwan Univ., Taipei, Taiwan, Province of China
Study of Particle Generation During Laser Ablation with Applications
Liu, C.; Sep. 2005; 174 pp.; In English
Report No.(s): DE2005-860383; No Copyright; Avail.: National Technical Information Service (NTIS)

A study has been made of the generation of particles during laser ablation and has included size distribution measurements and observation of the formation processes. The particle size distribution with respect to different laser parameters was obtained in-line using a differential mobility analyzer (DMA) and a particle counter. The experimental results show that the particle size varies with laser energy, laser pulsewidth, ambient gas flowrate and sample properties. The results serve as a basis

for controlling the size of nanoparticles generated by laser ablation. Laser shadowgraph imaging was used to study mass ejection processes and mechanisms. At higher laser irradiance, some particles were ejected in the liquid and even in the solid phase. Time-resolved images show the propagation of the shockwaves: external shockwaves propagate outward and decelerate, and internal shockwaves reflect back and forth between the gas contact surface and the sample surface. The internal shockwave is proposed to cause the ejection of liquid particles when the internal shockwave strikes the liquid molten layer. A simulation based on vapor plume expansion was carried out and provides satisfactory agreement with experimental results. Different material properties result in different particle ejection behavior: particle ejection for most materials including metals result in a conically shaped envelope for the ejected material while ejection for silicon resembles a liquid jet. The difference in density change when the materials melt was proposed to be an important factor in the different ejection behavior. The characteristics of particles generated by laser ablation have a strong influence on the chemical analysis of the irradiated sample. Large particles are more difficult to completely vaporize and ionize, and induced preferential vaporization causes fractionation (i.e. a detected chemical composition that differs from the sample material). Large particles also result in spikes in measurements using inductively coupled plasma mass spectrometry (ICP-MS) which result in errors. Three different methods were employed to study the effects of particle size on chemical analysis: generating smaller particles utilizing a fs laser, filtering out larger particles with a cascade impactor and altering the size distribution by using a second pulse to fracture particles generated from the first pulse. It was found that the chemical composition of the particles varies with particle size. The variation of the composition with respect to particle size was analyzed and it was proposed that it was related to the vapor formed particles condensing on larger ejected liquid droplets.
NTIS
Laser Ablation; Particle Size Distribution; Nanoparticles

24
COMPOSITE MATERIALS

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

20060009145 Forest Products Lab., Madison, WI USA
Stresses Within Curved Laminated Beams of Douglas-Fir
Norris, C. B.; Nov. 1963; 22 pp.; In English
Report No.(s): PB2006-102282; FPL-020; No Copyright; Avail.: CASI: A03, Hardcopy
No abstract available
Beams (Supports); Composite Structures; Conifers; Curved Beams; Laminates; Wood

20060009485 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA, Cornell Univ., Ithaca, NY, USA, Air Force Research Lab., Kirkland AFB, NM, USA
Electronic and Optical Properties of Energetic Particle-Irradiated In-rich InGaN
Li, S. X.; Yu, K. M.; Jones, R. E.; Wu, J.; Walukiewicz, W.; January 2005; 10 pp.; In English
Report No.(s): DE2005-861520; No Copyright; Avail.: National Technical Information Service (NTIS)
We have carried out a systematic study of the effects of irradiation on the electronic and optical properties of InGaN alloys over the entire composition range. High energy electrons, protons, and (sup 4)He(sup +) were used to produce displacement damage doses (D(sub d)) spanning over five orders of magnitude. The free electron concentrations in InN and In-rich InGaN increase with D(sub d) and finally saturate after a sufficiently high D(sub d). The saturation of carrier density is attributed to the formation of native donors and the Fermi level pinning at the Fermi Stabilization Energy (E(sub FS)), as predicted by the amphoteric native defect model. Electrochemical capacitance-voltage (ECV) measurements reveal a surface electron accumulation whose concentration is determined by pinning at E(sub FS).
NTIS
Electrical Properties; Energetic Particles; Irradiation; Optical Properties

20060010004 NASA Glenn Research Center, Cleveland, OH, USA
Structural Composites Corrosive Management by Computational Simulation
Chamis, Christos C.; Minnetyan, Levon; February 2006; 18 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 984754.02.07.03
Report No.(s): NASA/TM-2006-214221; E-15469; Copyright; Avail.: CASI: A03, Hardcopy

A simulation of corrosive management on polymer composites durability is presented. The corrosive environment is assumed to manage the polymer composite degradation on a ply-by-ply basis. The degradation is correlated with a measured Ph factor and is represented by voids, temperature, and moisture which vary parabolically for voids and linearly for temperature and moisture through the laminate thickness. The simulation is performed by a computational composite mechanics computer code which includes micro, macro, combined stress failure, and laminate theories. This accounts for starting the simulation from constitutive material properties and up to the laminate scale which exposes the laminate to the corrosive environment. Results obtained for one laminate indicate that the ply-by-ply managed degradation degrades the laminate to the last one or the last several plies. Results also demonstrate that the simulation is applicable to other polymer composite systems as well.
Author
Degradation; Failure; Laminates; Composite Materials; Combined Stress; pH Factor; Moisture

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INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY

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

20060008999 NASA Glenn Research Center, Cleveland, OH, USA
Polyimides by Photochemical Cyclopolymerization
Meador, Michael A., Inventor; December 13, 2005; 13 pp.; In English; Original contains black and white illustrations
Patent Info.: Filed 8 Jul. 2003; US-Patent-6,974,755; US-Patent-Appl-SN-617447; US-Patent-Appl-SN-827140; NASA-Case-LEW-17133-3; No Copyright; Avail.: CASI: A03, Hardcopy

The novel polyimides of this invention are derived from Diels-Alder cyclopolymerization of photochemically generated bisdienes with dienophiles, such as bismaleimides, trismaleimides and mixtures thereof with maleimide endcaps. Irradiation of one or more diketones produces two distinct hydroxy o-quinodimethane (photoenol) intermediates. These intermediates are trapped via Diels-Alder cycloaddition with appropriate dienophiles, e.g., bismaleimide and/or trismaleimides to give the corresponding polyimides in quantitative yields. When bismaleimides, trismaleimides or mixtures thereof with maleimide end-caps are used as the dienophile, the resulting polyimides have glass transition temperatures (Tg) as high as 300 C. Polyimide films can be prepared by ultraviolet irradiation of high solids content varnishes of the monomers in a small amount of solvent, e.g., cyclohexanone, dimethyl formamide, N-methylpyrollidone and the like. These novel polyimides are characterized as having high glass transition temperatures, good mechanical properties and improved processing in the manufacture of adhesives, electronic materials and films.
Official Gazette of the U.S. Patent and Trademark Office
Cyclic Compounds; Polyimides; Polymerization

20060009009 NASA Glenn Research Center, Cleveland, OH, USA
Substituted Cyclohexene Endcaps for Polymers with Thermal-Oxidative Stability
December 27, 2005; 11 pp.; In English; Original contains black and white illustrations
Patent Info.: Filed 23 Oct. 2003; US-Patent-6,979,721; US-Patent-Appl-693852; NASA-Case-LEW-17429-1; No Copyright; Avail.: CASI: A03, Hardcopy

This invention relates to polyimides having improved thermal-oxidative stability, to the process of preparing said polyimides, and the use of polyimide prepolymers in the preparation of prepregs and composites. The polyimides are particularly usefull in the preparation of fiber-reinforced, high-temperature composites for use in various engine parts including inlets, fan ducts, exit flaps and other parts of high speed aircraft. The polyimides are derived from the polymerization of effective amounts of at least one tetracarboxylic dianhydride, at least one polyamine and a novel dicarboxylic endcap having the formula presented.
Official Gazette of the U.S. Patent and Trademark Office
Polyimides; Polymerization; Thermal Stability; Hexenes; Cyclic Compounds

20060009135 Geological Survey, Las Vegas, NV, USA
Hydrogeochemical Studies of Historical Mining Areas in the Humboldt River Basin and Adjacent Areas, Northern Nevada
Nash, J. T.; January 2004; 184 pp.; In English
Report No.(s): PB2006-102926; No Copyright; Avail.: National Technical Information Service (NTIS)

The goal of this investigation is to use knowledge of mineral resources to predict where geochemical hazards may be caused by historical mining (Plumlee and Nash, 1995; Plumlee and others, 1999); to observe and sample those predicted sites; and to evaluate the new information and chemical results to understand processes that do or do not mobilize metals in the surficial environment. Descriptions of mining districts in this report focus on the central part of the Humboldt River Basin, but discussions later in the report use field observations and geochemical information for other parts of the basin and adjacent mining areas of northern Nevada.
NTIS
Contamination; Geochemistry; Ground Water; Histories; Hydrogeology; Mining; Nevada; River Basins; Surface Water

20060009137 Geological Survey, Albany, NY, USA
Characterization of Dissolved and Particulate Natural Organic Matter (NOM) in Neversink Reservoir, New York
Wershaw, R. L.; Leenheer, J. A.; Cox, L.; January 2005; 28 pp.; In English
Report No.(s): PB2006-102907; No Copyright; Avail.: CASI: A03, Hardcopy

Natural organic matter (NOM) was isolated from the water of the Neversink Reservoir, part of the New York City water supply, located in the Catskill Mountains of New York. The NOM was fractionated into the following nine different fractions by the isolation procedure: (1) coarse particulates, (2) fine-particulate organics, (3) solvent-extractable organics, (4) hydrophobic neutrals (HPON fraction), (5) dissolved colloids, (6) bases, (7) hydrophobic acids (HPOA), (8) transphilic acids + neutrals (TPI-A+N), and (9) hydrophilic acids + neutrals (HPI-A+N). Each of these fractions, with exception of the first and the third which were too small for the complete series of analyses, was characterized by elemental, carbohydrate, and amino acid analyses, and by nuclear magnetic resonance and infrared spectrometry. The data obtained from these analyses indicate (1) that the fine-particulate organics and colloids are mainly composed of peptidoglycans, and lipopolysaccharides derived from algal, bacterial, and fungal cell walls, (2) that the HPO-N fraction most likely consists of a mixture of alicyclic terpenes and carbohydrates, (3) that the HPOA fraction consists mainly of lignin components conjugated to carbohydrates, (4) that the TPI-A+N and the HPI-A+N fractions most likely represent complex mixtures of relatively low molecular weight carboxylic acids derived from terpenes, carbohydrates, and peptides, and (5) that the base fraction is composed of free amino acids, browning reaction products, and peptide fragments.
NTIS
Dissolved Organic Matter; Organic Materials; Particulates; Reservoirs

20060009156 National Renewable Energy Lab., Golden, CO USA
Energy Storage Fuel Cell Vehicle Analysis
Pesaran, A.; Aug. 2005; 30 pp.; In English
Report No.(s): DE2005-859324; NREL/PR-540-38143; No Copyright; Avail.: National Technical Information Service (NTIS)

In recent years, hydrogen fuel cell (FC) vehicle technology has received considerable attention as a strategy to decrease oil consumption and reduce harmful emissions. However, the cost, transient response, and cold performance of FC systems may present significant challenges to widespread adoption of the technology for transportation in the next 15 years. The objectives of this effort were to perform energy storage modeling with fuel cell vehicle simulations to quantify the benefits of hybridization and to identify a process for setting the requirements of ES for hydrogen-powered FC vehicles for U.S. Department of Energy's Energy Storage Program.
NTIS
Charts; Conferences; Energy Storage; Fuel Cells; Hydrogen Fuels

20060009478 Agency for Toxic Substances and Disease Registry, Atlanta, GA USA
Public Health Assessment for Former St. Joe Forest Products Site (A/K/A St. Joe Paper Mill), Port St. Joe, Gulf County, Florida, January 6, 2006. EPA Facility ID: FLD004056602
Jan. 06, 2006; 110 pp.; In English
Report No.(s): PB2006-103493; No Copyright; Avail.: National Technical Information Service (NTIS)

The former St. Joe Forest Products site is at 600 West U.S. Highway 98 on St. Joe Bay in Port St. Joe, Gulf County, Florida. From 1938 to 1974, St. Joe Paper Company discharged mill wastewater into an unlined impoundment on the northern part of the site and into St. Joe Bay. After 1974, St. Joe Paper Company conveyed its mill wastewater to the Port St. Joe wastewater treatment plant. In 1996, St. Joe Paper Company sold the southern millworks to Florida Coast Paper. St. Joe Paper Company (now St. Joe Company) retains ownership of the northern part of the site. Florida Coast Paper temporarily closed

the mill in 1997 and then permanently closed it in 1998 due to financial difficulties. Stone Container Corporation took ownership in 2000 and later decided to dismantle the mill. Cleanup of the site is proceeding under Florida's Brownfields redevelopment program. Stone Container Corporation and St. Joe Company have formed a joint venture to develop the property and each company agreed to assess and remediate the portion of the site it owns.
NTIS
Assessments; Florida; Forests; Gulfs; Hazards; Health; Public Health; Risk; Toxic Diseases

20060009949 General Atomics Co., San Diego, CA USA
Supercritical Water Partial Oxidation. Phase I - Pilot-Scale Testing/Feasibility Studies. Final Report
January 2005; 202 pp.; In English
Report No.(s): DE2005-860159; GA-C24239; No Copyright; Avail.: National Technical Information Service (NTIS)
Under Cooperative Agreement No. DE-FC36-00GO10529 for the Department of Energy, General Atomics (GA) is developing Supercritical Water Partial Oxidation (SWPO) as a means of producing hydrogen from low-grade biomass and other waste feeds. The Phase I Pilot-scale Testing/Feasibility Studies have been successfully completed and the results of that effort are described in this report.
NTIS
Feasibility; Hydrogen; Oxidation; Water

20060009956 Mississippi Univ., University, MS, USA
Novel Fission Product Separation Based on Room-Temperature Ionic Liquids. (Report for September 15, 2001-September 14, 2005)
January 2005; 16 pp.; In English
Report No.(s): DE2005-859442; No Copyright; Avail.: Department of Energy Information Bridge
The aqueous high-level waste (HLW) resulting from the reprocessing of civilian nuclear reactor fuel and other nuclear materials contains many long-lived fission products, including (sup 137)Cs(sup +) and (sup 90)Sr(sup 2+). These radionuclides present a serious health risk because they are a major source of radioactivity. In addition, they are significant contributors to the heat that is produced by HLW, which complicates the design of storage facilities. Both (sup 137)Cs(sup +) and (sup 90)Sr(sup 2+) have relatively small thermal cross sections and are therefore poor candidates for transmutation. Thus, HLW waste containing these species must be treated by conventional processing methods such as precipitation or ion exchange in order to achieve a reduction in volume and to lower the radioactivity of the waste. The liquid-liquid extraction of long-lived (sup 137)Cs(sup +) and (sup 90)Sr(sup 2+) radionuclides from aqueous tank waste into hydrophobic organic solvents, e.g., 1,2-dichloroethane, dichloromethane, toluene, xylene, with various ionophores, such as macrocyclic ligands, has been studied extensively. However, the high vapor pressure and toxicity associated with such solvents are problematic. As a result, hydrophobic room-temperature molten salts or ionic liquids have been investigated as substitutes for the organic solvents normally used in this application (2-6). These ionic solvents have no detectable vapor pressure at room temperature. Although the toxicity of these solvents is unknown, they are believed to be less toxic than most of the molecular organic solvents listed above. One class of macrocycles that are promising candidates for the extraction of Cs(sup +) is the calix-arene-crown ethers, especially those based on calix(4)arenes. In a recent investigation, calix(4)arene-bis (t-octylbenzo-crown-6) (BOBCalixC6) dissolved in 1-C(sub n)-ethyl-3-methyl-imidazolium bis((trifluoromethyl) sulfonyl)imide (Tf9 sub 2)N-) ionic liquids was found to be an extremely effective extraction system for Cs(sup +). Likewise, dicyclohexano-18-crown-6 (DCH18C6) was found to be an effective extractant for Sr9 sup 2+) in this same ionic liquid. However,before this extraction system can be used to remove Cs(sup +) and Sr(sup2+) from aqueous tank waste on a practical scale, an economical method for recycling the expensive extraction solvent (macrocyclic ligands + ionic liquid) must be developed.
NTIS
Fission Products; Liquids; Radioactive Wastes; Waste Management

20060009995 Minnesota Univ., Minneapolis, MN, USA
New Concept for the Fabrication of Hydrogen Selective Silica Membranes. Annual Report, August 1, 2004 - July 31, 2005
Tsapatsis, M.; Oct. 2005; 18 pp.; In English
Report No.(s): DE2005-860205; No Copyright; Avail.: Department of Energy Information Bridge
It is attempted to synthesize hydrogen selective silica-based membranes through a novel thin film deposition concept. This

report describes the progress made during the 1st Year of this award. All project Tasks, for Year 1, were completed and the first thin films were prepared and characterized.
NTIS
Fabrication; Hydrogen; Membranes; Silicon Dioxide

20060010033 NASA Kennedy Space Center, Cocoa Beach, FL, USA
Polyimides from 2,3,3',4'-Biphenyltetracarboxylic Dianhydride and Aromatic Diamines
Hergenrother, Paul M., Inventor; Smith, Joseph G., Inventor; Connell, John W., Inventor; Watson, Kent A., Inventor; October 25, 2005; 18 pp.; In English; Original contains black and white illustrations
Patent Info.: Filed 7 Apr. 2003; US-Patent-6,958,192; US-Patent-Appl-SN-414562; US-Patent-Appl-SN-373342; NASA-Case-KSC-12209; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention relates generally to polyimides. It relates particularly to novel polyimides prepared from 2,3, 3',4' -biphenyltetracarboxylic dianhydride and aromatic diamines. These novel polyimides have low color, good solubility, high thermal emissivity, low solar absorptivity and high tensile strength.
Official Gazette of the U.S. Patent and Trademark Office
Anhydrides; Diamines; Polyimides; Aromatic Compounds; Phenyls; Carboxyl Group

20060010034 NASA Kennedy Space Center, Cocoa Beach, FL, USA
High Performance Immobilized Liquid Membrane for Carbon Dioxide Separations
Parrish, Clyde F., Inventor; October 25, 2005; 9 pp.; In English; Original contains black and white illustrations
Patent Info.: Filed 17 Sep. 2003; US-Patent-6,958,085; US-Patent-Appl-666821; US-Patent-Appl-458874; NASA-Case-KSC-12540; No Copyright; Avail.: CASI: A02, Hardcopy

An immobilized liquid membrane has a substrate. A plurality of capsules is disposed on the substrate. Each of the capsules is permeable to a first gas of a mixture of gases comprising the st gas and a second gas. Each of the capsules is substantially impermeable to the second gas. A liquid is disposed in each of the capsules that is permeable to the first gas and substantially impermeable to the second gas.
Official Gazette of the U.S. Patent and Trademark Office
Carbon Dioxide; Gas Mixtures; Membranes

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METALS AND METALLIC MATERIALS

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

20060009000 NASA Glenn Research Center, Cleveland, OH, USA
Nickel Base Superalloy Turbine Disk
Gabb, Timothy P., Inventor; Gauda, John, Inventor; Telesman, Ignacy, Inventor; Kantzos, Pete T., Inventor; December 13, 2005; 17 pp.; In English
Patent Info.: Filed 29 Oct. 2002; US-Patent-6,974,508; US-Patent-Appl-SN-283220; NASA-Case-LEW-17318-1; No Copyright; Avail.: CASI: A03, Hardcopy

A low solvus, high refractory alloy having unusually versatile processing mechanical property capabilities for advanced disks and rotors in gas turbine engines. The nickel base superalloy has a composition consisting essentially of, in weight percent, 3.0-4.0 N, 0.02-0.04 B, 0.02-0.05 C, 12.0-14.0 Cr, 19.0-22.0 Co, 2.0-3.5 Mo, greater than 1.0 to 2.1 Nb, 1.3 to 2.1 Ta,3.04.OTi,4.1 to 5.0 W, 0.03-0.06 Zr, and balance essentially Ni and incidental impurities. The superalloy combines ease of processing with high temperature capabilities to be suitable for use in various turbine engine disk, impeller, and shaft applications. The Co and Cr levels of the superalloy can provide low solvus temperature for high processing versatility. The W, Mo, Ta, and Nb refractory element levels of the superalloy can provide sustained strength, creep, and dwell crack growth resistance at high temperatures.
Official Gazette of the U.S. Patent and Trademark Office
Heat Resistant Alloys; Refractory Metal Alloys; Nickel Alloys; Rotors; Gas Turbine Engines; Mechanical Properties

20060009152 NASA Langley Research Center, Hampton, VA, USA

Electron Beam Freeform Fabrication (EBF3) for Cost Effective Near-Net Shape Manufacturing

Taminger, Karen M.; Hafley, Robert A.; March 2006; 14 pp.; In English; Original contains color and black and white illustrations

Patent Info.: Filed 581.02.08.07

Report No.(s): NASA/TM-2006-214284; L-19241; No Copyright; Avail.: CASI: A03, Hardcopy

Manufacturing of structural metal parts directly from computer aided design (CAD) data has been investigated by numerous researchers over the past decade. Researchers at NASA Langley Research Center are developing a new solid freeform fabrication process, electron beam freeform fabrication (EBF3), as a rapid metal deposition process that works efficiently with a variety of weldable alloys. EBF3 deposits of 2219 aluminium and Ti-6Al-4V have exhibited a range of grain morphologies depending upon the deposition parameters. These materials have exhibited excellent tensile properties comparable to typical handbook data for wrought plate product after post-processing heat treatments. The EBF3 process is capable of bulk metal deposition at deposition rates in excess of 2500 cubic centimeters per hour (150 in3/hr) or finer detail at lower deposition rates, depending upon the desired application. This process offers the potential for rapidly adding structural details to simpler cast or forged structures rather than the conventional approach of machining large volumes of chips to produce a monolithic metallic structure. Selective addition of metal onto simpler blanks of material can have a significant effect on lead time reduction and lower material and machining costs.

Author

Electron Beams; Fabrication; Cost Effectiveness; Manufacturing

20060009160 Worcester Polytechnic Inst., MA, USA

Low Cost and Energy Efficient Methods for the Manufacture of Semi-Solid (SSM) Feedstock. (Report for January 15, 2002-June 30, 2005)

Apelian, D.; Pan, Q.; Jha, M.; January 2005; 48 pp.; In English

Report No.(s): DE2005-859300; No Copyright; Avail.: National Technical Information Service (NTIS)

The SSM Consortium (now ACRC) at WPI has been carrying out fundamental, pre-competitive research in SSM for several years. Current and past research (at WPI) has generated many results of fundamental and applied nature, which are available to the SSM community. These include materials characterization, yield stress effects, alloy development, rheological properties, process modeling/simulation, semi-solid slurry formation, etc. Alternative method to produce SSM slurries at lower processing costs and with reduced energy consumption is a critical need. The production of low cost SSM feedstock will certainly lead to a dramatic increase in the tonnage of castings produced by SSM, and will provide end users such as the transportation industry, with lighter, cheaper and high performance materials. In this program, the research team has addressed three critical issues in semi-solid processing. They are: (1) Development of low cost, reliable slurry-on-demand approaches for semi-solid processing; (2) Application of the novel permanent grain refining technology-SiBloy for the manufacture of high-quality SSM feedstock, and (3) Development of computational and modeling tools for semi-solid processing to enhance SSM process control. Salient results from these studies are summarized and detailed in our final technical report.

NTIS

Costs; Energy Conservation; Low Cost; Manufacturing; Metals

20060009296 NASA Glenn Research Center, Cleveland, OH, USA

Observations of a Cast Cu-Cr-Zr Alloy

Ellis, David L.; February 2006; 16 pp.; In English

Contract(s)/Grant(s): WBS 22-617-44-20

Report No.(s): NASA/TM-2006-213968; E-15286; No Copyright; Avail.: CASI: A03, Hardcopy

Prior work has demonstrated that Cu-Cr-Nb alloys have considerable advantages over the copper alloys currently used in regeneratively cooled rocket engine liners. Observations indicated that Zr and Nb have similar chemical properties and form very similar compounds. Glazov and Zakharov et al. reported the presence of Cr2Zr in Cu-Cr-Zr alloys with up to 3.5 wt% Cr and Zr though Zeng et al. calculated that Cr2Zr could not exist in a ternary Cu-Cr-Zr alloy. A cast Cu-6.15 wt% Cr-5.25 wt% Zr alloy was examined to determine if the microstructure developed would be similar to GRCop-84 (Cu-6.65 wt% Cr-5.85 wt% Nb). It was observed that the Cu-Cr-Zr system did not form any Cr2Zr even after a thermal exposure at 875 C for 176.5 h. Instead the alloy consisted of three phases: Cu, Cu5Zr, and Cr.

Author

Copper Alloys; Microstructure; Regenerative Cooling; Rocket Engines; Chemical Properties

20060009953 West Virginia Univ., Morgantown, WV USA

Understanding and Improving High-Temperature Structural Properties of Metal-Silicide Intermetallics

Kang, B. S.; Oct. 2005; 148 pp.; In English

Report No.(s): DE2005-859223; No Copyright; Avail.: National Technical Information Service (NTIS)

The objective of this project was to understand and improve high-temperature structural properties of metal-silicide intermetallic alloys. Through research collaboration between the research team at West Virginia University (WVU) and Dr. J.H. Schneibel at Oak Ridge National Laboratory (ORNL), molybdenum silicide alloys were developed at ORNL and evaluated at WVU through atomistic modeling analyses, thermo-mechanical tests, and metallurgical studies. In this study, molybdenum-based alloys were ductilized by dispersing MgAl(sub 2)O(sub 4) or MgO spinel particles. The addition of spinel particles is hypothesized to getter impurities such as oxygen and nitrogen from the alloy matrix with the result of ductility improvement. The introduction of fine dispersions has also been postulated to improve ductility by acting as a dislocation source or reducing dislocation pile-ups at grain boundaries. The spinel particles, on the other hand, can also act as local notches or crack initiation sites, which is detrimental to the alloy mechanical properties. Optimization of material processing condition is important to develop the desirable molybdenum alloys with sufficient room-temperature ductility. Atomistic analyses were conducted to further understand the mechanism of ductility improvement of the molybdenum alloys and the results showed that trace amount of residual oxygen may be responsible for the brittle behavior of the as-cast Mo alloys. For the alloys studied, uniaxial tensile tests were conducted at different loading rates, and at room and elevated temperatures. Thermal cycling effect on the mechanical properties was also studied. Tensile tests for specimens subjected to either ten or twenty thermal cycles were conducted. For each test, a follow-up detailed fractography and microstructural analysis were carried out. The test results were correlated to the size, density, distribution of the spinel particles and processing time. Thermal expansion tests were carried out using thermo-mechanical analyzer (TMA). Results showed that the coefficient of thermal expansion (CTE) value decreases with the addition of spinel and silicide particles. Thermo-cycling tests showed that molybdenum alloy with 6% wt of spinel (MgAl(sub 2)O(sub 4)) developed microcracks which were caused by thermal expansion mismatch between the spinel particles and molybdenum matrix, as well as the processing conditions. Detailed post-mortem studies of microstructures and segregation of impurities to the oxide dispersion/Mo interfaces were conducted using x-ray diffraction (XRD), scanning electron microscopy (SEM), and energy dispersive spectroscopy (EDS).

NTIS

High Temperature; Intermetallics; Silicides

20060009960 Department of Energy, Washington, DC, USA, Tennessee Univ., Knoxville, TN, USA, Oak Ridge National Lab., TN USA

Development of Combinatorial Methods for Alloy Design and Optimization

Pharr, G. M.; Pharr, E. P.; Santella, M. L.; Jul. 2005; 98 pp.; In English

Report No.(s): DE2005-842122; No Copyright; Avail.: National Technical Information Service (NTIS)

The primary goal of this research, which was sponsored under the Knowledge Base or Core Activities category of IMF solicitation DE-PS07-01ID14123, was to develop a comprehensive methodology for designing and optimizing metallic alloys by combinatorial principles. Because conventional techniques for alloy preparation are unavoidably restrictive in the range of alloy composition that can be examined, combinatorial methods promise to significantly reduce the time, energy, and expense needed for alloy design. Combinatorial methods can be developed not only to optimize existing alloys, but to explore and develop new ones as well. The scientific approach involved fabricating an alloy specimen with a continuous distribution of binary and ternary alloy compositions across its surface an alloy library and then using spatially resolved probing techniques to characterize its structure, composition, and relevant properties. The three specific objectives of the project were (1) to devise means by which simple test specimens with a library of alloy compositions spanning the range of interest can be produced; (2) to assess how well the properties of the combinatorial specimen reproduce those of the conventionally processed alloys; and (3) to devise screening tools which can be used to rapidly assess the important properties of the alloys. As proof of principle, the methodology was applied to the Fe-Ni-Cr ternary alloy system that constitutes many commercially important materials such as stainless steels and the H-series and C-series heat- and corrosion-resistant casting alloys. Three different techniques were developed for making alloy libraries: (1) vapor deposition of discrete thin films on an appropriate substrate followed by use of solid-state diffusion to alloy film and substrate together; (2) co-deposition of the alloying elements from three separate magnetron sputtering sources onto an inert substrate; and (3) localized melting of thin films with a focused electron-beam welding (EBW) system. Each of the techniques was found to have its own advantages and disadvantages.

NTIS

Combinatorial Analysis; Design Optimization; Alloying

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*.

20060009122 Alabama Univ., Birmingham, AL, USA
Low Cost Thermolplastic Wrap to Enhance Bridge Safety
Uddin, N.; Perdue, J. D.; Vaidya, U.; Jan. 2006; 74 pp.; In English
Report No.(s): PB2006-104437; No Copyright; Avail.: CASI: A04, Hardcopy

The risk of damage to bridge piers from accidental loads remains a concern as roadways and waterways become more congested. Fiber reinforced composite materials are finding a wide array of civil infrastructure applications. Most of these applications utilize pre-preg thermosetting composites, the most common of which is carbon fiber reinforced polymer. Presently, there are no existing studies on thermoplaslic materials for civil infrastructure. The ability to readily form thermoplastics and their inherent high impact resistance make them desirable in civil infrastructure applications. This research was an essential step towards developing thermoplastic confining jackets for bridge pier vulnerability reduction. This research focused on the development of thermoplastic composite material produced in continuous pultruded form thermoplastic polymer jackets for confining concrete columns. The effects of compression and impact loading of high strength concrete confined by a prefabricated polypropylene jacket were investigated. For comparison purposes similar specimens confined by carbon fiber/epoxy were also considered. The results from both loading cases demonstrated the superior performance of thermoplastic polymer jackets to displace in-elastically without significant degradation of strength or stiffness.
NTIS
Bridges (Structures); Highways; Low Cost; Safety; Thermoplasticity; Wharves

20060009142 Forest Products Lab., Madison, WI USA
Importance of Balanced Construction in Plastic-Faced Wood Panels
Heebink, B. G.; Nov. 1963; 10 pp.; In English
Report No.(s): PB2006-102283; FPL-021; No Copyright; Avail.: CASI: A02, Hardcopy

The report is on the warping of plastic-faced panels that have cores of plywood, particle board, hardboard or paper honeycomb. The Laboratory explain the causes of the warping and, if possible, to suggest measures to remedy the difficulty.
NTIS
Construction; Panels; Plastics; Wood

20060009165 Department of Energy, Washington, DC, USA
Improving Energy Efficiency at U.S. Plastics Manufacturing Plants: Summary Report and Case Studies
January 2005; 46 pp.; In English
Report No.(s): DE2005-15020407; No Copyright; Avail.: National Technical Information Service (NTIS)

Industrial Technologies Programs BestPractices report based on a comprehensive plant assessment project with ITP's Industrial Assessment Center, The Society of the Plastics Industry, Inc., and several of its member companies.
NTIS
Energy Conservation; Industries; Manufacturing; Plastics

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COMMUNICATIONS AND RADAR

Includes radar; radio, wire, and optical communications; land and global communications; communications theory. For related information see also 04 Aircraft Communications and Navigation; and *17 Space Communications, Spacecraft Communications, Command and Tracking*; for search and rescue, see *03 Air Transportation and Safety*; and *16 Space Transportation and Safety*.

20060009128 Newcastle-upon-Tyne Univ., Newcastle, UK
Grid Computing Using Web Services
Parastatidis, S.; Watson, P.; Webber, J.; Aug. 2005; 22 pp.; In English
Report No.(s): PB2006-103554; CS-TR-926; Copyright; Avail.: National Technical Information Service (NTIS)

Service-Oriented Architecture (SOA) is the contemporary paradigm of choice for developing scalable, loosely-coupled applications that span organizations. However the architectural paradigm that is SOA is often confused with the

implementation technology that is Web Services. In this paper we aim to clarify the fundamental tenets of SOA and their relevance to Internet-scale computing (or Grid computing). We then show how to apply the principles of SOA to building Internet-scale applications using Web Services technologies and how to avoid software pitfalls by adhering to a number of deliberately simple architectural constraints.
NTIS
Communication Networks; Grid Computing (Computer Networks); Interprocessor Communication

20060009130 Newcastle-upon-Tyne Univ., Newcastle, UK
Design and Performance Study of Crash Tolerant Protocols for Broadcasting and Reaching Consensus in MANETs
Vollset, E.; Ezhilchelvan, P. D.; Aug. 2005; 30 pp.; In English
Report No.(s): PB2006-103553; CS-TR-925; Copyright; Avail.: National Technical Information Service (NTIS)

The mobile ad-hoc networking (MANET) technology offers an ideal medium for hosting self-organized collaborative applications in terrains with no infrastructure support for untethered communication. Collaboration involves users with potentially different initial opinions deciding identically, i.e., reaching consensus. Efficient consensus solutions require efficient broadcast support. This paper presents four crash-tolerant broadcast protocols which are designed (1) to provide the maximum broadcast coverage that can ever be guaranteed, and (2) to suit a wide range of MANET types: from a connected MANET (no partitions) to intermittently disconnected one (partitions occurring rarely and healing swiftly) to an intermittently connected one (partitions taking longer to heal and re-appearing swiftly). The resulting design challenges are addressed systematically, beginning with formulating a MANET liveness property and deriving two foundational results that would guide the protocol design. The protocols' performance is then studied through simulations for a range of node speeds and network densities. The one with the smallest overhead is used to support a known, randomized consensus protocol. The consensus overhead and the latency remain surprisingly small even as the number of nodes with distinct initial opinions increases.
NTIS
Broadcasting; Communication Networks; Crashes; Protocol (Computers)

20060009132 Newcastle-upon-Tyne Univ., Newcastle, UK
Optimization of Encounter Gossip Propagation in Mobile Ad-Hoc Networks
Cooper, D. E.; Ezhilchelvan, P.; Mitrani, I.; Vollset, E.; Jul. 2005; 16 pp.; In English
Report No.(s): PB2006-103551; CS-TR-921; Copyright; Avail.: National Technical Information Service (NTIS)

Encounter Gossip is a family of message propagation protocols for mobile ad-hoc networks. The coverage of message propagation (the fraction of nodes that receive it), can be made arbitrarily close to 1, but the cost of increased coverage is an increase in message traffic. This paper proposes modifications which aim to minimize the number of broadcasts without compromising the achieved coverage. Two approaches to broadcast reduction are pursued: timer based and history based. The effectiveness of each of these approaches is assessed through an extensive set of simulation experiments in the context of two mobility models.
NTIS
Communication Networks; Messages; Protocol (Computers); Traffic

20060009475 Coast Guard, Groton, CT, USA
Intelligent Gateway Design and Development. Final Report
Oct. 1996; 40 pp.; In English
Report No.(s): PB2006-103590; No Copyright; Avail.: CASI: A03, Hardcopy

The Intelligent Gateway (IG) is a Research and Development (R&D) effort to design an algorithm to provide computer-aided routing of ACP-123/X.400 messages by a USA Coast Guard (USCG) Communications Area Master Station (CAMS). The algorithm is designed to be implementation independent; i.e. it is not dependent on a particular programming language, methodology, or hardware platform. The IG development is a proof-of-concept effort and is not intended to be fielded as a stand alone Defense Message System (DMS) component. Instead the USCG is working with the U.S. Navy and DMS product vendors to incorporate IG functionality into future Commercial Off-The-Shelf (COTS) DMS products.
NTIS
Algorithms; Messages

20060009481 Small Business Administration, Washington, DC, USA
Broadband Use by Rural Small Businesses
Dec. 2005; 36 pp.; In English
Contract(s)/Grant(s): SBAHQ-02-M-0528
Report No.(s): PB2006-101287; No Copyright; Avail.: National Technical Information Service (NTIS)

This research explores two popular beliefs pertaining to the deployment and use of broadband services. First, that these services provide tangible benefit to the overall economy. Second, that rural deployment lags urban deployment. It has often been suggested that the universal provision of broadband services in rural areas was cost prohibitive; thus creating the urban-rural digital divide. This study investigates and verifies these assertions, specifically, as they apply to rural small businesses. It relies primarily on data from the Federal Communications Commission (FCC) and an Office of Advocacy survey. The study finds that an urban-rural digital divide does exist in the provision and adoption of broadband services. This difference in broadband use is statistically significant. A major concern is that many benefits have been associated with the availability and adoption of broadband services, and rural small businesses are not obtaining them.
NTIS
Broadband; Commerce; Communication Networks; Rural Areas; Telecommunication

20060009497 National Inst. of Justice, Washington, DC, USA
Working Together To Bridge the Communications Gap to Save Lives. A Guide for Public Officials
Feb. 2003; 76 pp.; In English
Report No.(s): PB2006-103631; No Copyright; Avail.: CASI: A05, Hardcopy

In an era where technology can bring news, current events, and entertainment to the farthest reaches of the world, many law enforcement officers, firefighters, and emergency medical service personnel working in the same jurisdiction cannot communicate with one another. The inability of our public safety officials to readily communicate with one another threatens the publics safety and often results in unnecessary loss of lives and property. Recognizing that solutions to this national issue can only be achieved through cooperation between all levels of government, 18 national associations representing State and local elected and appointed officials and public safety officials formed a task force to address this issue. The case studies and articles contained in this document are the result of the significant commitment by members of this task force who shared their knowledge, experience, and wisdom.
NTIS
Telecommunication; Radio Communication

20060009929 National Telecommunications and Information Administration, Washington, DC USA
Proceedings of the International Symposium on Advanced Radio Technologies. Held in Boulder, Colorado on March 7-9, 2006
Raush, P. J.; Novik, K. E.; Mar. 2006; 190 pp.; In English; International Symposium on Advanced Radio Technologies., March 7 - 9, 2006, Boulder, Colorado
Report No.(s): PB2006-107719; NTIA-SP-06-438; No Copyright; Avail.: National Technical Information Service (NTIS)

The International Symposium on Advanced Radio Technologies (ISART) brings together technical researchers, business leaders, government policy makers, and regulators for the purpose of forecasting the development and application of radio frequency technologies.
NTIS
Conferences; Radio Equipment

20060009965 Fermi National Accelerator Lab., Batavia, IL, USA, Indiana Univ., Indianapolis, IN, USA, Chicago Univ., Chicago, IL USA, Florida Univ., Gainesville, FL, USA
Grid2003 Monitoring Metrics, and Grid Cataloging System
Grundhoefer, L.; Quick, R.; Hicks, J.; January 2005; 20 pp.; In English
Report No.(s): DE2005-15016967; FERMILAB-CONF-04-458; No Copyright; Avail.: National Technical Information Service (NTIS)

Grid computing involves the close coordination of many different sites which offer distinct computational and storage resources to the Grid user community. The resources at each site need to be monitored continuously. Static and dynamic site

information needs to be presented to the user community in a simple and efficient manner.
NTIS
Grid Computing (Computer Networks); Coordination

20060010005 NASA Glenn Research Center, Cleveland, OH, USA
A Novel, Free-Space Optical Interconnect Employing Vertical-Cavity Surface Emitting Laser Diodes and InGaAs Metal-Semiconductor-Metal Photodetectors for Gbit/s RF/Microwave Systems
Savich, Gregory R.; Simons, Rainee N.; March 2006; 19 pp.; In English; Photonics West 2006, 21-26 Jan. 2006, San Jose, CA, USA; Original contains black and white illustrations
Contract(s)/Grant(s): WBS 953033.01.03.12
Report No.(s): NASA/TM-2006-214251; E-15496; Paper number 6126-11; Copyright; Avail.: CASI: A03, Hardcopy

Emerging technologies and continuing progress in vertical-cavity surface emitting laser (VCSEL) diode and metal-semiconductor-metal (MSM) photodetector research are making way for novel, high-speed forms of optical data transfer in communication systems. VCSEL diodes operating at 1550 nm have only recently become commercially available, while MSM photodetectors are pushing the limits of contact lithography with interdigitated electrode widths reaching sub micron levels. We propose a novel, free-space optical interconnect operating at about 1Gbit/s utilizing VCSEL diodes and MSM photodetectors. We report on development, progress, and current work, which are as follows: first, analysis of the divergent behavior of VCSEL diodes for coupling to MSM photodetectors with a 50 by 50 m active area and second, the normalized frequency response of the VCSEL diode as a function of the modulating frequency. Third, the calculated response of MSM photodetectors with varying electrode width and spacing on the order of 1 to 3 m as well as the fabrication and characterization of these devices. The work presented here will lead to the formation and characterization of a fully integrated 1Gbit/s free-space optical interconnect at 1550 nm and demonstrates both chip level and board level functionality for RF/microwave digital systems.
Author
Laser Cavities; Diodes; Semiconductor Lasers; Surface Emitting Lasers; Photometers; Free-Space Optical Interconnects

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*.

20060009004 NASA Glenn Research Center, Cleveland, OH, USA
CHARGING of DEVICES BY MICROWAVE POWER BEAMING
Landis, Geoffrey A., Inventor; November 22, 2005; 10 pp.; In English
Patent Info.: Filed 5 Jun. 2003; US-Patent-6,967,462; US-Patent-Appl-SN-455139; NASA-Case-LEW-17383-1; No Copyright; Avail.: CASI: A02, Hardcopy

A system for providing wireless, charging power and/or primary power to electronic/electrical devices is described whereby microwave energy is employed. Microwave energy is focused by a power transmitter comprising one or more adaptively-phased microwave array emitters onto a device to be charged. Rectennas within the device to be charged receive and rectify the microwave energy and use it for battery charging and/or for primary power. A locator signal generated by the device to be charged is analyzed by the system to determine the location of the device to be charged relative to the microwave array emitters, permitting thc microwave energy to be directly specifically towards the device to be charged. Backscatter detectors respond to backscatter energy reflected off of any obstacle between the device to be charged and the microwave array emitters. Power to any obstructed microwave array emitter is reduced until the obstruction is removed. Optionally, data can be modulated onto microwave energy beams produced by the array emitter and demodulated by the device, thereby providing means of data communication from the power transmitter to the device. Similarly, data can be modulated onto the locator signal and demodulated in the power transmitter, thereby providing means of data communication from the device to the power transmitter.
Official Gazette of the U.S. Patent and Trademark Office
Microwave Power Beaming; Transmitters; Microwave Transmission; Backscattering; Electric Batteries; Communication Equipment; Emitters

20060009010 NASA Johnson Space Center, Houston, TX, USA
Practical Active Capacitor Filter
Shuler, Robert L., Jr., Inventor; September 13, 2005; 12 pp.; In English; Original contains black and white illustrations
Patent Info.: Filed 21 May 2003; US-Patent-6,943,619; US-Patent-Appl-443233; NASA-Case-MSC-23538-1; No Copyright; Avail.: CASI: A03, Hardcopy

A method and apparatus is described that filters an electrical signal. The filtering uses a capacitor multiplier circuit where the capacitor multiplier circuit uses at least one amplifier circuit and at least one capacitor. A filtered electrical signal results from a direct connection from an output of the at least one amplifier circuit.
Official Gazette of the U.S. Patent and Trademark Office
Capacitors; Circuits; Multipliers; Signal Transmission

20060009045 Massachusetts Inst. of Tech., Cambridge, MA, USA
Fixed Wireless Carrier Economics: An Idea Whose Time Has Come?
Stuck, Bart W.; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2005 USA Cambridge); [2005]; 46 pp.; In English; See also 20060009039; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Answer: The future role of wireless depends on relative economics of wireline versus wireless Now and in the future For different types of telecom transmissions Ability to fit within a triple-play environment: voice, data, and video For wireless, this needs to take into account practical issues re access to sufficient spectrum at what frequencies. Best frequencies at low GHz with low attenuation also are the most crowded with limited bandwidth, non line-of-sight. Lots of available bandwidth at high GHz, but this comes with high attenuation, but not line of sight. In theory, wireless has three fundamental advantages over wireline: 1) Can facilitate mobility/portability 2) Less wiring (conduit for wires, poles, concrete slabs with wiring concentrators, connectors, and less associated labor) 3) More variable cost structure.
Derived from text
Economics; Line of Sight; Wireless Communication; Fiber Optics; Wiring; Costs; Bandwidth

20060009046 Skvode Univ., Skvode, Sweden
Smart Antennas in Mobile Computing
ShanmukhaShri, V. Sri; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2005 USA Cambridge); [2005]; 45 pp.; In English; See also 20060009039; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The concept of using multiple antennas and innovative signal processing to serve cells more intelligently has existed for many years. In fact, varying degrees of relatively costly smart antenna systems have already been applied in defense systems. Until recent year, cost barrier have prevented their use in commercial systems. The advent of powerful low-cost digital signal processors (D S Ps), general purpose processors and A S I C s, as well as innovative software-based signal processing techniques (algorithms) have made intelligent antennas practical for cellular communications systems or in other terms mobile computing.
Author
Antenna Design; Mobile Communication Systems; Signal Processing; Signal Analyzers; Algorithms

20060009127 Newcastle-upon-Tyne Univ., Newcastle, UK
Derivation of Set and Reset Covers for gC Elements and Standard C Implmentation Using STG Unfoldings
Khomenko, V.; Sep. 2005; 22 pp.; In English
Report No.(s): PB2006-103558; CS-TR-930; Copyright; Avail.: National Technical Information Service (NTIS)

The behaviour of asynchronous circuits is often described by Signal Transition Graphs (STGs), which are Petri nets whose transitions are interpreted as rising and falling edges of signals. One of the crucial problems in the synthesis of such circuits is deriving the set and reset covers for the state-holding elements implementing each output signal of the circuit. The derived covers must satisfy certain correctness constraints, in particular the Monotonic Cover condition must hold for the standard C implementation. The covers are usually derived using state graphs. In this paper, we avoid constructing the state graph of an STG, which can lead to state space explosion, and instead use only the information about causality and structural conflicts between the events involved in a finite and complete prefix of its unfolding. We propose an efficient algorithm for deriving the set and reset covers of gC elements and standard C implementation based on the Incremental Boolean Satisfiability (SAT)

approach. Experimental results show that this technique leads not only to huge memory savings when compared with the methods based on state graphs, but also to significant speedups in many cases, without affecting the quality of the solution.
NTIS
Circuits; Synchronism

20060009138 Geological Survey, Reston, VA USA
Indium. Mineral Commodity Profile
Jorgenson, J. D.; George, M. W.; January 2005; 28 pp.; In English
Report No.(s): PB2006-102295; USGS/OFR-2004-1300; No Copyright; Avail.: CASI: A03, Hardcopy
;Contents: Overview; Historical background; Description; Sources; Production technologies; Uses; Industry and market; Indium and the environment; Supply, demand, and sustainability; Economic factors; Outlook; References cited; Appendix; Figures and Tables.
NTIS
Commodities; Economics; Indium; Minerals

20060009146 National Renewable Energy Lab., Golden, CO USA
Ultracapacitors and Batteries in Hybrid Vehicles
Pesaran, A.; Markel, T.; Zolot, M.; Sprik, S.; January 2005; 38 pp.; In English
Report No.(s): DE2005-859416; NREL/PR-540-38484; No Copyright; Avail.: National Technical Information Service (NTIS)
Using an ultracapacitor in conjunction with a battery in a hybrid vehicle combines the power performance of the former with the greater energy storage capability of the latter.
NTIS
Charts; Electric Batteries; Electric Motor Vehicles; Electrochemical Capacitors

20060009153 NASA Langley Research Center, Hampton, VA, USA
Nano-interconnection for microelectronics and polymers with benzo-triazole
Park, Yeonjoon; Choi, Sang H.; Noh, Hyunpil; Kuk, Young; [2006]; 7 pp.; In English; SPIE 13th Annual International Symposium Smart Structures and Materials, 26 Feb. - 2 Mar. 2006, San Diego, CA, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 581.02.08
Report No.(s): SPIE-Paper-6172-40; Copyright; Avail.: CASI: A02, Hardcopy
Benzo-Triazole (BTA) is considered as an important bridging material that can connect an organic polymer to the metal electrode on silicon wafers as a part of the microelectronics fabrication technology. We report a detailed process of surface induced 3-D polymerization of BTA on the Cu electrode material which was measured with the Ultraviolet Photoemission Spectroscopy (UPS), X-ray Photoemission Spectroscopy (XPS), and Scanning Tunneling Microscope (STM). The electric utilization of shield and chain polymerization of BTA on Cu surface is contemplated in this study.
Author
Microelectronics; Silicon; Wafers; Fabrication; Polymerization; Electrodes

20060009172 Princeton Resources, Inc., NJ, USA, Colorado Univ., Colorado Springs, CO, USA
Proceedings of the International Symposium on Integrated Ferroelectrics (16th) (ISIF-16). Part 5 of 6. Volume 68 (2004). Held in Gyeongju, Korea on April 5-8, 2004
Balk, S.; Taylor, G. W.; Paz de Arujo, C. A.; January 2005; 318 pp.; In English; International Symposium on Integrated Ferroelectrics (16th) (ISIF-16). Part 5 of 6. Volume 68 (2004)., April 5 - 8, 2004, Gyeongju, Korea
Report No.(s): PB2006-101622; No Copyright; Avail.: National Technical Information Service (NTIS)
The 16th International Symposium on Integrated Ferroelectrics (ISIF 2004) took place on April 5-8 at Hotel Hyundai Gyeongju located in the Bomun Lake Resort in the suburb of Gyeongju, Korea, which is the most famous historic city in Korean peninsular. It was held, in particular, jointly with the 5th Korean Workshop on High Dielectric and Ferroelectric Devices and Materials. The ISIF 2004 was again proved to be the worldwide prime forum for those involved in the science, technology and manufacturing of integrated ferroelectric thin film devices and products including the FeRAM which has been considered as one of the most promising next-generation memory devices. Around 400 scientists and engineers attended the meeting from 20 different countries around the world. They presented 415 technical papers including 3 plenary lectures, 46

invited presentations, 128 contributed oral presentations and 243 poster presentations covering whole spectrum of current topics on ferroelectric thin films and devices such as FeRAM, MEMS, Microwave components, high-K dielectrics, etc.
NTIS
Ferroelectricity; Korea; Conferences

20060009173 Princeton Resources, Inc., NJ, USA, Colorado Univ., Colorado Springs, CO, USA
Proceedings of the International Symposium on Integrated Ferroelectrics (16th) (ISIF-16). Part 4 of 6. Volume 67 (2004). Held in Gyeongju, Korea on April 5-8, 2004
Taylor, G. W.; Paz De Araujo, C. A.; Balk, S.; January 2005; 328 pp.; In English; International Symposium on Integrated Ferroelectrics (16th) (ISIF-16). Part 4 of 6. Volume 67 (2004)., April 5 - 8, 2004, Gyeongju, Korea
Report No.(s): PB2006-101621; Copyright; Avail.: National Technical Information Service (NTIS)

The 16th International Symposium on Integrated Ferroelectrics (ISIF 2004) took place on April 5-8 at Hotel Hyundai Gyeongju located in the Bomun Lake Resort in the suburb of Gyeongju, Korea, which is the most famous historic city in Korean peninsular. It was held, in particular, jointly with the 5th Korean Workshop on High Dielectric and Ferroelectric Devices and Materials. The ISIF 2004 was again proved to be the worldwide prime forum for those involved in the science, technology and manufacturing of integrated ferroelectric thin film devices and products including the FeRAM which has been considered as one of the most promising next-generation memory devices. Around 400 scientists and engineers attended the meeting from 20 different countries around the world. They presented 415 technical papers including 3 plenary lectures, 46 invited presentations, 128 contributed oral presentations and 243 poster presentations covering whole spectrum of current topics on ferroelectric thin films and devices such as FeRAM, MEMS, Microwave components, high-K dielectrics, etc.
NTIS
Conferences; Ferroelectricity; Korea

20060009175 Princeton Resources, Inc., NJ, USA, Colorado Univ., Colorado Springs, CO, USA
Proceedings of the International Symposium on Integrated Ferroelectrics (16th) (ISIF-16). Part 3 of 6. Volume 66 (2004). Held in Gyeongju, Korea on April 5-8, 2004
Taylor, G. W.; Balk, S.; Paz De Arujo, C. A.; January 2004; 376 pp.; In English; International Symposium on Integrated Ferroelectrics (16th) (ISIF-16). Part 3 of 6. Volume 66 (2004)., April 5 - 8, 2004, Gyeongju, Korea
Report No.(s): PB2006-101620; Copyright; Avail.: National Technical Information Service (NTIS)

The 16th International Symposium on Integrated Ferroelectrics (ISIF 2004) took place on April 5-8 at Hotel Hyundai Gyeongju located in the Bomun Lake Resort in the suburb of Gyeongju, Korea, which is the most famous historic city in Korean peninsular. It was held, in particular, jointly with the 5th Korean Workshop on High Dielectric and Ferroelectric Devices and Materials. The ISIF 2004 was again proved to be the worldwide prime forum for those involved in the science, technology and manufacturing of integrated ferroelectric thin film devices and products including the FeRAM which has been considered as one of the most promising next-generation memory devices. Around 400 scientists and engineers attended the meeting from 20 different countries around the world. They presented 415 technical papers including 3 plenary lectures, 46 invited presentations, 128 contributed oral presentations and 243 poster presentations covering whole spectrum of current topics on ferroelectric thin films and devices such as FeRAM, MEMS, Microwave components, high-K dielectrics, etc.
NTIS
Conferences; Ferroelectricity; Korea

20060009177 Princeton Resources, Inc., NJ, USA, Colorado Univ., Colorado Springs, CO, USA
Proceedings of the International Symposium on Integrated Ferroelectrics (16th) (ISIF-16). Part 6 of 6. Volume 69 (2005). Held in Gyeongju, Korea on April 5-8, 2004
Balk, S.; Taylor, G. W.; Paz De Arujo, C. A.; January 2005; 544 pp.; In English; International Symposium on Integrated Ferroelectrics (16th) (ISIF-16). Part 6 of 6. Volume 69 (2005)., April 5 - 8, 2004, Gyeongju, Korea
Report No.(s): PB2006-101623; Copyright; Avail.: National Technical Information Service (NTIS)

The 16th International Symposium on Integrated Ferroelectrics (ISIF 2004) took place on April 5-8 at Hotel Hyundai Gyeongju located in the Bomun Lake Resort in the suburb of Gyeongju, Korea, which is the most famous historic city in Korean peninsular. It was held, in particular, jointly with the 5th Korean Workshop on High Dielectric and Ferroelectric Devices and Materials. The ISIF 2004 was again proved to be the worldwide prime forum for those involved in the science, technology and manufacturing of integrated ferroelectric thin film devices and products including the FeRAM which has been considered as one of the most promising next-generation memory devices. Around 400 scientists and engineers attended the

meeting from 20 different countries around the world. They presented 415 technical papers including 3 plenary lectures, 46 invited presentations, 128 contributed oral presentations and 243 poster presentations covering whole spectrum of current topics on ferroelectric thin films and devices such as FeRAM, MEMS, Microwave components, high-K dielectrics, etc.
NTIS
Conferences; Ferroelectricity; Korea

20060009178 Princeton Resources, Inc., NJ, USA, Colorado Univ., Colorado Springs, CO, USA
Proceedings of the International Symposium on Integrated Ferroelectrics (16th) (ISIF-16). Part 2 of 6. Volume 65 (2004). Held in Gyeongju, Korea on April 5-8, 2004
Taylor, G. W.; Balk, S.; Paz De Arujo, C. A.; January 2004; 258 pp.; In English; International Symposium on Integrated Ferroelectrics (16th) (ISIF-16). Part 2 of 6. Volume 65 (2004)., April 5 - 8, 2004, Gyeongju, Korea
Report No.(s): PB2006-101619; Copyright; Avail.: National Technical Information Service (NTIS)

The 16th International Symposium on Integrated Ferroelectrics (ISIF 2004) took place on April 5-8 at Hotel Hyundai Gyeongju located in the Bomun Lake Resort in the suburb of Gyeongju, Korea, which is the most famous historic city in Korean peninsular. It was held, in particular, jointly with the 5th Korean Workshop on High Dielectric and Ferroelectric Devices and Materials. The ISIF 2004 was again proved to be the worldwide prime forum for those involved in the science, technology and manufacturing of integrated ferroelectric thin film devices and products including the FeRAM which has been considered as one of the most promising next-generation memory devices. Around 400 scientists and engineers attended the meeting from 20 different countries around the world. They presented 415 technical papers including 3 plenary lectures, 46 invited presentations, 128 contributed oral presentations and 243 poster presentations covering whole spectrum of current topics on ferroelectric thin films and devices such as FeRAM, MEMS, Microwave components, high-K dielectrics, etc.
NTIS
Conferences; Ferroelectricity; Korea

20060009179 Princeton Resources, Inc., NJ, USA, Colorado Univ., Colorado Springs, CO, USA
Proceedings of the International Symposium on Integrated Ferroelectrics (16th) (ISIF-16). Part 1 of 6. Volume 64 (2004). Held in Gyeongju, Korea on April 5-8, 2004
Taylor, G. W.; Balk, S.; Paz De Arujo, C. A.; January 2005; 356 pp.; In English; International Symposium on Integrated Ferroelectrics (16th) (ISIF-16). Part 1 of 6. Volume 64 (2004)., April 5 - 8, 2004, Gyeongju, Korea
Report No.(s): PB2006-101618; Copyright; Avail.: National Technical Information Service (NTIS)

The 16th International Symposium on Integrated Ferroelectrics (ISIF 2004) took place on April 5-8 at Hotel Hyundai Gyeongju located in the Bomun Lake Resort in the suburb of Gyeongju, Korea, which is the most famous historic city in Korean peninsular. It was held, in particular, jointly with the 5th Korean Workshop on High Dielectric and Ferroelectric Devices and Materials. The ISIF 2004 was again proved to be the worldwide prime forum for those involved in the science, technology and manufacturing of integrated ferroelectric thin film devices and products including the FeRAM which has been considered as one of the most promising next-generation memory devices. Around 400 scientists and engineers attended the meeting from 20 different countries around the world. They presented 415 technical papers including 3 plenary lectures, 46 invited presentations, 128 contributed oral presentations and 243 poster presentations covering whole spectrum of current topics on ferroelectric thin films and devices such as FeRAM, MEMS, Microwave components, high-K dielectrics, etc.
NTIS
Conferences; Ferroelectricity; Korea

20060009241 Institute of Electrical and Electronics Engineers, New York, NY, USA
1982 International Symposium on Circuits And Systems, Volume 1
[1982]; 228 pp.; In English; 1982 International Symposium on Circuits And Systems, Volume 1, 10-12 May 1982, Rome, Italy; See also 20060009242 - 20060009291; Original contains color and black and white illustrations
Report No.(s): IEEE-Catalog-82CH1681-6-Vol-1; LC-80-646530; Copyright; Avail.: Other Sources

Topics discussed include: Analysis Of SCN's With Nonlinear And Time-Varying Elements Using Time-Invariant Charge Variables; An Efficient Computer-Aided Analysis Of Very Large Switched Capacitor Networks; Analysis of switched-capacitor networks; An Analysis Program For Switched-Capacitor Filters Including The Effects Of Op-Amp Bandwidth And Switch Resistance; General Computer Analysis Of Switched-Capacitor Networks Including Non-Ideal Amplifiers; Analysis And Design Of Discrete Time Networks With Submultiple Delays, Switched Capacitor Filter Applications; A Pictorial Derivation Of The Signal Processing Mechanism Of Multiphase Switched Capacitor Networks; Loop Equation Formulation

For Switched Capacitor Networks Containing Nullors; An Efficient Lu Factorization Scheme For The Analysis Of Switched-Capacitor Filters; Equivalent Noise Sources Of Switched-Capacitor Network Elements; A Comparison of Logic Minimization Strategies Using ESPRESSO: An APL Program Package for Partitioned Logic Minimalization; The Decomposition And Factorization Of Boolean Expressions; Staggered Input Networks: An Approach To Automatic Logic Decomposition; Fast Recursive Boolean Function Manipulation; MOS Switch Level Simulation, Macromodeling, And Testing; Switch-Level Modeling Of Mos Digital Circuits; Hazard Detection In A Multiple Delay Logic Simulator; Planar Least Squares Inverse Polynomials: Stabilization Of Two Dimensional Recursive Digital Filters; On The Properties Of Linear Spectral Transformations For 2-Dimensional Digital Filters; An Improved Method For The Design Of 2-D Fir Digital Filters With Circular And Rectangular Cut-Off Boundary Using Kaiser Window One-Dimensional Linear Shift-Variant Digital Filtering Using Two-Dimensional Techniques On The Design Of 2-D Stable Analog Filters And Recursive Digital Filters; Two Dimensional Variable Cutoff Linear Phase Digital Filters; Synthesis Of The Pseudolossless I-D And 2-D Digital Filters Which Simulate Reciprocal Or Nonreciprocal Reactance; Necessary and Sufficient Conditions For Robust Stability Of Linear Distributed Feedback System; Nonlinear Oscillation Via Volterra Series; Series Expansions For Nonlinear Systems; Stability Analysis Of Interconnected Systems: A Constructive Approach; Sensitivity-Based Statistical Tolerance Assignment In Electrical Networks; The Scattering And Immittance Parameters And Two-Port Invariants In Linear Amplifier Computer Aided Design; Automatic Network Tuning And Worst-Case Analysis By Global Quadratic Optimization; etc.
Derived from text
Amplifier Design; Boolean Functions; Digital Electronics; Electrical Impedance; Logic Circuits; Nonlinear Systems; Signal Processing; Network Analysis; Computer Aided Design; Capacitors; Linear Filters

20060009242 Texas Univ., Austin, TX, USA
One-Dimensional Linear Shift-Variant Digital Filtering Using Two-Dimensional Techniques
Park, S. H.; Huang, N. C.; Aggarwal, J. K.; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 89-92; In English; See also 20060009241
Contract(s)/Grant(s): F49620-77-C-0101; Copyright; Avail.: Other Sources
This paper investigates some problems associated with the implementation of one,dimensional (1-D) linear shift-variant (LSV) digital filters. By mapping 1-D input and output sequences into two-dimensional (2-D) sequences, we may characterize the input-output relationship of a 1-D LSV digital filter as a 2-D convolution. In this way, a 1-D LSV digital filter may be approximately implemented as a 2-D recursive difference equation. The advantages and disadvantages of this implementation are discussed.
Author
Digital Filters; Phase Shift; Linear Systems; Sequencing

20060009243 Windsor Univ., Ontario, Canada
An Improved Method For The Design Of 2-D Fir Digital Filters With Circular And Rectangular Cut-Off Boundary Using Kaiser Window
Ahmadi, M.; Chottera, A.; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 84-88; In English; See also 20060009241; Copyright; Avail.: Other Sources
In this paper a minimax approach to the design of 2-D FIR digital filters is given. This method utilizes the well known Fourier series method in conjunction with Kaiser Window. A suitable nonlinear optimization method for calculating the parameter e of the Kaiser Window is used so as to minimize the maximum of error in the passband and stopband of the filter. This technique provides some improvement over the straight forward approach whereby alpha is calculated by the empirical formula of Kaiser. To illustrate the method several examples of 2-D lowpass FIR digital filters with circular and rectangular cut-off boundary are given.
Author
Fir Filters; Minimax Technique; Fourier Series; Boundaries

20060009244 Concordia Univ., Montreal, Quebec, Canada
On The Design Of 2-D Stable Analog Filters And Recursive Digital Filters
Ramachandran, V.; Ahmadi, M.; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 93-96; In English; See also 20060009241; Copyright; Avail.: Other Sources
In this paper we present a method for the design of 2-D analog filters and recursive digital filters. This method employs a stable structure in analog domain whereby for any calculated values of the filter's parameters in analog domain the

denominator of the filter is always very strictly Hurwitz Polynomial (VSHP), hence non-essential singularities of the second kind do not occur. This will ensure a stable 2-D recursive digital filter by the use of the bilinear transformations. Several examples are given to illustrate the method.
Author
Digital Filters; Electrical Impedance; Polynomials; Singularity (Mathematics); Computation; IIR Filters

20060009245 Bell-Northern Research Ltd., Ottawa, Ontario, Canada
An Efficient Computer-Aided Analysis Of Very Large Switched Capacitor Networks
Brglez, Franc; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 5-8; In English; See also 20060009241; Copyright; Avail.: Other Sources

The fundamental algorithm formulation that performs general and functionally exact nodal analysis, in time as well as frequency, produces a typically sparse system matrix of rank K*(N+M). K designates the number of topologically distinct switched states assumed by the network (K\g2), N relates to N+1 nodes in the network, and M is the sum of voltage sources and ideal switches. The value of M is usually dominated by the number of switches in the network; most often M/N\g1. In the proposed sparse matrix formulation approach, the rank of the system matrix is reduced to K*N, regardless of the value of M, and the network is solved in each of the K switched states only for the desired N node voltages. Furthermore, the formulation requires direct solution for node voltages in a single, 'reference' switched state only; in all other states, merely solutions for sequential voltage differences are necessary, relative to the voltages in the preceding state. This formulation emulates the structure of the canonical block-matrix LU decomposition of the closed-form voltage solution proposed by the author earlier.
Author
Capacitors; Network Analysis; Matrices (Mathematics); Computer Techniques; Switching; Algorithms; Decomposition

20060009247 Waterloo Univ., Ontario, Canada
Analysis of switched-capacitor networks
Vlach, J.; Singhal, K.; Vlach, M.; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 9-12; In English; See also 20060009241; Copyright; Avail.: Other Sources

The paper summarizes the theoretical steps in the analysis of switched capacitor networks with ideal elements and with arbitrary number of phases. Emphasis is placed on computational efficiency.
Author
Capacitors; Switching; Matrices (Mathematics); Efficiency

20060009248 Katholieke Univ. te Leuven, Belgium
A Pictorial Derivation Of The Signal Processing Mechanism Of Multiphase Switched Capacitor Networks
Vandewalle, J.; DeMan, H.; Rabaey, J.; Claesen, L.; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 25-28; In English; See also 20060009241; Copyright; Avail.: Other Sources

It is the purpose of this paper to give a straightforward analysis of the signal processing mechanism of switched capacitor (s.c.) circuits in the time and frequency domain. All effects of continuous coupling, finite op amp gain, multiple phases and baseband and aliasing effects are taken into account. Efforts have been made to represent all operations by diagrams and to make the derivations as simple as possible. So equations and pictures tell their part of the story.
Author
Signal Processing; Electric Networks; Capacitance Switches; Capacitors

20060009250 Iowa State Univ. of Science and Technology, Ames, IA, USA
Stability Analysis Of Interconnected Systems: A Constructive Approach
Michel, A. N.; Miller, R. K.; Hee, Nam Boo; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 114-117; In English; See also 20060009241
Contract(s)/Grant(s): NSF ECS-81-00690; Copyright; Avail.: Other Sources

In [i] and [2] it is also shown that if a set of matrices, with E(A) finite, is asymptotically stable, then the constructive algorithm given above will terminate 'stable' in a finite number of steps. Thus, a set A can be determined stable in a finite number of steps if A is asymptotically stable. We have no way of knowing, by means of the constructive algorithm alone, that A is asymptotically stable at the termination of the algorithm. However, we can show that A is asymptotically stable by

choosing a P \g 1 sufficiently small and then showing that pA is stable by using the constructive algorithm.
Derived from text
Algorithms; Stability Tests; Dynamical Systems

20060009252 South Carolina Univ., Columbia, SC, USA
Synthesis Of Temperature Variable Capacitors
Wierzba, Gregory M.; Knotts, Brian W.; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 194-197; In English; See also 20060009241
Contract(s)/Grant(s): NSF ECS-81-06460; Copyright; Avail.: Other Sources

Methods are presented for synthesizing a certain class of capacitances with real axis roots in absolute temperature. Also presented is a technique for converting nonlinear temperature variable voltage transfer functions into nonlinear capacitances versus temperature.
Author
Capacitance; Low Temperature; Electric Potential; Capacitors; Resistors; Circuits

20060009253 Kogakuin Univ., Tokyo, Japan
On A Decomposition Technique For The Synthesis Of Non-Series-Parallel Three-Terminal RC Networks
Shiizuka, Hisao; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 178-181; In English; See also 20060009241; Copyright; Avail.: Other Sources

A new structure of three-terminal RC network having no series-parallel and series-parallel-cascade equivalents is proposed. The network to be considered in this paper is, in principle, assumed to be composed of six two-terminal RC admittances and one three-terminal RC component network. A decomposition technique for the synthesis of proposed network is given. A numerical example, which cannot be equivalent to any series-parallel and also series-parallel-cascade networks, is given to illustrate the arguments of this paper.
Author
Network Synthesis; RC Circuits; Electrical Impedance; Decomposition; Transformers

20060009255 California Univ., Berkeley, CA, USA
Nonlinear Oscillation Via Volterra Series
Chua, L. O.; Tang, Y. S.; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 109; In English; See also 20060009241
Contract(s)/Grant(s): N00014-76-C-0572; NSF ECS-80-20640; NSF ENG-77-22745; Copyright; Avail.: Other Sources

Using a novel approach, the amplitude and frequency of nearly sinusoidal nonlinear oscillators can be calculated by solving two algebraic nonlinear equations. These determining equations can be generated to within any desired accuracy using a recursive algorithm based on Volterra series. Our method inherits many desirable features of the harmonic balance method, the describing function method, and the averaging method. Our technique is analogous to, but is much simpler than, the classic approach due to Krylov, Bogoliubov and Mitropolsky. Unlike conventional techniques, however, our approach imposes no severe restriction on either the degree of nonlinearity, or the amplitude of oscillation. Moreover, the accuracy of the solution can be determined by a constructive algorithm.
Author
Nonlinear Equations; Algorithms; Frequencies; Harmonic Analysis; Oscillations; Sine Waves

20060009256 Poznan Technical Univ., Poland
Synthesis Of The Pseudolossless 1-D And 2-D Digital Filters Which Simulate Reciprocal Or Nonreciprocal Reactance 2-Ports
Domanski, Marek; 1982 International Symposium on Circuits And Systems, Volume 1; [1982]; See also 20060009241; Copyright; Avail.: Other Sources

This paper gives a general analytical method of synthesis of pseudolossless I-D and 2-D digital filters. By means of this method a digital structure can be obtained from a corresponding 1-V or 2-V reactance matrix of an analogue 2-port. The method is based on the generalized Foster partial-fraction synthesis of a lossless n-port and on the bilinear transformation. An algorithm of elimination of delay-free loops is given.
Author
Digital Filters; Simulation; Digital Electronics; Network Synthesis; Algorithms

20060009257 Tennessee Technological Univ., Cookeville, TN, USA

Realization Of Resistively-Terminated Two-Variable Lossless Ladder Networks

Reddy, H. C.; Rajan, P. K.; Swamy, M. N. S.; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 166-169; In English; See also 20060009241; Copyright; Avail.: Other Sources

A major problem to be solved in the design of two-dimensional wave digital filters is the realization of resistively terminated two-variable analog reference network satisfying the prescribed specifications. This paper presents a simple procedure for the realization of a two-variable doubly (resistively)-terminated low pass ladder network with all transmission zeros at s(sub 1) = and s(sub 2) = infinity (in the complex {S(sub l), S(sub 2)} biplane). The transfer function of the realized network will not have non-essential singularities of first or second kind in the closed right half of {S(sub l), S(sub 2)} planes including infinite distant points, so the analog network realized can be converted into a 2-D wave digital filter with guaranteed stability. The realization is obtained using the two-variable approach.

Author

Digital Filters; Lossless Materials; Electric Networks; Transformations (Mathematics)

20060009258 Colorado Univ., Boulder, CO, USA

MOS Switch Level Simulation, Macromodeling, And Testing

Lightner, M. R.; Hachtel, G. D.; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 6367; In English; See also 20060009241

Contract(s)/Grant(s): N00014-79-C-0424; NSF ESC-80-07075; Copyright; Avail.: Other Sources

In this paper we present a unified view of switch level MOS circuits. This view includes the simulation, macromodeling, and testing of MOS switch level networks. New results are presented in each of these areas.

Author

Simulation; Mathematical Models; Metal Oxide Semiconductors; Circuits; Electric Switches

20060009259 Illinois Univ., Urbana, IL, USA

Hazard Detection In A Multiple Delay Logic Simulator

Rao, V. B.; Trick, t. N.; Lightner, M. R.; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 72-75; In English; See also 20060009241

Contract(s)/Grant(s): N00014-79-C-0424; Copyright; Avail.: Other Sources

In the logic simulation of MOS combinatorial functional blocks it is shown that although there are many possible paths for a given transition, the network can be declared free of static hazards if the principal path is free of static hazards. Furthermore, it is shown that the detection of dynamic hazards is equivalent to the detection of static hazards in these circuits.

Author

Combinatorial Analysis; Simulators; Logic Circuits; Detection; Metal Oxide Semiconductors

20060009260 Bulgarian Academy of Sciences, Sofia, Bulgaria

Design And Application Of Negative R, C, And L Two-Poles Based On Four-Frequency Parametric Systems

Damgov, Vladimir N.; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 190-193; In English; See also 20060009241; Copyright; Avail.: Other Sources

Conditions for design of wide-band low-noise negative C, L, and R using four-frequency parametric systems have been investigated both theoretically and experimentally. Some possible applications of the studied phenomenon are discussed.

Author

Frequencies; Independent Variables; Mathematical Models; Parametric Amplifiers

20060009262 Kyushu Univ., Fukuoka, Japan

On The Minimum-Gyrator Synthesis Of Lossless N-Ports: Application of Gyroscattering Matrices

Oono, Yosiro; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 174-177; In English; See also 20060009241; Copyright; Avail.: Other Sources

The problem of minimum-gyrator synthesis of passive n-ports was first solved for the lossless case and later for the lossy case on the basis of the lossless case. However, the solutions so far known for the lossless case require somewhat complicated discussion on synthesis procedures. The solution given in this paper is an application of gyroscattering matrices. Although

some preparations are needed, the present solution is simple at least in principle, because there holds some parallelism with the ordinary scattering matrix theory.
Author
Gyrators; Matrix Theory; Scattering; Resistors

20060009263 International Business Machines Corp., Yorktown Heights, USA
A Comparison of Logic Minimization Strategies Using ESPRESSO: An APL Program Package for Partitioned Logic Minimalization
Brayton, R. K.; Hachtel, G. D.; Hemachandra, L. a.; Sangiovanni-Vincentelli, A. L. M.; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 42-48; In English; See also 20060009241; Copyright; Avail.: Other Sources

We describe in this paper ESPRESSO, a program package for partitioned logic minimalization. New computational techniques and theoretical results are given for program features which have proven to be a clear win in testing to date. These features are in the areas of partitioned rninimalization, partioned complementation and tautology checking, and 'look-ahead' heuristics for cube and part selection in 'the cube expansion to primality' phase of the minimalization. We describe the application of ESPRESSO to the minimalization of a 34-input, 31 output logic structure that represents the control logic of a modern VLSI microprocessor. The logic was reduced from 3262 product terms to 889 in 86 cpu-minutes and 6MB on an IBM3033.
Author
Control Systems Design; Microprocessors; Sequential Control; Optimization

20060009264 Columbia Univ., New York, NY, USA
Analysis Of SCN's With Nonlinear And Time-Varying Elements Using Time-Invariant Charge Variables
Fang, s. C.; Tsividis, Y. P.; Wing, O.; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 1-4; In English; See also 20060009241
Contract(s)/Grant(s): NSF ESC-79-22109; Copyright; Avail.: Other Sources

A formulation is presented for analyzing SCN's containing nonlinear and continuously time-varying elements. The formulation uses as network variables charges that remain constant in each switching interval (despite the time-varying nature of the network). It is shown that these variables are few in number, that the state equation formulated with them is purely discrete-timed, and that the analysis method is suitable for computer simulation.
Author
Switching; Capacitors; Variations; Time; Nonlinearity

20060009265 Hull Univ., UK
General Computer Analysis Of Switched-Capacitor Networks Including Non-Ideal Amplifiers
Cutland, N. J.; Lau, C.; Sewell, J. I.; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 17-20; In English; See also 20060009241; Copyright; Avail.: Other Sources

A computer program for the analysis of multiphase switched-capacitor (SC) networks is presented. It is capable of providing the sampled transfer functions of the wide range of SC networks currently known. Time and store saving facilities are employed to contain these demands in large circuit analysis. In particular, if the amplifiers have finite constant gains, special properties of the network matrices can be exploited to the full. Sparse techniques are also used. Some details of the inclusion of multi-pole amplifier frequency dependence are also given.
Author
Computer Programs; Computer Techniques; Network Analysis; Capacitance Switches

20060009266 Calgary Univ., Alberta, Canada
Loop Equation Formulation For Switched Capacitor Networks Containing Nullors
Bruton, L. T.; Bailey, G. R.; Bhattacharjee, G.; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 29-32; In English; See also 20060009241; Copyright; Avail.: Other Sources

A method is given for determining the loop equations of an ideal active switched capacitance (SC) network containing switches, capacitors and nullors. These equations are obtained by matrix multiplication using the passive unswitched loop

elastance matrix. The results are extended for the P-phase case. It is shown that the loop charges can be solved for and that the branch voltages can be obtained from the loop charges.
Author
Capacitors; Electric Networks; Capacitance Switches; Topology; Loops

20060009267 Institut za Nuklearne Nauke Boris Kidric, Belgrade, Macedonia
On Real Multiport Network Functions Realization Problem
Stamenkovic, Borivoje B.; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 162-165; In English; See also 20060009241; Copyright; Avail.: Other Sources

A new theorem is formulated concerning the number of ideal grounded voltage-controlled voltage sources (VCVSs) sufficient and, in general, necessary to realize an arbitrary m x n real matrix as a network function of a grounded (n+m-q)-port active resistive network embedding grounded VCVSs as active devices, where n and m are, respectively, the numbers of the input and output voltage and/or current ports, and q denotes the number of ports which are simultaneously the input and output ports.
Author
Circuits; Electric Networks; Theorems

20060009270 Institut za Nuklearne Nauke Boris Kidric, Belgrade, Macedonia
The Hybrid Method Of Network Analysis And Topological Degree Of Freedom
Stamenkovic, Borivoje B.; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 158-161; In English; See also 20060009241; Copyright; Avail.: Other Sources

The concepts of dense, medium or sparse graphs are introduced. Criteria for testing absolute non-denseness or non-sparseness are derived. The notion of harmonious decomposition of a graph is developed. It is shown that the hybrid rank with respect to any harmonious decomposition of a graph equals its topological degree of freedom, _ich corresponds to the minimum number of independent variables taken in the hybrid analysis of electrical networks.
Author
Degrees of Freedom; Network Analysis; Decomposition

20060009271 Yokogawa Hewlett-Packard Co.,, Yokogawa, Japan
A Multipurpose Impedance Circuit Consisting Of A Voltage-Current Converter and C,R Elements
Hiwada, Kiyoyasu; Kudo, Michio; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 182-185; In English; See also 20060009241; Copyright; Avail.: Other Sources

In this paper, we proposed a new type of multipurpose impedance circuit which consists of a voltage-current converter and C,R elements. By arranging C,R elements adequately, various impedances of z(C,L,R) can be realized over wide frequency band. Finally, the above impedance characteristics can be confirmed satisfactorily by measurements as well as computer aided calculations.
Author
Impedance; Electric Potential; Frequencies; Broadband; Circuits

20060009272 Wien Univ., Austria
Equivalent Noise Sources Of Switched-Capacitor Network Elements
Weinrichter, Hans; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 38-41; In English; See also 20060009241; Copyright; Avail.: Other Sources

The continuous noise of RC-networks and op. amps with capacitive feedback is analyzed. Then, the noise in SC-filters is modelled by random sequences leading to equivalent noise voltage sources in the reference filter. As an example noise equivalent circuits of two multiphase SC-filters are derived.
Author
Continuous Noise; Capacitors; Switching; Equivalent Circuits; RC Circuits

20060009274 Minnesota Univ., Minneapolis, MN, USA
An Analysis Program For Switched-Capacitor Filters Including The Effects Of Op-Amp Bandwidth And Switch Resistance
Rudd, Eric P.; Scfhaumann, Rolf; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 13-16; In English; See also 20060009241
Contract(s)/Grant(s): NSF ECS-78-25577; Copyright; Avail.: Other Sources

efficient computer program to calculate the frequency domain responses of switched-capacitor circuits under the assumption of non-zero switch resistance and finite gain-bandwidth product (GB) of amplifiers is described. Computer predictions of circuit behavior are compared to experimental performance. Agreement is excellent even under extreme conditions.
Author
Capacitors; Switches; Switching; Circuits

20060009276 Warsaw Technical Univ., Poland
On The Realization Of Linear, Non-Linear And X-Controlled Transformation Circuits And Their Applications To Network Synthesis
Cichocki, Andrzej; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 198-201; In English; See also 20060009241; Copyright; Avail.: Other Sources

Unified approach or practical realization of any linear transformation convertor (LTC) is presented. It is shown that an arbitrary grounded resistive LTC can be realized by using only two ideal summers and an ungrounded resistive LTC by using only three ideal summers. The proposed structures of the LTC are generalized for synthesizing x-controlled and nonlinear transformation convertors. The new devices enables independent tuning of all parameters and in general are simpler and more economical, if compared with previously reported modules. Moreover, they allow to realize short circuit stable as well as open circuit stable elements.
Author
Linear Transformations; Network Synthesis; Short Circuits; Modules

20060009277 Technical Univ. of Warsaw, Warsaw, Poland
An Approach To Yield Optimization By A Sample Neighborhood Method
Maly, W.; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 202-205; In English; See also 20060009241
Contract(s)/Grant(s): NSF ECS-79-3291; Copyright; Avail.: Other Sources

In this paper we discuss a yield estimation algorithm which can be used as base for the yield optimization procedure which is intended for designing of monolithic ICs. The method proposed is a sort of a Monte Carlo approach in which for a part of samples a circuit performance is being guessed. The guesswork of the circuit performance is less expensive than,circuit simulation and therefore our method has a significant advantage over an ordinary Monte Carlo approach preserving simplicity of the Monte Carlo algorithm.
Author
Algorithms; Monte Carlo Method; Circuits; Simulation; Yield; Estimating

20060009278 Concordia Univ., Montreal, Quebec, Canada
On The Properties Of Linear Spectral Transformations For 2-Dimensional Digital Filters
Prasad, K. P.; Antoniou, a.; Bhattacharyya, B. B.; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 80-83; In English; See also 20060009241; Copyright; Avail.: Other Sources

A set of eight linear spectral transformations which can be used in the design of two-dimensional digital filters is studied from a group theoretic point of view. Several properties of the transformations, some of them known and some of them new, are deduced, and are then applied in the implementation of 2-D digital filters. It is shown that trade-offs exist which can be used to reduce either the amount of memory required for the programming or to reduce the amount of data manipulation.
Author
Linear Transformations; Spectra; Digital Filters; Data Reduction

20060009279 Tokyo Inst. of Tech., Tokyo, Japan
Realization Of Multi-Port Networks Using Operational Amplifiers And Its Applications
Nishihara, Akinori; Yanagisawa, Takeshi; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 170-173; In English; See also 20060009241; Copyright; Avail.: Other Sources

A systematic method for synthesizing multi-port networks specified by scattering matrices is proposed. First, a basic circuit for converting the port parameters is introduced. At each port the basic circuit converts the voltage and the current into the incident and the reflected wave quantities. Then each element of the scattering matrix is realized using the conventional techniques for the realization of one-input one-output transfer functions. When all the elements of the scattering matrix are

either positive constant or zero, the resultant network can be simplified. Application of the proposed method leads to the known circuits, as well as two new structures for hybrid networks. One of the salient feature of the proposed method is that it also provides the physical interpretation of the circuits derived. Experimental results are also given.
Author
Electric Networks; Circuits; Operational Amplifiers

20060009280 California Univ., Berkeley, CA, USA
Necessary and Sufficient Conditions For Robust Stability Of Linear Distributed Feedback System
Chen, M. J.; Desoer, C. A.; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 105-108; In English; See also 20060009241
Contract(s)/Grant(s): F49620-79-C-0178; Copyright; Avail.: Other Sources

In this paper, we study the robust stability of linear time-invariant distributed multivariable systems with more general feedback configurations than unity-feedback. Using efficient formulations of classical results in complex analysis, we obtain a necessary and sufficient condition for robust stability over a class of additive plant perturbations. The robust stability requirement clearly exhibits the limitations imposed on feedback system design by plant uncertainties: we prove that the greater the plant uncertainty the smaller the desensitization (to additive output disturbances). Note that all proofs are omitted but can be found in [Chen 1].
Author
Feedback; Linear Systems; Stability Tests; Robustness (Mathematics)

20060009281 Universidade Federal do Rio Grande do Norte, Natal, Brazil
Realizability Of Passive Ladder Networks And Stability Of Linear Systems Via Tridiagonal Matrices
Rego, J. I.; Hsu, L.; Kaszkurewicz, E.; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 186-189; In English; See also 20060009241; Copyright; Avail.: Other Sources

This paper utilizes a tridiagonal state-space description of impedance functions to establish new necessary and sufficient conditions for the realizability of passive ladder networks. A systematic procedure for the synthesis of impedance functions is proposed. Moreover, new necessary and sufficient stability conditions for linear systems are obtained based on tridiagonal matrices. The resulting stability criteria is computationally simple because of its recurrent form.
Author
Matrices (Mathematics); Linear Systems; Transfer Functions; Stability; Algorithms; Impedance

20060009282 Tatung Inst. of Tech., Taipei, Taiwan, Province of China
Two Dimensional Variable Cutoff Linear Phase Digital Filters
Pei, Soo-Chang; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 97-100; In English; See also 20060009241; Copyright; Avail.: Other Sources

This paper discusses an effective approach for the design of two dimensional variable cutoff linear phase FIR filters; By this approach, the cutoff frequency along the two frequency axes can be independently controlled, each by a single parameter in the cosine transformation.
Author
Digital Filters; Two Dimensional Models; Linear Filters

20060009283 Queensland Univ., Brisbane, Australia
A Partitioning Approach To The Statistical Design Of Large Circuits And Systems
Downs, T.; Cook, A. S.; Rogers, P. G.; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 138-141; In English; See also 20060009241; Copyright; Avail.: Other Sources

This paper describes an approach to statistical design which has been developed specifically for large circuits and systems. The approach is based upon the partitioning of a given system into subsystems and requires extensive use of integral transforms. The paper shows that the method is flexible, very efficient, and produces accurate results.
Author
Transfer Functions; Integral Transformations; Complex Systems; Circuits; Distribution Functions

20060009284 Imperial Coll. of Science and Technology, London, UK
Sensitivity-Based Statistical Tolerance Assignment In Electrical Networks
Ilumoka, A. A.; Spence, R.; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 118-121; In English; See also 20060009241; Copyright; Avail.: Other Sources

This paper describes a new Monte-Carlo based method for assigning tolerances to the components of a network. The nominal design is assumed fixed; parameter tolerances are then varied to minimise circuit cost, which in general is a function of both the manufacturing yield and the component tolerancing cost. The response sensitivity to each circuit parameter calculated at each sample point allows computationally efficient exploration of the parameter space using linear estimates of circuit response. Results from a circuit example are discussed and compared with those achieved by an existing method for tolerance assignment.
Author
Electric Networks; Monte Carlo Method; Sensitivity; Statistical Analysis; Algorithms

20060009285 Ceskoslovenska Akademie Ved, Prague, Czechoslovakia
The Scattering And Immittance Parameters And Two-Port Invariants In Linear Amplifier Computer Aided Design
Zima, Vaclav; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 122-125; In English; See also 20060009241; Copyright; Avail.: Other Sources

A new method for computer aided design of linear amplifiers using two-port invariants and scattering parameters is described. The stability is precisely defined and related to a two-port invariant psi(sub m). Its geometrical interpretation and relation to the Smith chart is explained. The computational programs used are very practical for an exact description of the optimal behaviour of any active device over a broad frequency range.
Author
Computer Aided Design; Electrical Impedance; Scattering

20060009286 Linkoeping Univ., Sweden
Analysis And Design Of Discrete Time Networks With Submultiple Delays, Switched Capacitor Filter Applications
Fjallbrant, Tore; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 21-24; In English; See also 20060009241; Copyright; Avail.: Other Sources

A method is presented for the analysis of discrete time networks with submultiple delays T/N, where T is the sample interval of the input signal and N an integer. It is shown how the N simultaneously implemented transfer functions of such networks with output signals at iT/N + kT, for i=0 to N-1, can be derived from the knowledge of the transfer function of the same network with full delays and irrespectively of the network configuration. A number of resulting transfer functions are tabelized, which can be used in the analysis of digital filters and SC-networks. By making use of these results, the terminated LDI-integrator is analyzed with respect to stability, and some SC-filter networks are suggested in order to obtain filters with special properties with respect to noise and required capacitance area.
Author
Time Lag; Digital Filters; Capacitance Switches; Electrical Engineering

20060009287 Illinois Univ., Urbana, IL, USA
An Efficient Lu Factorization Scheme For The Analysis Of Switched-Capacitor Filters
Davis, R. D.; Trick, T. N.; Jenkins, W. K.; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 33-37; In English; See also 20060009241
Contract(s)/Grant(s): NSF ESC-80-22951; Copyright; Avail.: Other Sources

In this paper the frequency-domain solution of switched-capacitor filters is studied. The modified nodal analysis method is used to formulate the network equations resulting in a matrix equation of the form A x = u. A novel and efficient scheme is presented for performing a 'pre-Lu factorization' of the matrix 4. As a result the dimension of the subblock of A which must be inverted at each frequency point is greatly reduced.
Author
Factorization; Frequency Domain Analysis; Network Analysis; Algorithms; Capacitance Switches

20060009290 California Inst. of Tech., USA
Switch-Level Modelling Of Mos Digital Circuits
Bryant, Randal E.; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 68-71; In English; See also 20060009241; Copyright; Avail.: Other Sources

The switch-level model describes the logical behavior of digital circuits implemented in metal oxide semiconductor (MOS) technology. In this model a network consists of a set of nodes connected by transistor 'switches' with each node having a state 0, 1, or X, and each transistor having a state open, closed, or unknown. The logic simulator MOSSIM II has been implemented with this model as its basis. MOSSIM II can simulate a wide variety of MOS circuits at speeds approaching those of event-driven logic gate simulators. The simulator can apply additional tests to detect potential timing errors, unrestored logic levels in CMOS, and unrefreshed dynamic charge. This paper provides an overview of the swltch-level model and how it is applied in MOSSIM II.
Author
Circuits; Digital Electronics; Metal Oxide Semiconductors; Switches; Mathematical Models

20060009291 Ludwig-Maximilians-Univ., Munich, Germany
Interactive Design Centering By An Efficient Assessment Criterion
Koblitz, R. K.; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 130-133; In English; See also 20060009241; Copyright; Avail.: Other Sources

The presented design-centering algorithm is based on YIELD and VARIANCE prediction formulas which calculate the circuit yield and its variance for arbitrary variations of the nominal values. With the aid of both formulas, a constrained optimization problem and its resulting graphic assessment criterion are derived so that the centering process can be controlled in a very clear and simple way. Great importance is attached to an appropriate number of random samples in the Monte Carlo analyses. Random samples of the past Monte Carlo analyses can be used for an additional updating process if the algorithm requires more centering steps. Therefore, this algorithm guarantees the minimum amount of random samples for a given statistical accuracy.
Author
Algorithms; Circuits; Criteria; Approximation

20060009482 Princeton Resources, Inc., NJ, USA, Colorado Univ., Colorado Springs, CO, USA
Integrated Ferroelectrics, an International Journal. Volume 72 (2005)
Paz De Araujo, C. A.; Taylor, G. W.; January 2005; 86 pp.; In English
Report No.(s): PB2006-101626; Copyright; Avail.: National Technical Information Service (NTIS)

Contents: The Surface Morphology of Ba (sub 065) TiO (Sub3) Sol Gel Method; Calcium and Strontium Doped ZNO Films for Love Wave Sensor Applications; Thermal Conductivity and Thermal Expansion of Ceramics PZT in the Region of Phase Transition; Switching Induced Electroluminescence in PZT Ceramics in High-Voltage Pulse Field; and A Dynamic Reference Scheme for Nonvolatile Ferroelectric Ram.
NTIS
Ferroelectricity; Electroluminescence; Doped Crystals; Sol-Gel Processes

20060009489 Princeton Resources, Inc., NJ, USA, Colorado Univ., Colorado Springs, CO, USA
Proceedings of the International Symposium on Integrated Ferroelectrics (17th) (ISIF-17). Part 2 of 9. Volume 74 (2005). Held in Shanghai, China on April 17-20, 2005
Taylor, G. W.; Tang, T. A.; Narayan, S.; Baik, S.; Dey, S. K.; January 2005; 224 pp.; In English; International Symposium on Integrated Ferroelectrics (17th) (ISIF-17). Part 2 of 9. Volume 74 (2005)., April 17 - 20, 2005, Shanghai, China
Report No.(s): PB2006-101627; Copyright; Avail.: National Technical Information Service (NTIS)

Contents: Guest Editorial; Organizing Committee and Sponsors; Section D: High K Materials and Devices: Well-Behaved Metal-Oxide-Semiconductor Capacitor Characteristics of Zirconium Oxide Films Fabricated by Surface Sol-Gel Process; Microstructures and Electrical Properties of PMNT Ceramics Doped with Lithium Fluoride; Effect of Lithium Salts Addition on Sintering Temperature and Electrical Properties of PMNT Ceramics; An Interface Kinetics Study of Oxidation Process of Silicon; Dielectric Properties of MnO(sub 2)-Doped 0.9PMN-0.1PT Ceramics Under A DC Bias Field; Dielectric Characteristics of Polymer-Ceramic-Metal Composites for the Application of Embedded Passive Devices; Microstructure Evolution and Dielectric Properties of (Ba(sub 1-x)Sr(sub x)(sub 4)Na(sub 2)Nb(sub 10)O(sub 30) Ceramics with Different Ba/Sr Ratios; Electrical Characterization of Nickel Oxide Thin Films Deposited by Reactive Sputtering for Memory Applications; Boron Diffusion Properties and Electrical Characteristics of P(sup +)POLY-Si(sub 0.73)Ge(sub 0.27)/AIN(sub x)/AI(sub 2)O(sub 3)/AIN(sub x)/n-Si(100) Using In-Situ ALD; Properties of Multilayer Ceramic Capacitor With BaTiO(sub 3) Thin Layers Deposited by E-Beam Evaporation; Stability of Metal Electrodes for MLCC with BaTiO(sub 3) Thin Layers by Deposition Method; Interfacial Microstructure of High-k Dielectric CaZrO(sub x) Films Deposited by Pulse Laser

Deposition in Low Oxygen Pressure; Electrical Characterization of Zirconium Oxide Layers Grown by Liquid Delivery MOCVD; Pressure Induced Dielectric Constant Suppression in CaCu(sub 3)Ti(sub 4)O(sub 12) Ceramics; Effect of Nitrogen Incorporation on Electrical Properties of High-k Nanomixed Hf(sub x)Al(sub y)O(sub z) Film Capacitors Grown on RU Metal Electrodes by Atomic Layer Deposition; The Microstructure Characteristics and Dielectric Behaviors of the Compositionally Graded Ba(Ti,Sn)O(sub 3) Thin Films; Preparation and Dielectric Properties of Ba(Zr(sub x)Ti(sub 1-x))O(sub 3) Thin Films Grown by a Sol-Gel Process; A Barium Zirconate Titanate-Based Inorganic Dielectric Material with High Permittivity as a Lead-Free Insulator for Semiconductor Applications; High-Temperature Amorphous Hafnia (HfO(sub 2)) for Microelectronics; Dielectric Characterization of Metal-Oxide-Semiconductor Capacitor Using Ga(sub 2)O(sub 3) Dielectrics on p-Si (100); Plasma-Enhanced Atomic Layer Deposition of Ultrathin Ga(sub 2)O(sub 3)-TiO(sub 2) Gate Dielectrics on Si (001) Substrates; Leakage Current Mechanisms of SrTiO(sub 3) Thin Films with MIS Structures; and Color Plates;
NTIS
China; Conferences; Ferroelectricity

20060009918 Department of Energy, Walnut Creek, CA, USA, California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
New Developments in High Performance Magnetic Separation Technology for Laboratory and Industrial Applications
Humphries, D.; Pollard, M.; January 2005; 46 pp.; In English
Report No.(s): DE2005-861256; No Copyright; Avail.: National Technical Information Service (NTIS)
No abstract available
Magnetic Fields; Separators; Technology Utilization

20060009957 Knolls Atomic Power Lab., Schenectady, NY, USA
Selection of the InGaAs/InP as the Single TPV Diode Material System for NR Research and Development
Dashiell, M.; Dec. 2004; 22 pp.; In English
Report No.(s): DE2005-850138; LM-04K157; No Copyright; Avail.: National Technical Information Service (NTIS)
Advanced Concepts has focused on developing two material systems (InGaAs/InP and InGaAsSb/GaSb) over the past several years. This work summarizes a scientific evaluation of both material systems to determine which material has the greatest potential for high-efficiency (27%) and power density (0.8W/cm(sup 2)) TPV energy conversion. Lockheed Martin, KAPL Inc. and Bechtel Bettis have issued a joint recommendation to focus all diode development efforts in the future on InGaAs/InP TPV diodes, based on it's potential to acquire the required performance.
NTIS
Energy Conversion; Indium Gallium Arsenides; Indium Phosphides

20060010049 Institute of Electrical and Electronics Engineers, New York, NY, USA
1982 International Symposium on Circuits and Systems, Volume 2
[1982]; 534 pp.; In English; 1982 International Symposium on Circuits and Systems, 10-12 May 1982, Rome, Italy; See also 20060010050 - 20060010176
Report No.(s): IEEE-Catalog-82CH1681-6-Vol-2; LC-80-646530; Copyright; Avail.: Other Sources
Topics discussed include: Switched-Capacitor Frequency-Sampling N-Path Filter Design Of Multiplexed Switched-Capacitor Filters; Equivalence Transformation Of Switched-Capacitor Networks And Of Micro-Strip Filters; A Monolithic Switched-Resistor Integrator Building Block; Large Time Constant SC Circuits And Uni-Value Capacitors; SC Circuits Using Multiphase Clock; A Switched-Capacitor Realization Of A Spectral Line Enhancer; Passive And Active Switched-Capacitor Networks; On The Switched Capacitor Equalizers; 2-Micron CMOS Switched Capacitor Circuits For Analog Video LSI; Realization Of Norton Amplifier Switched-Capacitor Networks; A Menu-Driven Graphical User Environment For Cad; Chip Assembly Tools; Tools For The Design Of Large VLSI Circuits; A Class Of Efficient Interpolators And Decimators With Applications In Transmultiplexing; Efficient Sampling Rate Increase And Decrease In Wave Digital Filters With Applications In Communication Systems; A Per-Channel Transmultiplexer Applying IIR Filters And Logarithmic Processing; VLSI Realization Of Wave Digital Filters For Communication Systems; A CVSD/PCM Converter Implemented With New Dsp LSI Chips; A Study Of The Asymptotic Behavior Of Neural Networks; Lagrangian Functionals For Nonlinear Resistive Networks Part I: Mathematical Background; Section-Wise Uniform Functions: A New Tool For Modeling Nonlinear N-Port Networks; A New Symbolic Calculus For The Response Of Nonlinear Systems; Analysis Of Piecewise Linear Resistive Networks With Time Varying Inputs; A Quantitative Research Of Nonlinear Behaviour Of A Phase-Locked Loop; Nonlinear Resistive Network Synthesis Using Minimum Number Of Grounded Voltage- Or Current-Controlled Conductors; Power System

Transient Stability Analysis: A Hamiltonian Approach; Exact Power Network Sensitivities Via Generalized Complex Branch Modelling; etc.
Derived from text
Computer Aided Design; Digital Filters; Electric Potential; Integrated Circuits; Very Large Scale Integration; Phase Locked Systems; Nonlinear Systems; Multiplexing

20060010050 California Univ., Los Angeles, CA, USA
A Switched-Capacitor Realization Of A Spectral Line Enhancer
Martin, Ken; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 229-232; In English; See also 20060010049
Contract(s)/Grant(s): NSF ECS-81-01566; Copyright; Avail.: Other Sources

An adaptive system is described that tracks the peak of the spectral density function of the input signal. The system has been designed so that it can be easily realized in a single MOS integrated circuit using switched-capacitor techniques. Measured performance of a discrete prototype indicates that circuit could be useful for tracking sine waves corrupted by noise or for inexpensive real time analysis of speech signals.
Author
Capacitors; Line Spectra; Adaptive Control; Capacitance Switches

20060010051 Concordia Univ., Montreal, Quebec, Canada
A Study Of The Asymptotic Behavior Of Neural Networks
Dimopoulos, Nikitas; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 280-283; In English; See also 20060010049
Contract(s)/Grant(s): NSERC-A1337; Copyright; Avail.: Other Sources

The stability properties of Neural Networks described by the set of differential equations T(x+x)=w x f(x)+ K are studied.This study establishes network topologies hat exhibit asymptotic behavior with prime examples being networks topologically similar to the cerebellum.The method used in establishing these results obtain bounds on the solutions that behave asymptotically with time.
Author
Asymptotic Properties; Neural Nets; Differential Equations; Stability

20060010052 McMaster Univ., Hamilton, Ontario, Canada
Practical Complex Solution Of Power Flow Equations
Bandler, J. W.; El-Kady, M. A.; Gupta, H.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 317-320; In English; See also 20060010049
Contract(s)/Grant(s): NSERC-G0647; Copyright; Avail.: Other Sources

This paper applies and illustrates the compact, complex notation introduced by Bandler and EI-Kady to the practical solution of the power flow equations. The solution of the complex linearized power flow equations, which is required by the Newton-Raphson method, is obtained by a direct method. The method, fully and exactly, incorporates generator buses as well as dummy load buses.
Author
Newton-Raphson Method; Flow Equations; Impedance

20060010053 Menoufia Univ., Menoufia, Egypt
Analysis And Design Of A New Synchronized Delay Circuit Using Thyristors
Halim, Tadros M.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 333-336; In English; See also 20060010049; Copyright; Avail.: Other Sources

This paper presents the analysis and design of a new synchronized time delay circuit using thyristors. The analysis is based on a simplified circuit and design equations are derived from a balance among circuit constants. A design example is presented. The experimental results are in close agreement with the theoretical analysis given.
Author
Delay Circuits; Design Analysis; Thyristors

20060010054 California Univ., Los Angeles, CA, USA
Stable And Generic Synthesis Of Systems Satisfying V(X) = 0
Green, D. N.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 385-388; In English; See also 20060010049; Copyright; Avail.: Other Sources

A number of papers in the last decade dealt with synthesizing a set of n coupled differential equations x = f(x) which have particular globally stable desired solutions, usually periodic. This paper looks at the generic and stable synthesis of such systems which have the common property that the desired particular solutions satisfy m less than n constraint equations V(x) = 0. The stability and genericity properties are inherent and easily derived from well known properties of the function V. First, Lyapunov techniques are used to guarantee that solutions satisfy the constraints. Next, well known properties of manifolds are used to show that satisfying the constraint equation is a natural way to guarantee that solutions have particular properties such as periodicity. Further, these properties are generic in that almost all such possible V have them.
Author
Differential Equations; Autonomy; Stability; Network Synthesis

20060010055 Technical Univ. of Warsaw, Warsaw, Poland
On Large Networks With Random Admittances
Gierasimowicz, Henryk; Jankowski, Stanislaw; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 431-434; In English; See also 20060010049; Copyright; Avail.: Other Sources

The paper presents the results of experimental and numerical simulation of large networks with random admittances. Three types of regular networks were con- sidered: square, triangular and simple cubic. The edge admittances in the form of parallel RC circuits were assumed as binary random variables. The equivalent admittances of considered networks were presented as equivalent resistances and equivalent capacities. The results were related to some topics of the percolation theory. The random RC networks described in the paper can be considered as a new class of useful models of electrical properties of inhomogeneous granular materials in AC regime. .
Author
Random Variables; RC Circuits; Electrical Impedance; Electrical Properties; Granular Materials

20060010056 Kanazawa Inst. of Tech., Ishikawa, Japan
High Q Switched-Capacitor All-Pass Networks With Low Sensitivities
Kato, Kyoko; Takebe, Tsuyoshi; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 447-450; In English; See also 20060010049; Copyright; Avail.: Other Sources

This paper presents anew method to get high Q factor second order switched-capacitor all-pass sections with low amplitude sensitivities. The method is based on spectral transformations, replacing the unit delay element in a conventional first order section by a second order all-pass network. The coefficient sensitivities are examined and the improvem6nts in the configuration are proposed to diminish the amplitude sensitivities.
Author
Q Factors; Capacitors; Switching

20060010057 Swiss Federal Institute of Technology, Zurich, Switzerland
Noise Analysis Of A Switched-Capacitor Biquad
Furrer, Beat; Guggenbuhl, Walter; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 460-463; In English; See also 20060010049; Copyright; Avail.: Other Sources

In this paper the analysis of the output noise spectrum of a switched-capacitor (s.c.) second order filter using a z-domain method is presented. Calculated and measured noise of a prototype lowpass filter is found in good agreement. As an interesting fact the analysis shows that the specific biquad circuit discussed in this paper is able to significantly suppress the 1/f noise of one of the op amps. This is a very desirable property for s.c. MOS circuits.
Author
Noise Spectra; Mathematical Models; Capacitance Switches

20060010058 Waterloo Univ., Ontario, Canada
Root Sensitivity Optimization Of Digital Filters
Jain, Narendra K.; Singhai, Kishore; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 511-514; In English; See also 20060010049; Copyright; Avail.: Other Sources

An efficient computational method is described to find roots and their sensitivities with respect to multiplier coefficients of a digital filter. No explicit form of the network function is assumed. A technique is then described to minimize the sensitivities of roots.
Author
Digital Filters; Optimization; Sensitivity

20060010059 GTE Lenkurt, Inc., San Carlos, CA, USA
Switched-Capacitor MODEM For Amplitude Modulation
Chang, Chieh; Lee, Man Shek; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 557-560; In English; See also 20060010049; Copyright; Avail.: Other Sources

Switched-capacitor circuits that perform modulation and demodulation functions are examined. The experimental results are compared with the analytical values.
Author
Amplitude Modulation; Modems; Capacitance Switches; Integrated Circuits

20060010060 Illinois Univ., Chicago, IL, USA
A Method For Realizing The Synchronic Distance Matrix As A Marked Graph
Murata, Tadao; Le, Van Ban; Leu, Di Jen; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 609-612; In English; See also 20060010049
Contract(s)/Grant(s): NSF ECS-81-05649; Copyright; Avail.: Other Sources

The synchronic distance between two nodes in a marked graph is defined in this paper as the maximum number of times that one node can fire without firing the other. This paper introduces the notion of synchronic distance matrix and suggests a method for finding a marked graph from a given synchronic distance matrix.
Author
Algorithms; Graph Theory; Matrix Methods; Integers

20060010061 Technical Univ. of Istanbul, Turkey
On Determination of Dependent and Independent Sensitivity Functions In Signal-Flow Graphs
Acar, Cevdet; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 625-628; In English; See also 20060010049; Copyright; Avail.: Other Sources

For the signal-flow graphs which have general topology, first the relations between the sensitivities of a graph transfer function due to the branch transmittances are studied and then independent sensitivity equations, dependent and independent sensitivities are determined by the use of the sensitivity graph redefined in this work. The results obtained simplify the sensitivity analysis.
Author
Signal Flow Graphs; Sensitivity Analysis; Transfer Functions

20060010062 Belgrade Univ., Belgrade, Yugoslavia
Transfer Function of a Saw Device with Apodized Transducers
Hribsek, Marija f.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 636-638; In English; See also 20060010049; Copyright; Avail.: Other Sources

The transfer function derivation of a SAW device with apodized transducers is presented. The results are valid for all types of substrates and also take care of the triple transit echo effect. The application of the procedure presented to the case of unapodized transducers is discussed.
Author
Apodization; Electric Fields; Transfer Functions

20060010063 Colorado State Univ., Fort Collins, CO, USA
Periodically Time-Varying Bandwidth Compressor
Loeffler, Charles M.; Burrus, C. Sidney; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 663-665; In English; See also 20060010049
Contract(s)/Grant(s): NSF ECS-81-00453; Copyright; Avail.: Other Sources

This paper applies the bi-frequency map to the analysis and design of a digital bandwidth compressor. The problem is

formulated as a periodically time-varying filter and examined in the two-dimensional frequency domain.
Author
Bandwidth; Compressors; Variations; Frequency Domain Analysis; Time Signals

20060010064 California Univ., Berkeley, CA, USA
A Symbolic Layout Design System
Ellis, S. A.; Keller, K. H.; Newton, A. R.; Pederson, D. O.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 670-676; In English; See also 20060010049
Contract(s)/Grant(s): N00039-78-G-0013-0004; Copyright; Avail.: Other Sources

As integrated circuit design has become increasingly complex, the need for more effective data description techniques has become critical. Design verification from mask artwork data alone can consume vast amounts of computer time for VLSI circuits, if it can be performed at all. The use of a symbolic design description, which allows the designer or synthesis program to express circuit structure as well as maintain full connectivity information, can reduce dramatically the burden placed on the verification tools. This paper presents a prototype symbolic design system and its associated data base, SQUID, and focuses on features of the symbolic data model which are unique to this system.
Author
Integrated Circuits; Layouts; Data Bases; Proving; Very Large Scale Integration

20060010065 Bendix Corp., Fort Lauderdale, FL, USA
A CMOS Si-Gate 8-Bit, 8 Microsec A/D Converter
Kanopoulos, N.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 573-576; In English; See also 20060010049; Copyright; Avail.: Other Sources

This paper describes an 8-bit A/D converter with a conversion time of 8 microsec. and differential nonlinearities of 1/2 LSB. The design of the A/D converter is based on the successive approximation technique. The D/A converter used is a R/2R ladder network with voltage switches. The comparator function is realized by a redundant auto-zeroed sample-and-hold differential comparator circuit. Due to the redundancy used, the reliability of the overall circuit has been improved. The Successive Approximation Register (SAR) has been divided into two functions: combinational logic and a clocked latch. This technique improved the speed/space ratio of the SAR. The overall circuit operates over the -55 C to 125 C temperature range. This A/D converter is part of a larger VLSI system.
Author
Analog to Digital Converters; Comparator Circuits; Electric Potential; Approximation; Redundancy; CMOS

20060010066 Warsaw Technical Univ., Poland
Synthesis Of Passive Switching Networks
Kropacz, Witold S.; Mikolajuk, Kazimierz; Ogonowski, Jerzy; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 329-332; In English; See also 20060010049; Copyright; Avail.: Other Sources

This paper gives the new approach to designing power electronic networks. A method for determining passive time-varying network is derived when time functions of excitation and response are given. Sequence of linear time-invariant circuits is realized using switches. Switched coils of multiport transformer are defined. Such transformer allows to realize sequence of dynamic networks. The method secures continuity of state variables.
Author
Switching; Linear Circuits; Time Functions; Switches; Transformers

20060010067 Linkoeping Univ., Sweden
Design Of Parasitics-Insensitive Bilinear Switched-Capacitor Filters - A Flowgraph Conversion Method
Eriksson, Sven; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 443-446; In English; See also 20060010049; Copyright; Avail.: Other Sources

A method for the design of bilinear-transformed SC filters is presented. The method makes use of signal flowgraphs, derived from analog, doubly terminated LC filters. By suitable modifications of the bilinear-transformed flowgraphs, structures usable for the realization of SC filters are obtained. The filters, which can be scaled optimally, can be made insensitive to

parasitic capacitances. A lowpass and a bandpass filter were experimentally built, using discrete components, and are also discu
Author
Bandpass Filters; Capacitors; Capacitance; Switching

20060010068 Karlsruhe Univ., Germany
Evaluation of the Determinant of True-Feedback Signal Flow Graphs
Fliege, Norbert; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 629-632; In English; See also 20060010049; Copyright; Avail.: Other Sources

A new method for the evaluation of the determinant of feedback signal flow graphs with only one forward path is proposed. By means of topological considerations a simple but useful rule is derived suitable for hand or computer calculation of the determinant of the graph.
Author
Signal Flow Graphs; Digital Filters; Feedback; Circuits

20060010069 Czech Technical Univ., Prague, Czechoslovakia
Analysis of Combined Circuit-Block Diagrams
Mann, Herman J.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 636-642; In English; See also 20060010049; Copyright; Avail.: Other Sources

The paper proposes a systematical approach to the analysis of block and combined circuit-block diagrams which can be easily implemented in current circuit analysis programs based on the modified method of nodal voltages. The approach simplifies the circuit diagram analysis too. It is easily extendable to the nonlinear cases.
Author
Circuit Diagrams; Block Diagrams; Electric Networks; Network Analysis

20060010070 Illinois Univ., Urbana-Champaign, IL, USA
A New Approach To The Design Of An Error Checker For Failure Resistant Residue Number Digital Filters
Jenkins, W. K.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 369-372; In English; See also 20060010049
Contract(s)/Grant(s): NSF ESC-81-13219; Copyright; Avail.: Other Sources

factor that has limited the use of redundant residue number system theory in practical digital filters is the hardware complexity of the error checker required to detect errors and locate failures within the hardware structure. This paper presents a mathematical analysis of the error correction algorithm, which results in a design for the error checker with considerably reduced hardware complexity. A hardware architecture for the error checker is proposed which has potential for VLSI implementation.
Author
Digital Filters; Error Analysis; Residues; Number Theory; Errors

20060010071 Electricite de France, Clamart, France
A New EDF Model To Plan Medium-Voltage Distribution Networks Based On A Search For Radial Operating Configurations
Merlin, A.; Hautot, A.; Hertz, A.; Lemaitre, J. L.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 545-548; In English; See also 20060010049; Copyright; Avail.: Other Sources

Several models were built at EDF to help distribution network planning. Some of them are used to test if intended networks can actually be operated. The model to be described thereafter is named CORALI. It can take into account voltage constraints as well as load-flow constraints and other operative constraints during the search for radial (or tree-like) operating configurations. Minimization of thermal losses is also pursued during the search for standard operating configurations.
Author
Electric Potential; Optimization; Dynamic Programming; Loads (Forces); Transformers

20060010072 Liege Univ., Belgium

State Estimation In Electric Power Systems

VanCutsem, Th.; Ribbens-Pavella, M.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 553-556; In English; See also 20060010049; Copyright; Avail.: Other Sources

This paper summarizes our experience in the field of static estimation in electric power systems. An algorithm is proposed for state estimation as such, resulting from the combination of a two-level concept with an entirely decoupled single-level algorithm. Other related functions are also discussed.

Author

State Estimation; Electric Power Supplies; Data Bases

20060010073 California Univ., Berkeley, CA, USA

Probabilistic Dynamic Security Assessment Of Power Systems, Part 1, Basic Model

Wu, Felix F.; Tsai, Yu-Kun; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 541-544; In English; See also 20060010049

Contract(s)/Grant(s): DE-AC01-79-ET29364; Copyright; Avail.: Other Sources

A comprehensive framework for power system security assessment which incorporates probabilistic aspects of disturbances and system dynamic responses to disturbances is presented. Standard mathematical models for power system (steady-state) power flow analysis and transient stability (dynamic) analysis are used. The probability distribution of the time to in security is shown to be obtainable from the solution of a linear vector differential equation. The coefficients of the differential equation contain the transition rates of system structural changes and a set of transition probabilities defined in terms of the steady-state and the dynamic security regions. These regions are defined in the space of power injections,

Author

Dynamic Response; Probability Theory; Security; Transition Probabilities; Warning Systems; Systems Analysis

20060010074 Ruhr Univ., Bochum, Germany

VLSI Realization Of Wave Digital Filters For Communication Systems

Gazsi, Lajos; Fettweis, Alfred; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 272-275; In English; See also 20060010049; Copyright; Avail.: Other Sources

Wave digital filters (WDF8) are particularly suitable for application in communication systems. This is largely due to their excellent stability behavior, which in certain respects becomes even more important in the case VLSI realization. This paper briefly surveys the VLSI realization of wave digital filters using both custom and general purpose approaches and presents some novel aspects. The design principles will be illustrated by discussing the realization of PCM filters and by pointing out applications to filters needed for building a 60 channel transmultiplexer.

Author

Very Large Scale Integration; Digital Filters; Telecommunication; Design Analysis; Multiplexing

20060010075 Princeton Univ., NJ, USA

Quantization Effects in Computationally Efficient Realization of Recursive Filters

Liu, Bede; Ansari, Rashid; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 716-720; In English; See also 20060010049

Contract(s)/Grant(s): NSF ECS-79-19615; Copyright; Avail.: Other Sources

This paper investigates the quantization effects in a recently proposed realization of recursive filters that is computationally efficient. The realization consists of a parallel connection of two al!pass filters, each realized as a cascade of first and second order sections. It is shown that this realization results in small error due to quantization.

Author

IIR Filters; Efficiency; Errors; Measurement

20060010076 Tampere Univ. of Technology, Finland

Design Of Low Noise Digital Filters With Reduced Number Of Multipliers And Short Coefficient Wordlength

Renfors, Markku; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 519-522; In English; See also 20060010049; Copyright; Avail.: Other Sources

A new method for designing efficient low-noise fixed-point digital filters is introduced. The approach is based on eliminating low-magnitude coefficients from a standard state-space network. The state-space form of a normalized ladder

realization is found to be a good starting point. An efficient coefficient quantization procedure is also described.
Author
Digital Filters; Measurement; Low Noise; Multipliers

20060010077 Colorado State Univ., Fort Collins, CO, USA
Design Of Periodically Time-Varying Digital Filters
Loeffler, Charles M.; Burrus, C. S.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 495-498; In English; See also 20060010049
Contract(s)/Grant(s): NSF ECS-81-00453; Copyright; Avail.: Other Sources

The bi-frequency system function(hi-frequency map) of a periodically time-varying digital system is shown to be composed of P distinct non-zero lines.The form of the bi-frequency system function illustrates the inherent structure of a periodically time-varying system. Using this structure, the design problem is formulated as a linear approximation problem. An optimal solution is found. This procedure can be used to approximate any desired bi-frequency map
Author
Digital Filters; Design Analysis; Digital Systems; Approximation; Frequencies

20060010078 Bell Telephone Labs., Inc., Holmdel, NJ, USA
Parasitic Insensitive Bi-Phase Switched Capacitor Filters Realized With One Op Amp Per Pole Pair
Laker, K. R.; Fleischer, P. E.; Ganesan, A.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 435-439; In English; See also 20060010049; Copyright; Avail.: Other Sources

Practical techniques are given for reducing the number of op amps in switched capacitor filters. Op amp count is typically reduced to one op amp per pole pair while maintaining the insensitivity to top and bottom plate parasitics heretofore associated with one op amp per pole structures. These techniques are used to develop a parasitic insensitive single amplifier resonator and a general single amplifier biquad. The same methods may also be applied to leap frog structures, where similar op amp savings result.
Author
Capacitors; Resonators; Switching; Digital Filters; Amplifiers

20060010079 Florence Univ., Italy
Analogue Saw Transversal Filter For Baseband Processing
Gerli, D.; Tortoli, P.; Manes, G. F\g; Atzeni, C.; Raffini, C.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 358-361; In English; See also 20060010049; Copyright; Avail.: Other Sources

A programmable transversal filter has been implemented, based on a surface-acoustic-wave (SAW) tapped delay line (TDL) operating in the baseband region according to an original technique. The use of Digital to Analog multipliers (M-DAC) at the SAW output taps allows digital programmability of the filter response to be achieved, thus resulting in a versatile structure capable of implementing a variety of processing functions under microprocessor control.
Author
Analogs; Digital Filters; Sound Waves; Surface Waves; Multipliers; Numerical Control

20060010081 Osaka Univ., Suita, Japan
Power System Transient Stability Analysis: A Hamiltonian Approach
Kumagai, Sadatoshi; Wu, Felix F.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 309-312; In English; See also 20060010049
Contract(s)/Grant(s): DE-AC01-79-ET29364; NSF ENG-75-21747; Copyright; Avail.: Other Sources

A nonlinear dynamic circuit model is proposed to represent the differential-algebraic equations arising from the analysis of power system transient stability. By using the circuit-theoretic model, we derive the conditions for the existence of Hamiltonian formulation of power systems.
Author
Dynamic Models; Circuits; Differential Equations; Systems Engineering

20060010082 Beijing Research Inst. of Semiconductor Devices, Beijing, China

Unifying the Admittance Matrix Analysis of Networks Containing Operational Amplifiers

Yi, Ming-Guang; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 655-658; In English; See also 20060010049; Copyright; Avail.: Other Sources

A unified rule of constructing the constrained admittance matrix of networks containing operational amplifiers is derived and generalized to the case of the contained operational amplifiers having an arbitrary gain and finite common-mode rejection ratio.

Author

Electrical Impedance; Matrices (Mathematics); Operational Amplifiers; Electric Networks

20060010083 Minnesota Univ., Minneapolis, MN, USA

On Exciting A Lossless (Or Low Loss) Second Order System Into Motion Without Any Accompanying Ringing

Chen, Hong-bin; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 400-403; In English; See also 20060010049; Copyright; Avail.: Other Sources

When driving a lossless (or low-loss) second order system into motion, we are always disturbed by the accompanying ringing. The solution of the problem is the cascading of a correcting system shown in Figs. 1 and 7. It is proved in the paper that these are optimal systems: The impulse response of the resultant system is a non-negative pulse of finite duration of exactly one third of the natural period of the second order system, which is the minimum attainable length of the impulse response of the corrected system.

Author

Lossless Materials; Signal Transmission; Electrical Engineering

20060010084 Universidad del Pais Vasco, Spain

Aperiodic Sampling In Nonparametric Matching Of Linear Time-Invariant Systems

delaSen, Manuel; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 393-396; In English; See also 20060010049; Copyright; Avail.: Other Sources

This paper considers the problem af matching a system under control ta a model using output feedback when both the given System and the model are described by nonparametric models such as the impulse response matrix. The problem is reduced to solve a linear system of equations by choosing an appropriate set of samples of the outputs.

Author

Aperiodic Functions; Linear Systems; Sampling; Numerical Analysis; Matching

20060010085 Technical Univ. of Brno, Czechoslovakia

Current And Voltage Conveyors: A Family Of Three-Port Immittance Converters

Dostal, Tomas; Pospisil, Jiri; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 419-422; In English; See also 20060010049; Copyright; Avail.: Other Sources

The class of well-known current conveyors is extended by a novel type and these new voltage conveyors are presented in this paper. It is proved that all discussed conveyors are special cases of two basic types of three-port immittance converters.

Author

Electric Potential; Electrical Impedance; Electric Current; Mathematical Models; Current Converters (AC to DC)

20060010086 Technion - Israel Inst. of Tech., Haifa, Israel

First-Order Predistortion Of Simple LC Ladder Filters With Arbitrary Dissipations

Navot, I.; Netanyahu, N.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 341-344; In English; See also 20060010049; Copyright; Avail.: Other Sources

The paper presents a new simple first-order predistortion method for singly terminated simple LC ladder filters. In this method the unknown incremental element values are related to the known arbitrary small dissipations by a triangular matrix with entries directly available from the synthesis of the ideal ladder. In certain special cases this leads to simple explicit formulas for the predistorted element values.

Author

Dissipation; Low Pass Filters

20060010087 Technische Univ., Munich, Germany
A New Approximation Method For FIR Filters
Entemann, Walter; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 515-518; In English; See also 20060010049; Copyright; Avail.: Other Sources

The paper presents a new approximation method for the design of FIR filters with maximally flat attenuation response in the passband and chebyshev behavior in the stopband. As will be shown, this class of filters is advantageous e.g. in the design of antialiasing filters for sampled-data systems. In contrast to existing solutions yielding filters with chebyshev or maximally flat response in both the passband and the stopband, the frequency response of the filters designed by the new method have the following properties: (a) Due to the monotone response in the passband the resulting attenuation distortion can easily be compensated by subsequent filter (b) due to the chebyshev response in the stopband the sensitivity behavior with respect to manufacturing tolerances is optimal, as will be shown. This is of great importance for the implementation of these filters in VLSI technology. After the presentation of the new algorithm the results are summerized in diagrams relating the various design parameters. As an example the design of an antialiasing filter for a PCM lowpass filter is considered.
Author
Approximation; Fir Filters; Electrical Engineering

20060010088 Santa Clara Univ., CA, USA
Synthesis of Distributed Networks Using z-Transforms
Owens, Robert C.; Chan, Shu-Park; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 617-621; In English; See also 20060010049; Copyright; Avail.: Other Sources

Networks of lossless commensurate transmission lines can be synthesized in the frequency domain using the Richards transformation, lambda= tanh(sT). An equivalent treatment is presented here based on the impulse response and using z-transform methods similar to those used in digital filter design. Applications and extensions of this time-domain method are discussed.
Author
Digital Filters; Transformations (Mathematics); Electric Networks; Network Synthesis

20060010089 General Electric Co., Syracuse, NY, USA
Clustering Techniques For VLSI
Akers, Sheldon B.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 472-477; In English; See also 20060010049; Copyright; Avail.: Other Sources

Successful VLSI layout relies on the initial clustering/partitioning process which converts a large digital system into blocks of manageable size. Many traditional partitioning techniques which successively subdivide the network become unworkable for VLSI because of the sheer complexity of the problem. This paper describes a clustering process which systematically builds up the required clusters, thus avoiding many of these global complications.
Author
Very Large Scale Integration; Partitions (Mathematics)

20060010090 Illinois Univ., Urbana, IL, USA
Singular Perturbations And Time Scales In Nonlinear Models Of Power Systems
Peponides, G.; Kokotovic, P. V.; Chow, J. H.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 535-540; In English; See also 20060010049
Contract(s)/Grant(s): N00014-79-C-0424; DE-AC05-77ET29104; DE-AC01-79ET-29040; NSF ECS-79-19396; Copyright; Avail.: Other Sources

Recent results on linear slow coherency and aggregation are extended to nonlinear electromechanical models of power systems and similar dynamic networks. Conservation and equilibrium properties are used for the derivation of nonlinear singular perturbation models with explicit separation of time scales.
Author
Electromechanics; Nonlinearity; Perturbation; Mathematical Models; Singularity (Mathematics); Power Transmission

20060010091 Pavia Univ., Italy
An Algorithmic Serial Companding DAC For Codec Applications
Maloberti, Franco; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 565-568; In English; See also 20060010049; Copyright; Avail.: Other Sources

An algorithmic serial companding DAC is propo sed. A switched capacitor (SC) circuit constructs the required voltage in successive steps of approximation passing through the same values of decision level required in the companding D/A operation. The circuit employs the same building blocks used to implement the filtering function; it is suitable for implementing both the segmented p-law and the segm ented A-law. It requires less then forty unit capa citors matched within only 8-bit accuracy. This feature allows its practical realization within a very small chip area.
Author
Algorithms; Coders; Digital Electronics; Approximation; Companding

20060010092 Eindhoven University of Technology, Eindhoven, Netherlands
A Dynamic Data Structure Allowing For 'On The Flight' Skipping Of Pivots
Troubors, P. M.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 593-596; In English; See also 20060010049; Copyright; Avail.: Other Sources

In a previous paper a method, called 'pivotstep skipping' is introduced by which the simulation time of an electrical circuit can be reduced. In that paper we discussed the implementation of the method for the compiled code approach. In this paper we discuss a 'linked list' data structure appropriate for pivotstep skipping. Such a datastructure requires less storage compared with the compiled code approach. Pivotstep skipping is implemented by adjusting the data structure during the actual simulation of the circuit. The adjustments imply the temporary removal of certain pivots together with the coefficients in the pivotrows and columns. We present a datastructure for which these adjustments can be done very efficiently. We show that the time spent to adjust the datastructure is little compared to the reduction of the total simulation time. The quantitative performance of the method is illustrated by means of some examples.
Author
Data Structures; Pivots; Computerized Simulation; Algorithms

20060010093 Technical Univ. of Warsaw, Warsaw, Poland
Analysis of Ungrounded N-Port Networks by Using the Short-Circuit Admittance Matrix Approach
Osowski, Stanislaw; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 647-650; In English; See also 20060010049; Copyright; Avail.: Other Sources

The short-circuit admittance matrix approach is extended to the networks with ungrounded ports. It is shown that simple calculations allow to transform the description of the multiport networks with grounded ports to the reduced dimension multiport network with ungrounded ports. The general rule transforming the grounded network into ungrounded one is simplified in special cases of voltage transfer function calculation. The examples of applications of the presented approach are also included.
Author
Electrical Impedance; Matrices (Circuits); Short Circuits

20060010094 Roorkee Univ., Roorkee, India
A Hierarchical Decomposition Approach for Network Analysis
Gupta, H.; Bandler, J. W.; Starzyk, J. A.; Sharma, J.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 643-646; In English; See also 20060010049
Contract(s)/Grant(s): NSERC-A7239; NSERC-G0647; Copyright; Avail.: Other Sources

A novel approach for analyzing large electrical networks is presented in which the network is decomposed into subnetworks in a hierarchical manner by removing some interconnections. These subnetworks are solved separately and then interconnected at a number of computing levels to obtain the solution of original network.
Author
Decomposition; Network Analysis; Electric Networks

20060010095 Eidgenoessische Technische Hochschule, Zurich, Switzerland
Design Of Multiplexed Switched-Capacitor Filters
Hoekenek, E.; Brugger, U. W.; Moschytz, G. S.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 213-216; In English; See also 20060010049; Copyright; Avail.: Other Sources

The fundamentals for the design of multiplexed SC filters, and several multiplexing techniques that reduce the number of components (amplifiers and capacitors) in switched-capacitor networks, are presented. The proposed methods require only unity-gain amplifiers to implement the resulting active SC filters. The presented multiplexing procedures can be combined and

extended for single unity-gain amplifier realization of higher-order SC filters. Practical limits inherent in this design technique are also discussed.
Author
Multiplexing; Electric Filters; Capacitance Switches; Electric Networks

20060010096 Rockwell International Corp., Anaheim, CA, USA
An Adaptive Tuning Filter for Communications
White, Stanley A.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 705-708; In English; See also 20060010049; Copyright; Avail.: Other Sources

Many proposed high-speed sampled-data filters have been discussed in the literature for high performance radio receivers. Transversal CCD structures using GaAs technology have been reported operating in the many-gigahertz range A reasonable next step in filter evolution is the development of the adaptive ability of a filter to concentrate its rejection power on those frequencies where strong interference exists, rather than blindly on the basis of frequency only. An adaptive spectrum shaper is presented as a means of providing such intelligent tuning.
Author
Adaptive Filters; Communication; Tunable Filters

20060010097 Concordia Univ., Montreal, Quebec, Canada
Passive And Active Switched-Capacitor Networks
Mohan, P. V. Ananda; Ramachandran, V.; Swamy, M. N. S.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 233-236; In English; See also 20060010049; Copyright; Avail.: Other Sources

Second-order passive switched-capacitor (s.c.) low-pass networks and second-order Sallen-Key and Bach's s.c. low-pass filters using Forward-Euler-Integration (FEI) and Backward-Euler-Integration (BEI) types of resistors are analyzed and compared. Phase-shift-oscillators using three sections s.c. lowpass ladders and bridged-T s.c. null networks both using FEI resistors are studied. Wien bridge passive networks and oscillators using FEI and BEI resistors are evaluated. Finally, the design of passive all-pass and notch filters using voltage inversion type s.c.s, is discussed.
Author
Low Pass Filters; Electric Networks; Capacitance Switches; Capacitors

20060010098 Keio Univ., Japan
Large Time Constant SC Circuits And Uni-Value Capacitors SC Circuits Using Multiphase Clock
Yamamoto, Masahiro; Tanaka, Mamoru; Mori, Shinsaku; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 225-228; In English; See also 20060010049; Copyright; Avail.: Other Sources

In this paper, we propose two kinds of SC circuits. One has large time constant by using additional few capacitors and multiphase clock. The other is constructed by only uni-value capacitors and by the op-amp with the same frequency range as one of the custom SC circuit, in spite of the multiphase clock system. And we show the filters based on these two methods.
Author
Capacitors; Circuits; Capacitance Switches; Time Constant

20060010099 Oki Electric Industry Ltd., Tokyo, Japan
On The Switched Capacitor Equalizers
Kawakami, Izumi; Komazaki, tomokazu; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 237-240; In English; See also 20060010049; Copyright; Avail.: Other Sources

One of the means to solve the problems that reduce in volume and economize the cost of communication equipments is to adopt LSIs in the components of the equipments. The designing method of the equalizers discussed in this paper has been already established adequately. However, it seems to be not enough in a point of view of establishing the optimum designing method of switched capacitor (SC) equalizers. Many circuits have been reported as the suitable circuit for applying SC. In this paper, the circuit composed of tandemly connected biquads is described by reason of its insensitivity to stray capacitors.
Author
Equalizers (Circuits); Capacitance Switches; Capacitors

20060010100 McMaster Univ., Hamilton, Ontario, Canada
Exact Power Network Sensitivities Via Generalized Complex Branch Modelling
Bandler, J. W.; El-Kady, M. A.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 313-316; In English; See also 20060010049
Contract(s)/Grant(s): A7239; G0647; Copyright; Avail.: Other Sources

This paper presents an application of the Tellegen's theorem approach to power network sensitivity calculations. Our theory employs an adjoint network concept based upon a novel, generalized complex branch modelling procedure allowing the exact steady-state component models of power networks to be considered without any approximation. Exact formulas for first-order change and reduced gradients are derived and tabulated.
Author
Sensitivity; Mathematical Models; Electric Networks

20060010101 Quebec Univ., Montreal, Quebec, Canada
Energetic Relations In General Dynamic Systems
Jacyno, Z.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 389-392; In English; See also 20060010049; Copyright; Avail.: Other Sources

In this paper, an extension of hyperphase space notion to general linear dynamical systems is sought. Based on previously obtained results for systems in state space, given by companion coefficient-matrix, an appropriate transformation is obtained, allowing energetic decomposition of strongly internally coupled systems into kinetic, potential and dissipative components. Application of developed decomposition method is illustrated on the examples of second, third and fourth order systems.
Author
Dynamical Systems; Linear Systems; Autonomy

20060010102 Technische Univ., Munich, Germany
A New Approach For Solving The Placement Problem Using Force Models
Antreich, Kurt J.; Johannes, Frank M.; Kirsch, Fritz H.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 481-486; In English; See also 20060010049; Copyright; Avail.: Other Sources

In the computer-aided layout of electrical circuits, components can be placed using force models, which represent interconnection affinities as attracting and repelling forces. An improved approach is proposed to facilitate the placement task for printed circuit boards and for integrated circuits. A new structuring of system equations is introduced, whose clarity affords much insight into the solution of the problem. Force equilibrium then determines the optimum relative positioning of components. A high degree of stability, a good numerical condition, and a low number of iteration steps in the quadratically-convergent solution method are among its important characteristics.
Author
Mathematical Models; Circuits; Layouts

20060010103 Tokyo Inst. of Tech., Tokyo, Japan
Effects Of Finite Gain-Bandwidth Products On Switched-Capacitor Networks- Approached Via Equivalent Representations
Kunieda, Hiroaki; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 464-467; In English; See also 20060010049; Copyright; Avail.: Other Sources

This paper presents equivalent representations for Switched-Capacitor (SC) networks to predict simply the errors in the transfer function due to the finite Gain-Bandwidth (GB) products of OP Amps. They are derived from the exact network equations in the z-domain by using simplifying approximations. Equivalent circuits are presented by resistors, capacitors and OP Amps whose gains are described by the 'effective GB products'. Therefore they provide similar insights into the performance of SC networks, insights which have been achieved with RC active circuits.
Author
Bandwidth; Capacitance Switches; Electric Networks; Amplification

20060010104 Instituto Nacional de Astrofisica, Optica y Electronica, Puebla, Mexico
Minimization Of Gain-Bandwidth Product Effects In Switched-Capacitor Filters
Sanchez-Siencio, Edgar; Geiger, Randall L.; Silvia-Martinez, Jose; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 468-471; In English; See also 20060010049; Copyright; Avail.: Other Sources

An approach to minimize the effects of the operational amplifier gain-bandwidth product (GB) on the performance of switched capacitor networks is presented. Each operational amplifier (OA) is replaced by a topology with two OA's such that the GB effects are minimized. Furthermore, the GB values of the OA's involved can be very small in comparison with the GB value of the OA that is replaced. Besides, the clock frequency can be as high as approximately GB/2pi. The theoretical and experimental results are in good agreement.
Author
Bandwidth; Operational Amplifiers; Amplification; Capacitance Switches; Optimization

20060010105 Italian Electricity Board, Milan, Italy
Use Of Lyapunov And Energy Methods For Stability Analysis Of Multimachine Power Systems
DiCaprio, Umberto; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 531-534; In English; See also 20060010049; Copyright; Avail.: Other Sources

With reference to a n-machine Power System represented by means of an electromechanic model pointing out the machine rotor angles and electric speeds as the system state variables, an illustration is made of the potentialities offered by the application of Direct-Methods (Liapunov and/or Energy Type) for obtaining synthetic information about the system stability.
Author
Energy Methods; Stability Tests; Mathematical Models; Electromechanics; Liapunov Functions

20060010106 Technische Hochschule, Stuttgart, Germany
Nonideal Operational Amplifiers In Reverse Switched Capacitor Networks
Spahlinger, Guenter; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 455-459; In English; See also 20060010049; Copyright; Avail.: Other Sources

The frequency response of SC-filters is distorted if nonideal operational amplifiers are used. In addition, the noise generated by the operational amplifiers, limits the available dynamic range. Under certain conditions the influence of these effects can be calculated for reverse switched capacitor filters as shown in this contribution, where a method to simultaneously treat time discrete and time continuous signals and systems is introduced. The solution of the problem is given for SC-filters with an arbitrary number of operational amplifiers, where the amplifiers can have any rational transfer function. The method provides data for the design of operational amplifiers.
Author
Capacitors; Operational Amplifiers; Electric Networks; Capacitance Switches

20060010107 Illinois Univ., Urbana, IL, USA
A Low Sensitivity Switched-Capacitor Structure
Attaie, N.; El-Masry, E. I.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 451-454; In English; See also 20060010049
Contract(s)/Grant(s): nsf eng-78-17815; Copyright; Avail.: Other Sources

A new switched-capacitor (SC) filter structure is presented. The proposed structure resembles the inverse follow-the-leader feedback configuration and is realized by strays-insensitive first-order SC building blocks. Design equations are obtained in closed from for the Nth-order filter. It is shown that the sensitivity of the transfer function with respect to the capacitance ratios is reduced if the design parameters (capacitance ratios) assume their lowest possible values. Procedures for obtaining the optimal values of design parameters are presented. A design example of a fifth-order filter is presented and its sensitivity performance is examined by the Monte Carlo analysis.
Author
Sensitivity; Capacitance Switches; Low Pass Filters

20060010108 University of the Budeswehr-Munich, France
Noise And Linearity Problems In High Frequency Mixer Circuits
Lindenmeier, H. K.; Reiter, L. M.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 569-572; In English; See also 20060010049; Copyright; Avail.: Other Sources

For evaluating the sensitivity of balanced mixers the noise contributions of bipolar transistor noise sources and the noise sources of the mixer network are investigated as a function of the amplitude of a sinusoidal and a rectangular oscillator wave function. The suppression of undesired intermodulation products is limited exclusively to the influence of parasitic elements, such as emitter and base series resistances, source resistances of the oscillator signal and the source admittance of the signal

current source. Best sensitivity as well as linearity are obtained in the switching mode of the transistors. In this way, the dynamic is maximum and only a function of the bias current, signal source admittance and the IF-bandwidth.
Author
High Frequencies; Linearity; Mixing Circuits; Noise (Sound)

20060010109 Centro Studi e Laboratori Telecomunicazioni, Turin, Italy
Line Encoding And Jitter Accumulation In A Chain Of Regenerative Repeaters
DelPistoia, A.; Mengal, U.; Molpen, R.; Pellegrini, G.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 561-564; In English; See also 20060010049; Copyright; Avail.: Other Sources

The present work is concerned with the problem of timing jitter in a digital communication network. The commonest jitter sources are specified, together with the main impairments of a digital link. The international diffusion of digital transmission systems generates the need for standard specifications on jitter network performance. CEPT and CCITT specifications are referred to, as well as the international perspectives on this kind of transmissions. Then, the jitter caused by a regenerator is particularly investigated, and a very general model is proposed for its evaluation in a chain of repeaters. Special emphasis is put on the effect of a line coding scheme on jitter behaviour. Finally, numerical results are reported.
Author
Coding; Communication Networks; Regenerators; Repeaters; Vibration; Mathematical Models

20060010110 Eindhoven University of Technology, Eindhoven, Netherlands
The Solution of Large Piecewise Linear Systems
vanEijndhoven, J. T. J.; Jess, J. A. G.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 597-600; In English; See also 20060010049; Copyright; Avail.: Other Sources

We demonstrate that piecewise linear systems can be decomposed into subsystems. This way they can be stored using a hierarchical tree structure. Furthermore we show for the resistive case that a Katzenelson-type algorithm can be adapted to work on such a tree structure. The resulting process resembles very much the operation of an event driven logic simulator.
Author
Algorithms; Linear Systems; Mathematical Models

20060010111 Genoa Univ., Genoa, Italy
A Circuit Theory Approach for Deriving the Electrical Properties of Statistical Mixtures
Bianco, Bruno; Degani, Giandolfo; Parodi, Mauro; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 651-654; In English; See also 20060010049; Copyright; Avail.: Other Sources

A new theory for investigating the electrical properties of statistical mixtures is presented. The theory is based on the similarity between a statistical mixture and a proper electrical network. The theoretical results obtained deal with the equivalent conductance of the mixture versus the conductances and concentrations of its components, and have been checked successfully by a proper computer simulation. Similar results hold for the equivalent dielectric constant. Finally, a comparison with the most popular results given by other authors has been made.
Author
Circuits; Electrical Properties; Statistical Analysis; Mathematical Models

20060010112 Hitachi Ltd., Tokyo, Japan
2-Micron CMOS Switched Capacitor Circuits For Analog Video LSI
Matsui, Kazuyuki; Matsuura, Tatsuji; Iwasaki, Kazuhiko; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 241-244; In English; See also 20060010049; Copyright; Avail.: Other Sources

An 18 MHz clock switched capacitor filter and a 64-sample capacitor memory, both realized by 2-micron CMOS technology, and single-stage cascode op-amp circuits, prove the possibility of video signal processing ISIs. In addition to fabrication, the speeds of MOS switched capacitor circuits are also analyzed.
Author
Capacitors; Metal Oxide Semiconductors; Signal Processing; Video Signals; Large Scale Integration; CMOS; Switching

20060010113 Technical Univ. of Istanbul, Turkey

Realization Of Norton Amplifier Switched-Capacitor Networks

Anday, Fuat; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 245-247; In English; See also 20060010049; Copyright; Avail.: Other Sources

A switched-capacitor synthesis procedure realizing second-order z-domain voltage transfer functions using Norton (current differencing) amplifiers is presented. The proposed synthesis procedure consists in finding the simplified equivalent circuit corresponding to the transfer function and then obtaining the Norton amplifier SC-network from the equivalent circuit. Author

Capacitors; Switching; Current Amplifiers; Equivalent Circuits; Transfer Functions

20060010114 West Virginia Univ., Morgantown, WV, USA

An Implementation Of A Continuous Time Frequency-Domain Adaptive System

Mikhael, W. B.; Yassa, F. F.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 585-588; In English; See also 20060010049; Copyright; Avail.: Other Sources

The hardware implementation of a continuous adaptive system is presented in this paper. The system uses a continuous-time second order filter with independent coefficients. The sequential-linear-search (SLS) adaptation algorithm is employed. The system incorporates three main parts, namely, the adaptive filter, the error-signal measuring circuitry and the logic circuits implementing the algorithm. The experimental results of the continuous adaptive system implementation are reported, which confirmed the excellent convergence properties of the algorithm, and the attractive features of the implementation due to its simplicity. The results are obtained for unknown transfer functions with orders less than or equal to that of the adaptive filter, and for different types of input signals to the system.

Author

Adaptive Filters; Error Signals; Logic Circuits; Transfer Functions; Convergence

20060010115 Southwest Research Inst. of Electronics Technology, Chengdu, China

Analysis And Experiment Of Bandpass Phase-Feedback Loop In PM Negative Feedback Receiver

Cheng-fang, Huang; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 589-592; In English; See also 20060010049; Copyright; Avail.: Other Sources

The PM negative feedback receiver (PMNFR) is similar to a maximum a posteriori estimation receiver model presented by H.L.Van Trees (i) for the phase modulated signal by multiple subcarriers. It is composed of a carrier phase lock loop (CPLL) and multiple subcarrier phase modulation feedback loops called a bandpass phase-feedback loop(BPPFL). Although detailed analysis on the BPPFL in the receiver has been made in references(2), (3), and (4), the effect of delay in the receiver channel on the BPPFL was neglected. In a practical receiver the received signal must be converted in the mixer and amplified in many stages in order to obtain a high enough signal level. In such case, it is unavoidable that a pure delay equal to the delay in the receiver channel,t, should be introduced into the BPPFL, which causes a severe effect on its stability and even makes it unstable. In addition other characteristics of the BPPFL are changed. Therefore, its optimum performance is not obtained unless certain conditions are met. This paper emphasises the effect of the delay in the receiver channel on the BPPFL and derives the conditions under which the BPPFL with delay is stable. The linearized characteristics of the BPPFL with delay and the conditions under which its optimum performance can be obtained are analyzed. In the paper discusses that the BPPFL makes improvements on the noncoherent subcarrier phase shift due to variations of receiver parameters and on the signal-noise spectral density ratio over a conventional phase-lock loop. Finally, the experiment results are given.

Author

Negative Feedback; Receivers; Phase Modulation; Optimization; Loops

20060010116 University of South Florida, Tampa, FL, USA

Multirate Technique For Wideband Circuits And Systems Identification

Jain, V. K.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 577-580; In English; See also 20060010049; Copyright; Avail.: Other Sources

Measuring wideband transfer functions is important in a variety of electronic circuits and systems. We present a multirate sampling approach to the identification of such systems. It permits determination of the transfer function of a four-to-five decade wide linear system from certain transient tests. Careful selection of sampling rates and excitation inputs in these tests decomposes the wideband problem into three simpler problems. Each of these entails a bandwidth of one-to-two decades, and requires only a single transient test. From the corresponding test data, three transfer functions, H(sub L)(s), H(sub M)(S) and

H(sub H)(S) are identified via the pencil-of-functions method, and then adjoined together to build the wideband transfer functions H(s). The methodology is demonstrated by a simulated RF amplifier.
Author
Broadband; Circuits; Linear Systems; Transfer Functions; Sampling; Bandwidth

20060010117 Texas Univ., Arlington, TX, USA
An ADPCM Receiver For NTSC Composite Video Signals
Sun, M. T.; Rao, K. R.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 581-584; In English; See also 20060010049; Copyright; Avail.: Other Sources

An ADPCM codec for carrying one broadcast quality NTSC color TV channel at a bit rate of 42.9 Mb/s has been proposed. The system uses 3 fsc sampling, adaptive intra-field contour prediction, adaptive quantization, 4/8-bit dual length coding, and horizontal blanking interval suppression techniques. The receiver of the video codec is designed and implemented in ECL for recovery of the original signal. The receiver accepts a 42.9 Mb/s serial data stream with a synchronous clock from the transmitter. The receiver detects the line synchronization code, demultiplexes the audio signal ana video signal, and generates the horizontal blanking patterns which have been removed at the transmitter side. The 4/8-bit dual length code is decoded and fed to the ADPCM reconstruction loop to obtain the reconstructed active video signal. The generated horizontal blanking pattern is multiplexed with the reconstructed video signal and sent through a D/A converter to form the reconstructed analog NTSC composite video signal.
Author
Video Signals; Color Television; Decoding; Transmitters; Receivers; Sampling

20060010118 Tampere Univ. of Technology, Finland
Design Of Optimum Wideband Recursive Digital Filters
Saramaki, Tapio; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 503-506; In English; See also 20060010049; Copyright; Avail.: Other Sources

This paper introduces a general class of lowpass digital filters with optimum magnitude in the Chebyschev sense and different order numerator and denominator. The generalized filter class includes filters having some zeros off the unit circle. These zeros increase the number of passband ripples, whereas the number of stopband ripples is decreased by the same number. The basic properties of the new filters and their efficiency in wideband applications are discussed.
Author
Digital Filters; Low Pass Filters; IIR Filters

20060010119 Erlangen-Nuernberg Univ., Erlangen, Germany
Design Of Recursive Digital Filters With Optimum Magnitude Frequency Response
Unbehauen, Rolf; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 499-502; In English; See also 20060010049; Copyright; Avail.: Other Sources

The problem of designing a recursive digital filter is considered for the case that the magnitude frequency response approximates a constant value in the equiripple sense in any given frequency interval. It is shown how this requirement can be met with the aid of a solution in closed form. The transfer functions of the filters may have different numbers of poles and zeros outside the origin. The free parameters existing in the closed form solution are used to fulfill a prescription on the magnitude frequency response outside the mentioned interval, i.e., in one or two disjoint frequency intervals. The approach is based on z-domain concepts. The results are demonstrated with the aid of examples.
Author
Digital Filters; Frequency Response; Transfer Functions

20060010120 Research Inst. for Diesel Locomotives, Praha, Czechoslovakia
Dynamical Characteristics Of The Electro-Mechanical Circuit In The Individual Axle-Driving System
Zahradka, Josef; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 321-324; In English; See also 20060010049; Copyright; Avail.: Other Sources

The paper deals with the analysis in which the characteristics of the electric circuit in the complete electromechanical system of the axle-drive of locomotives are investigated. In the first case the calculation of natural frequencies of the electric

circuit is performed. The analysis of forced oscillations excited by un-uniform motion of the mechanical system shows the resonance character of the electric system.
Author
Electromechanical Devices; Resonant Frequencies; Electromechanics; Circuits; Forced Vibration

20060010121 Rome Univ., Rome, Italy
Solar Disc Aiming System Using Photosensitive CCD Linear Arrays
Bolle, G.; Marietti, P.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 325-328; In English; See also 20060010049; Copyright; Avail.: Other Sources

A system able to aim and track the solar disc is presented. Two linear arrays of photosites detect the coordinates of the sun as projected onto the focal plane of an optical system and memorize them in two CCD arrays. The aiming accuracy is determined as the change of angle, from which the source of light is seen ,that gives rise to a change on the coordinates, corresponding to one photosite (imrad). Preliminary measurements on a prototype confirm the design calculations.
Author
Charge Coupled Devices; Linear Arrays; Light Sources; Coordinates; Tracking (Position)

20060010122 Waterloo Univ., Ontario, Canada
FDNR Switched-Capacitor Filters Insensitive To Parasitic Capacitances
Faruque, S. M.; Vlach, M.; Vlach, J.; Singhal, K.; Viswanathan, T. R.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 440-442; In English; See also 20060010049; Copyright; Avail.: Other Sources

The switched-capacitor transconductance is used to simulate a new FDNR element which is insensitive to parasitic capacitances and requires few components. The element is used in SC simulation of a fifth-order LC lowpass filter. It is shown that the influence of Other SC parasitic capacitances, occurring in the filter due to the switches, can be eliminated and that the resulting network is, except for a flat loss, exactly equivalent to the original ideal network.
Author
Switching; Capacitors; Transconductance; Capacitance; Switches

20060010124 Osaka Univ., Suita, Japan
Positive Realness Of The Immittance Of Formal System For Linear Passive Networks
Ozaki, Hiroshi; Okabe, Shunichi; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 408-411; In English; See also 20060010049; Copyright; Avail.: Other Sources

The positive realness of the immittance of Network (linear passive physical system) was derived from the principle of energy directly or from the similar concept deduced graph-theoretically from the same principle applying the Telegen's theorem [i]. In the present paper, the 'Formal Network' are newly defined utilizing S-matrices and it is shown that S-matrix of any formal network is regular para-unitary. This is equivalent to say that the immittance matrices of the networks are positive real. The principle of energy is not used for the proof of the positive realness. The reasons why S-matrices are used instead of immittance matrices are the followings. (i) If the immittance matrix exists, there exists an S-matrix corresponding to it. (ii) Ideal transformers, ideal gyrators and linear graphs have no immittance matrix, but each of them has its own S-matrix.
Author
Electrical Impedance; Gyrators; Theorems; Proving

20060010125 Technische Univ., Munich, Germany
Power Wave Representation Of The Chain Matrix
Pauli, Rainer; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 412-414; In English; See also 20060010049; Copyright; Avail.: Other Sources

The paper presents a new formulation of the chain matrix elements for lumped reciprocal lossless two-ports in terms of the transfer function and the characteristic function, which are ratios of power waves. The results for resistively terminated two-ports are well established. Based on Youla's complex normalization of bounded-real scattering matrices, these results can be generalized to the case of non-Foster positive-real rational terminating impedances. The relations obtained are of fundamental interest to the synthesis of impedance matching circuits and related topics.
Author
Transfer Functions; Matrices (Mathematics); Circuits; Scattering; Eigenvalues

20060010126 Massachusetts Inst. of Tech., Cambridge, MA, USA
Thermodynamics of Electrical Noise: A Frequency-Domain Generalization of the Second Law for Linear Systems
Wyatt, John L., Jr.; Siebert, William M.; Tan, Han-Ngee; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 622-624; In English; See also 20060010049
Contract(s)/Grant(s): NSF ECS-800-6878; Copyright; Avail.: Other Sources

This paper addresses the frequency-domain characterization of electrical noise in linear time-invariant distributed networks. A new general inequality is derived. The flow of noise power from one source to another through a lossless coupling network is shown to obey a relation analogous to the second law of thermodynamics. The noise sources can be any second-order stationary random processes and need not represent thermal noise. In this sense the conclusions are quite general. Proofs are based on standard techniques from the theory of linear circuits and random signals; thermodynamic concepts enter only in the interpretation of the results.
Author
Thermodynamics; Noise Generators; Random Signals; Linear Circuits; Flow Noise; Thermal Noise

20060010127 Pennsylvania Univ., Philadelphia, PA, USA
Evaluating Permanents of Special Classes of (0,1) Matrices
Pierentozzi, D.; Bderosian, S. D.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 633-635; In English; See also 20060010049
Contract(s)/Grant(s): N00014-75-C-0768; Copyright; Avail.: Other Sources

The definition and some uses of the permanent of the network adjacency matrix are discussed in Ref [i]. A few classical algorithms for evaluating permanents are also presented therein. Here we present a closed form polynomial solution for the permanent which permits efficient evaluation when used under the stated conditions. This is done with the aid of rook polynomials and the concept of forbidden positions. The latter are taken to be the zero entries in the adjacency matrix of the digraph representing the network or system. We hope that this brief introduction will encourage wider use of the permanent in various circuit and system applications.
Author
Matrices (Mathematics); Circuits; Polynomials

20060010128 National Inst. of Astrophysics, Puebla, Mexico
Effects On The Performance Of A Pair Of SC Biquads Due To The OP AMP Gain-Bandwidth Product
Martinez, Jose Silva; Sanchez-Sinecio, Edgar; Sedra, Adel S.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 373-376; In English; See also 20060010049; Copyright; Avail.: Other Sources

A detailed analysis of a pair of strays-insensitive second-order bandpass switched-capacitor circuits [I] is presented to determine the effects on their transfer functions due to the op amp's finite gain-bandwidth product. It is shown analytically and verified experimentally that although both filters ideally have the same transfer function, when the op amps are modelled with one dominant pole their frequency responses differ significantly.
Author
Transfer Functions; Capacitors; Bandwidth; Circuits; Switching

20060010129 Concordia Univ., Montreal, Quebec, Canada
The Energy Spread Of Electrical Systems
Reza, F. M.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 377-380; In English; See also 20060010049; Copyright; Avail.: Other Sources

A linear time-invariant system {N} is subjected to a fixed frequency normalized exponential input signal [i]=K. We study the spread of the complex energy F and the ranges of the active energy P and reactive energy Q. The inter-relations between natural modes of the system and the energy spreads are discussed. Upper bounds and lower bounds for energy spreads are given in terms of the elements of the impedance or admittance matrices of the system.
Author
Linear Systems; Electrical Impedance; Frequencies

20060010130 California Univ., Santa Barbara, CA, USA
Performance Characteristics of the Unconstrained Frequency Domain Adaptive Filter
Mansour, David; Gray, Augustine H., Jr.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 695-698; In English; See also 20060010049; Copyright; Avail.: Other Sources

Performance characteristics of the Unconstrained Frequency domain LMS (UFLMS) adaptive filter is examined. Conditions for the UFLMS to converge to the optimal Wiener solution are reviewed. A modified constrained Frequency domain LMS (FLMS) algorithm with a frequency dependent convergence factor is introduced. The UFLMS algorithm is shown to achieve lower mean square error than both the FLMS and the optimal Wiener filter of order K when the system to be identified is IIR or FIR with order greater than K. This result is also experimentally illustrated through the actual identification of an fIR filter.
Author
Frequency Distribution; Adaptive Filters; Fir Filters; Mean Square Values; Wiener Filtering

20060010131 Bell Telephone Labs., Inc., Holmdel, NJ, USA
Quantization Schemes for Recursive Digital Filters
Lawrence, V. R.; Lee, E. A.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 690-694; In English; See also 20060010049; Copyright; Avail.: Other Sources

The implementation of digital filters involves the use of finite precision arithmetic. This leads to quantization of the results of arithmetic operations, e.g., rounding or truncation of products. Such quantization operations are nonlinear, and significant self-sustained oscillations (limit cycles) are observed at the output of many filters even when the input is zero. Moreover, in the so-called idle channel conditions, d.c. inputs and periodic inputs of period 2 are typically encountered and conventional quantization has the effect of generating significant parasitic oscillations, i.e., the response of the filter is substantially different from the response of the underlying infinite-precision model. In this paper, we discuss the effects of different filter implementations on limit cycles. For one implementation, we show the existence of some unusual limit cycles with large amplitudes. For another implementation, we discuss a new controlled quantization scheme, distinctly different from rounding or truncation, that has the capability of suppressing self-sustained and parasitic oscillations in recursive digital filter sections. This quantization scheme depends not only on the quantity to be quantized but also on the two past outputs of the quantization operation. This new controlled quantization scheme has been implemented on a Digital Signal Processor and its performance is compared to other quantization schemes.
Author
Digital Filters; IIR Filters; Arithmetic; Oscillations; Precision; Measurement

20060010132 Katholieke Univ. te Leuven, Belgium
Mixed-Mode Simulation for MOS-VLSI: Why, Where and How?
DeMan, Hugo J.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 699-701; In English; See also 20060010049; Copyright; Avail.: Other Sources

In principle mixed-mode simulators allow simultaneous simulation of a circuit at different levels of abstraction in order to reduce the cost of simulation by trading off accuracy in favor of speed of simulation wherever possible. After an overview of existing mixed-mode simulators the problems of their use by designers will be discussed. All these problems relate mainly to design methodology and modeling problems. They impose the following actions: a)find a strategy for embedding mixed-mode in a design methodology :which levels are really to be mixed ? b)improvements of algorithms especially at timing and logic mode for MOS : switch models, scheduling mechanisms, instantaneous vs. waveform relaxation etc... c)preprocessing programs to analyse VLSl MOS logic and/or prepare models for mixed-mode simulations. Solutions to these problems and their implementation in the K.U. Leuven MOS VLSl-design system are indicated.
Author
Design Analysis; Circuits; Simulators; Switches; Cost Reduction

20060010133 BBC Brown, Boveri and Co. Ltd., Baden, Switzerland
Possibilities Of Improvement Of The Classical Network Equivalent For The Use In Power System Monitoring
Hager, Helmut; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 548-552; In English; See also 20060010049; Copyright; Avail.: Other Sources

After an evaluation of the properties of the classical network equivalent some possible improvements are discussed. These are centered around the development of radial, tree-shaped passive equivalent called GRANEQ (General RAdial Network Equivalent). This is not able to give a perfect replica of the original network, but the accuracy of the representation of different regions is controllable. The impedances and the structure of the radial equivalent are found by a search procedure directed at minimizing an error function on the transfer impedances to be matched by the equivalent. Injections are treated in terms of

the REI - network. Results for practical power systems are given, which show the feasibility of this reduction method in power system monitoring.
Author
Computer Networks; Equivalence; Error Functions

20060010134 Ruhr Univ., Bochum, Germany
Uniform Recurrence Formulae For The Characteristic Function Of Classical LC-Filters, Wave Digital Filters, And VIS-SC-Filters, With Tchebycheff Pass-Band
Owenier, Klaus A.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 337-340; In English; See also 20060010049; Copyright; Avail.: Other Sources

Simply structured recurrence formulae are derived, which permit the efficient calculation of the coefficients of the filter characteristic function. The used parameters are the cut-off frequencies, the poles or the pole-type branch points of the characteristic function, and the amplitude of the Tchebycheff ripple in the pass-band. No separate formulae are needed for symmetric and antimetric filters.
Author
Digital Filters; Coefficients; Eigenvalues; Eigenvectors

20060010135 AEG-Telefunken-Nachrichtentechnik G.m.b.H., Germany
A Per-Channel Transmultiplexer Applying IIR Filters And Logarithmic Processing
Goeckler, Heinz; Scheuermann, Helmut; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 268-271; In English; See also 20060010049; Copyright; Avail.: Other Sources

This paper describes an extension of a recently published memory-oriented design for a digital transmultiplexer which performs conversion between TDM and FDM on a per-channel basis [2]. The processor uses a particular class of optimal IIR bandpass filters [5, 9] for interpolation (TDM-to-FDM) and decimation (FDM-to-TDM). Hardware efficiency is obtained by implementing the transversal filter part in a logarithmic mode, wherein multiplication becomes addition. The low-order recursive filter part is separately realized and operates at the PCM sample rate in either direction. To guarantee stability under looped conditions [6], wave digital filters [7] are used for the implementation of the recursive filter part.
Author
Digital Filters; Memory (Computers); Interpolation; Bandpass Filters; Multiplexing

20060010136 Nippon Electric Co. Ltd., Kawasaki, Japan
A CVSD/PCM Converter Implemented With New Dsp LSI Chips
Maruta, Rikio; Aikoh, Shinichi; Sakaguchi, Hisashi; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 276-279; In English; See also 20060010049; Copyright; Avail.: Other Sources

An all digital equipment, for mutual conversion between 32 kbps CVSD (Continuously Variable Slope Delta) encoded signals and 64 kbps standard PCM encoded signals, has been developed by utilizing digital signal processing (DSP) techniques and new DSP LSl chips. This paper describes equipment design, implementation and performance, especially emphasizing design considerations to make digitally implemented CVSD codec performance compatible with that of existing CVSD codecs that are made up of analog components. Measured performance has shown to be satisfactory in various connections, i.e., analog CVSD coder to PCM decoder, PCM coder to analog CVSD decoder and PCM coder to PCM decoder through a looped back digital CVSD codec.
Author
Digital Techniques; Signal Processing; Coders; Chips; Large Scale Integration

20060010137 Rockwell International Corp., Anaheim, CA, USA
A High Performance Sonar Signal Processor
Dentino, Mauro J.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 712-715; In English; See also 20060010049; Copyright; Avail.: Other Sources

The trend in modern passive sonar systems is to continue to increase both the aperture and number of hydrophone sensors. Theoretically, the improved acoustic sensors allow the sonar system to simultaneously achieve improved detection sensitivity and spatial resolution. Unfortunately, this theoretical advantage becomes more difficult to realize in typical real-world situations where strong mutual interference exists. This paper describes a recent successful experiment that demonstrates the usefulness of an Adaptive Frequency Domain Interference Cancelling Processor System. The practical limitations introduced

by undesirable interference can be effectively eliminated in a cost-effective manner with the Frequency Domain Adaptive Processor.
Author
Sonar; Signal Processing; Detection; Signal Detectors; Signal Analyzers; Acoustics; Spatial Resolution

20060010138 Democritus Nuclear Research Center, Athens, Greece
Design And Implementation Of A Special Class Of Multiplierless Digital Filters
Varoufakis, S. J.; Venetsanopoulos, A. N.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 523-526; In English; See also 20060010049; Copyright; Avail.: Other Sources

This paper deals with the design of discrete low-pass filters, using a special class of polynomials of the second and third order, with coefficients which are powers of two. To take advantage of the characteristics of these polynomials, the discrete integrator is used as a basic component. The filters so derived are multiplierless, resulting in hardware economy. Simulation indicates that the filters obtained are equally good or better to those obtained by the application of the impulse invariance method.
Author
Digital Filters; Design Analysis; Low Pass Filters; Simulation; Integrators; Impulses

20060010139 Manitoba Univ., Winnipeg, Manitoba, Canada
Design Of Digital Filters With A Diagonal Lyapunov Function Based On Elliptic Reference Filters
Martens, G. O.; Jarmasz, M. R.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 527-530; In English; See also 20060010049; Copyright; Avail.: Other Sources

A method for designing digital filters with a diagonal Lyapunov function based on elliptic reference filters is described. The signals are voltage waves which are related by an n-port adaptor which yields the state equations. The suppression of zero-input parasitic oscillations is guaranteed, if sign-magnitude truncation is used at the states. The number of delays is canonic as is the number of design parameters. Specific design formulae for finite word-length multiplier coefficients are obtained for the design of 5th order digital filters based on elliptic reference filters. An example to illustrate the design procedure including the realization requirements is presented.
Author
Digital Filters; Liapunov Functions; Design Analysis; Multipliers; Equations of State

20060010140 Siemens A.G., Munich, Germany
Efficient Sampling Rate Increase And Decrease In Wave Digital Filters With Applications In Communication Systems
Nossek, Josef A.; Fettweis, Alfred; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 264-267; In English; See also 20060010049; Copyright; Avail.: Other Sources

Sampling rate increase (interpolation) of decrease (decimation) are frequently required operations in digital signal processing systems. They do not affect the linearity but make the system time-variant. Efficient realizations of such multirate recursive digital filters can be arrived at by making use of the additional terminals available at the input and outputport of a wave digital filter, preserving the well known sensitivity and stability properties. This realization schemes seem to be advantageously applicable in communication systems involving digital signal processing, e.g. in transmultiplexers and digital PCM-Codec-Filter chips.
Author
Digital Filters; Digital Systems; Signal Processing; Telecommunication; Sampling

20060010141 Karlsruhe Univ., Germany
Routability Test With Variable Wire Width For Hierarchical Chip Design Based On A New Database System
Rothermel, H-J.; Wiesel, M.; Mlynski, D. A.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 491-494; In English; See also 20060010049; Copyright; Avail.: Other Sources

This new approach to hierarchical chip design in VLSI requires data structures, which consider n-corner rectangles of any shade and size for modelling ‘macrocells’ or ‘building blocks’. Due to the need of this kind of models a new database system (D_S) has been developed and implemented. Using this database a routabilit_[test, which considers variable wire width, is shown. For this test a new fast path algorithm is presented. The algorithm is based on an appropriate channel model.
Author
Very Large Scale Integration; Chips; Data Bases; Data Structures

20060010142 Philips Kommunikationsindustrie A.G., Nuernberg, Germany

Transfer Functions Of Periodically Switched Linear Networks With S-H At The Input And Output Ports

Wehrhahn, Erich; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 427-430; In English; See also 20060010049; Copyright; Avail.: Other Sources

For every linear system with sampled and held input and output signals, a rational transfer function in the z-domain can be found. The systems considered in this paper are periodically switched, general, linear, electrical networks with concentrated elements. Conditions are presented, under which the solution will also approximate quite well the solution of the same circuit without sample and hold circuits on the input and output ports. The major application will be the analysis of switched-capacitor networks. The advantages over other methods are the lower computational effort needed for the analysis and the characterisation of the transfer function by poles and zeros.

Author

Transfer Functions; Switching; Capacitors; Electric Networks; Approximation

20060010143 Hiroshima Univ., Japan

Optimal Transmission Of Time-Variant Flow Streams Through Discrete-Time Network With Time-Invariant Capacity And Transit Time

Onaga, Kenji; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 605-608; In English; See also 20060010049

Contract(s)/Grant(s): MOE-00435013; MOE-56550252; Copyright; Avail.: Other Sources

Using routing information (p(sub i), delta(sub i), gamma(sub i))(i=1,2 ..... k) of minicost static flows,efficient algorithms for uniformly maximum transmissions of time-variant flow streams are developed for networks with time-invariant capacity and transit time. When flow is made of particles, the service principle of first-come first-enter at the origin can be incorporated.

Author

Algorithms; Transit Time; Circuits; Streams

20060010144 Chuo Univ., Tokyo, Japan

A Sufficient Condition For Any Two Matroidally Isomorphic Graphs With The Same Edge Set To Have A Common Tree

Shinoda, Shoji; Chen, Wai-Kai; Kuwahara, Takashi; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 601-604; In English; See also 20060010049

Contract(s)/Grant(s): MOE-00435013; Copyright; Avail.: Other Sources

Two graphs G and G' with edge sets E and E', respectively, are said to be matroidally isomorphic if there exists a bijection f: E approaches E' such that (a) for every tree t of G f(t) is a tree of G' and (b) for every tree t' of G' f(sup -1)(t') is a tree of G. In this paper, based on Edmonds' intersection theorem of two matroids, a sufficient condition for any two matroidally isomorphic graphs with the same edge set to have a common tree is characterized by using the principal partition of a graph which was introduced by Kishi and Kajitani in 1967.

Author

Graph Theory; Edges; Theorems; Trees (Mathematics)

20060010145 Tesla Strasnice, Prague, Czechoslovakia

The Synthesis Of Bridged Bandpass Filters- An Extension

Stepanek, K.; Pavlik, P.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 366-368; In English; See also 20060010049; Copyright; Avail.: Other Sources

A new method is described using the inverse generalized eigenvalue problem. Basic matrix equations are formulated and the sum of squares of errors is minimized using the explicit formulas for its gradient. This design of LC bandpasses with the general L, C, or LC coupling was applied on its mechanical analogy.

Author

Bandpass Filters; Matrices (Mathematics); Gradients; Errors; Analogies

20060010146 Athens Univ., Greece

Fast Algorithms For Optimum Lag Multichannel Wiener Filters

Manclakis, D.; Kalouptsidis, N.; Carayannis, G.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 362-365; In English; See also 20060010049; Copyright; Avail.: Other Sources

This paper introduces two new and fast algorithms for the determination of optimum lag multichannel FIR Wiener filters. Both algorithms also include a new recursive formula for the calculation of minimum MSE which makes them considerably faster than the widely used Simpson's sideway recursions. The above algorithms apply to the optimum prediction distance problem as well.
Author
Fir Filters; Wiener Filtering; Algorithms

20060010147 West Virginia Univ., Morgantown, WV, USA
Stable High Order, Continuous Adaptive Filters
Mikhael, W. B.; Yassa, F. F.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 666-669; In English; See also 20060010049
Contract(s)/Grant(s): NSF -ERMPRM-80-11453; Copyright; Avail.: Other Sources
Two new configurations, easily implementable using simple hardware, for stable high order analog adaptive filters are presented. The first structure is based on signal flow graph realizations of the filter. The second structure is based on processing the input as well as the output of the system. Both structures are tested for stability and convergence properties using a linear search technique and computer simulation results are given which are very encouraging.
Author
Adaptive Filters; Convergence; Signal Flow Graphs; Stability

20060010148 Technical Univ. of Warsaw, Warsaw, Poland
Nonlinear Resistive Network Synthesis Using Minimum Number Of Grounded Voltage- Or Current-Controlled Conductors
Osowski, Stanislaw; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 305-308; In English; See also 20060010049; Copyright; Avail.: Other Sources
The new approach to the nonlinear resistive multiport network synthesis is presented in the paper.This approach is generally based on the state space method extended to the nonlinear networks from the linear circuit theory. It is shown that any nonlinear network can be realized analogously to the linear one as an active resistive multiport network loaded on n of its ports by n grounded x-controlled conductors,where n denotes degree of function or matrix of functions. The nonlinear transformations described in the paper reduce the basic nonlinear elements(analog multipliers)to small, close to minimum number.
Author
Nonlinearity; Network Synthesis; Conductors; Matrices (Mathematics)

20060010149 Columbia Univ., New York, NY, USA
Automated Gate Matrix Layout
Wing, Omar; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 681-685; In English; See also 20060010049; Copyright; Avail.: Other Sources
An algorithm is presented which obtains a layout of a CMOS circuit in the style of Gate Matrix. Placement of all the transistors a.d ill=it interconnections are treated at the same time and the layout is accomplished globally. The algorithm is based on the recognition that the transistors and their interconnections can be represented as intervals on a real line, and on a method of reconstruction of a dominant clique matrix of a graph, which represents, the connectivity of the circuit, such that the matrix becomes that of an interval graph. From the interval graph thus generated, a layout is systematically obtained with the number of tracks equal to the maximum clique size of the interval graph.
Author
Algorithms; Circuits; CMOS; Transistors

20060010150 Fairchild Camera and Instrument Corp., Palo Alto, CA, USA
Block Adaptive Equalization
Ramesh, N. S.; Mitra, S. K.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 686-689; In English; See also 20060010049; Copyright; Avail.: Other Sources
High speed data transmission over voiceband (telephone) channels is limited by the slowly time-varying amplitude and phase distortion introduced by the channel. Such distortion results in intersymbol interference at the receiver. In this paper, we describe an adaptive equalizer based on a block Kalman filter having the same performance as the Godard equalizer, but

requiring only 4N multiplications per sample. A tracking version of this equalizer is also described, which is capable of adapting to slowly time-varying channels. Such a tracking technique requires minimal additional effort.
Author
Equalizers (Circuits); Adaptive Control; Kalman Filters

20060010151 Texas Univ., Austin, TX, USA
Time-Varying Digital Signal Processing: A Review
Huang, Nian-Chyi; Aggarwal, J. K.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 659-662; In English; See also 20060010049
Contract(s)/Grant(s): F49620-77-C-0101; Copyright; Avail.: Other Sources

This paper reviews recent developments in the area of time-varying digital signal processing. The discussion emphasizes on the following topics: (1) the characterizations of linear time-varying (LTV) digital filters and their interrelationships; (2) time- and frequency-domain techniques to determine filter characteristics; and (3) problems associated with the synthesis and implementation of recursive LTV digital filters.
Author
Signal Processing; Digital Filters; Variations; Time Domain Analysis

20060010152 Imperial Coll. of Science and Technology, London, UK
A Class Of Efficient Interpolators And Decimators With Applications In Transmultiplexing
Constantinides, A. G.; Valenzuela, R. A.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 260-263; In English; See also 20060010049; Copyright; Avail.: Other Sources

An efficient structure for Interpolation/Decimation by a factor N is presented consisting of N parallel all-pass branches in Z(sup -N) with real coefficients. Overflow free implementation structures are given. It is shown that for N = 2 the proposed structures simulate doubly terminated lossless lattice networks preserving their sensitivity attributes. An efficient, analytic method which yields optimal equiripple designs is given for this case. A two-step design method based on non-linear optimization techniques is given for the general case. Evaluation of more than 70 optimal designs shows that substantial improvement in computational complexity, storage requirements as well as performance under finite precision are achieved.
Author
Interpolation; Optimization

20060010153 Universidad del Pais Vasco, Spain
On The Modelling Of Aperiodic Sampling Systems
delaSen, Manuel; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 397-399; In English; See also 20060010049; Copyright; Avail.: Other Sources

It is shown that a periodic discrete-continuous sampling systems may be modeled by a difference equation matrix which may be used in the same way that in the case of periodic discrete systems. This fact allows one to compute the out puts as finite combinations of previous inputs and outputs using a finite set of time-varying parameters, which are dependent on the parameters of the continuous transfer matrix and on a finite set of sampling periods equal to the order of the system state, avoiding impulse response methods and state variable measurements.
Author
Mathematical Models; Discretization (Mathematics); Aperiodic Functions; Sampling

20060010154 SUPELEC, Gif-sur-Yvette, France
A New Symbolic Calculus For The Response Of Nonlinear Systems
Lamnabhi, M.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 292-296; In English; See also 20060010049; Copyright; Avail.: Other Sources

We present a new operational calculus for computing the response of nonlinear systems to various deterministic excitations. The use of a new tool: non commutative generating power series, allows us to derive, by simple algebraic manipulations, the Volterra functional series of the solution of a large class of nonlinear forced differential equations. The symbolic calculus introduced appears as a natural generalization, to the nonlinear domain, of the well known Heaviside's operational calculus. Moreover, this method has the advantage of allowing the use of a computer.
Author
Nonlinear Systems; Operational Calculus

20060010155 Dayalbagh Educational Inst., Dayalbagh, India

Analysis Of Piecewise Linear Resistive Networks With Time Varying Inputs

Prasad, V. C.; Prabhakar, A.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 297-300; In English; See also 20060010049; Copyright; Avail.: Other Sources

The problem of tracing the solution curve of piecewise linear resistive network having time varying inputs is studied. The conditions under which the solution curve enters a new region at a simple boundary point end a corner point arm derived. The phenomenon of jump in the solution of the network from one region to another is investigated.

Author

Linear Systems; Electric Networks; Numerical Analysis; Electrical Resistivity

20060010156 Academia Sinica, Beijing, China

A Quantitative Research Of Nonlinear Behaviour Of A Phase-Locked Loop

Yihui, Lu; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 301-304; In English; See also 20060010049; Copyright; Avail.: Other Sources

It is found that the linear frequency modulation is used on a voltage-controlled oscillator (VCO) and a phase-locked loop (PLL) to lock its starting-frequency phase for generating a coherent chirp signal. For a high-gain second-order loop the loop parameters and the modulating frequency rate must be chosen to satisfy this condition, 0 less than epsilon less than 1, and then the loop is unlocked during each LFM pulse, being not necessarily broken as the epsilon is enough small. The PLL's equation is transformed into a nearly linear differential equation and its asymptotic solution is given, thus, the quantitative relationships about the effects of the PLL on the LFM waveform are obtained. Finally, the results of simulation by means of computer show good agreements with theoretical analysis.

Author

Nonlinearity; Phase Locked Systems; Chirp Signals

20060010157 Tokyo Univ., Japan

Duality And Reciprocity: A Qualitative Approach

Iri, Masao; Recski, Andras; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 415-418; In English; See also 20060010049; Copyright; Avail.: Other Sources

In a previous paper we compared the usual 'engineering' and the usual 'mathematical' definitions of duality (i.e. interchange of voltage and current on the one hand and orthogonal subspaces on the other hand) and found that, unless every device is reciprocal, there are two, entirely different voltage-current symmetries. Now we continue this study by concentrating on qualitative properties only. E.g. two n-ports with descriptions A'u+B' i=0 and A'u+B'i=0 respectively are qualitatively equivalent when any collection of columns of the matrix [A' B'] is linearly independent if and only if the corresponding column set of [A' B"] is independent. Then concepts like qualitatively dual, inverse, adjoint, reciprocal etc. multiports can be introduced. Finally, a comparison of various weakenings (by different authors) of the concept of reciprocity is given, and an indication how these results can be applied to obtain new realizability criteria.

Author

Duality Principle; Applications of Mathematics; Reciprocity Theorem

20060010158 State Univ. of New York, Stony Brook, NY, USA

Jump Phenomena In Active-RC Circuits: A Simplified Analytical Approach

Krishnarao, I. Sailesh; Rao, K. Radhakrishna; Moni, R. S.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 423-426; In English; See also 20060010049; Copyright; Avail.: Other Sources

The main purpose of this work was to develop an analytical expression for the describing function governing the input-output relationship of high-Q second-order active-RC building blocks employing bipolar-input Operational-Amplifiers and operating at high frequencies under large signal excitations. Closed-form expressions describing several important nonlinear characteristics of the circuit have been derived and compared with experimental results and computer-simulation studies for a typical high-Q bandpass second-order section.

Author

Circuits; Operational Amplifiers; Mathematical Models; Numerical Analysis

20060010159 Chalmers Univ. of Technology, Goeteborg, Sweden

Elementary Proof Of The Explicit Formulae For The Element Values Of Butterworth Lowpass Filter

Bolinder, E. F.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 345-349; In English; See also 20060010049; Copyright; Avail.: Other Sources

Impedance transformations through lossLess lowpass Butterworth filters are split into alternating hyperbolic and parabolic transformations corresponding to ideal transformers and series inductors/parallel capacitors. By using the newly presented insertion loss power ratio model it is shown that the splitting procedure can be conveniently done by the classical continued fraction expansion of the input impedance. A general recurrence formula is obtained. The k to k + 1 step in the expansion splits off the parabolic part as a general expression which simplifies to the Bennett formula for the matched case. General formulae are obtained also for the hyperbolic transformations (ideal transformer). They show why no explicit formula has been found for the general non-minimum case. There is none. The new formulae are easy to program. A closed expression has been found in the minimum phase case. It leads to known formulae. The recurrence formula is also valid for the Chebyshev filters.
Author
Low Pass Filters; Electrical Impedance; Mathematical Models

20060010160 Nippon Electric Co. Ltd., Kawasaki, Japan
A Simultaneous Frequency And Time Domain Approximation For Discrete-Time Filters
Nakayama, Kenji; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 354-357; In English; See also 20060010049; Copyright; Avail.: Other Sources

A simultaneous frequency and time domain approximation method for discrete-time filters is proposed in this paper. Filter coefficients are divided into two subsets X(sub 1) and X(sub 2) which are used to optimize a time response and a frequency response, respectively. The optimum solution for X(sub 1) is always guaranteed through linear equations during the frequency response optimization. The frequency response is optimized by iterative methods. The proposed method does not impose any constraints on pole-zero locations and on filter responses. Hence, sufficient reductions in filter order and in final hardware size can be achieved.
Author
Approximation; Time Domain Analysis; Frequency Domain Analysis; Electric Filters; Algorithms

20060010161 Technische Univ., Vienna, Austria
High-Order Elliptic Analog Low-Pass and Band-Pass Filters with Current Controlled Frequency Response
Doblinger, Gerhard; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 350-353; In English; See also 20060010049; Copyright; Avail.: Other Sources

Elliptic analog signal flow graph (SFG)-filters with variable frequency response are derived from passive reference filters with ideal transformers. The basic active building block of these variable filters is a new integrator circuit with current controlled unity gain frequency, an improved input voltage range of 20 Vpp typically, and suitability for integration in bipolar technology. Experimental results of 10th-order elliptic low-pass and band-pass filters are presented showing a usable frequency range of 200 kHz, a linear control range of 1:100, and a dynamic range of 60 dB (lowpass filter) and 50 dB (band-pass filter) at an input voltage of 2 V(sub rms).
Author
Bandpass Filters; Frequency Response; Signal Flow Graphs; Analogs; Low Pass Filters

20060010162 Tokyo Inst. of Tech., Tokyo, Japan
A Synthesis Of Digital Filters With Minimum Pole Sensitivity
Nishihara, Akinori; Sugahara, Kazunori; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 507-510; In English; See also 20060010049; Copyright; Avail.: Other Sources

This paper presents an approach to the realization of low-sensitivity second-order digital filters. In contrast to existing methods, which use amplitude sensitivity as a criterion, the proposed method uses pole sensitivity. Pole sensitivity is quite useful for evaluating and comparing the performance of various types of filters because it is not a function of frequency. The relation between pole sensitivity and amplitude sensitivity is clarified. For the minimization of pole sensitivity, the denominator polynomial of a second-order transfer function is expressed in a general form including two multiplier coefficients and some arbitrary integer parameters. Under certain constraints on the range of the parameters, which limit the filter complexity, the values of the parameters are determined through an exclusive search such that the pole sensitivity is minimized. The optimum set of the parameters is fully dependent on the given specifications, i.e. locations of the poles. Therefore the z-plane can be partitioned into some regions, in each of which a single set of the parameters is chosen. The resultant map enables one to realize low-sensitivity digital filters having any given characteristics.
Author
Digital Filters; Sensitivity

20060010163 Hiroshima Univ., Japan
Self-Repairability of Microcomputer Networks
Mayeda, Wataru; Komatsu, Masaharu; Kishida, Hajime; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 613-616; In English; See also 20060010049; Copyright; Avail.: Other Sources

This paper consider a network consisting of many microcomputers joined together to perform an information processor. It will be shown that techniques of transmitting information among microcomputers in such a network become simple by choosing special structure namely a basic M-graph. Also it will show that such networks can have self-diagncsability and self-repairability.
Author
Microcomputers; Computer Networks; Self Repairing Devices

20060010164 Texas A&M Univ., TX, USA
A Monolithic Switched-Resistor Integrator Building Block
Bass, James T.; Geiger, Randall L.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 221-224; In English; See also 20060010049; Copyright; Avail.: Other Sources

The design of a monolithic switched-resistor integrator building block is discussed. The switched-resistor design which results in filters which are essentially continuous-time in nature offer an alternative to the discrete-time switched-capacitor filters. The effective rc time constants of the switched-resistor integrators are determined by capacitor ratios as in the switched-capacitor case but can be operated at both low and high frequencies. A computer simulation of an nmos version of this building block designed for operation around 50khz is presented which shows that the effects of parasitic capacitances in the switches and mosfets are quite insignificant.
Author
Integrators; Integrated Circuits; Resistors

20060010165 Technische Univ., Munich, Germany
Equivalence Transformation Of Switched-Capacitor Networks And Of Micro-Strip Filters
Dasch, Bernd; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 217-220; In English; See also 20060010049; Copyright; Avail.: Other Sources

The theory of equivalent networks is extended to a class of switched-capacitor (SC-) networks with a non-overlapping two-phase clock sequence. It is demonstrated how equivalent SC-networks with a minimum number of elements can be generated using a modified congruence transformation. With a correspondence to micro-strip (MS) descriptions, it is shown that the SC-transformation can generate equivalent MS-filters.
Author
Microstrip Devices; Electric Networks; Capacitance Switches; Equivalent Circuits; Transformations (Mathematics); Electric Filters

20060010166 Eidgenoessische Technische Hochschule, Zurich, Switzerland
Switched-Capacitor Frequency-Sampling N-Path Filter
vonGrunigen, D; Brugger, U. W.; Moschytz, G. S.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 209-212; In English; See also 20060010049; Copyright; Avail.: Other Sources

The theory of equivalent networks is extended to a class of switched-capacitor (SC-) networks with a non-overlapping two-phase clock sequence. It is demonstrated how equivalent SC-networks with a minimum number of elements can be generated using a modified congruence transformation. With a correspondence to micro-strip (MS) descriptions, it is shown that the SC-transformation can generate equivalent MS-filters.
Author
Frequencies; Sampling; Capacitance Switches; Electric Filters

20060010167 General Electric Co., USA
A New Circuit Simulation Program Based on a Tree-Link Approach
deGeus, Aart J.; Rohrer, Ronald A.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 702-704; In English; See also 20060010049
Contract(s)/Grant(s): NSF ECS-80-07684; Copyright; Avail.: Other Sources

A new transient analysis circuit simulation program based on a tree-link partitioning approach is presented as an

alternative to nodal analysis. At every time step during the analysis an optimal tree is chosen thus avoiding ill-conditionning of the set of equations describing the circuit. The system thus obtained can be solved iteratively. The tree incorporates if possible the elements with the smallest resistance values and is found through row/column manipulations of the incidence matrix. These operations that can be characterized symbolically in terms of premultiplications by elementary matrices can be rendered sparse and efficient.
Author
Circuits; Iteration; Simulation; Trees (Mathematics)

20060010168 Sandia National Labs., Albuquerque, NM, USA
A Survey of IIR Adaptive Filtering Algorithms
Stearns, S. D.; David, R. A.; Etter, D. M.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 709-711; In English; See also 20060010049
Contract(s)/Grant(s): DE-AC04-76-DP00789; Copyright; Avail.: Other Sources

Several adaptive algorithms for IIR filters have been presented in recent years. These algorithms can be categorized as gradient search or non-gradient search. We present here an example in which a non-quadratic, multimodal error surface is possible. In particular, a case is presented which models a fourth-order FIR plant with a twopole adaptive IIR filter. The resulting error surface has three distinct minima. Using this example, we compare the NRLMS (gradient search) algorithm with the Genetic (non-gradient search) Algorithm. A combination of the two algorithms is then presented which has improved performance over the individual algorithms.
Author
Algorithms; Surveys; Mathematical Models; IIR Filters; Adaptive Filters

20060010169 Carnegie-Mellon Univ., Pittsburgh, PA, USA
A Menu-Driven Graphical User Environment For Cad'
Slack, T. B.; Director, S. W.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 248-250; In English; See also 20060010049
Contract(s)/Grant(s): DAAG/29/79/C/0213; Copyright; Avail.: Other Sources

For the most part, papers which have been published in the CAD area introduce new algorithms and or programs but, in general, do not concern themselves with the usermachine environment in which they are to be used. The result is that the circuit designer is often expected to employ a number of different programs, each having a different input language and assuming a different design methodology. This paper describes an approach aimed at creating a more uniform environment for computer-aided design programs.
Author
Algorithms; Computer Aided Design; Graphical User Interface; Electrical Engineering

20060010170 California Inst. of Tech., Pasadena, CA, USA
Chip Assembly Tools
Trimberger, Stephen; Kingsley, Chris; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 252-255; In English; See also 20060010049; Copyright; Avail.: Other Sources

In large-scale Integrated circuit design, chip assembly is more difficult, more time consuming, and more error prone than the design of the low-level cells. Assembly errors tend to persist until late in the design cycle requiring extensive rework Unfortunately, the tools traditionally provided for custom integrated circuit design address the problems of cell design well, but do not properly address the problems of chip assembly. A great deal of emphasis at Caltech has been placed on tools that do address chip assembly. This paper reports on some of these tools.
Author
Integrated Circuits; Electrical Engineering; Chips (Electronics)

20060010171 Massachusetts Inst. of Tech., Cambridge, MA, USA
Tools For The Design Of Large VLSI Circuits
Sussman, G. J.; Shrobe, H. E.; Batali, J.; Rivest, R. L.; Leiserson, C. E.; Penfield, P.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 256-259; In English; See also 20060010049
Contract(s)/Grant(s): N00014-80-C-D622; AFOSR-F49620-810054; Copyright; Avail.: Other Sources

For 'very large' systems, the design must be specified in terms of the algorithms to be implemented. Such an approach

will emphasize the process of compiling algorithmic descriptions, and constructing circuits that can efficiently implement them. The design of the SCHEME-81 microprocessor provided a situation in which design tools and methodologies could be developed and tested. Microcode for SCHEME-81 was compiled into a sequence of operations as well as the specifications of a machine. The machine specifications were used to construct large circuit modules. Several placement and routing tools were then available to connect the modules into the desired system.
Author
Algorithms; Very Large Scale Integration; Microprocessors; Computer Systems Design

20060010172 McGill Univ., Montreal, Quebec, Canada, Concordia Univ., Montreal, Quebec, Canada
Natural Modes, Eigenvalues - Classical And State-Space Settings
Reza, F. M.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 381-384; In English; See also 20060010049; Copyright; Avail.: Other Sources

A state space approach for the study of the general linear reciprocal passive dynamical system (n-port) is presented using energy functions. The parallelism between Kirchhoff's laws of the classical circuit theory and the statespace format is accentuated by an appropriate formulation. This procedure preserves the selfadjoint character of the incurring system operators. The equivalence of the classical natural modes and the characteristic values of the corresponding state-space dissipative operator is demonstrated. The quadratic bundle of operators associated with the Lagrange's energy functions provides a useful and potent link between the state-space method of study of the electrical circuits and the spectral analysis of operator theory.
Author
Eigenvalues; Circuits; Modal Response; Operators (Mathematics)

20060010173 Tri-State Univ., Angola, IN, USA
Lagrangian Functionals For Nonlinear Resistive Networks, Part 1, Mathematical Background
Fatic, Vuk M.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 284-287; In English; See also 20060010049; Copyright; Avail.: Other Sources

Path-dependent integrals are admitted as variables of Lagrangians. A restricted class of such integrals is considered here, namely those with variable upper limit and integrands which depend on generalized coordinates and their derivatives up to the second order. Appropriate generalized Lagrangian equations are derived and conditions for path-independence of integrals are discussed. Two variational principles are formulated for nonlinear reciprocal resistive networks.
Author
Integrals; Lagrangian Function; Nonlinearity; Applications of Mathematics

20060010174 Universidad de Sevilla, Spain
Section-Wise Uniform Functions: A New Tool For Modeling Nonlinear N-Port Networks
Heurtas, J. L.; Rueda, A.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 288-291; In English; See also 20060010049; Copyright; Avail.: Other Sources

A new procedure for representing multidimensional characteristics associated to a resistive n-port network is described. The new functions are an extension of section-wise piecewise-linear functions and can be interesting for approximating and synthesizing nonlinear networks. In particular, two subclasses (polynomic and spline-wise multidimensional functions) are considered in detail with reference to obtain their associated canonic global representations.
Author
Nonlinearity; Spline Functions; Mathematical Models; Electric Networks

20060010175 International Business Machines Corp., Yorktown Heights, USA
Analysis Of A Network Partitioning Technique
Burstein, Michael; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 477-480; In English; See also 20060010049; Copyright; Avail.: Other Sources

The paper is devoted to the following problem: given an interconnection network of a VLSI circuit, partition the set of components of this circuit into two subsets (usually of equal size) in a way that the number of nets connecting components from different subsets is as small as possible. This classical partitioning problem arises in many stages of VLSI design automation. It has an important relationship with the class of placement algorithms based on partitioning and with the characterization of logic structure. In this paper we first develop the hypergraph model of logic network, which seems to be

more appropriate for partitioning problem then traditional graph-theoretic model, then we calculate the average number of nets dissected by all possible partitions (i.e. expected number of dissected nets by a random partition). It turns out that the average number of dissected nets is almost independent of the network structure and can be determined in terms of numbers of terminals in the nets. Finally we examine and compare several simple partitioning algorithms. We introduce several constructive procedures generating reasonable partitions in linear time and describe the methodology for iterative improvement which is similar to classical Kernighan-Lin technique, produces the same quality partitions, but is the order of magnitude faster.
Author
Logic Circuits; Very Large Scale Integration; Mathematical Models

20060010176 Tektronix, Inc., Beaverton, OR, USA
Techniques And Controls For A Cell-Expansion Router
Bonzer, Roger P.; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 487-490; In English; See also 20060010049; Copyright; Avail.: Other Sources

Cell-expansion routers are usually called upon to complete the last interconnections of a circuit board. Sometimes though, the router will find a path with 'less than ideal' characteristics which creates unnecessary obstructions for future paths. Using a cell-expansion algorithm should not force acceptance of inferior paths nor require large amounts of computer time. By understanding the characteristics of the cell-expansion router and identifying the parameters affecting the quality of the path, the routing algorithm can be made more intelligent and thereby choose a better path. This paper examines the techniques of: 1) two-pattern searching, 2) cell-data analysis, 3) search-pattern control, 4) line-shooting from a cell-expansion router, 5) multiplehit analysis, and 6) altering the completed path. Use of these techniques will not always guarantee 100% routing, but it should reduce the amount of interactive clean-up time by eliminating the poor quality paths.
Author
Algorithms; Circuit Boards; Electrical Engineering; Iteration

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*.

20060009163 Knolls Atomic Power Lab., Schenectady, NY, USA
Two-Phase Frictional Pressure Drop Multipliers for SUVA R-134a Flowing in a Rectangular Duct
Vassallo, P.; Keller, K.; Dec. 13, 2004; 24 pp.; In English
Report No.(s): DE2005-850141; LM-04K165; No Copyright; Avail.: National Technical Information Service (NTIS)

The adiabatic two-phase frictional multipliers for SUVA, R-134a flowing in a rectangular duct (with D(sub H) = 4.8 mm) have been measured for 3 nominal system pressures (0.9 MPa, T(sub sat)=35.5 deg C; 1.38 MPa, T(sub sat)=51.8 deg C; and 2.41 MPa, T(sub sat)=75.9 deg C) and 3 nominal mass fluxes (510, 1020 and 2040 kg/m(sup 2)/s). The data is compared with several classical correlations to assess their predictive capabilities. The Lockhart-Martinelli model gives reasonable results at the lowest pressure and mass flux, near the operating range of most refrigeration systems, but gives increasingly poor comparisons as the pressure and mass flux are increased. The Chisholm B-coefficient model is found to best predict the data over the entire range of test conditions; however, there is significant disagreement at the highest pressure tested (with the model over predicting the data upwards of 100% for some cases). The data shows an increased tendency toward homogenous flow as the pressure and flow rate are increased, and in fact the homogeneous model best predicts the bulk of the data at the highest pressure tested.
NTIS
Ducts; Friction Factor; Multipliers; Two Phase Flow

20060009961 Department of Energy, Washington, DC USA
Fundamental Study of Dispersed Multiphase Flows at Small Scales, August 1, 2003 - July 31, 2005
Acrivos, A.; Khusid, B.; Koplik, J.; Jul. 31, 2005; 6 pp.; In English
Report No.(s): DE2005-839346; No Copyright; Avail.: Department of Energy Information Bridge

During the two-year period covered by this report, our research on Dispersed Multiphase Flows at Small Scales focused on two broad areas: (I) The Rheology of Suspensions of non-Colloidal Particles; and, (II) The Transport of a Nano-Sized

Particle through a Fluid-Filled Nano-Channel. These two parts of our program will be considered separately.
NTIS
Multiphase Flow; Colloids

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*.

20060009005 NASA Kennedy Space Center, Cocoa Beach, FL, USA
THERMAL INSULATION SYSTEMS
Augustynowicz, Stanislaw D., Inventor; Fesmire, James E., Inventor; November 22, 2005; 15 pp.; In English
Patent Info.: Filed 20 Aug. 2001; US-Patent-6,967,051; US-Patent-Appl-939286; US-Patent-Appl-302315; NASA-Case-KSC-1202-2; No Copyright; Avail.: CASI: A03, Hardcopy

Thermal insulation systems and with methods of their production. The thermal insulation systems incorporate at least one reflection layer and at least one spacer layer in an alternating pattern. Each spacer layer includes a fill layer and a carrier layer. The fill layer may be separate from the carrier layer, or it may be a part of the carrier layer, i.e., mechanically injected into the carrier layer or chemically formed in the carrier layer. Fill layers contain a powder having a high surface area and low bulk density. Movement of powder within a fill layer is restricted by electrostatic effects with the reflection layer combined with the presence of a carrier layer, or by containing the powder in the carrier layer. The powder in the spacer layer may be compressed from its bulk density. The thermal insulation systems may further contain an outer casing. Thermal insulation systems may further include strips and seams to form a matrix of sections. Such sections serve to limit loss of powder from a fill layer to a single section and reduce heat losses along the reflection layer.
Official Gazette of the U.S. Patent and Trademark Office
Thermal Insulation; Systems Engineering

20060009012 NASA Johnson Space Center, Houston, TX, USA
Flexible Multi-Shock Shield
Christiansen, Eric L., Inventor; Crews, Jeanne L., Inventor; May 31, 2005; 11 pp.; In English; Original contains black and white illustrations
Patent Info.: Filed 16 Jun. 2001; US-Patent-6,899,009; US-Patent-Appl-892355; NASA-Case-MSC-23314-1; No Copyright; Avail.: CASI: A03, Hardcopy

Flexible multi-shock shield system and method are disclosed for defending against hypervelocity particles. The flexible multi-shock shield system and method may include a number of flexible bumpers or shield layers spaced apart by one or more resilient support layers, all of which may be encapsulated in a protective cover. Fasteners associated with the protective cover allow the flexible multi-shock shield to be secured to the surface of a structure to be protected.
Official Gazette of the U.S. Patent and Trademark Office
Shock Waves; Flexibility; Shielding

20060009014 NASA Johnson Space Center, Houston, TX, USA
Auto-Routable, Configurable, Daisy Chainable Data Acquisition System
Shuler, Robert L., Inventor; September 13, 2005; 19 pp.; In English; Original contains black and white illustrations
Patent Info.: Filed 21 May 2003; US-Patent-6,943,621; US-Patent-Appl-443234; NASA-Case-MSC-23539-1; No Copyright; Avail.: CASI: A03, Hardcopy

A method and apparatus for an acquisition system includes a plurality of sensor input signal lines. At least one of the plurality of sensor input signal lines operatively connects to at least one of a plurality of amplifier circuits. At least one of the plurality of amplifier circuits operatively connects to at least one of a plurality of filter circuits.
Official Gazette of the U.S. Patent and Trademark Office
Data Acquisition; Sensors; Mechanical Engineering

20060009150 NASA Ames Research Center, Moffett Field, CA, USA

Carbon Nanotube Purification

Delzeit, Lance D., Inventor; Delzeit, Clement J., Inventor; December 06, 2005; 11 pp.; In English; Original contains black and white illustrations

Patent Info.: Filed 25 Apr. 2002; US-Patent-6,972,056; US-Patent-Appl-SN-135013; NASA-Case-ARC-14733-1; No Copyright; Avail.: CASI: A03, Hardcopy

A method for cleaning or otherwise removing amorphous carbon and other residues that arise in growth of a carbon nanotube (CNT) array. The CNT array is exposed to a plurality of hydroxyls or hydrogen, produced from a selected vapor or liquid source such as H2O or H2O2. and the hydroxyls or hydrogen (neutral or electrically charged) react with the residues to produce partly or fully dissolved or hydrogenated or hydroxylizated products that can be removed or separated from the CNT array. The hydroxyls or hydrogen can be produced by heating the CNT array, residue and selected vapor or liquid source or by application of an electromagnetic excitation signal with a selected frequency or range of frequencies to dissociate the selected vapor or liquid. The excitation frequency can be chirped to cover a selected range of frequencies corresponding to dissociation of the selected vapor or liquid. Sonication may be uscd to supplement dissociation of the H2O and/or H2O2.

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

Carbon Nanotubes; Purification

20060009919 Oak Ridge National Lab., TN USA

Heavy Vehicle Propulsion Materials Program Quarterly Progress Report for April through June 2002

Johnson, D. R.; January 2002; 94 pp.; In English

Contract(s)/Grant(s): DE-AC05-00OR22725

Report No.(s): PB2006-107691; No Copyright; Avail.: National Technical Information Service (NTIS)

The objective of this work is to evaluate cast austenitic stainless steels as high-performance alternatives to SiMo ductile cast iron, which is currently the standard material used in most diesel engines for exhaust manifold and turbocharger housing components. The new material must be able to withstand prolonged exposure at temperatures of 750 degs C or above, as well as to survive the severe thermal cycling from near room-temperature to such high-temperatures without developing cracks. This project has tested commercially available cast alloys, as well as developed new, modified cast alloys with significantly enhanced performance. The ultimate project goal is to provide high-performance, reliable materials that are also cost-effective for such applications.

NTIS

Diesel Engines; Propulsion; Propulsion System Configurations; Propulsion System Performance

20060009930 Oak Ridge National Lab., TN USA

Heavy Vehicle Propulsion Materials Program Quarterly Progress Report for January through March 2002

Johnson, D. R.; January 2002; 86 pp.; In English

Contract(s)/Grant(s): DE-AC05-00OR22725

Report No.(s): PB2006-107692; No Copyright; Avail.: National Technical Information Service (NTIS)

The objective of this work is to evaluate cast austenitic stainless steels as high-performance alternatives to SiMo ductile cast iron, which is currently the standard material used in most diesel engines for exhaust manifold and turbocharger housing components. The new material must be able to withstand prolonged exposure at temperatures of 750 degs C or above, as well as to survive the severe thermal cycling from near room-temperature to such high-temperatures without developing cracks. This project has tested commercially available cast alloys, as well as developed new, modified cast alloys with significantly enhanced performance. The ultimate project goal is to provide high-performance, reliable materials that are also cost-effective for such applications.

NTIS

Diesel Engines; Propulsion; Propulsion System Configurations; Propulsion System Performance

20060009998 Praxair, Inc., Tonawanda, NY USA

Development of OTM Syngas Process and Testing of Syngas Derived Ultra-clean Fuels in Diesel Engines and Fuel Cells. Final Report, January 1, 2001-December 31, 2004

Robinson, E. T.; Sirman, J.; Apte, P.; Gui, X.; Bulicz, T. R.; May 2005; 208 pp.; In English

Report No.(s): DE2005-860173; No Copyright; Avail.: National Technical Information Service (NTIS)

This final report summarizes work accomplished in the Program from January 1, 2001 through December 31, 2004 Most

of the key technical objectives for this program were achieved. A breakthrough material system has lead to the development of an OTM (oxygen transport membrane) compact planar reactor design capable of producing either syngas or hydrogen. The planar reactor shows significant advantages in thermal efficiency and a step change reduction in costs compared to either autothermal reforming or steam methane reforming with CO2 recovery. Syngas derived ulltra-clean transportation fuels were tested in the Nuvera fuel cell modular pressurized reactor and in International Truck and Engine single cylinder test engines. The studies compared emission and engine performance of conventional base fuels to various formulations of ultra-clean gasoline or diesel fuels. A proprietary BP oxygenate showed significant advantage in both applications for reducing emissions with minimal impact on performance. In addition, a study to evaluate new fuel formulations for an HCCI engine was completed.
NTIS
Clean Fuels; Diesel Engines; Fuel Cells; Membranes; Synthesis Gas

20060010035 NASA Marshall Space Flight Center, Huntsville, AL, USA
Resistive Exercise Device
Smith, Damon C., Inventor; October 25, 2005; 21 pp.; In English; Original contains black and white illustrations
Patent Info.: Filed 26 Sep. 2002; US-Patent-6,958,032; US-Patent-Appl-263288; NASA-Case-MSC-23196-1; No Copyright; Avail.: CASI: A03, Hardcopy

An exercise device 10 is particularly well suited for use in low gravity environments, and includes a frame 12 with plurality of resistance elements 30,82 supported in parallel on the frame. A load transfer member 20 is moveable relative to the frame for transferring the applied force to the free end of each captured resistance element. Load selection template 14 is removably secured both to the load transfer member, and a plurality of capture mechanisms engage the free end of corresponding resistance elements. The force applying mechanism 53 may be a handle, harness or other user interface for applying a force to move the load transfer member.
Official Gazette of the U.S. Patent and Trademark Office
Physical Exercise; Mechanical Engineering; Resistance

20060010036 NASA Marshall Space Flight Center, Huntsville, AL, USA
Microwave Medical Treatment Apparatus and Method
Arndt, G. Dickey, Inventor; Ngo, Phong H., Inventor; Carl, James R., Inventor; George, W. Rflfoul, Inventor; September 13, 2005; 19 pp.; In English; Original contains black and white illustrations
Patent Info.: Filed 29 Nov. 2002; US-Patent-6,944,504; US-Patent-Appl-302323; US-Patent-Appl-746533; US-Patent-6,675,050; US-Patent-Appl-511961; No Copyright; Avail.: CASI: A03, Hardcopy

Methods, simulations, and apparatus are provided that may be utilized for medical treatments which are especially suitable for treatment of benign prostatic hyperplasia (BPH). In a preferred embodiment, a plurality of separate microwave antennas are utilized to heat prostatic tissue to promote necrosing of the prostatic tissue that relieves the pressure of the prostatic tissue against the urethra as the body reabsorbs the necrosed or dead tissue. By utilizing constructive and destructive interference of the microwave transmission, the energy can be deposited on the tissues to be necrosed while protecting other tissues such as the urethra. Saline injections to alter the conductivity of the tissues may also be used to further focus the energy deposits. A computer simulation is Provided that can be used to Predict the resulting temperature profile produced in the prostatic tissue. By changing the various control features of one or more catheters and the methods of applying microwave energy, a temperature profile can be predicted and produced that is similar to the temperature profile desired for the particular patient.
Official Gazette of the U.S. Patent and Trademark Office
Medical Equipment; Microwave Transmission; Computerized Simulation

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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*.

20060009304 NASA Langley Research Center, Hampton, VA, USA
A Micromechanics-Based Damage Model for [+/- Theta/90n]s Composite Laminates
Mayugo, Joan-Andreu; Camanho, Pedro P.; Maimi, Pere; Davila, Carlos G.; March 2006; 43 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 581.02.07.07
Report No.(s): NASA/TM-2006-214285; L-19242; Copyright; Avail.: CASI: A03, Hardcopy

A new damage model based on a micromechanical analysis of cracked [+/- Theta/90n]s laminates subjected to multiaxial loads is proposed. The model predicts the onset and accumulation of transverse matrix cracks in uniformly stressed laminates, the effect of matrix cracks on the stiffness of the laminate, as well as the ultimate failure of the laminate. The model also accounts for the effect of the ply thickness on the ply strength. Predictions relating the elastic properties of several laminates and multiaxial loads are presented.
Author
Micromechanics; Damage; Loads (Forces); Composite Materials; Laminates; Failure; Cracks

20060009470 NASA Langley Research Center, Hampton, VA, USA, Army Research Lab., Hampton, VA, USA
Effect of Reinforcement Architecture on Fracture of Selectively Reinforced Metallic Compact Tension Specimens
Abada, Christopher H.; Farley, Gary L.; Hyer, Michael W.; March 2006; 41 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): 759.07.11
Report No.(s): NASA/TM-2006-214286; L-19238; ARL-TR-3769; Copyright; Avail.: CASI: A03, Hardcopy

A computer-based parametric study of the effect of reinforcement architectures on fracture response of aluminum compact-tension (CT) specimens is performed. Eleven different reinforcement architectures consisting of rectangular and triangular cross-section reinforcements were evaluated. Reinforced specimens produced between 13 and 28 percent higher fracture load than achieved with the non-reinforced case. Reinforcements with blunt leading edges (rectangular reinforcements) exhibited superior performance relative to the triangular reinforcements with sharp leading edges. Relative to the rectangular reinforcements, the most important architectural feature was reinforcement thickness. At failure, the reinforcements carried between 58 and 85 percent of the load applied to the specimen, suggesting that there is considerable load transfer between the base material and the reinforcement.
Author
Computer Techniques; Aluminum; Fracturing; Loads (Forces); Blunt Leading Edges; Sharp Leading Edges; Failure

20060009472 NASA Glenn Research Center, Cleveland, OH, USA
Composite Erosion by Computational Simulation
Chamis, Christos C.; February 2006; 29 pp.; In English; SAMPE 2006 Conference and Exhibition, 30 Apr. - 4 May 2006, Long Beach, CA, USA
Contract(s)/Grant(s): WBS 754.02.07.03
Report No.(s): NASA/TM-2006-214096; E-15300-1; No Copyright; Avail.: CASI: A03, Hardcopy

Composite degradation is evaluated by computational simulation when the erosion degradation occurs on a ply-by-ply basis and the degrading medium (device) is normal to the ply. The computational simulation is performed by a multi factor interaction model and by a multi scale and multi physics available computer code. The erosion process degrades both the fiber and the matrix simultaneously in the same slice (ply). Both the fiber volume ratio and the matrix volume ratio approach zero while the void volume ratio increases as the ply degrades. The multi factor interaction model simulates the erosion degradation, provided that the exponents and factor ratios are selected judiciously. Results obtained by the computational composite mechanics show that most composite characterization properties degrade monotonically and approach ‘zero’ as the ply degrades completely.
Author
Degradation; Erosion; Void Ratio; Computer Programs

20060009495 Los Alamos National Lab., NM USA

Effects of Various Blowout Panel Configurations on the Structural Response of Los Alamos National Laboratory Building 16-340 to Internal Explosions

January 2005; 168 pp.; In English

Report No.(s): DE2005-861280; LA-14196-T; No Copyright; Avail.: National Technical Information Service (NTIS)

The risk of accidental detonation is present whenever any type of high explosives processing activity is performed. These activities are typically carried out indoors to protect processing equipment from the weather and to hide possibly secret processes from view. Often, highly strengthened reinforced concrete buildings are employed to house these activities. These buildings may incorporate several design features, including the use of lightweight frangible blowout panels, to help mitigate blast effects. These panels are used to construct walls that are durable enough to withstand the weather, but are of minimal weight to provide overpressure relief by quickly moving outwards and creating a vent area during an accidental explosion. In this study the behavior of blowout panels under various blast loading conditions was examined. External loadings from explosions occurring in nearby rooms were of primary interest. Several reinforcement systems were designed to help blowout panels resist failure from external blast loads while still allowing them to function as vents when subjected to internal explosions. The reinforcements were studied using two analytical techniques, yield-line analysis and modal analysis, and the hydrocode AUTODYN. A blowout panel reinforcement design was created that could prevent panels from being blown inward by external explosions. This design was found to increase the internal loading of the building by 20%, as compared with nonreinforced panels. Nonreinforced panels were found to increase the structural loads by 80% when compared to an open wall at the panel location.

NTIS

Blowouts; Explosions; Panels

20060009943 NASA Glenn Research Center, Cleveland, OH, USA

Probabilistic Structural Evaluation of Uncertainties in Radiator Sandwich Panel Design

Kuguoglu, Latife; Ludwiczak, Damian; March 2006; 23 pp.; In English; Earth and Space 2006, 5-8 Mar. 2006, Houston, TX, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 22-794-20-69

Report No.(s): NASA/TM-2006-214116; E-15451; Copyright; Avail.: CASI: A03, Hardcopy

The Jupiter Icy Moons Orbiter (JIMO) Space System is part of the NASA's Prometheus Program. As part of the JIMO engineering team at NASA Glenn Research Center, the structural design of the JIMO Heat Rejection Subsystem (HRS) is evaluated. An initial goal of this study was to perform sensitivity analyses to determine the relative importance of the input variables on the structural responses of the radiator panel. The desire was to let the sensitivity analysis information identify the important parameters. The probabilistic analysis methods illustrated here support this objective. The probabilistic structural performance evaluation of a HRS radiator sandwich panel was performed. The radiator panel structural performance was assessed in the presence of uncertainties in the loading, fabrication process variables, and material properties. The stress and displacement contours of the deterministic structural analysis at mean probability was performed and results presented. It is followed by a probabilistic evaluation to determine the effect of the primitive variables on the radiator panel structural performance. Based on uncertainties in material properties, structural geometry and loading, the results of the displacement and stress analysis are used as an input file for the probabilistic analysis of the panel. The sensitivity of the structural responses, such as maximum displacement and maximum tensile and compressive stresses of the facesheet in x and y directions and maximum VonMises stresses of the tube, to the loading and design variables is determined under the boundary condition where all edges of the radiator panel are pinned. Based on this study, design critical material and geometric parameters of the considered sandwich panel are identified.

Author

Sensitivity Analysis; Structural Analysis; Panels; Design Analysis; Performance Tests; Structural Design; Tensile Stress

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ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells; and solar, geothermal, windpower, and waterwave conversion systems; energy storage; and traditional power generators. For technologies related to nuclear energy production see *73 Nuclear Physics*. For related information see also *07 Aircraft Propulsion and Power; 20 Spacecraft Propulsion and Power*; and *28 Propellants and Fuels*.

20060009086 National Renewable Energy Lab., Golden, CO USA
Workplan and Annex: Solar Resource Knowledge Management
Renne, D.; Jan. 2005; 10 pp.; In English
Report No.(s): DE2005-861214; NREL/CP-710-37607; No Copyright; Avail.: Department of Energy Information Bridge

Solar Resource Knowledge Management will be a new task under the International Energy Agency's Solar Heating and Cooling Programme. The task development has involved researchers from Germany, France, Switzerland, Spain, Portugal, Italy, Canada, the U.S. that have been engaged in the use of satellite imagery to develop solar resource maps and datasets around the world. The task will address three major areas: (1) 'Benchmarking' of satellite-based solar resource methods so that resource information derived from approaches developed in one country or based on a specific satellite can be quantitatively intercompared with methods from other countries using different satellites, as well as with ground data; (2) Data archiving and dissemination procedures, especially focusing on access to the data by end users; and (3) basic R&D for improving the reliability and usability of the data, and for examining new types of products important to the solar industry, such as solar resource forecasts.
NTIS
Industries; Resources Management; Solar Cooling; Solar Heating

20060009089 National Renewable Energy Lab., Golden, CO USA
FY 2005 Final Report: Solar Radiometry and Metrology Task PVC57301
Myers, D. R.; Stoffel, T. L.; Andreas, A. M.; Wilcox, S. M.; Gotseff, P.; January 2005; 64 pp.; In English
Report No.(s): DE2005-859910; NREL/TP-560-38917; No Copyright; Avail.: National Technical Information Service (NTIS)

This report documents technical detail for work performed in the Solar Radiometry and Metrology Task in the period from October 1, 2004 to September 30, 2005.
NTIS
Metrology; Radiometers

20060009158 National Renewable Energy Lab., Golden, CO USA
Improving Battery Design with Electro-Thermal Modeling
Pesaran, A.; Aug. 2005; 24 pp.; In English
Report No.(s): DE2005-859323; NREL/PR-540-38164; No Copyright; Avail.: National Technical Information Service (NTIS)

Temperature greatly affects the performance and life of batteries in electric and hybrid vehicles under real driving conditions, so increased attention is being paid to battery thermal management. Sophisticated electrochemical models and finite element analysis tools are available for predicting the thermal performance of batteries, but each has limitations. In this study we describe an electro-thermal finite element approach that predicts the thermal performance of a cell or module with realistic geometry, material properties, loads, and boundary conditions.
NTIS
Conferences; Electric Batteries; Temperature Effects; Temperature Control

20060009297 NASA Glenn Research Center, Cleveland, OH, USA
MEMS CLOSED CHAMBER HEAT ENGINE and ELECTRIC GENERATOR
Landis, Geoffrey A., Inventor; December 27, 2005; 18 pp.; In English
Patent Info.: Filed 16 Sep. 2003; US-Patent-6,978,611; US-Patent-Appl-SN-453251; NASA-Case-LEW-17391-1; No Copyright; Avail.: CASI: A03, Hardcopy

A heat engine, preferably combined with an electric generator, and advantageously implemented using micro-electromechanical system (MEMS) technologies as an array of one or more individual heat engine/generators. The heat engine is based on a closed chamber containing a motive medium, preferably a gas; means for alternately enabling and disabling transfer of thermal energy from a heat source to the motive medium; and at least one movable side of the chamber that moves

in response to thermally-induced expansion and contraction of the motive medium, thereby converting thermal energy to oscillating movement. The electrical generator is combined with the heat engine to utilize movement of the movable side to convert mechanical work to electrical energy, preferably using electrostatic interaction in a generator capacitor. Preferably at least one heat transfer side of the chamber is placed alternately into and out of contact with the heat source by a motion capacitor, thereby alternately enabling and disabling conductive transfer of heat to the motive medium.
Official Gazette of the U.S. Patent and Trademark Office
Microelectromechanical Systems; Heat Engines; Heat Transfer; Electrostatic Generators; Thermal Energy; Temperature Effects

20060009493 National Renewable Energy Lab., Golden, CO USA, Smith Coll., Northampton, MA, USA
Update on Reducing the Uncertainty in Solar Radiometric Measurements
Myers, D.; Reda, I.; Wilcox, S.; Lester, A.; May 2005; 30 pp.; In English
Report No.(s): DE2005-861422; NREL/PR-560-38202; No Copyright; Avail.: National Technical Information Service (NTIS)
The report contains a presentation giving an update on reducing the uncertainty in solar radiometric measurements.
NTIS
Radiometers; Solar Radiation

20060010048 NASA Johnson Space Center, Houston, TX, USA, Georgia Inst. of Tech., Atlanta, GA, USA
Carbon-Nanotube-Based Electrochemical Double-Layer Capacitor Technologies for Spaceflight Applications
Arepalli, S.; Fireman, H.; Huffman, C.; Maloney, P.; Nikolaev, P.; Yowell, L.; Kim, K.; Kohl, P. A.; Higgins, C. D.; Turano, S. P.; JOM; December 2005, pp. 26-31; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNJ05HA25G; DASG60-03-1-0004; Copyright; Avail.: Other Sources
Electrochemical double-layer capacitors, or supercapacitors, have tremendous potential as high-power energy sources for use in low-weight hybrid systems for space exploration. Electrodes based on single-wall carbon nanotubes (SWCNTs) offer exceptional power and energy performance due to the high surface area, high conductivity, and the ability to functionalize the SWCNTs to optimize capacitor properties. This paper will report on the preparation of electrochemical capacitors incorporating SWCNT electrodes and their performance compared with existing commercial technology. Preliminary results indicate that substantial increases in power and energy density are possible. The effects of nanotube growth and processing methods on electrochemical capacitor performance is also presented. The compatibility of different SWCNTs and electrolytes was studied by varying the type of electrolyte ions that accumulate on the high-surface-area electrodes.
Author
Electrochemical Capacitors; Carbon Nanotubes; Electrolytes; Nanostructure Growth; Electrodes; Flux Density

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ENVIRONMENT POLLUTION

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

20060009002 NASA Kennedy Space Center, Cocoa Beach, FL, USA
APPARATUS and METHOD FOR TREATING POLLUTANTS IN A GAS USING HYDROGEN PEROXIDE and UV LIGHT
Cooper, Charles David, Inventor; Clauseu, christian Anthony, Inventor; November 29, 2005; 9 pp.; In English
Patent Info.: Filed 18 Jan. 2002; US-Patent-6,9696,486; US-Patent-Appl-SN-056842; NASA-Case-KSC-12209; No Copyright; Avail.: CASI: A02, Hardcopy
An apparatus for treating pollutants in a gas may include a source of hydrogen peroxide, and a treatment injector for creating and injecting dissociated hydrogen peroxide into the flow of gas. The treatment injector may further include an injector housing having an inlet, an outlet, and a hollow interior extending there between. The inlet may be connected in fluid communication with the source of hydrogen peroxide so that hydrogen peroxide flows through the hollow interior and toward the outlet. At least one ultraviolet (UV) lamp may be positioned within the hollow interior of the injector housing. The at least one UV lamp may dissociate the hydrogen peroxide flowing through the tube. The dissociated hydrogen peroxide may be injected into the flow of gas from the outlet for treating pollutants, such as nitrogen oxides.
Official Gazette of the U.S. Patent and Trademark Office
Gas Flow; Contaminants; Hydrogen Peroxide; Injectors; Nitrogen Oxides; Ultraviolet Radiation

20060009107 National Renewable Energy Lab., Golden, CO USA
Analysis of the Hydrogen Infrastructure Needed to Enable Commercial Introduction of Hydrogen-Fueled Vehicles
Melendez, M.; Apr. 2005; 36 pp.; In English
Report No.(s): DE2005-859417; NREL/PR-540-37802; No Copyright; Avail.: National Technical Information Service (NTIS)
No abstract available
Charts; Conferences; Hydrogen

20060009121 National Oceanic and Atmospheric Administration, Research Triangle Park, NC, USA
Approach to Unified Process-Based Regional Emission Flux Modeling Platform
Benjey, W. G.; Pierce, T. E.; January 2004; 14 pp.; In English
Report No.(s): PB2006-106647; EPA/600/R-06/020; No Copyright; Avail.: CASI: A03, Hardcopy
The trend towards episodic modeling of environmentally-dependent emissions is increasing, with models available or under development for dust, ammonia, biogenic volatile organic compounds, soil nitrous oxide, pesticides, sea salt and chloride, mercury, and wild fire emissions. These emissions are estimated as hourly values using numerical modeling from physical principles, resulting in more realistic values than the historical approach of using national annual air quality inventories with temporal and spatial disaggregation factors. The basis of many of these new modeling tools is a surface flux model, either one-way or bi-directional, underpinned by similar surface boundary physics, with modifications or parameters to treat the flux of a specific emission compound or class of emissions. These developments will result in closely-related emission modeling tools with overlapping input data requirements. The emission flux models will need to be installed in or coupled to an emission modeling system, such as the Sparse Matrix Operator Kernel Emission (SMOKE) system. To maintain a unified one-atmosphere approach to air quality modeling, and to ensure a consistent scientific basis and computational efficiency, a unified emission flux modeling approach capable of estimating all or most of the environmentally-dependent emissions is recommended.. This can be accomplished by establishing a model platform containing representations of the basic chemical and physical mechanisms for mass fluxes of gaseous and particulate emissions. The modeled emissions will be merged by SMOKE with reported emission data from an inventory and supplied to the Community Multiscale Air Quality (CMAQ) model, a regional Eulerian grid model. In some instances, modeling of bi-directional fluxes will be necessary, which may require a closer coupling with CMAQ to accommodate reinitialization of the concentration field at each time step.
NTIS
Air Quality; Exhaust Emission; Dust; Ammonia; Pesticides; Nitrous Oxides; Soils

20060009123 Sandia National Labs., Albuquerque, NM USA
Integrated Computer Modeling Environment for Regional Land Use, Air Quality, and Transportation Planning
Hanley, C. J.; Marshall, N. L.; Apr. 1997; 20 pp.; In English
Report No.(s): PB2006-103591; SAND97-0886; No Copyright; Avail.: CASI: A03, Hardcopy
The Land Use, Air Quality, and Transportation Integrated Modeling Environment (LATIME) represents an integrated approach to computer modeling and simulation of land use allocation, travel demand, and mobile source emissions for the Albuquerque, New Mexico, area. This environment provides predictive capability combined with a graphical and geographical interface. The graphical interface shows the casual relationships between data and policy scenarios and supports alternative model formulations. Scenarios are launched from within a Geographic Information System (GIS), and data produced by each model component at each time step within a simulation is stored in the GIS. A menu-driven query system is utilized to review link-based results and regional and area-wide results. These results can also be compared across time or between alternative land use scenarios. Using this environment, policies can be developed and implemented based on comparative analysis, rather than on single-step future projections.
NTIS
Air Pollution; Air Quality; Computerized Simulation; Land Use; Models; Planning; Pollution Monitoring; Transportation

20060009473 Environmental Protection Agency, Research Triangle Park, NC USA
User's Guide for the AERMOD Terrain Preprocessor (AERMAP)
Oct. 2004; 108 pp.; In English
Report No.(s): PB2006-104821; EPA/454/B-03/003; No Copyright; Avail.: CASI: A06, Hardcopy
The U. S. Environmental Protection Agency (EPA), in conjunction with the American Meteorological Society (AMS), has developed a new air quality dispersion model, the AMS/EPA Regulatory Model (AERMOD). AERMOD is designed to

calculate air pollutant concentrations in all types of terrain, from flat prairie to complex mountainous situations. AERMOD does not process its own terrain. A preprocessor program, AERMAP, has been developed to process this terrain data in conjunction with a layout of receptors and sources to be used in AERMOD control files.
NTIS
Air Quality; Environment Models; Terrain

20060009474 Centers for Disease Control and Prevention, Atlanta, GA, USA
Morbidity and Mortality Weekly Report, Vol. 43, No. 2, January 21, 1994. Carbon Monoxide Levels During Indoor Sporting Events--Cincinnati, 1992-1993
Jan. 1994; 20 pp.; In English
Report No.(s): PB2006-103610; No Copyright; Avail.: CASI: A03, Hardcopy

Carbon monoxide (CO) produced by internal combustion engines is an indoor health hazard. High CO levels can occur during indoor sporting events such as tractor pulls that involve vehicles modified to achieve high horsepower. In January and March 1992 and January 1993, the Cincinnati Health Department evaluated CO levels during tractor pulls, monster-truck jumps, and a mud race event held in an indoor arena with a seating capacity of approximately 16,000 persons. This report summarizes findings from the evaluations. The engines of vehicles involved in the events in Cincinnati used a variety of high octane fuels and had limited exhaust systems but no emission-control devices. During each of these events, 1015 vehicles were operated usually one at a time during the 23-hour event. In addition, approximately 34 other support vehicles were used for towing and resurfacing grounds. For each of the three events, attendance was approximately 40% of the arenas capacity; in addition, the ventilation systems supply and exhaust operated maximally, and the ground level commercial truck entrance was opened completely. CO levels were recorded in the arena at approximately 15-minute intervals before each event and during the event. Measurements were recorded at different elevations in the public seating area; most recordings were obtained at the midpoint elevation (area of the maximal seating occupancy by the audience).
NTIS
Carbon Monoxide; Indoor Air Pollution; Mortality

20060009477 Office of Air Quality Planning and Standards, Research Triangle Park, NC USA
Economic Impact Analysis for the Final Nutritional Yeast NESHAP
Jan. 2001; 22 pp.; In English
Report No.(s): PB2006-103520; EPA/452/R-00/004; No Copyright; Avail.: CASI: A03, Hardcopy

This report evaluates the economic impacts of pollution control requirements on nutritional yeast manufacturing facilities. These requirements are designed to reduce emissions of HAPs into the atmosphere., Section 1 12 of the Clean Air Act Amendments of 1990 establishes the authority to set nqtional emission standards for hazardous air pollutants. The emissions of HAPs from nutritional yeast manufacturing originate from the fermentation process. Acetaldehyde is a constituent of VOC emissions and is the only known HAP to be emitted in significant quantity during the manufacture and production of nutritional yeast.
NTIS
Air Pollution; Manufacturing; Pollution Control; Yeast

20060009488 National Renewable Energy Lab., Golden, CO USA, West Virginia Univ., Morgantown, WV, USA
Emission Testing of Washington Metropolitan Area Transit Authority (WMATA) Natural Gas and Diesel Transit Buses
Melendez, M.; Taylor, J.; Zuboy, J.; Wayne, W. S.; Smith, D.; Dec. 2005; 44 pp.; In English
Report No.(s): DE2005-861488; NREL/TP-540-36355; No Copyright; Avail.: Department of Energy Information Bridge

The Washington Metropolitan Area Transit Authority serves the public transportation needs of metropolitan Washington, D.C., including Northern Virginia and Southern Maryland. Because the EPA has classified this area as a severe ozone non-attainment area, WMATA is continually working to reduce local air pollution while providing reliable, low-cost service to its customers. A variety of low-emission bus technologies can help WMATA, and other transit agencies, achieve these goals. Among these options are compressed natural gas (CNG) buses and low-sulfur diesel buses equipped with advanced emission control technologies. A total of twelve 40-foot, low-floor WMATA buses were tested using West Virginia University's Transportable Heavy-Duty Vehicle Emission Testing Laboratory. These buses were of two types: CNG and low-sulfur diesel (approximately 17 ppm sulfur). All CNG buses had lean burn natural gas engines and oxidation catalysts. All diesel buses had catalyzed particulate filters, and one group of diesel buses had exhaust gas recirculation (EGR). The buses were tested for numerous regulated and unregulated emissions, including hydrocarbons, carbon monoxide, oxides of nitrogen (NOx),

particulate matter (PM), and various toxic emissions. The increasingly strict EPA and California standards set for NOx and PM, particularly NOx, are considered to be the greatest challenge for heavy-duty engines. NOx is also of particular concern to the Metropolitan Washington, D.C., area because this area's ozone problem is considered to be largely NOx limited. As such, most of its air quality control measures are focused on an overall NOx reduction strategy. All buses were tested over the WMATA cycle, a custom drive cycle designed to represent real-world operation of the WMATA buses. The following are the four test bus configurations included in the study: CNG buses with model year (MY) 2004 John Deere 6081H engines, equipped with oxidation catalysts; CNG buses with MY 2001 Cummins Westport, Inc. (CWI) C Gas Plus engines, equipped with oxidation catalysts; Diesel buses with MY 2004 Detroit Diesel Corporation (DDC) Series 50 engines, equipped with catalyzed particulate filters and EGR; Diesel buses with MY 2000 DDC Series 50 engines, equipped with catalyzed particulate filters.
NTIS
Cities; Diesel Fuels; Natural Gas; Emission

20060009920 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Causes and Prevention of Symptom Complaints in Office Buildings. Distilling the Experience of Indoor Environmental Quality Investigators
Mendell, M. J.; Diamond, R. C.; Fisk, W. J.; January 2005; 12 pp.; In English
Report No.(s): DE2005-861237; LBNL-56382; No Copyright; Avail.: Department of Energy Information Bridge
The goal of this project was to develop empirically based recommendations for practical strategies, suitable for use by those who own, lease, or manage office space, to prevent building-related symptoms in office buildings. Ideas from six experienced building investigators were gathered and prioritized in a multi-day workshop. The top ranked problems identified were, in priority order: excessive building moisture, inadequate outdoor air, dust on indoor surfaces, indoor gases and odors, inadequate thermal control, and inadequate attention by management to indoor environments. The highest priority strategies recommended for preventing building-related symptoms were: managing water at building exteriors, operating ventilation systems per design intent, providing at least minimum ventilation rates, and maintaining indoor temperatures at 7 deg F plus or minus 2 deg. Findings in the scientific literature were generally consistent with these recommendations. IEQ investigators showed considerable agreement on the most important causes of symptom complaints in office buildings and the key methods for preventing these problems. Despite the range of climates in which they worked, the investigators agreed that the highest priority prevention strategy was managing water at building exteriors. These recommendations, generally consistent with available research findings, provide useful practical guidelines for those who own, manage or maintain office buildings. The empirical knowledge of practitioners offers more guidance here for choosing health-protective strategies than current science, although efficacy of these empirically based strategies generally has not been confirmed.
NTIS
Buildings; Distillation; Environmental Quality; Prevention; Public Health; Signs and Symptoms

20060009922 Illinois State Environmental Protection Agency, Springfield, IL, USA
Report to the General Assembly, Response to Public Act 92-0682. 'Effectiveness of On-Board Diagnostic I/M Testing.'
Sep. 2003; 32 pp.; In English
Report No.(s): PB2006-104912; IEPA/BOA-03/012; No Copyright; Avail.: CASI: A03, Hardcopy
On July 16, 2002, Public Act 92-0682 was adopted, modifying Section 13B-25 of the Illinois Vehicle Code to phase-in the On-Board Diagnostics (OBD) system testing as part of Illinois' mandatory vehicle emissions inspection and maintenance (I/M) programs. This report summarizes the effectiveness of OBD testing in Illinois, based upon review of data and information collected during the phase-in period beginning in July 2002 through March 2003.
NTIS
Combustion Products; Diagnosis; Exhaust Emission; Exhaust Gases; Inspection; Maintenance; Motor Vehicles

20060009924 Environmental Protection Agency, Research Triangle Park, NC USA
AERMOD: Latest Features and Evaluation Results
Jun. 2003; 42 pp.; In English
Report No.(s): PB2006-108483; EPA/454/R-03/003; No Copyright; Avail.: National Technical Information Service (NTIS)
AERMOD is an advanced plume model that incorporates updated treatments of the boundary layer theory, understanding of turbulence and dispersion, and includes handling of terrain interactions. The model was formally proposed by EPA in April 2000 as a replacement for the ISCST3 model. Several model enhancements were made as a result of public comment,

including the installation of the PRIME downwash algorithm. The latest version of the model, version 02222, has been placed on the EPA web site for beta test purposes. This paper reviews the latest features and updated evaluation results for AERMOD version 02222.
NTIS
Downwash; Augmentation; Terrain

20060009926 Environmental Protection Agency, Research Triangle Park, NC USA
Comparison of Regulatory Design Concentrations: AERMOD vs. ISCST3, CTDMPLUS, ISC-PRIME
Jun. 2003; 94 pp.; In English
Report No.(s): PB2006-108482; EPA/454/R-03/002; No Copyright; Avail.: CASI: A05, Hardcopy

This report is a consequence analysis for the implementation of a new air dispersion model. A consequence analysis is designed to give the user community a sense of how regulatory design concentrations from the new model compare to those from an established model via a series of representative examples. For this study, the new model is AERMOD with the PRIME algorithms. The existing regulatory models used in this report are ISCST3, ISC-PRIME, and CTDMPLUS. This analysis shows, for an extensive number of typical source scenarios, the effects of the new model as compared to the existing regulatory model which it replaces. Overall, except for complex terrain, the models produce rather similar results, although there are significant differences for individual source types and settings. As expected in complex terrain, AERMOD typically produces concentrations that are lower than ISCST3. The model evaluation results, where available, support the differences seen between the models.
NTIS
Air Pollution; Environment Models

20060009945 Agency for Toxic Substances and Disease Registry, Atlanta, GA USA
Public Health Assessment for Ram Leather Care Site, Charlotte, Mecklenburg County, North Carolina, January 31, 2006. EPA Facility ID: NCD982096653
Jan. 31, 2006; 76 pp.; In English
Report No.(s): PB2006-105506; No Copyright; Avail.: National Technical Information Service (NTIS)

The Ram Leather Care site is a former dry cleaning and leather restoration facility in Charlotte, North Carolina. The facility, which operated from 1977 to 1993, is situated in a rural area of eastern Mecklenburg County, North Carolina. Because of improper waste-disposal practices at Ram Leather Care, chlorinated solvents have contaminated the on-site drinking water well and nearby off-site private wells. Chlorinated solvents have been detected in drinking water wells at concentrations exceeding drinking water standards. The main contaminants of concern are tetrachloroethylene (PCE), trichloroethylene (TCE), cis-1,2-dichloroethylene (cis-1,2-DCE), and vinyl chloride. Groundwater is the only source of drinking water within at least 4 miles of the facility.
NTIS
Cleaning; Drying; Hazards; Health; Industries; Leather; North Carolina; Public Health; Toxic Diseases

20060009950 California Inst. of Tech., Pasadena, CA USA
Development of On-line Instrumentation and Techniques to Detect and Measure Particulates. (Quarterly Report, July 1, 2005-September 30, 2005)
Wu, S.; Palm, S.; Tang, Y.; Goddard, W. A.; Oct. 2005; 22 pp.; In English
Report No.(s): DE2005-859942; No Copyright; Avail.: National Technical Information Service (NTIS)

In this final quarter, we have continued to collect more field data. Here, in this report representative data collected in the field with turbine engine are presented. We also made substantial progress in calibration of standard particles using MOUDI.
NTIS
On-Line Systems; Particulates; Detection

20060009972 Ion Optics, Inc., Waltham, MA, USA
MEMS Chip CO2 Sensor for Building Systems Integration
Greenwald, A. C.; January 2005; 44 pp.; In English
Report No.(s): DE2005-860161; DOE/NT-41970; No Copyright; Avail.: National Technical Information Service (NTIS)

The objective of this research was to develop an affordable, reliable sensor to enable demand controlled ventilation (DCV). A significant portion of total energy consumption in the USA is used for heating or air conditioning (HVAC) buildings.

To assure occupant safety and fresh air levels in large buildings, and especially those with sealed windows, HVAC systems are frequently run in excess of true requirements as automated systems cannot now tell the occupancy level of interior spaces. If such a sensor (e.g. thermostat sized device) were available, it would reduce energy use between 10 and 20% in such buildings. A quantitative measure of fresh air is the concentration of carbon dioxide (CO2) present. An inert gas, CO2 is not easily detected by chemical sensors and is usually measured by infrared spectroscopy. Ion Optics research developed a complete infrared sensor package on a single MEMS chip. It contains the infrared (IR) source, IR detector and IR filter.
NTIS
Buildings; Carbon Dioxide; Chips; Chips (Electronics); Microelectromechanical Systems; Sensors; Systems Integration; Ventilation

20060009980 National Energy Technology Lab., Pittsburgh, PA USA
Comparative Evaluation of Ambient Fine Particulate Matter (PM2.5) Data Obtained from Urban and Rural Monitoring Sites Along the Upper River Valley. Final Technical Report. October 1, 1998 through December 21, 2004
Khosah, R. P.; Shimshock, J. P.; Squires, K.; Penland, J. L.; Dec. 27, 2004; 108 pp.; In English
Report No.(s): DE2005-860996; No Copyright; Avail.: National Technical Information Service (NTIS)

Advanced Technology Systems, Inc. (ATS), with Desert Research Institute (DRI) and Ohio University as subcontractors, was contracted by the NETL in September 1998 to manage the Upper Ohio River Valley Project (UORVP), which included the establishment and operation of four ambient air monitoring sites located in the Upper Ohio River Valley (UORV). Two urban and two rural monitoring sites were included in the UORVP. The four sites selected for the UOVRP were collocated at existing local or state air quality monitoring stations. The goal of the UORVP was to characterize the nature and composition of PM(sup 2.5) and its precursor gases. In the process, the objectives of the UORVP were to examine the ambient air concentrations of PM(sup 2.5) as compared with the promulgated PM(sup 2.5) standards, the geographical, seasonal and temporal variations of ambient air concentrations of PM(sup 2.5), the primary chemical constituents of PM(sup 2.5), and the correlations between ambient air concentrations of PM(sup 2.5) and its precursor gases, other gaseous pollutants and meteorological parameters. A variety of meteorological and pollutant measurement devices, including several different PM(sup 2.5) samplers that provided either real-time or integrated concentration data, were deployed at the monitoring sites. The frequency of integrated sampling varied throughout the UORVP study period and was as follows: 'Intensive' sampling periods were defined as periods in which samples were collected on a relatively frequent basis (ranged from 6-hour integrated samples collected round-the-clock to one 24-hour integrated sample collected every third day) and background' sampling periods were defined as periods in which 24-hour integrated samples were collected every third or sixth day. Sampling activities for the UORVP were initiated in February 1999 and concluded in February 2003. This Final Technical Progress Report summarizes the data analyses and interpretations conducted during the period from October 1998 through December 2004. This report was organized in accordance with the Guidelines for Organization of Technical Reports (September 2003).
NTIS
Cities; Particulates; Rivers; Valleys

20060009981 Utah Univ., Salt Lake City, UT, USA, Connecticut Univ., Storrs, CT, USA
Fundamentals of Mercury Oxidation in Flue Gas. (Report for August 1, 2004-July 31, 2005)
Lighty, J. S.; Helble, J.; Aug. 2005; 28 pp.; In English
Report No.(s): DE2005-860439; No Copyright; Avail.: National Technical Information Service (NTIS)

The objective of this project is to understand the importance of and the contribution of gas-phase and solid-phase coal constituents in the mercury oxidation reactions. The project involves both experimental and modeling efforts. The team is comprised of the University of Utah, Reaction Engineering International, and the University of Connecticut. The objective is to determine the experimental parameters of importance in the homogeneous and heterogeneous oxidation reactions; validate models; and, improve existing models. Parameters to be studied include HCl, NOx, and SO(sub 2) concentrations, ash constituents, and temperature. This report summarizes Year 2 results for the experimental and modeling tasks. Experiments in the mercury reactor are underway and interesting results suggested that a more comprehensive look at catalyzed surface reactions was needed. Therefore, much of the work has focused on the heterogeneous reactions. In addition, various chemical kinetic models have been explored in an attempt to explain some discrepancies between this modeling effort and others.
NTIS
Flue Gases; Oxidation

20060009983 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Parametric Evaluation of an Innovative Ultra-Violet Photocatalytic Oxidation (UVPCO) Air Cleaning Technology for Indoor Applications
Hodgson, A. T.; Sullivan, D. P.; Fisk, W. J.; Oct. 31, 2005; 68 pp.; In English
Report No.(s): DE2005-860388; LBNL-59074; No Copyright; Avail.: Department of Energy Information Bridge

An innovative Ultra-Violet Photocatalytic Oxidation (UVPCO) air cleaning technology employing a semitransparent catalyst coated on a semitransparent polymer substrate was evaluated to determine its effectiveness for treating mixtures of volatile organic compounds (VOCs) representative of indoor environments at low, indoor-relevant concentration levels. The experimental UVPCO contained four 30 by 30-cm honeycomb monoliths irradiated with nine UVA lamps arranged in three banks. A parametric evaluation of the effects of monolith thickness, air flow rate through the device, UV power, and reactant concentrations in inlet air was conducted for the purpose of suggesting design improvements. The UVPCO was challenged with three mixtures of VOCs. A synthetic office mixture contained 27 VOCs commonly measured in office buildings. A building product mixture was created by combining sources including painted wallboard, composite wood products, carpet systems, and vinyl flooring. The third mixture contained formaldehyde and acetaldehyde. Steady state concentrations were produced in a classroom laboratory or a 20-m(sub 3) chamber. Air was drawn through the UVPCO, and single-pass conversion efficiencies were measured from replicate samples collected upstream and downstream of the reactor. Thirteen experiments were conducted in total.
NTIS
Air Filters; Air Purification; Oxidation; Technology Utilization

20060009987 Arizona State Univ., Tempe, AZ, USA
Novel Approach to Mineral Carbonation: Enhancing Carbonation While Avoiding Mineral Pretreatment Process Cost. Annual Report: June 22, 2004 through June 21, 2005
McKelvy, M. J.; Chizmeshya, A. V. G.; Squires, K.; Carpenter, R. W.; Bearat, H.; Oct. 2005; 50 pp.; In English
Report No.(s): DE2005-860811; No Copyright; Avail.: National Technical Information Service (NTIS)

Known fossil fuel reserves, especially coal, can support global energy demands for centuries to come, if the environmental problems associated with CO2 emissions can be overcome. Unlike other CO2 sequestration candidate technologies that propose long-term storage, mineral sequestration provides permanent disposal by forming geologically stable mineral carbonates. Carbonation of the widely occurring mineral olivine (e.g., forsterite, Mg(sub 2)SiO(sub 4)) is a large-scale sequestration process candidate for regional implementation, which converts CO(sub 2) into the environmentally benign mineral magnesite (MgCO(sub 3)). The primary goal is cost-competitive process development. As the process is exothermic, it inherently offers low-cost potential. Enhancing carbonation reactivity is key to economic viability. Recent studies at the U.S. DOE Albany Research Center have established that aqueous-solution carbonation using supercritical CO(sub 2) is a promising process; even without olivine activation, 30-50% carbonation has been achieved in an hour. Mechanical activation (e.g., attrition) has accelerated the carbonation process to an industrial timescale (i.e., near completion in less than an hour), at reduced pressure and temperature. However, the activation cost is too high to be economical and lower cost pretreatment options are needed. Herein, we report our first year progress in exploring a novel approach that offers the potential to substantially enhance carbonation reactivity while bypassing pretreatment activation.
NTIS
Carbonization; Cost Effectiveness; Costs; Minerals; Pretreatment

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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*.

20060009016 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Chemistry of Rocks and Soils in Gusev Crater from the Alpha Particle X-ray Spectrometer
Gellert, R.; Rieder, R.; Anderson, R. C.; Brueckner, J.; Clark, B. C.; Dreibus, G.; Economou, T.; Klingelhoefer, G.; Lugmair, G. W.; Ming, D. W., et al.; Science; [2005]; Volume 305, pp. 829-832; In English; Original contains color illustrations; Copyright; Avail.: Other Sources

The alpha particle x-ray spectrometer on the Spirit rover determined major and minor elements of soils and rocks in Gusev crater in order to unravel the crustal evolution of planet Mars. The composition of soils is similar to those at previous landing

sites, as a result of global mixing and distribution by dust storms. Rocks (fresh surfaces exposed by the rock abrasion tool) resemble volcanic rocks of primitive basaltic composition with low intrinsic potassium contents. High abundance of bromine (up to 170 parts per million) in rocks may indicate the alteration of surfaces formed during a past period of aqueous activity in Gusev crater.
Author
Soils; Rocks; Mars Craters; Planetary Evolution; X Ray Spectrometers; Alpha Particles; Igneous Rocks

20060009017 NASA Johnson Space Center, Houston, TX, USA
Superficial Deposits at Gusev Crater Along Spirit Rover Traverses
Grant, J. A.; Arvidson, R.; Bell, J. F., III; Cabrol, N. A.; Carr, M. H.; Christensen, P.; Crumpler, L.; DesMarsais, D.; Ehlmann, B. L.; Ming, Douglas W., et al.; Science; August 06, 2004; Volume 305, pp. 807-810; In English
Contract(s)/Grant(s): WBS 390-30-AA; Copyright; Avail.: Other Sources

The Mars Exploration Rover Spirit has traversed a fairly flat, rock-strewn terrain whose surface is shaped primarily by impact events, although some of the landscape has been altered by eolian processes.Impacts ejected basaltic rocks that probably were part of locally formed lava flows from at least 10 meters depth.Some rocks have been textured and/or partially buried by windblown sediments less than 2 millimeters in diameter that concentrate within shallow, partially filled, circular impact depressions referred to as hollows.The terrain traversed during the 90-sol (martian solar day) nominal mission shows no evidence for an ancient lake in Gusev crater.
Author
Mars Roving Vehicles; Sediments; Mars Craters; Deposits; Mars Exploration; Basalt

20060009018 NASA Johnson Space Center, Houston, TX, USA
APXS ANALYSES of BOUNCE ROCK: the FIRST SHERGOTTITE ON MARS
Ming, Douglas W.; Zipfel, J.; Anderson, R.; Brueckner, J.; Clark, B. C.; Dreibus, G.; Economou, T.; Gellert, R.; Lugmair, G. W.; Klingelhoefer, G., et al.; January 2005; 2 pp.; In English; Meteoritical Society Annual Meeting, 2-6 Aug. 2004, Rio de Janeiro, Brazil
Contract(s)/Grant(s): 390-30-AA; No Copyright; Avail.: CASI: A01, Hardcopy

During the MER Mission, an isolated rock at Meridiani Planum was analyzed by the Athena instrument suite [1]. Remote sensing instruments noticed its distinct appearance. Two areas on the untreated rock surface and one area that was abraded with the Rock Abrasion Tool were analyzed by Microscopic Imager, Mossbauer Mimos II [2], and Alpha Particle X-ray Spectrometer (APXS). Results of all analyses revealed a close relationship of this rock with known basaltic shergottites.
Derived from text
Shergottites; Mars Surface; Alpha Particles; Remote Sensing; Rocks

20060009019 NASA Johnson Space Center, Houston, TX, USA
ROCK and SOIL PHYSICAL PROPERTIES AT the MER GUSEV CRATER and MERIDIANI PLANUM LANDING SITES
Ming, Douglas W.; Richter, L.; Arvidson, R.; Bell, J.; Cabrol, N.; Gorevan, S.; Greeley, R.; Herkenhoff, K.; January 2006; 2 pp.; In English; 35th COSPAR Scientific Assembly, 18-24 Jul. 2004, Paris, France
Contract(s)/Grant(s): 390-30-AA; No Copyright; Avail.: Other Sources; Abstract Only

Following the successful landings of both Mars Exploration Rover (MER) vehicles at Gusev Crater and Meridiani Planum, respectively, their Athena suite of instruments is being used to study the geologic history of these two very different landing sites on Mars that had been selected on the basis of showing different types of evidence for aqueous processes in the planet s past. Utilizing the on-board instruments as well as the rovers mobility system, a wide range of physical properties investigations is carried out as well - the subject of this abstract - that provide additional information on the geology and processes at the sites. Results of the mission in general as well as of the physical properties studies thus far greatly exceed expectations in that observations and measurements by both vehicles show a rich variety in materials and processes: the Gusev site in the vicinity of the lander is remarkably flat and generally devoid of large rocks along traverses up to the time of this writing (approx.Sol 50) and suggestive of a deflated surface with generally only thin veneers of bright dust while exhibiting evidence of a widespread occurrence of a crust from cemented fines that has been observed to fail in the form of blocky clods when disturbed by vehicle rolling action; numerous small and shallow depressions - presumably created by impacts - are observed at the site which are infilled with bright, fine-grained material that likewise appears indurated and which was studied by a trenching experiment; small ripple bedforms are scattered across the site and were characterized in terms of particle size

distributions. At the Meridiani site, studies so far - up to approx.Sol 33 - have focussed on soils and the rock outcrop encountered within the approx.20 m diameter crater that the spacecraft came to rest in: from a physical properties point of view, a mantle of dark, well-sorted, apparently basaltic sand with small to moderate cohesion has been of interest - and has been studied by a trenching experiment - as well as a fine-grained unit underlying the mantle at least locally within the crater. Rock grindings were accomplished successfully at both sites at the time of this writing, suggesting different strengths of the two targets (the basaltic rock nicknamed Adirondack at Gusev and the Meridiani rock outcrop) in addition to enabling compositional measurements below the original rock surfaces.
Author
Soils; Rocks; Mars Landing Sites; Mars Exploration; Mars Craters; Plains; Mars Roving Vehicles; Paleontology; Soil Science

20060009026 NASA Johnson Space Center, Houston, TX, USA
Ibitira: A basaltic achondrite from a distinct parent asteroid
Mittlefehldt, David W.; [2004]; 33 pp.; In English; Original contains black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

I have done detailed petrologic study of Ibitira, nominally classified as a basaltic eucrite. The Fe/Mn ratio of Ibitira pyroxenes with \h10 mole % wollastonite component is 36.4 0.4, and is well-resolved from those of five basaltic eucrites studied for comparison; 31.2-32.2. Data for the latter completely overlap. Ibitira pyroxenes have lower Fe/Mg than the basaltic eucrite pyroxenes. Thus, the higher Fe/Mn ratio does not reflect a simple difference in oxidation state. Ibitira also has an oxygen isotopic composition, alkali element contents and a Ti/Hf ratio that distinguish it from basaltic eucrites. These differences support derivation from a distinct parent asteroid. Ibitira is the first recognized representative of the fifth known asteroidal basaltic crust.
Author
Asteroids; Basalt; Meteoritic Composition; Pyroxenes; Achondrites; Oxidation

20060009189 NASA Ames Research Center, Moffett Field, CA, USA
Convective lofting links Indian Ocean air pollution to paradoxical South Atlantic ozone maxima
Chatfield, R. B.; Guan, H.; Thompson, A. M.; Witte, J. C.; Geophysical Research Letters; March 28, 2004; ISSN 0094-8276; Volume 31, No. 6; 6 pp.; In English
Contract(s)/Grant(s): NCC2-1329
Report No.(s): Paper-2003GL018866; Copyright; Avail.: Other Sources

We describe a broad resolution of the Atlantic Parado concerning the seasonal and geographic distribution, of tropical tropospheric ozone. We highlight periods of significant maximum tropospheric O3 for Jan.- April, 1999, exploiting satellite estimates and SHADOZ (Southern Hemisphere Additional Ozonesondes). Trajectory analyses connecting sondes and Total Tropospheric Ozone (TTO) maps suggest a complex influence from the Indian Ocean: beginning with mixed combustion sources, then low level transport, cumulonimbus venting, possible stratospheric input, and finally high-level transport to the west, with possible mixing over Africa. For the Jan.-March highest column-O3 periods in the Atlantic, distinct sounding peaks trace to specific NO sources, especially lightning, while in the same episodes, recurring every 20-50 days, more diffuse buildups of Indian-to-Atlantic pollution make important contributions.
Author
Air Pollution; Atmospheric Composition; Convection; Indian Ocean; Lofting; Ozone; Atlantic Ocean

20060009302 California Univ., Los Angeles, CA, USA
The response of the near earth magnetotail to substorm activity
Kivelson, M. G.; McPherron, R. L.; Thompson, S.; Khurana, K. K.; Weygand, J. M.; Balogh, Andrew; Advances in Space Research; 2005; ISSN 0273-1177; Volume 36, pp. 1818-1824; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NAG5-12131; LANL-IGPP-03-1319; Copyright; Avail.: Other Sources

The large scale structure of the current sheet in the terrestrial magnetotail is often represented as the superposition of a constant northward-oriented magnetic field component (B(sub z)) and a component along the Earth-Sun direction (B(sub x)) that varies with distance from the center of the sheet (z(sub o) in GSM) as in a Hams neutral sheet. The latter implies that B(sub x) = B(sub Lx) tanh((z - z(sub o))/h) where B(sub Lx) is the magnitude of the B(sub x) component in the northern lobe. Correspondingly, the cross-tail current should be approximated by J(sub y) = (B(sub Lx)/h) sech(sup 2)((z - z(sub o))/h). Using data from the fluxgate magnetometer (FGM) on the Cluster I1 spacecraft tetrad, we have used measured fields and currents to ask if this model represents the large-scale properties of the system. During very quiet crossings of the plasmasheet, we find

that the model gives a reasonable estimate of the trend of the average current and field distributions, but during disturbed intervals, the best fit fails to represent the data. If, however, the parameters z(sub o) and h of the model are taken as variable functions of time, the fits can be reasonably good. The temporal variation of the fit parameter h that characterizes the thickness of the current sheet can be interpreted in terms of thinning during the growth phase of a substorm and thickening following the expansion phase. Ground signatures that give insight into the local time of substorm onset can be used to interpret the response of the plasmasheet to substorm related changes of the global system. During a substorm, the field magnitude in the central plasmasheet fluctuates at the period of Pi2 pulsations.
Author
Geomagnetic Tail; Magnetic Storms; Magnetic Fields; Temporal Distribution; Current Distribution; Geomagnetic Micropulsations

20060009303 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Cluster electric current density measurements within a magnetic flux rope in the plasma sheet
Slavin, J. A.; Lepping, R. P.; Gjerloev, J.; Goldstein, M. L.; Fairfield, D. H.; Acuna, M. H.; Balogh, A.; Dunlop, M.; Kivelson, M. G.; Khurana, K., et al.; Geophysical Research Letters; April 2, 2003; ISSN 0094-8276; Volume 30, No. 7, pp. 14-1 - 14-4; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAG5-12131; Copyright; Avail.: Other Sources

On August 22, 2001 all 4 Cluster spacecraft nearly simultaneously penetrated a magnetic flux rope in the tail. The flux rope encounter took place in the central plasma sheet, Beta(sub i) approx. 1-2, near the leading edge of a bursty bulk flow. The 'time-of-flight' of the flux rope across the 4 spacecraft yielded V(sub x) approx. 700 km/s and a diameter of approx.1 R(sub e). The speed at which the flux rope moved over the spacecraft is in close agreement with the Cluster plasma measurements. The magnetic field profiles measured at each spacecraft were first modeled separately using the Lepping-Burlaga force-free flux rope model. The results indicated that the center of the flux rope passed northward (above) s/c 3, but southward (below) of s/c 1, 2 and 4. The peak electric currents along the central axis of the flux rope predicted by these single-s/c models were approx.15-19 nA/sq m. The 4-spacecraft Cluster magnetic field measurements provide a second means to determine the electric current density without any assumption regarding flux rope structure. The current profile determined using the curlometer technique was qualitatively similar to those determined by modeling the individual spacecraft magnetic field observations and yielded a peak current density of 17 nA/m2 near the central axis of the rope. However, the curlometer results also showed that the flux rope was not force-free with the component of the current density perpendicular to the magnetic field exceeding the parallel component over the forward half of the rope, perhaps due to the pressure gradients generated by the collision of the BBF with the inner magnetosphere. Hence, while the single-spacecraft models are very successful in fitting flux rope magnetic field and current variations, they do not provide a stringent test of the force-free condition.
Author
Plasma Layers; Magnetic Flux; Magnetospheric Instability; Magnetic Fields; Magnetic Storms; Current Density; Density Measurement

20060009460 Lunar and Planetary Inst., Houston, TX, USA
Europa's Icy Shell: A Bridge Between Its Surface and Ocean
Schenk, Paul; Mimmo, Francis; Prockter, Louise; EOS, Transactions; August 17, 2004; ISSN 0096-3941; Volume 85, No. 33, pp. 311-312; In English
Contract(s)/Grant(s): NCC5-679; Copyright; Avail.: Other Sources

Europa, a Moon-sized, ice-covered satellite of Jupiter, is second only to Mars in its astrobiological potential. Beneath the icy surface, an ocean up to 150 km deep is thought to exist, providing a potential habitat for life,and a tempting target for future space missions. The Galileo mission to the Jovian system recently ended, but there are already long-range plans to send much more capable spacecraft,such as the proposed Jupiter Icy Moons Orbiter (JIMO), to take a closer look at Europa and her siblings, Ganymede and Callisto, some time in the next two decades. Europak outer icy shell is the only interface between this putative ocean and the surface, but many aspects of this shell are presently poorly understood; in particular, its composition, thickness, deformational history, and mechanical properties. To discuss the ice shell and our current understanding of it, 78 scientists from the terrestrial and planetary science communities in the USA and Europe gathered for a 3-day workshop hosted by the Lunar and Planetary Institute in Houston in February. A key goal was to bring researchers from disparate disciplines together to discuss the importance and limitations of available data on Europa with a post-Galileo perspective. The workshop featured 2 days of reviews and contributed talks on the composition, physical properties, stratigraphy, tectonics, and future exploration of the ice shell and underlying ocean. The final morning included an extended discussion period, moderated by

a panel of noted experts, highlighting outstanding questions and areas requiring future research.
Author
Europa; Extraterrestrial Oceans; Ganymede; Callisto; Terrestrial Planets; Mechanical Properties; Ice; Habitats

20060009466 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Plasma sheet turbulence observed by Cluster II
Weygand, James M.; Kivelson, M. G.; Khurana, K. K.; Schwarzl, H. K.; Thompson, S. M.; McPherron, R. L.; Balogh, A.; Kistler, L. M.; Goldstein, M. L.; Borovsky, J., et al.; Journal of Geophysical Research; January 14, 2005; ISSN 0148-0227; Volume 110; 30 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): NAG5-12131; Copyright; Avail.: Other Sources

Cluster fluxgate magnetometer (FGM) and ion spectrometer (CIS) data are employed to analyze magnetic field fluctuations within the plasma sheet during passages through the magnetotail region in the summers of 2001 and 2002 and, in particular, to look for characteristics of magnetohydrodynamic (MHD) turbulence. Power spectral indices determined from power spectral density functions are on average larger than Kolmogorov's theoretical value for fluid turbulence as well as Kraichnan's theoretical value for MHD plasma turbulence. Probability distribution functions of the magnetic fluctuations show a scaling law over a large range of temporal scales with non-Gaussian distributions at small dissipative scales and inertial scales and more Gaussian distribution at large driving scales. Furthermore, a multifractal analysis of the magnetic field components shows scaling behavior in the inertial range of the fluctuations from about 20 s to 13 min for moments through the fifth order. Both the scaling behavior of the probability distribution functions and the multifractal structure function suggest that intermittent turbulence is present within the plasma sheet. The unique multispacecraft aspect and fortuitous spacecraft spacing allow us to examine the turbulent eddy scale sizes. Dynamic autocorrelation and cross correlation analysis of the magnetic field components allow us to determine that eddy scale sizes fit within the plasma sheet. These results suggest that magnetic field turbulence is occurring within the plasma sheet resulting in turbulent energy dissipation.
Author
Plasma Layers; Magnetohydrodynamic Turbulence; Magnetometers; Mass Spectrometers; Magnetic Fields; Plasma Turbulence; Energy Dissipation

20060009467 California Univ., Los Angeles, CA, USA
Cluster observations of quasi-periodic impulsive signatures in the dayside northern lobe: High-latitude flux transfer events?
Thompson, S. M.; Kivelson, M. G.; Khurana, K. K.; Balogh, A.; Reme, H.; Fazakerley, A. N.; Kistler, L. M.; Journal of Geophysical Research; February 24, 2004; ISSN 0148-0227; Volume 109; 16 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): NAG5-12131; Copyright; Avail.: Other Sources

We report on a series of quasi-periodic reversals in GSM B(sub Z) observed by the four Cluster spacecraft in the northern dayside lobe poleward of the cusp on 23 February 2001. During an interval of about 35 min, multiple reversals (negative to positive) in B(sub Z) of approximately 1-min duration with an approximate 8-min recurrence time were observed. The individual structures do not resemble low-latitude flux transfer events (FTE) [Russell and Elphic, 1979] but the 8-min recurrence frequency suggests that intermittent reconnection may be occurring .Measurements (appropriately lagged) of the solar wind at ACE show that the IMF was southward-oriented with a strong B(sub X) and that a modest dynamic pressure increased as the events started. The multi-point observations afforded by the Cluster spacecraft were used to infer the motion (direction and speed) of the observed magnetic field reversals. The associated currents were also calculated and they are consistent with the spatial confinement of the observed magnetic field reversals. We propose that the observed reversals are due to flux tubes reconnecting with closed field lines on the dayside. Ancillary data from the Cluster Ion Spectrometry (CIS) and Plasma Electron And Current Experiment (PEACE) instruments were used to develop a physical picture of the reversals.
Author
Magnetic Fields; Boundary Layers; Clusters; Magnetic Field Reconnection; Flux Transfer Events; Solar Wind; Plasma Interactions; Magnetopause; Magnetosheath

20060009468 California Univ., Los Angeles, CA, USA
Dynamic Harris current sheet thickness from Cluster current density and plasma measurements
Thompson, S. M.; Kivelson, M. G.; Khurana, K. K.; McPherron, R. L.; Weygand, J. M.; Balogh, A.; Reme, H.; Kistler, L. M.; Journal of Geophysical Research; Feb. 19, 2005; ISSN 0148-0227; Volume 110; 31 pp.; In English
Contract(s)/Grant(s): NAG5-12131; Copyright; Avail.: Other Sources

We use the first accurate measurements of current densities in the plasma sheet to calculate the half-thickness and position of the current sheet as a function of time. Our technique assumes a Harris current sheet model, which is parameterized by lobe magnetic field B(o), current sheet half-thickness h, and current sheet position z(sub o). Cluster measurements of magnetic field, current density, and plasma pressure are used to infer the three parameters as a function of time. We find that most long timescale (6-12 hours) current sheet crossings observed by Cluster cannot be described by a static Harris current sheet with a single set of parameters B(sub o), h, and z(sub o). Noting the presence of high-frequency fluctuations that appear to be superimposed on lower frequency variations, we average over running 6-min intervals and use the smoothed data to infer the parameters h(t) and z(sub o)(t), constrained by the pressure balance lobe magnetic field B(sub o)(t). Whereas this approach has been used in previous studies, the spatial gnuhen& now provided by the Cluster magnetometers were unavailable or not well constrained in earlier studies. We place the calculated hdf&cknessa in a magnetospheric context by examining the change in thickness with substorm phase for three case study events and 21 events in a superposed epoch analysis. We find that the inferred half-thickness in many cases reflects the nominal changes experienced by the plasma sheet during substorms (i.e., thinning during growth phase, thickening following substorm onset). We conclude with an analysis of the relative contribution of (Delta)B(sub z)/(Delta)X to the cross-tail current density during substorms. We find that (Delta)B(sub z)/(Delta)X can contribute a significant portion of the cross-tail c m n t around substorm onset.
Author
Plasma Layers; Current Density; Current Sheets; Pressure Distribution; Thickness; Magnetometers; Density Measurement

20060010007 Lunar and Planetary Inst., Houston, TX, USA
Impactites of the Yaxcopoil-1 drilling site, Chicxulub impact structure: Petrography, geochemistry, and depositional environment
Dressler, Burkhard O.; Sharpton, Virgil L.; Schwandt, Craig S.; Ames, Doreen; Meteoritics and Planetary Science; [2004]; Volume 39, No. 6, pp. 857-878; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NCC5-679; Copyright; Avail.: Other Sources

The impact breccias encountered in drill hole Yaxcopoil-1 (Yax-1) in the Chicxulub impact structure have been subdivided into six units. The two uppermost units are redeposited suevite and suevite, and together are only 28 m thick. The two units below are interpreted as a ground surge deposit similar to a pyroclastic flow in a volcanic regime with a fine-grained top (unit 3; 23 m thick; nuee ardente) and a coarse breccia (unit 4; approx.15 m thick) below. As such, they consist of a melange of clastic matrix breccia and melt breccia. The pyroclastic ground surge deposit and the two units 5 and 6 below are related to the ejecta curtain. Unit 5 (approx.24 m thick) is a silicate impact melt breccia, whereas unit 6 (10 m thick) is largely a carbonate melt breccia with some clastic-matrix components. Unit 5 and 6 reflect an overturning of the target stratigraphy. The suevites of units 1 and 2 were deposited after emplacement of the ejecta curtain debris. Reaction of the super-heated breccias with seawater led to explosive activity similar to phreomagmatic steam explosion in volcanic regimes. This activity caused further brecciation of melt and melt fragments. The fallback suevite deposit of units 1 and 2 is much thinner than suevite deposits at larger distances from the center of the impact structure than the 60 km of the Yax-1 drill site. This is evidence that the fallback suevite deposit (units 1 and 2) originally was much thicker. Unit 1 exhibits sedimentological features suggestive of suevite redeposition. Erosion possibly has occurred right after the IUT impact due to seawater backsurge, but erosion processes spanning thousands of years may also have been active. Therefore, the top of the 100 m thick impactite sequence at Yaxcopoil, in our opinion, is not the K/T boundary.
Author
Breccia; Impact Melts; Melts (Crystal Growth); Sedimentary Rocks; Petrography; Meteorite Craters; Cretaceous-Tertiary Boundary

20060010008 Rice Univ., Houston, TX, USA
Discrete element simulations of gravitational volcanic deformation, 1, Deformation structures and geometries
Morgan, Julia K.; McGovern, Patrick J.; Journal of Geophysical Research; May 12, 2005; ISSN 0148-0227; Volume 110; 22 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): LPI-Contrib-1216; NCC5-679; NAG5-12226
Report No.(s): Paper-2004JB003252; Copyright; Avail.: Other Sources

We have carried out two-dimensional particle dynamics simulations of granular piles subject to frictional Coulomb failure criteria to gain a first-order understanding of different modes of gravitational deformation within volcanoes. Under uniform basal and internal strength conditions, granular piles grow self-similarly, developing distinctive stratigraphies, morphologies, and structures. Piles constructed upon cohesive substrates exhibit particle avalanching, forming outward dipping strata and angle of repose slopes. Systematic decreases in basal strength lead to progressively deeper and steeper internal detachment

faults and slip along a basal decollement; landslide forms grade from shallow slumps to deep-seated landslide and, finally, to axial subsidence and outward flank displacements, or volcanic spreading. Surface slopes decrease and develop concave up morphologies with decreasing decollement strength; depositional layers tilt progressively inward. Spatial variations in basal strength cause lateral transitions in pile structure, stratigraphy, and morphology. This approximation of volcanoes as Coulomb granular piles reproduces the richness of deformational structures and surface morphologies in many volcanic settings. The gentle slopes of Hawaiian volcanoes and Olympus Mons on Mars suggest weak basal decollements that enable volcanic spreading. High-angle normal faults, favored above weak decollements, are interpreted in both settings and may explain catastrophic sector collapse in Hawaii and broad aureole deposits surrounding Olympus Mons. In contrast, steeper slopes and shallow detachment faults predominate in the Canary Islands, thought to lack a weak decollement, favoring smaller, more frequent slope failures than predicted for Hawaii. The numerical results provide a useful predictive tool for interpreting dynamic behavior and associated geologic hazards of active volcanoes.
Author
Structural Properties (Geology); Two Dimensional Models; Deformation; Volcanoes; Failure; Dynamic Characteristics; Stratigraphy

20060010009 Lunar and Planetary Inst., Houston, TX, USA
Evolution of large shield volcanoes on Venus
Herrick, Robert R.; Dufek, Josef; McGovern, Patrick J.; Journal of Geophysical Research; January 21, 2005; ISSN 0148-0227; Volume 110; 19 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NCC5-679
Report No.(s): LPI-Contrib-1226; Paper-2004JE002283; Copyright; Avail.: Other Sources

We studied the geologic history, topographic expression, and gravity signature of 29 large Venusian shield volcanoes with similar morphologies in Magellan synthetic aperture radar imagery. While they appear similar in imagery, 16 have a domical topographic expression and 13 have a central depression. Typical dimensions for the central depression are 150 km wide and 500 m deep. The central depressions are probably not calderas resulting from collapse of a shallow magma chamber but instead are the result of a corona-like sagging of a previously domical volcano. The depressions all have some later volcanic filling. All but one of the central depression volcanoes have been post-dated by geologic features unrelated to the volcano, while most of the domical volcanoes are at the top of the stratigraphic column. Analysis of the gravity signatures in the spatial and spectral domains shows a strong correlation between the absence of post-dating features and the presence of dynamic support by an underlying plume. We infer that the formation of the central depressions occurred as a result of cessation of dynamic support. However, there are some domical volcanoes whose geologic histories and gravity signatures also indicate that they are extinct, so sagging of the central region apparently does not always occur when dynamic support is removed. We suggest that the thickness of the elastic lithosphere may be a factor in determining whether a central depression forms when dynamic support is removed, but the gravity data are of insufficient resolution to test this hypothesis with admittance methods.
Author
Venus (Planet); Volcanoes; Paleontology; Synthetic Aperture Radar; Structural Properties (Geology); Chronology; Stratigraphy

20060010010 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Mars chronology: assessing techniques for quantifying surficial processes
Doran, Peter T.; Clifford, Stephen M.; Forman, Steven L.; Nyquist, Larry; Papanastassiou, Dimitri A.; Stewart, Brian W.; Sturchio, Neil C.; Swindle, Timothy D.; Cerling, Thure; Kargel, Jeff, et al.; Earth-Science Reviews; April 02, 2004; ISSN 0012-8252; Volume 67, pp. 313-337; In English; Original contains black and white illustrations
Contract(s)/Grant(s): JPL-1215592; NCC5-679; NAG5-9427; Copyright; Avail.: Other Sources

Currently, the absolute chronology of Martian rocks, deposits and events is based mainly on crater counting and remains highly imprecise with epoch boundary uncertainties in excess of 2 billion years. Answers to key questions concerning the comparative origin and evolution of Mars and Earth will not be forthcoming without a rigid Martian chronology, enabling the construction of a time scale comparable to Earth's. Priorities for exploration include calibration of the cratering rate, dating major volcanic and fluvial events and establishing chronology of the polar layered deposits. If extinct andor extant life is discovered, the chronology of the biosphere will be of paramount importance. Many radiometric and cosmogenic techniques applicable on Earth and the Moon will apply to Mars after certain baselines (e.g. composition of the atmosphere, trace species, chemical and physical characteristics of Martian dust) are established. The high radiation regime may pose a problem for dosimetry-based techniques (e.g. luminescence). The unique isotopic composition of nitrogen in the Martian atmosphere may

permit a Mars-specific chronometer for tracing the time-evolution of the atmosphere and of lithic phases with trapped atmospheric gases. Other Mars-specific chronometers include measurement of gas fluxes and accumulation of platinum group elements (PGE) in the regolith. Putting collected samples into geologic context is deemed essential, as is using multiple techniques on multiple samples. If in situ measurements are restricted to a single technique it must be shown to give consistent results on multiple samples, but in all cases, using two or more techniques (e.g. on the same lander) will reduce error. While there is no question that returned samples will yield the best ages, in situ techniques have the potential to be flown on multiple missions providing a larger data set and broader context in which to place the more accurate dates.
Author
Planetary Evolution; Mars (Planet); Earth (Planet); Planetary Geology; Chronology; Craters; Emission Spectra

20060010016 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Crustal structure of Mars from gravity and topography
Neumann, G. A.; Zuber, M. T.; Wieczorek, M. A.; McGovern, P. J.; Lemoine, F. G.; Smith, D. E.; Journal of Geophysical Research; August 10, 2004; ISSN 0148-0227; Volume 109; 18 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NCC5-679; NAG5-12226
Report No.(s): LPI-Contrib-1199; Paper-2004JE002262; Copyright; Avail.: Other Sources

Mars Orbiter Laser Altimeter (MOLA) topography and gravity models from 5 years of Mars Global Surveyor (MGS) spacecraft tracking provide a window into the structure of the Martian crust and upper mantle. We apply a finite-amplitude terrain correction assuming uniform crustal density and additional corrections for the anomalous densities of the polar caps, the major volcanos, and the hydrostatic flattening of the core. A nonlinear inversion for Moho relief yields a crustal thickness model that obeys a plausible power law and resolves features as small as 300 km wavelength. On the basis of petrological and geophysical constraints, we invoke a mantle density contrast of 600 kg m-3; with this assumption, the Isidis and Hellas gravity anomalies constrain the global mean crustal thickness to be \g45 km. The crust is characterized by a degree 1 structure that is several times larger than any higher degree harmonic component, representing the geophysical manifestation of the planet's hemispheric dichotomy. It corresponds to a distinction between modal crustal thicknesses of 32 km and 58 km in the northern and southern hemispheres, respectively. The Tharsis rise and Hellas annulus represent the strongest components in the degree 2 crustal thickness structure. A uniform highland crustal thickness suggests a single mechanism for its formation, with subsequent modification by the Hellas impact, erosion, and the volcanic construction of Tharsis. The largest surviving lowland impact, Utopia, post-dated formation of the crustal dichotomy. Its crustal structure is preserved, making it unlikely that the northern crust was subsequently thinned by internal processes.
Author
Topography; Mars Surface; Gravity Anomalies; Planetary Crusts; Planetary Geology; Petrology

20060010017 Lunar and Planetary Inst., Houston, TX, USA
Comparing morphologies of drainage basins on Mars and Earth using integral-geometry and neural maps
Stepinski, T. F.; Coradetti, S.; Geophysical Research Letter; August 04, 2004; ISSN 0094-8276; Volume 31; 4 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NCC5-679
Report No.(s): LPI-Contrib-1206; Copyright; Avail.: Other Sources

We compare morphologies of drainage basins on Mars and Earth in order to confine the formation process of Martian valley networks. Basins on both planets are computationally extracted from digital topography. Integral-geometry methods are used to represent each basin by a circularity function that encapsulates its internal structure. The shape of such a function is an indicator of the style of fluvial erosion. We use the self-organizing map technique to construct a similarity graph for all basins. The graph reveals systematic differences between morphologies of basins on the two planets. This dichotomy indicates that terrestrial and Martian surfaces were eroded differently. We argue that morphologies of Martian basins are incompatible with runoff from sustained, homogeneous rainfall. Fluvial environments compatible with observed morphologies are discussed. We also construct a similarity graph based on the comparison of basins hypsometric curves to demonstrate that hypsometry is incapable of discriminating between terrestrial and Martian basins. INDEX TERMS: 1824 Hydrology: Geomorphology (1625); 1886 Hydrology: Weathering (1625); 5415 Planetology: Solid Surface Planets: Erosion and weathering; 6225 Planetology: Solar System Objects Mars. Citation: Stepinski, T. F., and S. Coradetti (2004), Comparing morphologies of drainage basins on Mars and Earth using integral-ge
Author
Drainage; Geomorphology; Encapsulating; Dichotomies; Weathering; Topography; Mars (Planet)

20060010023 NASA Goddard Space Flight Center, Greenbelt, MD, USA
A Solar System Survey of Forced Librations in Longitude
Cornstock, Robert L.; Bills, Bruce G.; Journal of Geophysical Research; September 3, 2003; Vol. 108, E9; 13 pp.; In English
Contract(s)/Grant(s): NAG5-11682; NRA 00-OSS-01; Copyright; Avail.: Other Sources

Forced librations are periodic rotational rate variations due to gravitational interactions with an orbital partner. We have developed an analytic theory capable of calculating expected amplitudes of forced librations for nonresonant rotators as well as for bodies existing in a spin-orbit resonance. The theory has been applied to 34 solar system bodies, including terrestrial planets, planetary satellites, and the asteroid Eros. Parameters governing libration amplitude are the body s orbital eccentricity, moment difference, and the ratio of its spin rate to its orbital rate. In each case the largest libration amplitude is associated with the forcing frequency 2 (p - 1) n, where n is the orbital mean motion and p is the spin/orbit rate ratio. This dominant frequency is simply semidiurnal as seen from the position of the torquing body. The maximum libration angular amplitude is 1.3 x 10(exp -2) radians for Thebe, and the maximum mean equatorial displacement is 1.4 km for Mimas.
Author
Libration; Librational Motion; Gravitational Effects; Periodic Variations

47
METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification.

20060009043 Indira Ghandi Inst. of Development Research, Bombay, India
Prediction of the Global Warming: Some evidences from India
Dwivedi, Dwijendra Nath; Sharma, Vinod Kumar; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2005 USA Cambridge); [2005]; 31 pp.; In English; See also 20060009039; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Proponents of the hypothesis of anthropogenic global warming assert that the increase in carbon dioxide (CO2) concentration in the atmosphere is the major contributor to the ‘greenhouse effect’. Climate forcing by CO2 is the largest forcing among all other anthropogenic green house gases. The concentration of anthropogenic CO2 and other green house gases has risen significantly in the atmosphere. Global average temperature has raised .15 oC per decade from 1976 to 2001 According to Intergovernmental panel on climate change (IPCC 2001). This paper analyzes the CO2 emission data from the India and world. A time series model is build to project the new forecast of emissions and temperature of globe and India on an average, other than the given by existing models by IPCC. For India temperature has been consistently rising in the last 90 years. A Vector auto Regression (VAR) analysis establishes a causal relationship between the CO2 forcing and the global warming.
Author
Carbon Dioxide; Atmospheric Temperature; Global Warming; Carbon Dioxide Concentration; Time Series Analysis

20060009097 Brookhaven National Lab., Upton, NY, USA
Aerosol, Clouds, and Climate Change
Schwartz, S. E.; Sep. 2005; 22 pp.; In English
Report No.(s): DE2005-861062; BNL-75155-2005-BC; No Copyright; Avail.: National Technical Information Service (NTIS)

Earth’s climate is thought to be quite sensitive to changes in radiative fluxes that are quite small in absolute magnitude, a few watts per square meter, and in relation to these fluxes in the natural climate. Atmospheric aerosol particles exert influence on climate directly, by scattering and absorbing radiation, and indirectly by modifying the microphysical properties of clouds and in turn their radiative effects and hydrology. The forcing of climate change by these indirect effects is thought to be quite substantial relative to forcing by incremental concentrations of greenhouse gases, but highly uncertain. Quantification of aerosol indirect forcing by satellite- or ground-based remote sensing has proved quite difficult in view of inherent large variation in the pertinent observables such as cloud optical depth, which is controlled mainly by liquid water path and only secondarily by aerosols. Limited work has shown instances of large magnitude of aerosol indirect forcing, with local instantaneous forcing upwards of 50 W m(sup 66)-2. Ultimately it will be necessary to represent aerosol indirect effects in climate models to accurately identify the anthropogenic forcing at present and over secular time and to assess the influence of this forcing in the context of other forcings of climate change. While the elements of aerosol processes that must be

represented in models describing the evolution and properties of aerosol particles that serve as cloud condensation particles are known, many important components of these processes remain to be understood and to be represented in models, and the models evaluated against observation, before such model-based representations can confidently be used to represent aerosol indirect effects in climate models.
NTIS
Aerosols; Climate; Climate Change; Clouds (Meteorology)

20060009119 Commerce Dept., Washington, DC, USA
National Hurricane Operations Plan, May 2005
May 2005; 170 pp.; In English
Report No.(s): PB2006-107686; FCM-P12-2005; No Copyright; Avail.: National Technical Information Service (NTIS)

The Interdepartmental Hurricane Conference (IHC) is sponsored annually by the Office of the Federal Coordinator for Meteorological Services and Supporting Research (OFCM) to provide a forum for the responsible Federal agencies, together with representatives from the user communities like emergency management, to review the Nations hurricane forecast and warning program and to make recommendations on how to improve the program in the future. The major objective is to plan and prepare for the upcoming hurricane season. The 59th IHC was held in Jacksonville, Florida, March 7-11, 2005, and the new procedures, procedural changes, and agreements reached at the conference were incorporated into this publication the 43rd edition of the National Hurricane Operations Plan (NHOP). At the 59th IHC, the Working Group for Hurricane and Winter Storms Operations and Research (WG/HWSOR) addressed 13 action items. Of the 13, 6 will be closed through incorporation into the NHOP as approved recommendations and/or changes. Two of the items were informational in nature, and one was withdrawn. This edition includes a number of minor revisions and changes to Chapter 3, General Operations and Procedures of the National Weather Service Hurricane Centers, and Chapter 5, Aircraft Reconnaissance. Chapter 6, Satellite Reconnaissance, and Appendix A, Local National Weather Service (NWS) Office Products, were substantially updated, and the breakpoints for California were added to Appendix B. For the state of Florida, the 2004 Atlantic tropical cyclone season was a season to remember. Two major hurricanes (Charley and Jeanne) hit Florida for the first time since 1950, with a third hurricane (Frances) making landfall in Florida and a fourth (Ivan) in Alabama, just west of the northern Panhandle. Hurricane Frances prompted the largest evacuation in Florida history, and Frances and Ivan each produced over 100 tornadoes in the U.S. Of the seasons 15 tropical or subtropical storms, 9 became hurricanes, and 6 became major hurricanes. A record eight tropical storms formed during the month of August. Hurricanes Charley, Frances, Gaston, Ivan, and Jeanne made landfall in the U.S.the most hurricane landfalls since 1985. The death toll for the season was over 3100, primarily due to the effects of Jeanne in Haiti; there were 60 direct deaths in the U.S. The unadjusted property damage in the U.S. is estimated to be near $45 billion the costliest hurricane season on record for the U.S. The bottom line, however, is that forecast track errors were at record lows, and our multiagency tropical cyclone warning support system superbly responded to a very challenging seasona tribute to the professionalism, dedication, and cooperation of the civilian and military agencies involved.
NTIS
Cyclones; Forecasting; Hurricanes; Storms (Meteorology); Tropical Storms

20060009140 Lawrence Livermore National Lab., Livermore, CA USA
Intercomparison of Present and Future Climates Simulated by Coupled Ocean Atmosphere GCMs
Covey, C.; AchutaRao, K. M.; Lambert, S. J.; Taylor, K. E.; Sep. 06, 2000; 56 pp.; In English
Report No.(s): DE2005-15013400; UCRL-ID-140325; No Copyright; Avail.: National Technical Information Service (NTIS)

We present an overview of results from the most recent phase of the Coupled Model Intercomparison Project (CMIP). This phase of CMIP has archived output from both unforced (control run) and perturbed (1 % per year increasing atmospheric carbon dioxide) simulations by 15 modem coupled ocean-atmosphere general circulation models. The models are about equally divided between those employing and those not employing ad hoc flux corrections at the ocean-atmosphere interface. The new generation of non-flux-corrected control runs are nearly as stable and agree with observations nearly as well as the flux-corrected models. This development represents significant progress in the state of the art of climate modeling since the Second (1995) Scientific Assessment Report of the Intergovernmental Panel on Climate Change (IPCC; see Gates et al. 1996). From the increasing-CO(sub2)- runs, we find that differences between different models, while substantial, are not as great as would be expected from earlier assessments that relied on equilibrium climate sensitivity.
NTIS
Air Water Interactions; Climate; Climate Models; Climatology; Simulation

20060009483 National Weather Service, Honolulu, HI, USA
2004 Tropical Cyclones: Central North Pacific (Honolulu, Hawaii, October 2005)
Oct. 2005; 24 pp.; In English
Report No.(s): PB2006-101282; No Copyright; Avail.: CASI: A03, Hardcopy

Total tropical activity for the season was slightly below normal, with three systems occurring within the area of responsibility of the Central Pacific Hurricane Center (CPHC). One tropical cyclone (01-C) developed within the central Pacific, and the other two, Darby and Estelle, moved into the area from the eastern Pacific. Estelle was the strongest of the three systems and the only one of tropical storm intensity. There were not deaths recorded or property damage reported in the central North Pacific due to these tropical cyclones.
NTIS
Cyclones; Pacific Ocean; Tropical Regions; Tropical Storms

20060009935 NASA Ames Research Center, Moffett Field, CA, USA
Processes Controlling Water Vapor in the Winter Arctic Tropopause Region
Pfister, Leonhard; Selkirk, Henry B.; Jensen, Eric J.; Padolske, James; Sachse, Glen; Avery, Melody; Schoeberl, Mark R.; Mahoney, Michael J.; Richard, Erik; Journal of Geophysical Research; Dec. 7, 2002; ISSN 0148-0227; Volume 108, No. D5; 2 pp.; In English
Contract(s)/Grant(s): NCC2-1334; Copyright; Avail.: Other Sources

This work describes transport and thermodynamic processes that control water vapor near the tropopause during the SAGE III-Ozone Loss and Validation Experiment (SOLVE), held during the Arctic 1999/2000 winter season. Aircraft-based water vapor, carbon monoxide, and ozone measurements were analyzed so as to establish how deeply tropospheric air mixes into the Arctic lowermost stratosphere and what the implications are for cloud formation and water vapor removal in this region of the atmosphere. There are three major findings. First, troposphere-to-stratosphere exchange extends into the Arctic stratosphere to about 13 km. Penetration is to similar levels throughout the winter, however, because ozone increases with altitude most rapidly in the early spring, tropospheric air mixes with the highest values of ozone in that season. The effect of this upward mixing is to elevate water vapor mixing ratios significantly above their prevailing stratospheric values of above 5ppmv. Second, the potential for cloud formation in the stratosphere is highest during early spring, with about 20% of the parcels which have ozone values of 300-350 ppbv experiencing ice saturation in a given 10 day period. Third, during early spring, temperatures at the troposphere are cold enough so that 5-10% of parcels experience relative humidities above 100%, even if the water content is as low as 5 ppmv. The implication is that during this period, dynamical processes near the Arctic tropopause can dehydrate air and keep the Arctic tropopause region very dry during early spring.
Author
Atmospheric Composition; Tropopause; Arctic Regions; Water Vapor; Dehydration; Stratosphere; Troposphere; Ozone; Moisture Content; Carbon Monoxide

20060009999 ENSCO, Inc., Cocoa Beach, FL, USA
Severe Weather Forecast Decision Aid
Bauman, William H., III; Wheeler, Mark M.; Short, David A.; August 2005; 53 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAS10-01052
Report No.(s): NASA/CR-2005-212563; Rept-05-001; No Copyright; Avail.: CASI: A04, Hardcopy

This report presents a 15-year climatological study of severe weather events and related severe weather atmospheric parameters. Data sources included local forecast rules, archived sounding data, Cloud-to-Ground Lightning Surveillance System (CGLSS) data, surface and upper air maps, and two severe weather event databases covering east-central Florida. The local forecast rules were used to set threat assessment thresholds for stability parameters that were derived from the sounding data. The severe weather events databases were used to identify days with reported severe weather and the CGLSS data was used to differentiate between lightning and non-lightning days. These data sets provided the foundation for analyzing the stability parameters and synoptic patterns that were used to develop an objective tool to aid in forecasting severe weather events. The period of record for the analysis was May - September, 1989 - 2003. The results indicate that there are certain synoptic patterns more prevalent on days with severe weather and some of the stability parameters are better predictors of severe weather days based on locally tuned threat values. The results also revealed the stability parameters that did not display any skill related to severe weather days. An interactive web-based Severe Weather Decision Aid was developed to assist the duty forecaster by providing a level of objective guidance based on the analysis of the stability parameters, CGLSS data, and

synoptic-scale dynamics. The tool will be tested and evaluated during the 2005 warm season.
Derived from text
Climatology; Weather Forecasting; Decision Support Systems; Lightning; Meteorological Parameters; Predictions; Data Bases

20060010030 Meteorological Satellite Center, Tokyo, Japan
Monthly Report of the Meteorological Satellite Center: October 2005
October 2005; In English; Document files and Satellite data are recorded in either ASCII or shift JIS code; Full Disk Earth's Cloud Images are recorded in Bit-Map (BMP) format; Copyright; Avail.: Other Sources

The CD-ROM concerning the October 2005 Monthly Report of the Meteorological Satellite Center (MSC) contains the observation data derived from the Geostationary Meteorological Satellite (GMS) of Japan and the Polar Orbital Meteorological Satellites operated by NOAA. The CD-ROM contains the following observation data: Full Disk Earth's Cloud Image; Cloud Image of Japan and its vicinity; Cloud Amount; Sea Surface Temperature; Cloud Motion Wind; Water Vapor Motion Wind; Equivalent Blackbody Temperature; OLR (Out-going Longwave Radiation), Solar Radiation; Snow and Ice Index; Orbit Data; Attitude Data; VISSR Image Data Catalog (Cartridge Magnetic Tape (CMT), Micro Film); TOVS (TIROS Operational Vertical Sounder) Vertical Profile of Temperature and Precipitable Water; and TOVS Total Ozone Amount.
Derived from text
Satellite Observation; Satellite Sounding; Atmospheric Sounding; Meteorological Parameters; Satellite Imagery; Japan

20060010031 Meteorological Satellite Center, Tokyo, Japan
Monthly Report of the Meteorological Satellite Center: November 2005
November 2005; In English; Document files and Satellite data are recorded in either ASCII or shift JIS code; Full Disk Earth's Cloud Images are recorded in Bit-Map (BMP) format; Copyright; Avail.: Other Sources

The CD-ROM concerning the November 2005 Monthly Report of the Meteorological Satellite Center (MSC) contains the observation data derived from the Geostationary Meteorological Satellite (GMS) of Japan and the Polar Orbital Meteorological Satellites operated by NOAA. The CD-ROM contains the following observation data: Full Disk Earth's Cloud Image; Cloud Image of Japan and its vicinity; Cloud Amount; Sea Surface Temperature; Cloud Motion Wind; Water Vapor Motion Wind; Equivalent Blackbody Temperature; OLR (Out-going Longwave Radiation), Solar Radiation; Snow and Ice Index; Orbit Data; Attitude Data; VISSR Image Data Catalog (Cartridge Magnetic Tape (CMT), Micro Film); TOVS (TIROS Operational Vertical Sounder) Vertical Profile of Temperature and Precipitable Water; and TOVS Total Ozone Amount.
Derived from text
Satellite Observation; Satellite Sounding; Atmospheric Sounding; Meteorological Parameters; Satellite Imagery; Japan

20060010032 Meteorological Satellite Center, Tokyo, Japan
Monthly Report of the Meteorological Satellite Center: December 2005
December 2005; In English; Document files and Satellite data are recorded in either ASCII or shift JIS code; Full Disk Earth's Cloud Images are recorded in Bit-Map (BMP) format; Copyright; Avail.: Other Sources

The CD-ROM concerning the December 2005 Monthly Report of the Meteorological Satellite Center (MSC) contains the observation data derived from the Geostationary Meteorological Satellite (GMS) of Japan and the Polar Orbital Meteorological Satellites operated by NOAA. The CD-ROM contains the following observation data: Full Disk Earth's Cloud Image; Cloud Image of Japan and its vicinity; Cloud Amount; Sea Surface Temperature; Cloud Motion Wind; Water Vapor Motion Wind; Equivalent Blackbody Temperature; OLR (Out-going Longwave Radiation), Solar Radiation; Snow and Ice Index; Orbit Data; Attitude Data; VISSR Image Data Catalog (Cartridge Magnetic Tape (CMT), Micro Film); TOVS (TIROS Operational Vertical Sounder) Vertical Profile of Temperature and Precipitable Water; and TOVS Total Ozone Amount.
Derived from text
Satellite Observation; Satellite Sounding; Atmospheric Sounding; Meteorological Parameters; Satellite Imagery; Japan

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*.

20060009008 NASA Marshall Space Flight Center, Huntsville, AL, USA
ORTHOPEDIC LEG BRACE
Myers, William Neil, Inventor; November 1, 2005; 8 pp.; In English
Patent Info.: Filed 22 Aug. 2003; US-Patent-6,960,175; US-Patent-Appl-652087; NASA-Case-MSF-31906-1; No Copyright; Avail.: CASI: A02, Hardcopy

Knee braces generally have been rigid in both the knee bending direction and in the knee straightening direction unless a manually operated release is incorporated in them to allow the knee to bend. Desirably a braced knee joint should effectively duplicate the compound, complex, actions of a normal knee. The key to knee braces is the knee joint housing. The housing herein carries a number of cam action pawls. with teeth adapted to engage the internal teeth of a ratchet ring mounted in the housing. Cam action return springs and the shape of the cam action pawl teeth allow rotation of the ratchet ring in a leg straightening direction while still supporting a load. The leg can then be extended during walking while at the same time being prevented by the cam action pawls from buckling in the knee bending direction.
Official Gazette of the U.S. Patent and Trademark Office
Orthopedics; Knee (Anatomy); Bending; Supports; Walking

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*.

20060009298 NASA Ames Research Center, Moffett Field, CA, USA
BODY SENSING SYSTEM
Mah, Robert W., Inventor; December 13, 2005; 15 pp.; In English
Patent Info.: Filed 16 Jan. 2004; US-Patent-6,976,013; US-Patent-Appl-SN-874003; US-Patent-Appl-SN-652,302; NASA-Case-ARC-14231-2; No Copyright; Avail.: CASI: A03, Hardcopy

System and method for performing one or more relevant measurements at a target site in an animal body, using a probe. One or more of a group of selected internal measurements is performed at the target site, is optionally combined with one or more selected external measurements, and is optionally combined with one or more selected heuristic information items, in order to reduce to a relatively small number the probable medical conditions associated with the target site. One or more of the internal measurements is optionally used to navigate the probe to the target site. Neural net information processing is performed to provide a reduced set of probable medical conditions associated with the target site.
Official Gazette of the U.S. Patent and Trademark Office
Detection; Targets; Neural Nets; Heuristic Methods

20060009479 Federal Highway Administration, McLean, VA, USA
Preliminary Human Factors Guidelines for Automated Highway System Designers (Second Edition). Volume II: User-System Transactions
Apr. 1998; 58 pp.; In English
Report No.(s): PB2006-102960; FHWA-RD-97-126; No Copyright; Avail.: CASI: A04, Hardcopy

This is the second volume of a two-volume report. The report presents the results of a comprehensive examination of human factors considerations related to the human centered design of Automated Highway Systems (AHS). The results are shown. as preliminary guidelines that AHS designers may utilize to maximize the effectiveness and efficiency of system performance, ensure a high level of system safety, and to improve user acceptance. These guidelines were compiled from material pertinent to AHS in existing handbooks, guidelines, human factors engineering texts and articles, as well as analyses in the current research projects in this effort. This report will be of interest to all AHS designers involved in such activities as specification of functional requirements, determination of interface philosophy, selection of controls and displays, design

of controls and displays, design of driver-system dialogues, and design of driver workspace.
NTIS
Automatic Control; Highways; Human Factors Engineering; Planning; Transportation

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*.

20060009041 Indian Inst. of Tech., New Delhi, India
A Hybrid Game-theoretic Approach to Controller Design for Nonlinear Systems
Sharma, R.; Gopal, M.; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2005 USA Cambridge); [2005]; 11 pp.; In English; See also 20060009039; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The paper investigates the problem of designing optimal controllers for nonlinear systems using a novel hybrid algorithm based on game theory. Controller optimization in presence of additive exogenous disturbances and parametric uncertainties of the plant has been formulated as a zero-sum markov game between the controller and the disturber (disturbances). The proposed approach yields an optimal policy by solving a sequence of zero-sum games using a hybrid game-theoretic algorithm, which is both safe as well as consistent . The algorithm uses annealed mixing of the min-max solution strategy and the fictitious play approach for generating optimal policy via a simple linear program. We empirically evaluate the approach on two benchmark control problems: i) Control of a Non-holonomic Mobile Robot, and ii) Inverted Pendulum swing-up task, and compare its performance against Q learning.
Author
Game Theory; Controllers; Nonlinear Systems; Algorithms; Approach Control

20060009048 Worcester State Coll., Worcester, MA, USA
Preference-based Frequent Pattern Mining - from Base Preferences to Combined Preferences
Braynova, Elena; Pendharkar, Hemant; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2005 USA Cambridge); [2005]; 6 pp.; In English; See also 20060009039; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

For a few years, Data Mining researchers have been concerned with preferences for data mining process. Preferences often occur in the problems when a user looks for information, but is unable to describe it precisely. Hence, preference-based mining is a good alternative for such type problems. In this paper we focus on preference-based frequent pattern mining. Most results in this field consider simple (in some literature referred as base) preferences. But what if a user preference is a combination of simple ones? What types of combinations of preferences are meaningful in the data mining context? How to represent a combined preference based on its base preferences representations? In this paper we address the above issues. We define some classes of combined preferences analytically, using the utility function approach, investigate their properties, and show how they can be pushed deep into the mining process.
Author
Data Mining; Decision Theory; Graph Theory; Commerce; Algorithms

20060009050 National Inst. of Standards and Technology, Gaithersburg, MD, USA
Simplicial Complexes, Edge Paths, and Digraph Automata
Boudreaux, J. C.; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2005 USA Cambridge); [2005]; 11 pp.; In English; See also 20060009039; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Discrete engineered artifacts may be represented as 3-manifolds with boundary. The boundary consists of a possibly disconnected set of compact smooth 2-manifolds (topological surfaces). For example, the 2-sphere is the single boundary of the closed 3-ball. In the general case, the class of structures includes more complicated objects that have enclosed voids and tunnels. But the fact that every compact 3-manifold M can be triangulated by an abstract simplicial complex K whose geometric realization in Euclidean 3-space, written |K|, is homeomorphic to M suggests that it is possible to construct parametric engineering models directly on finitary abstract combinatorial structures. This paper will propose that a suitable

framework for this approach can be based upon a functional model of computation in which a major part of the burden is carried by an abstract mathematical structure called a directed graph, shortened to digraph. A digraph is defined as a pair (V,E), where V is an unempty set of vertices, E is a set of edges, together with a pair of functions start,stop:E V such that an edge h is interpreted as an arrow from the vertex start(h) to the vertex stop(h). Specifically, a class of automata, called digraph automata, will be defined such that (1) every vertex is mapped onto to a pair (*, env), where is an evaluator and env is a mutable symbolic environment; and (2) every edge is associated with a transfer function that accepts a sequence of values on the start vertex and yields a sequence of values on the stop vertex. This paper will argue that digraph automata provides a general methodological framework for constructing parametric engineering models in the context of discrete-part manufacturing.
Author
Automata Theory; Manifolds (Mathematics); Boundaries; Computation; Transfer Functions; Graph Theory; Euclidean Geometry

20060009125 Newcastle-upon-Tyne Univ., Newcastle, UK
Empirical and Analytical Evaluation of Systems with Multiple Unreliable Servers
Palmer, J.; Mitrani, I.; Dec. 2005; 24 pp.; In English
Report No.(s): PB2006-103561; CS-TR-936; No Copyright; Avail.: CASI: A03, Hardcopy
We construct, analyze and solve models of systems where a number of servers offer services to an incoming stream of demands. Each server goes through alternating periods of being operative and inoperative. The objective is to evaluate and optimize performance and cost metrics. A large real-life data set containing information about server breakdowns is analyzed first. The results indicate that the durations of the operative periods are not distributed exponentially. However, hyperexponential distributions are found to be a good fit for the observed data. A model based on these distributions is then formulated, and is solved exactly using the method of spectral expansion. A simple approximation which is accurate for heavily loaded systems is also proposed. The results of a number of numerical experiments are reported.
NTIS
Queueing Theory; Approximation; Costs

20060009126 Newcastle-upon-Tyne Univ., Newcastle, UK
Exploring Microbial Genome Sequences to Identify Protein Families on the Grid
Sun, Y.; Wipat, A.; Pocock, M.; Lee, P.; Flanagan, K.; Oct. 2005; 14 pp.; In English
Report No.(s): PB2006-103559; CS-TR-931; Copyright; Avail.: National Technical Information Service (NTIS)
The analysis of microbial genome sequences can identify protein families that provide potential drug targets for new antibiotics. With the rapid accumulation of newly sequenced genomes, the analysis of complete genome sequences has become a computationally- and data-intensive problem which is intractable on common computer systems. This paper presents the Microbase project that has developed a Grid-based system to support large-scale comparative analysis of complete microbial genome sequences, and the identification of protein families based on the analysis. The system integrates Grid computing with genomic databases to provide a high-performance environment for efficient genome comparison, analysis and protein family search. A pre-computed dataset of sequence similarities and homologous protein families has been generated which can assist the discovery of new therapeutic agents and provide leads for drug development.
NTIS
Genome; Microorganisms; Proteins; Sequencing

20060009129 Newcastle-upon-Tyne Univ., Newcastle, UK
Pret a Voter: a Systems Perspective
Ryan, P. Y. A.; Peacock, T.; Sep. 2005; 22 pp.; In English
Report No.(s): PB2006-103557; Copyright; Avail.: National Technical Information Service (NTIS)
Numerous cryptographic voting schemes have been proposed in recent years. Many of these have highly desirable formal security properties. However, as with all security systems, even a well-designed technical system can be undermined by implementation details or environmental factors, typically including human users, that violate (often implicit) assumptions of the design and evaluation. In ‘Cryptographic Voting Protocols: a System Perspective’ Karl of et al perform a systems-based analysis of the Chaum and Neff schemes. They identify a number of vulnerabilities and discuss possible mitigations and counter-measures.
NTIS
Computers; Security; Voting; Proving

20060009131 Newcastle-upon-Tyne Univ., Newcastle, UK
GOLD Architecture Document
Conlin, A.; Cook, N.; Hiden, H.; Periorellis, P.; Smith, R.; Jul. 2005; 34 pp.; In English
Report No.(s): PB2006-103552; CS-TR-923; Copyright; Avail.: National Technical Information Service (NTIS)

This document is intended to identify and analyze a software architecture to support the formation, operation and termination of a Virtual Organization. As Virtual Organizations are characterised by the dynamic behaviour that they exhibit, it is necessary to provide a means of adding and removing members and functionalities in a flexible manner. The service-based approach provides one means of achieving this flexibility, by conveying a number of important benefits; most importantly, encapsulation, which can provide a solution to the problem of loose coupling but tight integration between organizations.
NTIS
Architecture (Computers); Dynamic Characteristics; Computer Programs; Organizations

20060009133 Newcastle-upon-Tyne Univ., Newcastle, UK
Implementing Fair Non-repudiable Interactions with Web Services
Robinson, P.; Cook, N.; Shrivastava, S.; Jun. 2005; 30 pp.; In English
Report No.(s): PB2006-103550; CS-TR-913; Copyright; Avail.: National Technical Information Service (NTIS)

The use of open, Internet-based communications for business-to-business (B2B) interactions requires accountability for and acknowledgment of the actions of participants. Accountability and acknowledgment can be achieved by the systematic maintenance of an irrefutable audit trail to render the interaction non-repudiable. To safeguard the interests of each party, the mechanisms used to meet this requirement should ensure fairness. That is, misbehaviour should not disadvantage well-behaved parties. Despite the fact that Web services are increasingly used to enable B2B interactions, there is currently no systematic support to deliver such guarantees. This paper introduces a flexible framework to support fair non-repudiable B2B interactions based on a trusted delivery agent. A Web service implementation is presented. The role of the delivery agent can be adapted to different end user capabilities and to meet different application requirements.
NTIS
Interprocessor Communication; Information Transfer; Safeguard System

20060009136 Geological Survey, Idaho Falls, ID, USA
Compilation of Geologic, Hydrologic, and Ground-Water Flow Modeling Information for the Spokane Valley-Rathdrum Prairie Aquifer, Spokane County, Washington, and Bonner and Kootenai Counties, Idaho
Kahle, S. C.; Caldwell, R. R.; Bartolino, J. R.; January 2005; 82 pp.; In English
Report No.(s): PB2006-102924; No Copyright; Avail.: National Technical Information Service (NTIS)

The Spokane Valley-Rathdrum Prairie (SVRP) aquifer is the sole source of drinking water for over 400,000 residents in Spokane County, Washington, and Bonner and Kootenai Counties, Idaho. Recent and projected urban, suburban, and industrial/commercial growth has raised concerns about potential future effects on water availability and water quality in the SVRP aquifer and the Spokane and Little Spokane Rivers. This report presents geologic, hydrologic, and groundwater flow modeling information compiled by the U.S. Geological Survey, in cooperation with the Idaho Department of Water Resources and Washington Department of Ecology for the SVRP aquifer. Descriptions of the geologic history, hydrogeologic framework, surface geophysical studies, waterbudget components, ground- and surface-water interactions, computer flow models, and further data needs are provided.
NTIS
Aquifers; Geological Surveys; Grasslands; Ground Water; Hydrology Models; Surface Water; Valleys; Washington; Water Flow; Water Quality

20060009164 National Renewable Energy Lab., Golden, CO USA
Standard Definitions of Building Geometry for Energy Evaluation
Deru, M.; Torcellini, P.; Oct. 2005; 20 pp.; In English
Report No.(s): DE2005-15020794; NREL/TP-550-38600; No Copyright; Avail.: Department of Energy Information Bridge

This document provides definitions of building features such as building envelope, ceiling, exterior wall, and fenestration as they are used in building energy analyses. This document also provides metrics, or standard definitions of measurable quantities, for building geometry such as volumes, gross floor areas, walls, and fenestration. The metrics can be used for

characterizing building geometry, for calculating energy performance metrics, and for conducting energy simulations.
NTIS
Energy Requirements; Industries

20060009166 Lawrence Livermore National Lab., Livermore, CA USA
Middleware for Astronomical Data Analysis Pipelines
Abdulla, G.; Liu, D.; Garlick, J.; Miller, M.; Nikolaev, S.; Jan. 27, 2005; 10 pp.; In English
Report No.(s): DE2005-859921; UCRL-CONF-209265; No Copyright; Avail.: National Technical Information Service (NTIS)

In this paper the authors describe the approach to research, develop, and evaluate prototype middleware tools and architectures. The developed tools can be used by scientists to compose astronomical data analysis pipelines easily. They use the SuperMacho data pipelines as example applications to test the framework. they describe their experience from scheduling and running these analysis pipelines on massive parallel processing machines. they use MCR a Linux cluster machine with 1152 nodes and Luster parallel file system as the hardware test-bed to test and enhance the scalability of the tools.
NTIS
Applications Programs (Computers); Astronomy; Pipelines

20060009249 International Business Machines Corp., Yorktown Heights, USA
Fast Recursive Boolean Function Manipulation
Brayton, R. K.; Cohen, J. D.; Hachtel, G. D.; Trager, B. M.; Yun, D. Y. Y.; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 58-62; In English; See also 20060009241; Copyright; Avail.: Other Sources

A recursive paradigm is given for manipulating Boolean functions using a heuristic aimed at efficient algorithms for manipulating unate Boolean functions.
Author
Algorithms; Boolean Functions; Heuristic Methods

20060009254 Bell Telephone Labs., Inc., Murray Hill, NJ, USA
Series Expansions For Nonlinear Systems
Sandberg, I. W.; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 110-113; In English; See also 20060009241; Copyright; Avail.: Other Sources

In this paper we generalize recent theorems concerning the existence (and algorithms for obtaining) a power-series-type expansion for a nonlinear system's outputs in terms of its inputs. The results given here are directly applicable to a much larger class of systems.
Author
Series Expansion; Nonlinear Systems; Power Series

20060009261 International Business Machines Corp., Yorktown Heights, USA
The Decomposition And Factorization Of Boolean Expressions
Brayton, R. K.; McMullen, Curt; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 49-54; In English; See also 20060009241; Copyright; Avail.: Other Sources

We describe n technique for the identification of sub-expressions common to two or more Boolean functions. The technique has been successfully applied to exploit global commonality in the simultaneous design of 28 logical functions depending on 34 inputs. The same methods are used to give a factorization algorithm for single functions.
Author
Boolean Functions; Decomposition; Factorization; Algorithms

20060009268 Purdue Univ., West Lafayette, IN, USA
Principal Partition Of Graphs And Connectivity Games
Lin, Pen-Min; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 146-149; In English; See also 20060009241; Copyright; Avail.: Other Sources

A two-person game related to the connectivity among all vertices of a graph is defined. Necessary and sufficient conditions

for the short, cut, and neutral games are given in terms of the principal partition of a graph. Winning strategies are described. Author

Games; Game Theory; Apexes

20060009273 Tokyo Inst. of Tech., Yokahama, Japan

Generalization Of Okada-Planck's Logic And Reduction Of Kirchhoff's Law By The Concept Of Principal Partition

Kishi, G.; Kajitani, Y.; Fukuda, Y.; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 154-157; In English; See also 20060009241; Copyright; Avail.: Other Sources

The logic which is often called Okada-Planck's logic insists that any two of KCL, KVL and PCL (power conservation law) in a network can derive the remaining law. This paper generalizes the logic by introducing the concept of dominating subsystem D which is a subset of the whole set of equations describing KCL, KVL and PCL such that the total system can be derived from D. A necessary and sufficient condition of the dominating subsystem is presented. The minimum dominating subsystem is characterized by the concept of principal partition.

Author

Graph Theory; Electric Potential; Conservation Laws; Identities

20060009275 Tokyo Inst. of Tech., Tokyo, Japan

Principal Partition In 2-Parity Problems

Kajitani, Yoji; Ueno, Shuichi; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 150-153; In English; See also 20060009241; Copyright; Avail.: Other Sources

In a 2-graph G which is the graph whose edges are arranged in disjoint pairs as mates, a parity set is the edge set that includes both or none of mates for each pair. The concept of the principal partition is introduced to 2-graphs as a natural generalization from that defined in the maximum intersection problem. Some results which characterize the maximum independent parity set are given by using the concept, including a main theorem by which a new class of 2-graphs (2-matroids) is shown to be solvable by the same principle as used in the intersection problem which has already been solved.

Author

Graph Theory; Parity; Polynomials; Theorems; Algorithms; Circuits

20060009289 Tennessee Technological Univ., Cookeville, TN, USA

Planar Least Squares Inverse Polynomials: Stabilization Of Two Dimensional Recursive Digital Filters

Reddy, H. C.; Reddy, P. S.; Swamy, M. N. S.; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 76-79; In English; See also 20060009241

Contract(s)/Grant(s): NSERC-A-7739; Copyright; Avail.: Other Sources

In this paper we prove a transformation theorem on Planar Least Squares Inverse (PLSI) polynomials and generalize the known results on the stability of PLSI polynomials. We also prove a few more results which strengthen Jury's conjecture on PLSI polynomials. In fact if the length of the polynomial is not a consideration we prove a result that proves the conjecture.

Author

Digital Filters; Polynomials; Two Dimensional Models; Stability

20060009476 Bureau of Reclamation, Denver, CO USA

Flood Frequency, Flow Duration and Precipitation Analyses. Hoh River Geomorphology Investigation Olympic Peninsula, Washington

Jan. 2003; 44 pp.; In English

Report No.(s): PB2006-103587; No Copyright; Avail.: National Technical Information Service (NTIS)

This final report summarizes flood frequency, flow duration and precipitation estimates within the Hoh River Watershed, Washington. The report finalizes preliminary draft estimates that were made in February 2000. The primary basis for the flood frequency and flow duration estimates are U.S. Geological Survey peak discharge and mean daily flow records. National Weather Service records, obtained from the Western Regional Climate Center, were used to compute precipitation statistics. The data and results presented in the report are appropriate for detailed hydraulic and geomorphic studies and analyses.

NTIS

Floods; Frequencies; Geomorphology; Peninsulas; Rivers

20060009490 Geological Survey, San Antonio, TX, USA
Three-Dimensional Geologic Framework Modeling of Faulted Hydrostratigraphic Units within the Edwards Aquifer, Northern Bexar County, Texas
Pantea, M. P.; Cole, J. C.; January 2004; 18 pp.; In English
Report No.(s): PB2006-103583; USGS-SIR-2004-5226; No Copyright; Avail.: National Technical Information Service (NTIS)

This report describes a digital, three-dimensional faulted hydrostratigraphic model constructed to represent the geologic framework of the Edwards aquifer system in the area of San Antonio, northern Bexar County, Texas. The model is based on mapped geologic relationships that reflect the complex structures of the Balcones fault zone, detailed lithologic descriptions and interpretations of about 40 principal wells (and qualified data from numerous other wells), and a conceptual model of the gross geometry of the Edwards Group units derived from prior interpretations of depositional environments and paleogeography.
NTIS
Aquifers; Texas; Three Dimensional Models

20060009927 Government Accountability Office, Washington, DC, USA
Telecommunications: States' Collection and Use of Funds for Wireless Enhanced 911 Services
Mar. 2006; 32 pp.; In English
Report No.(s): PB2006-107503; GAO-06-338; No Copyright; Avail.: CASI: A03, Hardcopy

Enhanced 911 (E911) service refers to the capability of public safety answering points to automatically receive an emergency caller's location information. An industry association estimates that nearly 82 million 911 calls are placed each year by callers using mobile phones. Wireless E911 technology provides emergency responders with the location and callback number of a person calling 911 from a mobile phone. The ENHANCE 911 Act of 2004 called for GAO to study state and local use of funds collected for the purpose of wireless E911 implementation. We are reporting on (1) the progress made in implementing wireless E911 services throughout the country, (2) the states and localities that have established taxes, fees, or charges for wireless E911 implementation, and (3) the states or localities that have used funds collected for the purposes of wireless E911 for unrelated purposes. To address these issues, we surveyed state-level E911 contacts on the collection and use of E911 funds. Of the 51 state E911 contacts (including the District of Columbia) who were asked to participate in our survey, we received 44 responses.
NTIS
Telephones; Emergencies; Surveys

20060009962 Fermi National Accelerator Lab., Batavia, IL, USA, Michigan State Univ., East Lansing, MI, USA
Mantis: The Geant4-based Simulation Specialization of the CMS COBRA Framework
Stavrianakou, M.; January 2004; 20 pp.; In English
Report No.(s): DE2005-15016973; FERMILAB-CONF-04-471; No Copyright; Avail.: National Technical Information Service (NTIS)

The CMS Geant4-based Simulation Framework, Mantis, is a specialization of the COBRA framework, which implements the CMS OO architecture. Mantis, which is the basis for the CMS-specific simulation program OSCAR, provides the infrastructure for the selection, configuration and tuning of all essential simulation elements: geometry construction, sensitive detector and magnetic field management, event generation and Monte Carlo truth, physics, particle propagation and tracking, run and event management, and user monitoring actions. The experimental setup is built by Mantis using the COBRA Detector Description Database, DDD, which allows transparent instantiation of any layout (full or partial CMS simulation, test beam setups etc). Persistency, histogramming and other important services are available using the standard COBRA infrastructure and are transparent to user applications.
NTIS
Simulation; Monte Carlo Method; Magnetic Fields; Data Bases

20060009963 Fermi National Accelerator Lab., Batavia, IL, USA, Deutsches Elektronen-Synchrotron, Hamburg, Germany
Managed Data Storage and Data Access Services for Data Grids
Bakken, J.; Fisk, I.; Fuhrmann, P.; Mkrtchyan, T.; January 2005; 56 pp.; In English
Report No.(s): DE2005-15016971; FERMILAB-CONF-04-472; No Copyright; Avail.: National Technical Information Service (NTIS)

The LHC needs to achieve reliable high performance access to vastly distributed storage resources across the network. USCMS has worked with Fermilab-CD and DESY-IT on a storage service that was deployed at several sites. It provides Grid access to heterogeneous mass storage systems and synchronization between them. It increases resiliency by insulating clients from storage and network failures, and facilitates file sharing and network traffic shaping. This new storage service is implemented as a Grid Storage Element (SE). It consists of dCache as the core storage system and an implementation of the Storage Resource Manager (SRM), that together allow both local and Grid based access to the mass storage facilities. It provides advanced functionalities for managing, accessing and distributing collaboration data. USCMS is using this system both as Disk Resource Manager at Tier-1 and Tier-2 sites, and as Hierarchical Resource Manager with Enstore as tape back-end at the Fermilab Tier-1. It is used for providing shared managed disk pools at sites and for streaming data between the CERN Tier-0, the Fermilab Tier-1 and U.S. Tier-2 centers. Applications can reserve space for a time period, ensuring space availability when the application runs. Worker nodes without WAN connection can trigger data replication to the SE and then access data via the LAN. Moving the SE functionality off the worker nodes reduces load and improves reliability of the compute farm elements significantly. We describe architecture, components, and experience gained in CMS production and the DC04 Data Challenge.
NTIS
Data Storage; Information Systems; Data Management; Data Processing

20060009964 Pacific Northwest National Lab., Richland, WA, USA
Experiment on Graph Analysis Methodologies for Scenarios
Brothers, A. J.; Whitney, P. D.; Wolf, K. E.; Kuchar, O. A.; Chin, G.; Sep. 2005; 66 pp.; In English
Report No.(s): DE2005-15020707; PNNL-15406; No Copyright; Avail.: National Technical Information Service (NTIS)

Visual graph representations are increasingly used to represent, display, and explore scenarios and the structure of organizations. The graph representations of scenarios are readily understood, and commercial software is available to create and manage these representations. The purpose of the research presented in this report is to explore whether these graph representations support quantitative assessments of the underlying scenarios. The underlying structure of the scenarios is the information that is being targeted in the experiment and the extent to which the scenarios are similar in content. An experiment was designed that incorporated both the contents of the scenarios and analysts' graph representations of the scenarios. The scenarios' content was represented graphically by analysts, and both the structure and the semantics of the graph representation were attempted to be used to understand the content. The structure information was not found to be discriminating for the content of the scenarios in this experiment; however, the semantic information was discriminating. A Clustering Analysis/Chi Square metric was able to distinguish graphs drawn for the same scenario by different analysts from graphs based on different scenarios. It was not able to make the finer distinction between types of scenarios. While in principle the ontologies were meant to be directly related to the graphs, in practice issues arose that would be difficult to resolve as part of an algorithmic process. Future research could identify additional measures and analytic methodologies that could better discriminate graphs based on either structural or semantic information or the combination of the two.
NTIS
Graph Theory; Graphs (Charts)

20060009969 Fermi National Accelerator Lab., Batavia, IL, USA
Planning for Computing
January 2005; 8 pp.; In English
Report No.(s): DE2005-15016963; FERMILAB-CONF-04-467; No Copyright; Avail.: National Technical Information Service (NTIS)

No abstract available
Computers; Planning

20060009970 National Renewable Energy Lab., Golden, CO USA
Distributed Computing Grid Experience in CMS Data Challenge
Fanfani, A.; Sep. 29, 2004; 22 pp.; In English
Report No.(s): DE2005-15016960; FERMILAB-CONF-04-486; No Copyright; Avail.: National Technical Information Service (NTIS)

The Compact Muon Solenoid experiment (CMS) is one of the four High Energy Physics experiments that will collect data at the Large Hadron Collider (LHC) being built at CERN. The CMS collaboration is currently taking part in computing

intensive Monte Carlo simulation studies of the detector. CMS has a long term need to perform large-scale simulation efforts, in which physics events are generated and their manifestations in the CMS detector are simulated. The challenge for the CMS computing infrastructure is to cope with the very large computational and data access requirements. The size of the resources required, the complexity of the software and the physical distribution of the CMS collaboration naturally imply a distributed computing and data access solution. The Grid paradigm is one of the most promising solutions to be investigated, and CMS is collaborating with many Grid projects with the aim of understanding how the Grid can be useful for CMS and how CMS software needs to be adapted to use Grid functionalities. The preparation and building of the Computing System able to treat the data being collected pass through sequentially planned steps of increasing complexities (data and physics challenges). Data Challenge for CMS during the year 2004 was planned to reach a complexity scale equal to about 25% of that foreseen for LHC initial running. The goal of the challenge was to run CMS reconstruction for sustained period at 25Hz input rate, distribute the data to the CMS Tier-1 centers and analyze them at remote sites. To achieve the challenge CMS undertook a large simulated event production in advance. Grid environments developed in Europe by the LHC Computing Grid (LCG) in Europe and in the US with Grid2003 were utilized to complete the aspects of the challenge. A description of the experiences, successes and lessons learned from experiences with grid infrastructure is presented.
NTIS
Data Acquisition; Distributed Processing; Muons; Solenoids

20060009990 Tennessee Univ., Knoxville, TN, USA, Oak Ridge National Lab., TN USA, University of Southern California, Los Angeles, CA USA, California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Introduction to the HPC Challenge Benchmark Suite
Luszczek, P.; Dongarra, J. J.; Koester, D.; Rabenseifner, R.; Lucas, B.; Mar. 2005; 16 pp.; In English
Report No.(s): DE2005-860347; No Copyright; Avail.: Department of Energy Information Bridge

The HPC Challenge benchmark suite has been released by the DARPA HPCS program to help define the performance boundaries of future Petascale computing systems. HPC Challenge is a suite of tests that examine the performance of HPC architectures using kernels with memory access patterns more challenging than those of the High Performance Linpack (HPL) benchmark used in the Top500 list. Thus, the suite is designed to augment the Top500 list, providing benchmarks that bound the performance of many real applications as a function of memory access characteristics e.g., spatial and temporal locality, and providing a framework for including additional tests. In particular, the suite is composed of several well known computational kernels (STREAM, HPL, matrix multiply - DGEMM, parallel matrix transpose - PTRANS, FFT, RandomAccess, and bandwidth/latency tests - b(underline)eff) that attempt to span high and low spatial and temporal locality space. By design, the HPC Challenge tests are scalable with the size of data sets being a function of the largest HPL matrix for the tested system.
NTIS
Computers; Bandwidth; Fast Fourier Transformations

20060009991 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Highly Parallel, High Precision Numerical Integration
Bailey, D. H.; Borwein, J. M.; Apr. 17, 2005; 18 pp.; In English
Report No.(s): DE2005-860346; No Copyright; Avail.: Department of Energy Information Bridge

This paper describes a scheme for rapidly computing numerical values of definite integrals to very high accuracy, ranging from ordinary machine precision to hundreds or thousands of digits, even for functions with singularities or infinite derivatives at end-points. Such a scheme is of interest not only in computational physics and computational chemistry, but also in experimental mathematics, where high-precision numerical values of definite integrals can be used to numerically discover new identities. This paper discusses techniques for a parallel implementation of this scheme, then presents performance results for 1-D and 2-D test suites. Results are also given for a certain problem from mathematical physics, which features a difficult singularity, confirming a conjecture to 20,000 digit accuracy. The performance rate for this latter calculation on 1024 CPUs is 690 Gflop/s. We believe that this and one other 20,000-digit integral evaluation that we report are the highest-precision non-trivial numerical integrations performed to date.
NTIS
Numerical Integration; Singularity (Mathematics); Integrals

20060009992 Department of Energy, Washington, DC USA
Pseudo-Random Number Generator Based on Normal Numbers
Bailey, D. H.; Dec. 11, 2004; 12 pp.; In English
Report No.(s): DE2005-860344; No Copyright; Avail.: Department of Energy Information Bridge

In a recent paper, Richard Crandall and the present author established that each of a certain class of explicitly given real constants, uncountably infinite in number, is bnormal, for an integer b that appears in the formula defining the constant. A b-normal constant is one where every string of m digits appears in the base-b expansion of the constant with limiting frequency b(sup m). This paper shows how this result can be used to fashion an efficient and effective pseudo-random number generator, which generates successive strings of binary digits from one of the constants in this class. The resulting generator, which tests slightly faster than a conventional linear congruential generator, avoids difficulties with large power-of-two data access strides that may occur when using conventional generators. It is also well suited for parallel processing-each processor can quickly and independently compute its starting value, with the collective sequence generated by all processors being the same as that generated by a single processor.
NTIS
Random Numbers; Binary Digits; Integers; Parallel Processing (Computers)

20060009993 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA, California Univ., San Diego, CA, USA
Performance Modeling: Understanding the Present and Predicting the Future
Bailey, D. H.; Snavely, A.; January 2005; 16 pp.; In English
Report No.(s): DE2005-860343; No Copyright; Avail.: National Technical Information Service (NTIS)

We present an overview of current research in performance modeling, focusing on efforts underway in the Performance Evaluation Research Center (PERC). Using some new techniques, we are able to construct performance models that can be used to project the sustained performance of large-scale scientific programs on different systems, over a range of job and system sizes. Such models can be used by vendors in system designs, by computing centers in system acquisitions, and by application scientists to improve the performance of their codes.
NTIS
Computers; Performance Prediction; Predictions

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COMPUTER OPERATIONS AND HARDWARE

Includes hardware for computer graphics, firmware and data processing. For components see *33 Electronics and Electrical Engineering*. For computer vision see *63 Cybernetics, Artificial Intelligence and Robotics*.

20060009311 NASA Langley Research Center, Hampton, VA, USA, National Inst. of Aerospace, Hampton, VA, USA
Deciding Termination for Ancestor Match- Bounded String Rewriting Systems
Geser, Alfons; Hofbauer, Dieter; Waldmann, Johannes; December 2005; 19 pp.; In English
Contract(s)/Grant(s): NCC1-02043; 23-065-10-22
Report No.(s): NASA/CR-2005-213920; NIA-Rept 2005-02; Copyright; Avail.: CASI: A03, Hardcopy

Termination of a string rewriting system can be characterized by termination on suitable recursively defined languages. This kind of termination criteria has been criticized for its lack of automation. In an earlier paper we have shown how to construct an automated termination criterion if the recursion is aligned with the rewrite relation. We have demonstrated the technique with Dershowitz's forward closure criterion. In this paper we show that a different approach is suitable when the recursion is aligned with the inverse of the rewrite relation. We apply this idea to Kurth's ancestor graphs and obtain ancestor match-bounded string rewriting systems. Termination is shown to be decidable for this class. The resulting method improves upon those based on match-boundedness or inverse match-boundedness.
Author
Strings; Languages; Criteria; Formalism; Deletion

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COMPUTER PROGRAMMING AND SOFTWARE

Includes software engineering, computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM. For computer software applied to specific applications, see also the associated category.

20060009003 NASA Ames Research Center, Moffett Field, CA, USA
EXTENSIBLE DATABASE FRAMEWORK FOR MANAGEMENT of UNSTRUCTURED and SEMI-STRUCTURED DOCUMENTS
Gawdiak, Yuri O., Inventor; La, Tracy T., Inventor; Lin, Shu-Chun Y., Inventor; Malof, David A., Inventor; Tran, Khai Peter B., Inventor; November 22, 2005; 17 pp.; In English

Patent Info.: Filed 29 Aug. 2002; US-Patent-6,968,338; US-Patent-Appl-SN-232975; NASA-Case-ARC-14662-1; No Copyright; Avail.: CASI: A03, Hardcopy

Method and system for querying a collection of Unstructured or semi-structured documents to identify presence of, and provide context and/or content for, keywords and/or keyphrases. The documents are analyzed and assigned a node structure, including an ordered sequence of mutually exclusive node segments or strings. Each node has an associated set of at least four, five or six attributes with node information and can represent a format marker or text, with the last node in any node segment usually being a text node. A keyword (or keyphrase) is specified. and the last node in each node segment is searched for a match with the keyword. When a match is found at a query node, or at a node determined with reference to a query node, the system displays the context andor the content of the query node.

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

Data Base Management Systems; Unstructured Grids (Mathematics); Display Devices; Strings

20060009039 IPSI Belgrade, Belgrade, Serbia

International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2005 USA Cambridge)

[2005]; In English; IPSI 2005, 7-10 Jul. 2005, Cambridge, MA, USA; See also 20060009040 - 20060009064; Copyright; Avail.: CASI: C01, CD-ROM

Topics covered include: Fixed Wireless Carrier Economics: An Idea Whose Time Has Come?; Effective Knowledge Dissemination Using RSS; Preference-based Frequent Pattern Mining - from Base Preferences to Combined Preferences; Using Java and Linda for Parallel Processing in Bioinformatics for Simplicity, Power and Portability; Simplicial Complexes, Edge Paths, and Digraph Automata; Artificial Intelligence Modeling of Materials' Bulk Chemical and Physical Properties; Autonomic Information Processing: Towards a Cohomological Approach; Replacing the Data Processing Computer with Brain-like Learning Machines: A New Communication and Computing Paradigm based on the Autosophy Information Theory; A Hybrid Game-theoretic Approach to Controller Design for Nonlinear Systems; Implementation of Probabilistic Packet Marking for IPv6 Traceback; Applied Software Development Risk Model; From Educational modelling languages to Stochastic Petri Net modelling for E-learning Technologies Analysis; On a Secured Object Signature for Web and XML Objects; Internet-based e-Learning System for Performance Centered Instruction in Microelectronics; A Space-Time Logic; Knowledge Visualization by Doctus Knowledge Galaxy; Optimization of the Tests Set Selection for Decision-Making in Intelligent Systems; Distributed Coordination of Project Information Changes: An Ontology-Based Multi-agent Framework; Prediction of the Global Warming: Some evidences from India; Multi Layered System Security;

Derived from text

Software Engineering; Parallel Processing (Computers); Computer Programming; Internets; Information Theory; Data Mining; Stochastic Processes; Nonlinear Systems; Automata Theory

20060009040 Tomsk State Univ. of Architecture and Building, Tomsk, Russia

Optimization of the Tests Set Selection for Decision-Making in Intelligent Systems

Yankovskaya, A.; Ametov, R.; Kolesnikova, S.; Mozheyko, V.; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2005 USA Cambridge); [2005]; 10 pp.; In English; See also 20060009039

Contract(s)/Grant(s): RFBR-04-01-00144; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper is concerned with the problem of a irredundant diagnostic test set selection optimization with the prescribed properties. It allows to construct the simple rules of decisionmaking in intelligent systems. The optimization criteria are formulated. Setting of the problem is given. The paper presents the result concerning development of the logical-combinatorial algorithm and the new algorithm based on the analytical hierarchies method. Illustrative example for both algorithms is given. Program realization of the first algorithm in the IMSLOG IST intended for applied intelligent systems designing is given. Program realization of the algorithm based on the analytical hierarchies method is described briefly. Expediency of algorithms application in medical intelligent systems and in interdisciplinary systems such as biomedical and geoecological ones is proved.

Author

Decision Making; Combinatorial Analysis; Algorithms

20060009042 Hong Kong Univ., Hong Kong

Distributed Coordination of Project Information Changes: An Ontology-Based Multi-agent Framework

Cai, Qiying; Ng, F. F.; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2005 USA Cambridge); [2005]; 6 pp.; In English; See also 20060009039; Original contains black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

During a project lifecycle, changes are inevitable due to various uncertainties, complexity of tasks and mobility of people involved. Once happen, these changes are propagated to different disciplines through the project value chain. Yet the impacts of such changes are embedded implicitly in the prevalent Internet-based project management systems. Stakeholders need to interpret the changes and evaluate their impacts manually. Due to the lack of coordination in decision-making, conflicts always happen. With the upcoming Semantic Web, technologies become available to enable intelligent software agents to access the distributed information resources in a semantic rich way. This enables the agents to represent the stakeholders to manage the information changes in a distributed environment. This paper describes an ongoing research to develop an ontology-based multi-agent framework to coordinate the information changes. After a brief review of technology background, a hybrid infrastructure consisting of ontology layer, agent layer and interface layer is presented, followed by an example to investigate how agents work in a fast-track project. The related works and future research plans are also discussed at the end of the pape
Author

Distributed Parameter Systems; Information Management; Project Management; Decision Making; Coordination

20060009044 National Central Univ., Chung-Li, Taiwan, Province of China

Using Intelligent Agent to Support Build System In Extreme Programming Environment

Chen, Jason Jen-Yen; Liao, Jyung-Jie; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2005 USA Cambridge); [2005]; 10 pp.; In English; See also 20060009039; Original contains black and white illustrations

Contract(s)/Grant(s): Proj. NSC93-2213-E-008-036; Proj. 93-EC-17-A-02-S1-029; Proj. EX91-E-FA06-4-4; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper presents an intelligent agent-based build system for extreme programming (XP) environment. In XP, source code is constantly being changed and integrated. An intelligent build system to compile, link, and unit-test source code is thus a necessity for XP environment. Java Agent Development framework (JADE) is used to develop a multi-agent system (MAS) for this build system, and a tool called Ant is included to execute the build. The expected benefits are: 1) Robust build process through Middle Agent in MAS, 2) Automatic source code upload using DARPA Agent Markup Language (DAML)-formatted build report, and 3) Being capable of unit testing applications of different domains.
Author

Software Engineering; Programming Environments; Domains; Document Markup Languages

20060009049 Rhodes Univ., South Africa

Using Java and Linda for Parallel Processing in Bioinformatics for Simplicity, Power and Portability

Wells, George; Akhurst, Tim; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2005 USA Cambridge); [2005]; 7 pp.; In English; See also 20060009039; Original contains black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper discusses the use of Java and the Linda coordination language (specifically, IBM's TSpaces implementation) for the construction of parallel processing applications in the field of bioinformatics. Much existing work in this field makes use of scripting languages such as Perl. Java provides a more powerful programming and deployment environment with strong support for processing genetic data. Furthermore, the Linda approach greatly simplifies the parallelization of bioinformatics applications. Results of a DNA string searching application show very favorable performance benefits arising from the use of Java and TSpaces on a network of commodity workstations. Near-linear speedup is observed for configurations of up to 15 processors, and execution times are reduced by up to 96%.
Author

Java (Programming Language); Parallel Processing (Computers); Programming Environments; Genetics; Deoxyribonucleic Acid; Strings

20060009054 Gifu Univ., Gifu, Japan

Implementation of Probabilistic Packet Marking for IPv6 Traceback

Narita-Harayama, Michiko; Kakehi, Naoyuki; Takeuchi, Daisaku; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2005 USA Cambridge); [2005]; 5 pp.; In English; See also 20060009039; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Recently, security in computer networks has become one of the most urgent problems. IP traceback method is expected to prevent most vicious attacks like denial of services(DoS) with false statement of the source address in IP packets. Among them, probabilistic packet marking (PPM) method is being watched with interest. Here, we have proposed an implementation method of PPM for IPv6 packets. A new hop-by-hop options of IPv6 has been defined as trace option, where information of passing node is added. Examinations in an experimental network show little influence on the routing performance in nodes. In this paper, definition of header, traceback algorithm, implementation and experimental results are described.

Author

Computer Networks; Computer Security; Algorithms; Probability Theory

20060009055 Syracuse Univ., NY, USA

Applied Software Development Risk Model

Fawcett, James W.; Gungor, Murat K.; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2005 USA Cambridge); [2005]; 12 pp.; In English; See also 20060009039; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Process of developing large software systems creates many source code files with complex inter-dependencies. Clusters of mutually dependent files introduce the possibility of a chain of forced consequential changes when a single cluster member file is changed. The software development risk model, developed here, shows that the density of dependencies within such clusters plays a crucial role in this behavior. We develop a file-rank procedure which orders the entire system s file set by increasing risk. This ranking process should prove to be useful while managing the development of large systems, indicating where attention should be focused to reduce development risk. We have applied this model to code from several projects with interesting results.

Author

Software Engineering; Computer Programs; Risk; Computer Programming

20060009057 Lawrence Technological Univ., Southfield, MI, USA

On a Secured Object Signature for Web and XML Objects

Chang, Peter H.; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2005 USA Cambridge); [2005]; 5 pp.; In English; See also 20060009039; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We present object-oriented security models for a secured object signature of web and XML objects. The models address web and XML securities in general. They address in particular security wrappers for web pages, security nodes for network machines, and mid-tier securities for middle-tier machines. We discuss in a high level implementations for security nodes and mid-tier securities. We discuss an implementation for security wrappers in detail. The implementation encrypts web and XML objects in a company s Intranet web site and enhances the protections of them against unauthorized accesses by an intruder. The encryption method uses the combination of a randomly generated session key, a session id that consists of remote host id and port number, and an access sequence number that is maintained by the web server. Although the encryption method addresses the security wrappers, its approach is equally applicable to security nodes and mid-tier securities as well.

Author

Computer Networks; Object-Oriented Programming; World Wide Web; Security; Signatures; Document Markup Languages

20060009059 Federal Univ. of the Bahia, Salvador, Brazil

A Space-Time Logic

Ferreira, Ulisses; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2005 USA Cambridge); [2005]; 60 pp.; In English; See also 20060009039; Original contains black and white illustrations; Copyright; Avail.: CASI: A04, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

It is well known that space and time are two primary notions that have always been present in the human consciousness independently of contexts. In this article, I propose a space-time logic with five epistemic values, together with uncertainty. My work considers the expressiveness of the language and, because of this, I also introduce a deductive system for the present logic in the same syntax. The present author'signal aim is mainly to introduce a general framework for writing formal semantics of programming languages that support code mobility e.g. mobile agents, among other more traditional applications such as knowledge representation. Moreover, the present logic is powerful enough for representing more sophisticated forms of reasoning, such as to weigh up possibilities. For being able to make fair judgments one should consciously attach honesty factors (in this case, floating-point numbers in [-1, +1]) to diversified implications between premises and some conclusion in such a way that that conclusion from weighing up possibilities can be based on those factors. As it is well known, this is a very common form of reasoning. Thus, the \@-logic also provides uncertainty-based representation combined with deduction for such purposes.
Author
Floating Point Arithmetic; Programming Languages; Syntax; Knowledge Representation

20060009060 Doctus Co., Budapest, Hungary
Knowledge Visualization by Doctus Knowledge Galaxy
Baracskai, Zoltan; Velencei, Jolan; Dorfler, Viktor; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2005 USA Cambridge); [2005]; 6 pp.; In English; See also 20060009039; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Making an attempt to develop a curriculum for web-based learning, we have realized that the existing solutions have adopted the traditional content management principles of printed books. By doing so, these solutions do not make use of benefits of a web-based system, namely the multimedia and the interactivity. Our new solution puts these benefits into the focus. Combining the features of semantic networks, cognitive maps and machine learning, we have developed a new generation knowledge visualization tool called Doctus Knowledge Galaxy shell. In our solution the topics and keywords are not in a sequential order, thus enabling the e-learner to choose her/his own learning route. The monitoring system of Doctus Knowledge Galaxy also allow us to observe how much time the learner spends on particular keywords and which next keyword she/he chooses after concluding a previous one by passing the test. The most important achievement of Doctus Knowledge Galaxy is its clear and transparent structure, which enables the learners into fast navigation and provides the developers with useful information about the learning routes and performance of the learner.
Author
Education; Multimedia; Knowledge Based Systems; Software Development Tools; Machine Learning

20060009063 Protegrity Corp., Stamford, CT, USA
A Practical Implementation of Transparent Encryption and Separation of Duties in Enterprise Databases: Protection against External and Internal Attacks on Databases
Mattsson, Ulf T.; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2005 USA Cambridge); [2005]; 8 pp.; In English; See also 20060009039; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Security is becoming one of the most urgent challenges in database research and industry, and there has also been increasing interest in the problem of building accurate data mining models over aggregate data, while protecting privacy at the level of individual records. Instead of building walls around servers or hard drives, a protective layer of encryption is provided around specific sensitive data items or objects. This prevents outside attacks as well as infiltration from within the server itself. This also allows the security administrator to define which data stored in databases are sensitive and thereby focusing the protection only on the sensitive data, which in turn minimizes the delays or burdens on the system that may occur from other bulk encryption methods. Encryption can provide strong security for data at rest, but developing a database encryption strategy must take many factors into consideration.We present column-level database encryption as the only solution that is capable of protecting against external and internal threats, and at the same time meeting all regulatory requirements. We use the key concepts of security dictionary, type transparent cryptography and propose solutions on how to transparently store and search encrypted database fields. Different stored data encryption strategies are outlined, so you can decide the best practice for each situation, and each individual field in your database, to handle different security and operating requirements. Application code and database schemas are sensitive to changes in the data type and data length. the paper

presents a policy driven solution that allows transparent data level encryption that does not change the data field type or length. Author

Transparence; Cryptography; Data Bases; Data Mining; Protection; Security

20060009064 Protegrity Corp., Stamford, CT, USA

A Real-Time Intrusion Prevention System for Commercial Enterprise Databases and File Systems

Mattsson, Ulf T.; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2005 USA Cambridge); [2005]; 6 pp.; In English; See also 20060009039; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Modern intrusion detection systems are comprised of three basically different approaches, host based, network based, and a third relatively recent addition called procedural based detection. The first two have been extremely popular in the commercial market for a number of years now because they are relatively simple to use, understand and maintain. However, they fall prey to a number of shortcomings such as scaling with increased traffic requirements, use of complex and false positive prone signature databases, and their inability to detect novel intrusive attempts. This paper presents an overview of our work in creating a practical database intrusion detection system. Based on many years of Database Security Research, the proposed solution detects a wide range of specific and general forms of misuse, provides detailed reports, and has a low false-alarm rate. Traditional commercial implementations of database security mechanisms are very limited in defending successful data attacks. Authorized but malicious transactions can make a database useless by impairing its integrity and availability. The proposed solution offers the ability to detect misuse and subversion through the direct monitoring of database operations inside the database host, providing an important complement to host-based and network-based surveillance. Author

Warning Systems; Computer Security; Prevention; Real Time Operation; Intrusion; Data Bases

20060009946 Geological Survey, Menlo Park, CA, USA

SideBar Computer Program, a Seismic-Shaking Intensity Meter: Users' Manual and Software Description (Release 3.0.TO)

Evans, J. R.; January 2003; 26 pp.; In English

Report No.(s): PB2006-105327; USGS/OFR-03-202; No Copyright; Avail.: National Technical Information Service (NTIS)

The SideBar computer program provides a visual display of seismic shaking intensity as recorded at one specific seismograph. This software allows a user to tap into the seismic data recorded on that specific seismograph and to display the overall level of shaking at the single location where that seismograph resides (usually the same place the user is). From this shaking level, SideBar also estimates the potential for damage nearby. SideBar cannot tell you the Richter magnitude of the earthquake, only how hard the ground shook locally and this estimate of how much damage is likely in the neighborhood. This combination of local effects is called the seismic intensity. SideBar principally fill an informational gap between the time of an earthquake and the availability of detailed, regional information, including ShakeMap, about 10 minutes later. Similarly, should Web access be impossible for some reason, SideBar can continue to fill the information gap indefinitely. For smaller earthquakes, educational opportunities also exist with SideBar, or, if these events occur during major sequences, the opportunity to calm nerves by showing immediately that the event is of no concern. SideBar provides a single datum-the shaking intensity at a single place-while USGS Web sites provide broad, regional information with very detailed drill down capability.

NTIS

Computer Programs; Earth Movements; Earthquakes; Seismographs; Shaking; User Manuals (Computer Programs)

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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.

20060009030 NASA Johnson Space Center, Houston, TX, USA

A Data-Based Console Logger for Mission Operations Team Coordination

Thronesbery, Carroll; Malin, Jane T.; Jenks, Kenneth; Overland, David; Oliver, Patrick; Zhang, Jiajie; Gong, Yang; Zhang, Tao; [2005]; 11 pp.; In English; 2005 IEEE Aerospace Conference, 5-12 Mar. 2005, Manhattan Beach, CA, USA

Contract(s)/Grant(s): Proj. 0928ape0200; Copyright; Avail.: CASI: A03, Hardcopy

Concepts and prototypes1,2 are discussed for a data-based console logger (D-Logger) to meet new challenges for coordination among flight controllers arising from new exploration mission concepts. The challenges include communication delays, increased crew autonomy, multiple concurrent missions, reduced-size flight support teams that include multidisciplinary flight controllers during quiescent periods, and migrating some flight support activities to flight controller offices. A spiral development approach has been adopted, making simple, but useful functions available early and adding more extensive support later. Evaluations have guided the development of the D-Logger from the beginning and continue to provide valuable user influence about upcoming requirements. D-Logger is part of a suite of tools designed to support future operations personnel and crew. While these tools can be used independently, when used together, they provide yet another level of support by interacting with one another. Recommendations are offered for the development of similar projects.
Author
Data Management; Mission Planning; Flight Control; Coordination; Data Base Management Systems; Consoles

20060009036 NASA Johnson Space Center, Houston, TX, USA
Enhancing International Space Station (ISS) Mission Control Center (MCC) Operations Using Tcl/Tk
OHagan, Brian; Long, Stephen K., Sr.; [2004]; 2 pp.; In English; 11th Annual Tel/Tk Conference, 13-15 Oct. 2004, New Orleans, LA, USA; Copyright; Avail.: CASI: A01, Hardcopy

This paper will discuss the use of Tcl/Tk to enhance the abilities of flight controllers to control the International Space Station (ISS) from the Mission Control Center (MCC) at the Johnson Space Center. We will discuss why existing tools where not able to meet these needs as easily as Tcl/Tk. In addition, we will also discuss how we interfaced with the existing MCC infrastructure to receive ISS telemetry, find servers, register services, and send commands to ISS.
Author
Flight Control; International Space Station; Telemetry

20060009047 Schlumberger Oilfield Services, USA
Effective Knowledge Dissemination Using RSS
Baudoin, Claude; Muller, Karyn; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2005 USA Cambridge); [2005], pp. 1-9; In English; See also 20060009039; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Knowledge workers, such as scientists and engineers, need timely access to relevant knowledge and technical news. However, current knowledge dissemination mechanisms have become ineffective, due in part to spam and in part to poorly classified and redundant messages. In this paper, we describe how RSS (Really Simple Syndication) can be used to aggregate and deliver internal and external news as a single feed for each topic of interest to an individual. News can be submitted by email, through a browser, or it can come from external RSS feeds. In turn, recipients can get the news through an RSS client, a browser, or in their email, according to their preferences. This flexibility means that users are not forced to switch suddenly to a new system, which allows a smooth transition to an RSS-based system.
Author
Scientists; Electronic Mail; Knowledge; Information Systems; Engineers

20060009052 National Research Council, Rome, Italy
Autonomic Information Processing: Towards a Cohomological Approach
Mascari, G. F.; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2005 USA Cambridge); [2005]; 7 pp.; In English; See also 20060009039; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The geometry of Autonomic Information Processing can be modeled by requests and supplies willing to match and mutually adapt in a dynamic way. Requests and supplies arise from interactions between tasks and resources. In this scenario we separate the concept of task and task request, as well as resource and resource supply. The interactive, adaptive and autonomic behaviors are modeled by algebraic methods based on category theory: a cohomological approach is announced.
Author
Information Flow; Data Processing; Information Systems; Complex Systems

20060009053 Autosophy, San Francisco, CA, USA
Replacing the Data Processing Computer with Brain-like Learning Machines: A new Communication and Computing Paradigm based on the Autosophy Information Theory
Holtz, Klaus; Holtz, Eric; Kalienky, Diana; International Conference on Advances in the Internet, Processing, Systems and

Interdisciplinary Research (IPSI-2005 USA Cambridge); [2005]; 13 pp.; In English; See also 20060009039; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Data processing computers may soon be eclipsed by a next generation of brain-like learning machines based on the 'Autosophy' information theory. This will have a profound impact on communication and computing applications. Data processing computers are essentially adding or calculating machines that cannot find 'meaning' as our own brains obviously can. No matter the speed of computation or the complexity of the software, computers will not evolve into brain-like machines. All that can be achieved are mere simulations. The basic problem can be traced back to an outdated (Shannon) information theory that treats all data items (such as ASCII characters or pixels) as 'quantities' in meaningless bit streams. In 1974 Klaus Holtz developed a new Autosophy information theory, which treats all data items as 'addresses.' The original Autosophy research explains the functioning of self-assembling natural structures, such as chemical crystals or living trees. The same natural laws and principles can also produce self-assembling data structures, which grow like data crystals or data trees in electronic memories, without computing or programming. Replacing the programmed data processing computer with brain-like, self-learning, failure-proof 'autosopher' promises a true paradigm shift in technology, resulting in system architectures with true 'learning' and eventually true Artificial Intelligence.

Author

Artificial Intelligence; Information Theory; Data Processing; Data Structures; Memory (Computers); Data Storage; Machine Learning

20060009056 Universite des Sciences et de la Technologie Houari Boumediene, Algiers, Algeria

From Educational modelling languages to Stochastic Petri Net modelling for E-learning technologies analysis

Salmi, Nabila; Ioualalen, Malika; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2005 USA Cambridge); [2005]; 9 pp.; In English; See also 20060009039; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Training and learning methods have been greatly improved thanks to the use of E-learning technologies, and have reached a large public including companies staff, remote and foreign students. Many works have been proposed in the literature in the field of E-learning research so that to allow actors to work with more efficiency and more effectiveness. These recent works focus more and more on educational modelling languages and object learning modelling languages. Among these languages, EML language (Educational Modelling Language) has been introduced for modelling learning processes, and on the other hand, the LOM (Learning Object Metadata) and IMS (Instructional Management Systems) specifications have been defined for modelling teaching resources (objects). In this article, we will present an approach for the design and performance evaluation of an e-learning platform, by first using a mixture of the two languages LOM and EML, then, modelling the platform with Stochastic Petri Net models. The modelling is proposed in order to analyse learning processes of the platform. We will see that this Petri net model can provide an efficient way to evaluate an e-learning platform.

Author

Education; Petri Nets; Metadata; Stochastic Processes; Performance Tests

20060009058 Technical Univ. of Sofia, Sofia, Bulgaria

Internet-based e-Learning System for Performance Centered Instruction in Microelectronics

Tzanova, Slavka; Schaeffer, Christian; Royer, Michel; Illyefalvi-Vitez, Zsolt; Mouthaan, Ton; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2005 USA Cambridge); [2005]; 6 pp.; In English; See also 20060009039; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In the presented in this manuscript project we offer a new approach of thinking up the vocational learning process - learning for knowledge work and its presentation system, as a performance-centered task-oriented educational system. It is a three-year project within the European program Leonardo da Vinci and the partners are from small and medium enterprises in microelectronics, training organizations and universities from four European countries - France, Bulgaria, the Netherlands and Hungary. The project is aimed at implementation of innovative approaches for performance-centered learning and development of new instruments in instructional design of task-performance-centered courses for training and education in microelectronics - Internet-based Performance Centered Instruction (IPCI). The IPCI contains an information area with the main course content presented with hyperlinks and in a database; a training area with examples, tutorials, exercises, tests, projects, and an advisory area with an expert system. In the IPCI environment job-related task-oriented learning materials will

be delivered for five courses in design of numeric, analogue and high frequency integrated circuits, microsystems, CMOS technology, components and microsystems assembly and packaging.
Author
Internets; Microelectronics; Education; Human Performance; Information Retrieval; Data Links; Integrated Circuits

20060009061 Telecom Italia Group, Milan, Italy
Multi Layered System Security
Ghioni, Fabio; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2005 USA Cambridge); [2005]; 7 pp.; In English; See also 20060009039; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Technology and the Internet have transformed criminals into pervasive entities that are able to launch attacks at any time and from virtually anywhere in the world. Information security specialists are thus challenged with protecting the cyber-space against unpredictable and ever changing attacks. Information security in a business must be rethought on a multi-layered basis with the objective of defending all the levels and processes of an information system from both internal (employees or brute force) and external (such as distributed denial of service and above all industrial and competitive intelligence) malicious attacks.
Author
Information Systems; Internets; Commerce; Computer Security; Launch Windows

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*.

20060009023 NASA Johnson Space Center, Houston, TX, USA
Robonaut Mobile Autonomy: Initial Experiments
Diftler, M. A.; Ambrose, R. O.; Goza, S. M.; Tyree, K. S.; Huber, E. L.; [2006]; 7 pp.; In English; ICRA 2005, 18-22 Apr. 2005, Barcelona, Spain
Contract(s)/Grant(s): NAS9-19100; No Copyright; Avail.: CASI: A02, Hardcopy

A mobile version of the NASA/DARPA Robonaut humanoid recently completed initial autonomy trials working directly with humans in cluttered environments. This compact robot combines the upper body of the Robonaut system with a Segway Robotic Mobility Platform yielding a dexterous, maneuverable humanoid ideal for interacting with human co-workers in a range of environments. This system uses stereovision to locate human teammates and tools and a navigation system that uses laser range and vision data to follow humans while avoiding obstacles. Tactile sensors provide information to grasping algorithms for efficient tool exchanges. The autonomous architecture utilizes these pre-programmed skills to form complex behaviors. The initial behavior demonstrates a robust capability to assist a human by acquiring a tool from a remotely located individual and then following the human in a cluttered environment with the tool for future use.
Author
Autonomy; Mobility; Robotics; Maneuverability; Tactile Sensors (Robotics)

64
NUMERICAL ANALYSIS

Includes iteration, differential and difference equations, and numerical approximation.

20060009007 NASA Ames Research Center, Moffett Field, CA, USA
HYBRID NEURAL NETWORK and SUPPORT VECTOR MACHINE METHOD FOR OPTIMIZATION
Rai, Man Mohan, Inventor; November 1, 2005; 24 pp.; In English
Patent Info.: Filed 7 Jan. 2002; US-Patent-6,961,719; US-Patent-Appl-043044; NASA-Case-ARC-14586-1; No Copyright; Avail.: CASI: A03, Hardcopy

System and method for optimization of a design associated with a response function, using a hybrid neural net and support vector machine (NN/SVM) analysis to minimize or maximize an objective function, optionally subject to one or more constraints. As a first example, the NN/SVM analysis is applied iteratively to design of an aerodynamic component, such as

an airfoil shape, where the objective function measures deviation from a target pressure distribution on the perimeter of the aerodynamic component. As a second example, the NN/SVM analysis is applied to data classification of a sequence of data points in a multidimensional space. The NN/SVM analysis is also applied to data regression.
Official Gazette of the U.S. Patent and Trademark Office
Neural Nets; Optimization; Vectors (Mathematics)

20060009193 NASA Johnson Space Center, Houston, TX, USA
Strip Yield Model Numerical Application to Different Geometries and Loading Conditions
Hatamleh, Omar; Forman, Royce; Shivakumar, Venkataraman; Lyons, Jed; [2006]; 18 pp.; In English; Copyright; Avail.: CASI: A03, Hardcopy

A new numerical method based on the strip-yield analysis approach was developed for calculating the Crack Tip Opening Displacement (CTOD). This approach can be applied for different crack configurations having infinite and finite geometries, and arbitrary applied loading conditions. The new technique adapts the boundary element / dislocation density method to obtain crack-face opening displacements at any point on a crack, and succeeds by obtaining requisite values as a series of definite integrals, the functional parts of each being evaluated exactly in a closed form.
Author
Loads (Forces); Integrals; Crack Opening Displacement; Cracks; Numerical Analysis

20060009246 Ghent Univ., Belgium
Automatic Network Tuning And Worst-Case Analysis By Global Quadratic Optimization
Tromp, H.; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 126-129; In English; See also 20060009241; Copyright; Avail.: Other Sources

An efficient algorithm for automatic post-production tuning of networks is presented. It also solves the related problem of worst-case analysis. The method is based on successive quadratic approximations of a performance criterion and their exact global minimization. It can be used for tuning problems where the variables may vary over a wide range. Several examples are included to illustrate the performance of the algorithm.
Author
Algorithms; Approximation; Optimization; Automatic Control; Quadratic Equations; Network Analysis

20060009251 Tokyo Inst. of Tech., Yokahama, Japan
Historical Survey Of Extensions Of The Concept Of Principal Partition And Their Unifying Generalization To Hypermatroids
Tomizawa, Nobuaki; Fujishige, Satoru; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 142-145; In English; See also 20060009241; Copyright; Avail.: Other Sources

We survey the hitherto obtained results on the principal partition from a unifying point of view of maximization/minimization of supermodular/submodular functions and give a unifying generalization of
Author
Histories; Partitions (Mathematics); Optimization; Surveys

20060009288 International Business Machines Corp., Yorktown Heights, NY, USA
Staggered Input Networks: An Approach To Automatic Logic Decomposition
Risch, Robert H.; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 55-57; In English; See also 20060009241; Copyright; Avail.: Other Sources

We present a method based on an updated version of Harvard charts, for decomposing a multiple output block of combinatorial logic into a network of k input, 1 output devices (k fixed). The primary inputs are ordered according to timing considerations. The algorithm produces a staggered input network such that the early arriving signals are allowed more stages of logic. The objective is to produce a network, satisfying timing requirements, with the least number of devices.
Author
Combinatorial Analysis; Boolean Functions; Automatic Control; Logic Programming

65
STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; time series analysis; and stochastic processes.

20060009085 Ross (S.L.) Environmenal Research Ltd., Ottawa, Ontario, Canada
Persistence Of Crude Oil Spills On Open Water
Buist, I.; Belore, R.; Lewis, A.; Bercha, F.; Cerovsek, M.; Nov. 2003; 74 pp.; In English
Contract(s)/Grant(s): MMS-1435-01-02-85091
Report No.(s): PB2006-101170; OCS-MMS-2003-047; No Copyright; Avail.: National Technical Information Service (NTIS)

The primary objective of this study was to develop mathematical descriptions of the persistence of crude oil spills at sea, as a function of spill size, based on a statistical analysis of historical spill data. Major oil spill incidents from the Torrey canyon in 1967 to the Erika in 1999 thru 2000 generated an immense amount of literature, but the information on oil slick persistence and volume spilled (the critical parameters to this study) were seldom detailed. The number of usable spills included 13 releases from tankers and 7 oil well blowouts. In addition to these, a database of 12 experimental spills was compiled, for which good persistence data existed. These spills all involved much small oil volumes than the tanker releases, and were thus kept in a separate database. For tanker spills, a correlation equation between persistence and spill size and water temperature was developed. For the few blowouts and for the smaller experimental, only size was correlated with persistence. Neither winds nor countermeasures demonstrates a significant effect on persistence. This product is documentation for the computer product, PB2006-500016.
NTIS
Crude Oil; Histories; Oil Slicks; Statistical Analysis; Water; Weathering

20060009118 Minerals Management Service, Anchorage, AK USA
Persistence Of Crude Oil Spills On Open Water (on CD-ROM)
Nov. 2003; In English
Report No.(s): PB2006-500016; OCS-MMS-2003-047-CD; No Copyright; Avail.: National Technical Information Service (NTIS)

This CD-ROM contains a study to develop mathematical descriptions of the persistence of crude oil spills at sea, as a function of spill size, based on a statistical analysis of historical spill data. Major oil spill incidents from the Torrey canyon in 1967 to the Erika in 1999 thru 2000 generated an immense amount of literature, but the information on oil slick persistence and volume spilled (the critical parameters to this study) were seldom detailed. The number of usable spills included 13 releases from tankers and 7 oil well blowouts. In addition to these, a database of 12 experimental spills was compiled, for which good persistence data existed. These spills all involved much small oil volumes than the tanker releases, and were thus kept in a separate database. For tanker spills, a correlation equation between persistence and spill size and water temperature was developed. For the few blowouts and for the smaller experimental, only size was correlated with persistence. Neither winds nor countermeasures demonstrates a significant effect on persistence.
NTIS
CD-ROM; Crude Oil; Histories; Oil Slicks; Statistical Analysis; Water; Weathering

20060009269 Imperial Coll. of Science and Technology, London, UK
Tolerance Design Via Cost Minimization
Maratos, N.; 1982 International Symposium on Circuits And Systems, Volume 1; [1982], pp. 134-137; In English; See also 20060009241; Copyright; Avail.: Other Sources

A new method is described for the tolerance design of circuits, via minimization of a cost function of the yield and tolerances. This problem is decomposed into the simpler problems of design centering with fixed tolerances, and tolerance assignment by efficient nonlinear optimization based on a local approximation of the yield-tolerance dependence. Implementable algorithms are proposed and their performance is evaluated on a simple example.
Author
Circuits; Tolerances (Mechanics); Optimization; Costs; Algorithms

67
THEORETICAL MATHEMATICS

Includes algebra, functional analysis, geometry, topology, set theory, group theory and number theory.

20060010080 Tennessee Univ., Chattanooga, TN, USA
Lyapunov Lemma for 2-D Systems
Sendaula, Musoke; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 677-680; In English; See also 20060010049; Copyright; Avail.: Other Sources

The Lyapunov lemma is extended to spatially casual, 2-dimensional discrete systems. The development used in this paper is based on the spectral factorization, and it constitutes a frequency-domain proof of the Lyapunov lemma, for both the single- and multi-dimensional discrete systems.
Author
Factorization; Proving; Theorems

20060010123 Kyushu Univ., Fukuoka, Japan
A Property Of A Sequence Of Unimodular Bounded Real Functions In The Unit Disc
Koga, Tosiro; Sato, Hidenori; 1982 International Symposium on Circuits and Systems, Volume 2; [1982], pp. 404-407; In English; See also 20060010049; Copyright; Avail.: Other Sources

In this paper, a theorem on a property of a sequence of UB functions obtained by Richards' transform is demonstrated, it is noted that the ordinary Richards' transform is obtained by substituting -zeta for zeta in the Richards' transform defined in this paper.
Derived from text
Circles (Geometry); Approximation; Theorems

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*.

20060009087 Brookhaven National Lab., Upton, NY, USA
Heavy Ion Physics with the ATLAS Detector
White, S.; January 2005; 14 pp.; In English
Report No.(s): DE2005-861067; BNL-75181-2005-CP; No Copyright; Avail.: National Technical Information Service (NTIS)

Soon after the LHC is commissioned with proton beams the ATLAS experiment will begin studies of Pb-Pb collisions with a center of mass energy of (radical)s(sub NN) = 5.5 TeV. The ATLAS program is a natural extension of measurements at RHIC in a direction that exploits the higher LHC energies and the superb ATLAS calorimeter and tracking coverage. At LHC energies, collisions will be produced with even higher energy density than observed at RHIC. The properties of the resulting hot medium can be studied with higher energy probes, which are more directly interpreted through modification of jet properties emerging from these collisions, for example. Other topics which are enabled by the 30-fold increase in center of mass energy include probing the partonic structure of nuclei with hard photoproduction (in UltraPeripheral collisions) and in p-Pb collisions. Here we report on evaluation of ATLAS capabilities for Heavy Ion Physics. Country of Publication USA NTIS
Heavy Ions; Collisions; Center of Mass

20060009088 Brookhaven National Lab., Upton, NY USA
Measurement of Charged Hadron Spectra in Au+Au Collisions at sNN=62.4 GeV at Rhic - PHENIX
Sakaguchi, T.; Kurihara, N.; Hamagaki, H.; Ozawa, K.; January 2005; 8 pp.; In English
Report No.(s): DE2005-859893; BNL-75064-2005-IR; No Copyright; Avail.: National Technical Information Service (NTIS)

No abstract available
Collisions; Gold; Hadrons; Ions; Spectra

20060009090 Brookhaven National Lab., Upton, NY USA
Measurement of Neutral Pion in Au + Au Collisions at RHIC-PHENIX
Sakaguchi, T.; January 2004; 8 pp.; In English
Report No.(s): DE2005-859892; BNL-75063-2005-IR; No Copyright; Avail.: Department of Energy Information Bridge
No abstract available
Collisions; Gluons; Pions; Plasmas (Physics); Quarks

20060009091 Brookhaven National Lab., Upton, NY, USA
Progress of the PHENIX Experiment in the Year 2004
Sakguchi, T.; January 2005; 6 pp.; In English
Report No.(s): DE2005-859890; No Copyright; Avail.: National Technical Information Service (NTIS)
No abstract available
Collisions; Gold; Ions

20060009092 Brookhaven National Lab., Upton, NY, USA
Direct Photon Measurement at RHIC-PHENIX
Sakaguchi, T.; January 2005; 14 pp.; In English
Report No.(s): DE2005-859889; BNL-75060-2005-CP; No Copyright; Avail.: National Technical Information Service (NTIS)
No abstract available
Photons; Heavy Ions

20060009093 Brookhaven National Lab., Upton, NY, USA
Inelastic Diffraction at Heavy Ion Colliders
White, S.; January 2005; 12 pp.; In English
Report No.(s): DE2005-861066; BNL-75180-2005-CP; No Copyright; Avail.: National Technical Information Service (NTIS)
The heavy ion physics approach to global event characterization has led us to instrument the forward region in the PHENIX experiment at RHIC. In heavy ion collisions this coverage yields a measurement of the ''spectator'' energy and its distribution about the beam direction. This energy flow is the basis of event-by-event determination of the centrality and reaction plane which are key to analyzing particle production in heavy ion collisions. These same tools have also enabled a unique set of measurements on inelastic diffraction with proton, deuteron and gold ion beams in the PHENIX experiment. We present first new results on this topic and discuss briefly the opportunity for diffractive physics with Heavy Ion beams at the LHC.
NTIS
Diffraction; Ionic Collisions; Deuterons; Heavy Ions

20060009094 Brookhaven National Lab., Upton, NY, USA
Experimental Test of SuperRadiance in a Single Pass Seeded FEL
Watanabe, T.; Liu, D.; Murphy, J. B.; Rose, J.; Shaftan, T.; Aug. 2005; 10 pp.; In English
Report No.(s): DE2005-861065; BNL-75172-2005-CP; No Copyright; Avail.: National Technical Information Service (NTIS)
Superradiance and nonlinear evolution of a FEL pulse in a single-pass FEL were experimentally demonstrated at the National Synchrotron Light Source (NSLS) Source Development Laboratory (SDL). The experiment was performed using a 1.5 ps high-brightness electron beam and a 100fs Ti:Sapphire seed laser. The seed laser and electron beam interact in the 10 meter long NISUS undulator with a period of 3.89 cm. The FEL spectrum, energy and pulse length along the undulator were measured. FEL saturation was observed, and gain of more the 200 (relative to seed laser) was measured. Both FEL spectrum widening and pulse length shortening were observed; FEL pulses as short as 65 fs FWHM were measured. The superradiance and nonlinear evolution were also simulated using the numerical code GENESIS1.3 yielding good agreement with the experimental results.
NTIS
Free Electron Lasers; Seeds; Light Sources; Brightness

20060009095 Brookhaven National Lab., Upton, NY, USA
Quad Family Centering
Pinayev, I.; January 2005; 12 pp.; In English
Report No.(s): DE2005-861064; BNL-75170-2005-CP; No Copyright; Avail.: National Technical Information Service (NTIS)

It is well known that beam position monitors (BPM) utilizing signals from pickup electrodes (PUE) provide good resolution and relative accuracy. The absolute accuracy (i.e. position of the orbit in the vacuum chamber) is not very good due to the various reasons. To overcome the limitation it was suggested to use magnetic centers of quadrupoles for the calibration of the BPM. The proposed method provides accuracy better then 200 microns for centering of the beam position monitors using modulation of the whole quadrupole family.
NTIS
Calibrating; Monitors; Accuracy

20060009096 Brookhaven National Lab., Upton, NY, USA
Experimental Characterization of Seeded FEL Amplifier at the NSLS SDL
Lie, D.; Murphy, J. B.; Rose, J.; Yu, L. H.; Watanabe, T.; Aug. 2005; 10 pp.; In English
Report No.(s): DE2005-861063; BNL-75168-2005-CP; No Copyright; Avail.: National Technical Information Service (NTIS)

Experimental characterization of a near-IR FEL amplifier at the NSLS SDL is presented in this report. SASE was observed from 0.8-1 (micro)m with 5 orders of magnitude gain. We have experimentally demonstrated saturation of a laser seeded FEL amplifier and control of the FEL output by the seed laser. Nonlinear harmonics have also been explored. The FEL pulse length for the first three harmonics was experimentally characterized and the increase of the FEL pulse length with harmonic number was observed for the first time. Computer simulation confirmed that the observed wide spectrum of the laser seeded FEL is due to the positive chirp of the seed laser.
NTIS
Free Electron Lasers; Near Infrared Radiation; Light Amplifiers

20060009098 Illinois Inst. of Tech., Chicago, IL, USA, Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
Simulations of a Gas-Filled Helical Muon Beam Cooling Channel
Yonehara, K.; Kaplan, D.; Beard, K.; Bogacz, S. A.; Derbenev, Y.; January 2005; 8 pp.; In English
Report No.(s): DE2005-861034; No Copyright; Avail.: National Technical Information Service (NTIS)

A helical cooling channel (HCC) has been proposed to quickly reduce the six-dimensional phase space of muon beams for muon colliders, neutrino factories, and intense muon sources. The HCC is composed of a series of RF cavities filled with dense hydrogen gas that acts as the energy absorber for ionization cooling and suppresses RF breakdown in the cavities. Magnetic solenoidal, helical dipole, and helical quadrupole coils outside of the RF cavities provide the focusing and dispersion needed for the emittance exchange for the beam as it follows a helical equilibrium orbit down the HCC. In the work presented here, two Monte Carlo programs have been developed to simulate a HCC to compare with the analytic predictions and to begin the process of optimizing practical designs that could be built in the near future. We discuss the programs, the comparisons with the analytical theory, and the prospects for a HCC design with the capability to reduce the six-dimensional phase space emittance of a muon beam by a factor of over five orders of magnitude in a linear channel less than 100 meters long.
NTIS
Cooling; Muons; Simulation

20060009099 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
Beam Physics for the 12 GeV CEBAF Upgrade Project
Benesch, J.; Bogacz, A.; Chao, Y.; Freyberger, A.; Grames, J.; January 2005; 8 pp.; In English
Report No.(s): DE2005-861031; No Copyright; Avail.: National Technical Information Service (NTIS)

Beam physics aspects of the 12 GeV Upgrade of CEBAF are presented. The CEBAF Upgrade to 12 GeV is achieved via 5.5 recirculations through the linacs, and the installation of 10 new high-gradient cryomodules. A new experimental hall, Hall D, is envisioned at the end of North Linac. Simulation results for straight-through and recirculated injectors are summarized and compared. Beam transport designs are discussed and evaluated with respect to matching and beam breakup (BBU) optimization. Effects of synchrotron radiation excitation on the beam properties are calculated. BBU simulations and derived specifications for the damping of higher order modes of the new 7-cell cavities are presented. The energies that provide

longitudinal polarization in multiple experimental halls simultaneously are calculated. Finally, a detailed optics design for the Hall D transport line has been obtained.
NTIS
Linear Accelerators; Optimization

20060009100 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
State of the Art Electron Guns and Injector Designs for Energy Recovery Linacs (ERL)
Todd, A. M.; Ambrosio, A.; Bluem, H.; May 01, 2005; 8 pp.; In English
Report No.(s): DE2005-860987; No Copyright; Avail.: National Technical Information Service (NTIS)

A key technology issue of ERL devices for high-power free-electron laser (FEL) and 4th generation light sources is the demonstration of reliable, high-brightness, high-power injector operation. Ongoing programs that target up to 1 Ampere injector performance at emittance values consistent with the requirements of these applications are described. We consider that there are three possible approaches that could deliver the required performance. The first is a DC photocathode gun and superconducting RF (SRF) booster cryomodule. Such a 750 MHz device is being integrated and will be tested up to 100 mA at the Thomas Jefferson National Accelerator Facility beginning in 2007. The second approach is a high-current normal-conducting RF photoinjector. A 700 MHz gun will undergo thermal test in 2006 at the Los Alamos National Laboratory, which, if successful, when equipped with a suitable cathode, would be capable of 1 Ampere operation. The last option is an SRF gun. A half-cell 703 MHz SRF gun capable of delivering 1.0 Ampere will be tested to 0.5 Ampere at the Brookhaven National Laboratory in 2006. The fabrication status, schedule and projected performance for each of these state-of-the-art injector programs will be presented.
NTIS
Electron Guns; Injectors; Linear Accelerators

20060009101 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
ELIC at CEBAF
Derbenev, Y.; Bogacz, A.; Delayen, J.; Grames, J.; Krafft, G.; January 2005; 8 pp.; In English
Report No.(s): DE2005-861000; No Copyright; Avail.: Department of Energy Information Bridge

We report on the progress of the conceptual development of the energy recovering linac (ERL)-based Electron-Light Ion Collider (ELIC) at CEBAF that is envisioned to reach luminosity level of 10(sup 33)-10(sup 35) /cm(sup 2)s with both beams polarized to perform a new class of experiments in fundamental nuclear physics. Four interaction points with all light ion species longitudinally or transversally polarized and fast flipping of the spin for all beams are planned. The unusually high luminosity concept is based on the use of the ERL and circulator ring-based electron cooling and crab crossing colliding beams. Our recent studies concentrate on the design of low beta interaction points with crab-crossing colliding beams, the exploration on raising the polarized electron injector current to the level of 3-30 mA with the use of electron circulator-collider ring, forming a concept of stacking and cooling of the ion beams, specifications of the electron cooling facility, and studies of beam-beam interaction and intra-beam scattering.
NTIS
Light Ions; Linear Accelerators

20060009103 Brookhaven National Lab., Upton, NY USA
Insights into the Role of the Operator in Advanced Reactor
Persensky, J.; O'Hara, J. M.; Nov. 2005; 8 pp.; In English
Report No.(s): DE2005-859888; BNL-NUREG-75049-2005; No Copyright; Avail.: National Technical Information Service (NTIS)

Nuclear power plant personnel play a vital role in the productive, efficient, and safe generation of electric power, whether for conventional light water reactors or new advanced reactors. It is widely recognized that human actions that depart from or fail to achieve what should be done can be important contributors to the risk associated with the operation of nuclear power plants. Advanced reactors are expected to present a concept of operations and maintenance to the power plant staff that is different from what is currently the case at conventional reactors. Therefore, regulatory staff will need new tools, developed from the best available technical bases, to support licensing and monitoring tasks. This paper addresses the development of regulatory review guidance to address these needs. The guidance will ensure that advanced reactor personnel have the tools,

knowledge, information, capability, work processes, and working environment (physical and organizational) to safely and efficiently perform their tasks.
NTIS
Advanced Test Reactors; Nuclear Power Plants; Personnel

20060009104 Brookhaven National Lab., Upton, NY, USA
Comparing Extractions of Sivers Functions
Vogelsang, W.; January 2005; 14 pp.; In English
Report No.(s): DE2005-861061; BNL-75134-2005-CP; No Copyright; Avail.: Department of Energy Information Bridge
A comparison is given of the various recently published extractions of the Sivers functions from the HERMES and COMPASS data on single-transverse spin asymmetries in semi-inclusive deeply inelastic scattering.
NTIS
Extraction; Polarization; Spin

20060009105 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA, North Carolina State Univ., Raleigh, NC USA
Contaminant Analysis of Polycrystalline and Single Crystal Niobium Used in Accelerator Cavities
Stevie, F. A.; Zhu, Z.; Griffis, D. P.; Myneni, G. R.; Kneisel, P.; Jul. 2005; 8 pp.; In English
Report No.(s): DE2005-859453; JLAB-ACC-05-445; No Copyright; Avail.: Department of Energy Information Bridge
Secondary Ion Mass Spectrometry (SIMS) can characterize the surface and near surface of Nb used in accelerator cavities. Results show Nb oxide in the 2-3 nm range, a depleted H concentration in the oxide compared with the bulk, and N, C, O lower in an annealed single crystal sample than several polycrystalline samples. Other metallic contaminants are primarily at the surface, but tantalum is distributed uniformly through the material.
NTIS
Cavities; Contaminants; Niobium; Polycrystals; Single Crystals

20060009106 Brookhaven National Lab., Upton, NY, USA
Rare Kaon Decays
Littenberg, L.; Nov. 2005; 40 pp.; In English
Report No.(s): DE2005-861059; BNL-75127-2005-CP; No Copyright; Avail.: Department of Energy Information Bridge
Lepton flavor violation (LFV) experiments have probed sensitivities corresponding to mass scales of well over 100 TeV, making life difficult for models predicting accessible LFV in kaon decay and discouraging new dedicated experiments of this type.
NTIS
Kaons; Particle Decay

20060009108 Fermi National Accelerator Lab., Batavia, IL, USA
Simultaneous Bunching and Precooling Muon Beams with Gas-Filled RF Cavities
Paul, K.; Johnson, R. P.; Roberts, T. J.; Neuffer, D.; Derbernev, Y.; January 2005; 8 pp.; In English
Report No.(s): DE2005-861038; No Copyright; Avail.: Department of Energy Information Bridge
High-gradient, pressurized RF cavities are investigated as a means to improve the capture efficiency, to effect phase rotation to reduce momentum spread, and to reduce the angular divergence of a muon beam. Starting close to the pion production target to take advantage of the short incident proton bunch, a series of pressurized RF cavities imbedded in a strong solenoidal field is used to capture, cool, and bunch the muon beam. We discuss the anticipated improvements from this approach to the first stage of a muon cooling channel as well as the requirements of the RF cavities needed to provide high gradients while operating in intense magnetic and radiation fields.
NTIS
Bunching; Cavities; Muons; Precooling; Radio Frequencies

20060009109 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
Ionization Cooling Using a Parametric Resonance
Derbenev, Y.; Johnson, R. P.; January 2005; 8 pp.; In English
Report No.(s): DE2005-861037; No Copyright; Avail.: National Technical Information Service (NTIS)

Muon collider luminosity depends on the number of muons in the storage ring and on the transverse size of the beams in collision. Ionization cooling as it is presently envisioned will not cool the beam sizes sufficiently well to provide adequate luminosity without large muon intensities. A new idea to combine ionization cooling with parametric resonances has been developed that will lead to beams with much smaller sizes so that high luminosity in a muon collider can be achieved with fewer muons. In the linear channel described here, a half integer resonance is induced such that the normal elliptical motion of particles in x-x' phase space becomes hyperbolic, with particles moving to smaller x and larger x' as they pass down the channel. Thin absorbers placed at the focal points of the channel then cool the angular divergence of the beam by the usual ionization cooling mechanism where each absorber is followed by RF cavities. We discuss the theory of Parametric-resonance Ionization Cooling, including the sensitivity to aberrations and the need to start with a beam that has already been cooled adequately.
NTIS
Cooling; Ionization

20060009110 Brookhaven National Lab., Upton, NY, USA, Bielefeld Univ., Germany
Static Quark Anti-Quark Free and Internal Energy in 2-Flavor QCD and Bound States in the QGP
Zantow, F.; Kaczmarek, O.; Oct. 2005; 12 pp.; In English
Report No.(s): DE2005-861058; BNL-75125-2005-CP; No Copyright; Avail.: Department of Energy Information Bridge

We present results on heavy quark free energies in 2-flavour QCD. The temperature dependence of the interaction between static quark anti-quark pairs will be analyzed in terms of temperature dependent screening radii, which give a first estimate on the medium modification of (heavy quark) bound states in the quark gluon plasma. Comparing those radii to the (zero temperature) mean squared charge radii of chasmonium states indicates that the J/(Psi) may survive the phase transition as a bound state, while (chi)(sub c) and (Psi)(prime) are expected to show significant thermal modifications at temperatures close to the transition. Furthermore we will analyze the relation between heavy quark free energies, entropy contributions and internal energy and discuss their relation to potential models used to analyze the melting of heavy quark bound states above the deconfinement temperature. Results of different groups and various potential models for bound states in the deconfined phase of QCD are compared.
NTIS
Free Energy; Internal Energy; Quantum Chromodynamics; Quarks

20060009111 Brookhaven National Lab., Upton, NY, USA
QCD Phase Diagram at Finite Density
Schmidt, C.; Fodor, Z.; Katz, S.; Oct. 2005; 12 pp.; In English
Report No.(s): DE2005-861057; BNL-75124-2005-CP; No Copyright; Avail.: Department of Energy Information Bridge

We study the density of states method to explore the phase diagram of the chiral transition on the temperature and quark chemical potential plane. Four quark flavours are used in the analysis. Though the method is quite expensive small lattices show an indication for a triple-point connecting three different phases on the phase diagram.
NTIS
Phase Diagrams; Quantum Chromodynamics

20060009112 Brookhaven National Lab., Upton, NY, USA
Synchrotron Radiation Monitor for NSLS Booster
Pinayev, I.; Shaftan, T.; Nov. 2005; 12 pp.; In English
Report No.(s): DE2005-861056; BNL-75105-2005-CP; No Copyright; Avail.: National Technical Information Service (NTIS)

NSLS booster diagnostics consisted of tune measurement system, system for turn-by-turn measurement on the electron beam, and beam intensity monitor, which is not absolutely calibrated. We present design and implementation of synchrotron light monitor for the booster, which expands diagnostics capabilities. The system allows to measure an orbit, beam sizes and coupling of the electron beam along the ramp.
NTIS
Monitors; Synchrotron Radiation

20060009114 Brookhaven National Lab., Upton, NY, USA
CP Violation Highlights: Circa 2005
Soni, A.; Oct. 2005; 32 pp.; In English
Report No.(s): DE2005-861054; BNL-75101-2005-CP; No Copyright; Avail.: Department of Energy Information Bridge

Recent highlights in CP violation phenomena, are reviewed. B-factory results imply that, CP-violation phase in the CKM matrix is the dominant contributor to the observed CP violation in K and B-physics. Deviations from the predictions of the CKM-paradigm due to beyond the Standard Model CP-odd phase are likely to be a small perturbation. Therefore, large data sample of clean B's will be needed. Precise determination of the unitarity triangle, along with time dependent CP in penguin dominated hadronic and radiative modes are discussed. Null tests in B, K and top-physics and separate determination of the K-unitarity triangle are also emphasized.
NTIS
CP Violation; Perturbation; Time Dependence; Hadrons

20060009117 Fermi National Accelerator Lab., Batavia, IL, USA, Illinois Inst. of Tech., Chicago, IL, USA, Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
Recent Innovations in Muon Beam Cooling and Prospects for Muon Colliders
Johnson, R. P.; Alsharo'a, M.; Hanlet, P. M.; Hartline, R.; Ankenbrandt, C.; January 2005; 8 pp.; In English
Report No.(s): DE2005-861036; No Copyright; Avail.: National Technical Information Service (NTIS)

A six-dimensional(6D)cooling channel based on helical magnets surrounding RF cavities filled with dense hydrogen gas* is used to achieve the small transverse emittances demanded by a high-luminosity muon collider. This helical cooling channel (HCC) has solenoidal, helical dipole, and helical quadrupole magnetic fields to generate emittance exchange. Simulations verify the analytic predictions and have shown a 6D emittance reduction of over 3 orders of magnitude in a 100 m HCC segment. Using three such sequential HCC segments, where the RF frequencies are increased and transverse dimensions reduced as the beams become cooler, implies a 6D emittance reduction of almost six orders of magnitude. After this, two new post-cooling ideas can be employed to reduce transverse emittances to one or two mm-mr, which allows high luminosity with fewer muons than previously imagined. In this report we discuss the status of and the plans for the HCC simulation and engineering efforts. We also describe the new post-cooling ideas and comment on the prospects for a Higgs factory or energy frontier muon collider using existing laboratory infrastructure.
NTIS
Cooling; Muons

20060009120 Lawrence Livermore National Lab., Livermore, CA USA
NIF Periscope Wall Modal Study Comparison of Results for 2 FEA Models with 2 Modal Tests
Eli, M. W.; Gerhard, M. A.; Lee, C. L.; Sommer, S. C.; Woehrle, T. G.; Oct. 26, 2000; 108 pp.; In English
Report No.(s): DE2005-15013511; UCRL-ID-141276; No Copyright; Avail.: Department of Energy Information Bridge

This report summarizes experimentally and numerically determined modal properties for one of the reinforced concrete end walls of the NIF Periscope Support Structure in Laser Bay 1. Two methods were used to determine these modal properties: (1) Computational finite-element analyses (modal extraction process); and (2) Experimental modal analysis based on measured test data. This report also includes experimentally determined modal properties for a prototype LM3/Polarizer line-replaceable unit (LRU) and a prototype PEPC LRU.
NTIS
Finite Element Method; Ignition; Periscopes; Walls

20060009139 Lawrence Livermore National Lab., Livermore, CA USA
(sup 48)Ti(n,xnpa(gamma)) Reaction Cross Sections Using Spallation Neutrons for E(sub n) = 1 to 20 MeV
Dashdorj, D.; Mitchell, G. E.; Garrett, P. E.; Agvaanluvan, U.; Becker, J. A.; Feb. 07, 2005; 152 pp.; In English
Report No.(s): DE2005-15015860; UCRL-TR-209474; No Copyright; Avail.: National Technical Information Service (NTIS)

Gamma-ray excitation functions have been measured for the interaction of fast neutrons with (sup 48)Ti (neutron energy from 1 MeV to 250 MeV). The Los Alamos National Laboratory spallation neutron source, at the LANSCE/WNR facility, provided a 'white' neutron beam which is produced by bombarding a natural W target with a pulsed proton beam. The prompt-reaction (gamma) rays were measured with the large-scale Compton-suppressed Ge spectrometer, GEANIE. Neutron energies were determined by the time-of-flight technique. Excitation functions were converted to partial (gamma)-ray cross sections, taking into account the dead-time correction, the target thickness, the detector efficiency, and neutron flux (monitored with an in-line fission chamber). The data analysis is presented here for neutron energies between 1 to 20 MeV. Partial (gamma)-ray cross sections for transitions in (sup 47,48)Ti, (sup 48)Sc, and (sup 45)Ca have been determined. These results are compared to Hauser-Feshbach predictions calculated using the STAPRE code, which includes compound nuclear and

pre-equilibrium emission. The partial cross sections for (gamma) rays, whose discrete (gamma)-ray cascade path leads to the ground state in (sup 48)Ti, (sup 47)Ti, (sup 48)Sc, and (sup 45)Ca have been summed to obtain estimates of the lower limits for reaction cross sections. Partial cross sections for unobserved (gamma)-rays are predicted from the STAPRE code. These lower limits are combined with Hauser-Feshbach calculations to deduce (sup 48)Ti(n,n')(sup 48)Ti, (sup 48)Ti(n,2n)(sup 47)Ti, (sup 48)Ti(n,p)(sup 48)Sc, and (sup 48)Ti(n,(alpha))(sup 45)Ca reaction channel cross sections.
NTIS
Neutron Sources; Neutrons; Spallation

20060009141 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA, Lawrence Livermore National Lab., Livermore, CA USA, Princeton Univ., NJ USA
Modeling Electron Cloud Effects in Heavy Ion Accelerators
Cohen, R. H.; Azevedo, A.; Friedman, A.; Furman, M. A.; Lund, S. M.; Apr. 21, 2003; 30 pp.; In English
Report No.(s): DE2005-15014123; No Copyright; Avail.: National Technical Information Service (NTIS)
No abstract available
Electron Clouds; Ion Accelerators

20060009144 Brookhaven National Lab., Upton, NY USA
Direct Photon Measurement at RHIC-PHENIX. (Annual Report, 2004)
Sakaguchi, T.; January 2005; 8 pp.; In English
Report No.(s): DE2005-860209; BNL-75062-2005-IR; No Copyright; Avail.: National Technical Information Service (NTIS)
The suppression of high transverse momentum (pT) hadrons in central Au+Au collisions called as 'jet quenching' has been of great interest since its first discovery by the PHENIX experiment at RHIC. The question has been asked, however, whether or not the phenomenon is attributed to energy loss of hard-scattered partons in a hot and dense medium (final state effect). Photons are excellent probes for extracting the direct information of where they are produced because they do not interact strongly with medium once produced. Thus, they are expected to provide hints to answer questions of whether the jet quenching is due to initial or final state effect. In this report, the latest results on direct photon measurement from the PHENIX experiment are shown, and the source of photons is discussed.
NTIS
Photons; Transverse Momentum

20060009147 Lawrence Livermore National Lab., Livermore, CA USA
Joint Noise Cancellation/Detection for a Towed Array in a Hostile Environment
Candy, J. V.; Sullivan, E. J.; Mar. 14, 2005; 12 pp.; In English
Report No.(s): DE2005-859383; UCRL-CONF-210524; No Copyright; Avail.: Department of Energy Information Bridge
Tow ship noise is a major problem plaguing the detection, classification, localization and tracking problems. It is a major contributor to towed array measurement uncertainties that can lead to large estimation errors in any form of signal processing problem aimed at extracting the weak target information. Many sonar-processing approaches ignore this problem relying on narrowband techniques to remove these undesirable interferences at the cost of precious signal-to-noise ratio (SNR). In this paper we address the idea of noise cancellation by formulating it in terms of a joint cancellation/detection problem. It is shown that the joint processor can be designed to perform in a broadband processing environment.
NTIS
Cancellation; Mathematical Models; Ships; Signal to Noise Ratios

20060009148 Lawrence Livermore National Lab., Livermore, CA USA
Cancelling Tow Ship Noise Using an Adaptive Model-Based Approach
Candy, J. V.; Sullivan, E. J.; Mar. 14, 2005; 12 pp.; In English
Report No.(s): DE2005-859381; UCRL-CONF-210523; No Copyright; Avail.: Department of Energy Information Bridge
Ship noise is a major contributor to towed array measurement uncertainties that can lead to large estimation errors. Many approaches ignore this problem, since they rely on inherent narrowband processing to remove these effects. The overall signal-to-noise ratio (SNR) available is therefore decreased making the signal extraction problem more difficult. In this paper we discuss the development of an adaptive model-based processor (AMBP) for signal enhancement from a set of noisy hydrophone measurements contaminated with tow ship noise. These results provide a solution to the adaptive joint

cancellation/signal enhancement problem. Here we concentrate on the underlying theoretical development demonstrating the relationship between the canceller and model-based signal enhancer.
NTIS
Cancellation; Mathematical Models; Ships; Signal to Noise Ratios

20060009149 Brookhaven National Lab., Upton, NY USA
Definition of the Number of Temporal Modes in the SASE Output
Aug. 2005; 10 pp.; In English
Report No.(s): DE2005-15020990; BNL-75011; No Copyright; Avail.: Department of Energy Information Bridge
The number of temporal modes in the SASE output can be defined in several ways: as the ratio of the phase space area occupied by the radiation to the minimum area allowed by the uncertainty principle; in terms of the fluctuation of the pulse energy; and in terms of the Wigner function. Here, we discuss these different definitions and show their equivalence for SASE from a Gaussian electron bunch, in the linear regime before saturation.
NTIS
Mathematical Models; Spontaneous Emission

20060009151 Department of Energy, Washington, DC USA
Study of the Doubly and Singly Cabibbo Suppressed Decays D(sup +) yields K(sup +)pi(sup -)pi(sup +) and D(sup +)(sub s) yields K(sup +)pi(sup -)pi(sup +) in the FOCUS Experiment
January 2005; 142 pp.; In English
Report No.(s): DE2005-15020131; No Copyright; Avail.: National Technical Information Service (NTIS)
No abstract available
Charm (Particle Physics); Mathematical Models; Mesons

20060009155 Kyungpook National Univ., Taegu, Korea, Republic of
Search for Gauge Mediated SUSY Breaking in Diphoton Events in rho overbar rho Collisions at Square root of S
Kim, M.; 140 pp.; In English
Report No.(s): DE2005-15017314; No Copyright; Avail.: National Technical Information Service (NTIS)
The authors present the results of a search for anomalous production of diphoton events with large missing transverse energy using the Collider Detector at Fermilab. In 202 pb(sup -1) of p(bar p) collisions at (radical)s = 1.96 TeV they observe no candidate events, with an expected standard model background of 0.27 (+-) 0.07(stat) (+-) 0.10(syst) events. The results exclude a lightest chargino of mass less than 167 GeV/c(sup 2), and lightest neutralino of 93 GeV/c(sup 2) at 95% confidence level in a gauge-mediated supersymmetry-breaking model with a light gravitino.
NTIS
Collisions; Measuring Instruments; Supersymmetry

20060009157 Arizona State Univ., Tempe, AZ USA
Measurement of the tau overbar tau Cross Section Using Dimuon Channel in rho overbar rho Collisions at Square root of S
McCroskey, R. C.; January 2005; 192 pp.; In English
Report No.(s): DE2005-15017342; No Copyright; Avail.: National Technical Information Service (NTIS)
The authors have measured the t(bar t) production cross section at (radical)s = 1.96 TeV using data collected by the D0 experiment at Fermilab. The integrated luminosity of the data set is 140 pb(sup -1) and a total of four candidate events are seen, with an expected background of 2.61 events. The measured cross section of (sigma)(sub t(bar t)) = 11.1(sub -9.3)(sup +22.1)(stat.)(sub -4.5)(sup +4.3)(sys.) pb is in agreement with a NNLO calculation of 6.77 pb.
NTIS
Collisions; Cross Sections

20060009161 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
High-Resolution Search for Pentaquark Partners in Hall A at Jefferson Lab
Hansen, J. O.; January 2005; 10 pp.; In English
Report No.(s): DE2005-859285; No Copyright; Avail.: Department of Energy Information Bridge
We have carried out a high-resolution search ((sigma) = 1.5 MeV) for narrow exotic resonances ((Gamma) \h 10 MeV)

in the mass range M (approx) 1500-1850 MeV in ep (yields) e'K(sup +)X, ep (yields) e'K(sup -)X and ep (yields) e'(pi)(sup +)X electroproduction at forward angles ((theta)(sup CM) (approx) 6-7 degrees). Such narrow resonances would be candidates for partner states of the speculative (Theta)(sup +)(1540) pentaquark. The experiment employed a 5 GeV CW electron beam incident on a liquid hydrogen target and two high-resolution magnetic spectrometers covering a total center-of-mass solid angle of (Delta)(Omega) (approx) 30-40 msr. We do not observe a statistically significant signal in any of the three reaction channels. Upper limits on the production cross sections were determined to be between 3 and 16 nb/sr, depending on the channel and the assumed width of the state. In addition, precise electroproduction data of the (Lambda)(1116), (Sigma)(1193) and (Lambda)(1520) resonances were obtained for calibration purposes.
NTIS
High Resolution; Quarks; Magnetic Spectroscopy

20060009162 Lockheed Martin Corp., Schenectady, NY, USA
Mixed Convection Heat Transfer Experiments in Smooth and Rough Vertical Tubes
Symolon, P.; Neuhaus, W.; Odell, R.; Dec. 2004; 14 pp.; In English
Report No.(s): DE2005-850142; LM-04K166; No Copyright; Avail.: Department of Energy Information Bridge

The mixed convection regime is a transitional heat transfer regime between forced convection and natural convection, where both the forced component of flow, and the buoyancy induced component are important. Aiding flow is when buoyancy forces act in the same direction as the forced flow (heated upflow or cooled downflow), while opposing flow is when the buoyancy force is in the opposite direction of the forced flow (cooled upflow or heated downflow). For opposing flow the buoyancy always increases the rate of heat transfer over the forced convection value. For aiding flow, as the heat flux increased, a reduction in heat transfer is encountered until a condition known as laminarization occurs, where the heat transfer is at a minimum value. Further increases in the wall heat flux causes re-transition to turbulence, and increased heat transfer. In this paper, for the first time, experiments were performed to characterize the effect of surface roughness on heat transfer in mixed convection, for the case of aiding flow. A correlation was developed to allow calculation of mixed convection heat transfer coefficients for rough or smooth tubes.
NTIS
Convection; Convective Heat Transfer; Heat Transfer

20060009167 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA
Sapphire Loaded TE011 Cavity for Surface Impedance Measurements: Design, Construction, and Commissioning Status
Phillips, L.; Davis, G. K.; Delayen, J. R.; Ozelis, J. P.; Plawski, T.; January 2005; 8 pp.; In English
Report No.(s): DE2005-859451; DDOE/ER/40150-3629; JLAB/ACC-05-447; No Copyright; Avail.: National Technical Information Service (NTIS)

In order to measure the superconducting surface properties of niobium that are of interest to SRF applications, a facility which utilizes a Nb cavity operating in the TE(sub 011) mode at 7.65 GHz which provides a well-defined RF field on a disk shaped sample has been designed and fabricated. The RF losses due to the sample's surface impedance are determined by using a calorimetric technique. The system has the capability to measure such properties as R(sub s),(T), and penetration depth, which can then be correlated with surface properties and preparation processes. The design, fabrication, and results from initial commissioning operations will be discussed, along with the near term sample evaluation program.
NTIS
Cavities; Construction; Electrical Impedance; Niobium; Sapphire; Surface Properties

20060009168 Ohio Univ., Athens, OH, USA
GlueX. The Search for Gluonic Excitations at Jefferson Laboratory
Carman, D. S.; January 2005; 14 pp.; In English
Report No.(s): DE2005-859450; No Copyright; Avail.: National Technical Information Service (NTIS)

One of the unanswered and most fundamental questions in physics regards the nature of the confinement mechanism of quarks and gluons in quantum chromodynamics (QCD). Exotic hybrid mesons manifest gluonic degrees of freedom and their detailed spectroscopy will provide the precision data necessary to test assumptions in lattice QCD and the specific phenomenology leading to confinement. Photoproduction is expected to be a particularly effective manner to produce exotic hybrids, however, existing data using photon beams are sparse. At Jefferson Laboratory, plans are underway by the GlueX Collaboration to use the coherent bremsstrahlung technique to produce a linearly polarized photon beam. A solenoid-based

hermetic detector will be used to collect data on meson production and decays with statistics that will exceed existing photoproduction data by several orders of magnitude after the first year of running. In order to reach the ideal photon energy of 9 GeV required for these studies, the energy of the Jefferson Laboratory electron accelerator, CEBAF, will be doubled from its current maximum energy of 6 GeV to 12 GeV. The physics motivating the search and the status of the project are reviewed.
NTIS
Excitation; Gluons; Linear Accelerators

20060009169 Brookhaven National Lab., Upton, NY, USA
Simulation of Transverse Instabilities in the NSLS II Storage Ring
Krinsky, S.; Sep. 2005; 40 pp.; In English
Report No.(s): DE2005-15020991; No Copyright; Avail.: Department of Energy Information Bridge

We have carried out computer simulations using MATLAB to study the transverse coupled-mode instability (TMCI) in the proposed NSLS-II storage ring. Our calculations have been performed using transverse short-range wakefields describing: a broad-band resonator; a resistive wall with normal surface impedance; and a chamber wall with extreme anomalous skin effect. We have considered: (1) the ring with a single-frequency RF system for which the equilibrium longitudinal bunch distribution is Gaussian; and (2) the ring with a third harmonic (Landau) cavity included to lengthen the bunch. Based on current NSLS-II design parameters, we report estimates of the TMCI threshold behavior.
NTIS
Light Sources; Simulation; Stability; Storage Rings (Particle Accelerators); Synchrotrons

20060009176 Brookhaven National Lab., Upton, NY, USA
Diffraction Dissociation--50 Years Later
White, S. N.; Jul. 20, 2005; 12 pp.; In English
Report No.(s): DE2005-861068; BNL-75182-2005-CP; No Copyright; Avail.: National Technical Information Service (NTIS)

The field of Diffraction Dissociation, which is the subject of this workshop, began 50 years ago with the analysis of deuteron stripping in low energy collisions with nuclei. We return to the subject in a modern context- deuteron dissociation in (radical)s(sub NN) = 200 GeV d-Au collisions recorded during the 2003 RHIC run in the PHENIX experiment. At RHIC energy, d (yields) n+p proceeds predominantly (90%) through Electromagnetic Dissociation and the remaining fraction via the hadronic shadowing described by Glauber. Since the dissociation cross section has a small theoretical error we adopt this process to normalize other cross sections measured in RHIC.
NTIS
Diffraction; Dissociation

20060009180 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
Discussions on the Cancellation Effect on a Circular Orbit
Li, R.; Derbenev, Y. S.; January 2005; 8 pp.; In English
Report No.(s): DE2005-861042; No Copyright; Avail.: Department of Energy Information Bridge

The canonical formulation and the cancellation effect for bunch dynamics under collective interaction on a curved orbit were presented in Ref. (*). Some possible controversial representations of the cancellation effect were later addressed by Geloni et al.** In this study, we discuss all the points raised in Ref. (**) based on our canonical treatment, and show how these points can be perceived from the view point of the cancellation picture.
NTIS
Cancellation; Circular Orbits

20060009480 Swedish Defence Research Establishment, Linkoeping, Sweden
Sol-Gel Synthesis of VO2 Thin Flims and the Effects of W and Re doping.(Sol-gel Sytnes av VO2 Filmer och Efekten av W och Re doping)
Moffatt, C.; Wigstein, A.; Jun. 2005; 50 pp.; In English
Report No.(s): PB2006-101692; FOI-R-1684-SE; No Copyright; Avail.: CASI: A03, Hardcopy

Vanadium dioxide (VO2) is a thermochromic material that undergoes a semiconductor-to-metal phase transition around 68 degrees C. This transition is accompanied by changes in the electrical, optical and magnetic properties of VO2. At room temperature the material is transparent and non-conductive but above the transition temperature the material becomes metallic

and IR reflecting. Potential practical applications for VO2 thin films are, for example, optical (IR) or electrical switching devices and energy-efficient windows. VO2 has also become interesting in defense applications due to its property to reflect IR radiation. However, for these purposes the transition temperature needs to be lowered which can be achieved by doping of the VO2 film with other metal cations. In this project the first step was to develop a process for the production of VO2 films from a vanadium alkoxide precursor by the sol-gel technique. When this was accomplished, doping of the VO2 films with tungsten and rhenium was performed with doping levels of 1 to 12 at-percent (%). The crystal structure and the optical switching characteristics were investigated with X-ray powder diffraction (XRPD) and Fourier transform infrared spectroscopy (FTIR), respectively. The surface morphology and chemical compositions of the films were analyzed by scanning electron microscopy (SEM) and X-ray photoelectron spectroscopy (XPS). A maximum lowering of the transition temperature was obtained for VO2 films doped with 4-at% W, resulting in a transition temperature of 22 degrees C. The Re doping did not succeed; no Re could be detected in the films.
NTIS
Additives; Gels; Oxides; Semiconductors (Materials); Sol-Gel Processes; Thin Films

20060009486 Brookhaven National Lab., Upton, NY USA
Numerical Methods for the Simulation of High Intensity Hadron Synchrotrons
Luccio, A.; D'Imperio, N.; Malitsky, N.; Sep. 2005; 14 pp.; In English
Report No.(s): DE2005-861491; BNL-75194-2005-CP; No Copyright; Avail.: Department of Energy Information Bridge
Numerical algorithms for PIC simulation of beam dynamics in a high intensity synchrotron on a parallel computer are presented. We introduce numerical solvers of the Laplace-Poisson equation in the presence of walls, and algorithms to compute tunes and twiss functions in the presence of space charge forces. The working code for the simulation here presented is SIMBAD, that can be run as standalone or as part of the UAL (Unified Accelerator Libraries) package.
NTIS
Hadrons; Numerical Analysis; Simulation; Synchrotrons

20060009487 Brookhaven National Lab., Upton, NY, USA
Violation of k-Perpendicular Factorization in Quark Production from the Color Glass Condensate
Venugopalan, R.; January 2005; 10 pp.; In English
Report No.(s): DE2005-861490; BNL-75190-2005-CP; No Copyright; Avail.: National Technical Information Service (NTIS)
We examine the violation of the k(sub(perpendicular)) factorization approximation for quark production in high energy proton-nucleus collisions. We comment on its implications for the open charm and quarkonium production in collider experiments.
NTIS
Color; Condensates; Factorization; Glass

20060009492 Institute for Scientific Research, Fairmont, WV, USA
On Whether Angular Momentum in Electric and Magnetic Fields Radiates to Infinity
Canning, Francis X.; Knudsen, Steven; March 2006; 25 pp.; In English
Contract(s)/Grant(s): NAS3-00124; WBS 949-10-01
Report No.(s): NASA/CR-2006-214124; E-15459; No Copyright; Avail.: CASI: A03, Hardcopy
The Feynman Disk experiment and a related thought experiment with a static magnetic field and capacitor are studied. The mechanical torque integrated over time (angular impulse) is related to the angular momentum in the electric/magnetic field. This is not called an electromagnetic field since quasi-static as well as electromagnetic effects are included. The angular momentum in the electric/magnetic field is examined to determine its static and radiative components. This comparison was then examined to see if it clarified the Abraham-Minkowski paradox.
Author
Angular Momentum; Electric Fields; Electromagnetic Fields; Magnetostatic Fields; Capacitors; Impulses; Magnetic Fields

20060009494 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Open and Hidden Charm Production in dA Collisions at RHIC and LHC
Vogt, R.; January 2005; 10 pp.; In English
Report No.(s): DE2005-861405; No Copyright; Avail.: Department of Energy Information Bridge

We discuss aspects of open and hidden charm production in deuterium-nucleus collisions at RHIC and LHC energies. We describe calculations of the total c(bar c) cross section and the charm quark transverse momentum distributions. We next explain how shadowing and moderate nuclear absorption can explain the PHENIX J/(psi) dAu/pp ratios and predict the combined effect of shadowing and absorption in 6.2 TeV d+Pb collisions.
NTIS
Collisions; Charm (Particle Physics); Quarks; Deuterium

20060009496 Los Alamos National Lab., NM USA
Phase-Space Density Analyses of the AE-8 Trapped Electron and the AP-8 Trapped Proton Model Environments
Cayton, T. E.; January 2005; 76 pp.; In English
Report No.(s): DE2005-861265; LA-14235; No Copyright; Avail.: Department of Energy Information Bridge
The AE-8 trapped electron and the AP-8 trapped proton models are used to examine the L-shell variation of phase-space densities for sets of transverse (or 1st) invariants, (mu), and geometrical invariants, K (related to the first two adiabatic invariants). The motivation for this study is twofold: first, to discover the functional dependence of the phase-space density upon the invariants; and, second, to explore the global structure of the radiation belts within this context. Variation due to particle rest mass is considered as well. The overall goal of this work is to provide a framework for analyzing energetic particle data collected by instruments on Global Positioning System (GPS) spacecraft that fly through the most intense region of the radiation belt. For all considered values of (mu) and K, and for 3.5 R(sub E) \h L \h 6.5 R(sub E), the AE-8 electron phase-space density increases with increasing L; this trend--the expected one for a population diffusing inward from an external source--continues to L = 7.5 R(sub E) for both small and large values of K but reverses slightly for intermediate values of K. The AP-8 proton phase-space density exhibits (mu)-dependent local minima around L = 5 R(sub E). Both AE-8 and AP-8 exhibit critical or cutoff values for the invariants beyond which the flux and therefore the phase-space density vanish. For both electrons and protons, these cutoff values vary systematically with magnetic moment and L-shell and are smaller than those estimated for the atmospheric loss cone. For large magnetic moments, for both electrons and protons, the K-dependence of the phase-space density is exponential, with maxima at the magnetic equator (K = 0) and vanishing beyond a cutoff value, K(sub c). Such features suggest that momentum-dependent trapping boundaries, perhaps drift-type loss cones, serve as boundary conditions for trapped electrons as well as trapped protons.
NTIS
Electrons; Protons; Trapping; Electron Density (Concentration)

20060009938 Rochester Univ., NY, USA
LLE Review. Quarterly Report. Volume 88 (July-September 2001)
January 2001; 71 pp.; In English
Contract(s)/Grant(s): DE-FC03-92SF19460
Report No.(s): PB2006-106659; DOE/SF/19460-404; No Copyright; Avail.: National Technical Information Service (NTIS)
The LLE Review 88, covering July through September 2001, begins with an article that describes a simple, low-cost, wide-dynamic-range, neutron bang time (NBT) detector that is currently installed on LLE's OMEGA laser. It is able to measure the neutron bang time of DD- and DT-filled ICF implosion capsules at neutron yields between 10(sup 7) and 10(Sup 11) with an absolute timing accuracy of better than 100 ps. Additional research reported in this volume include: the current substrate cleaning and handling methods used in the application of high reflectance optical coatings are so effective that it is necessary to test large parts in order to achieve statistically meaningful assessments. LLE's Optical Manufacturing group to used equipment designed by LLNL to test new coating designs test on full-sized NIF substrates; calculations show that the use of CH foam shells that are soaked with DT fuel offers improvements in implosion stability and higher neutron yield in comparison to more conventional DT only designs; concepts for the creation of ultrafast I/O interfaces suitable for applying digital superconducting electronics to produce ultrafast telecommunication routers are reviewed; a parametric study of vapor deposition polymerization techniques for producing polyimide shells for inertial confinement fusion (ICF) targets is reported. The production rate, yield, and reproducibility of the process were optimized; and concludes with reports on LLE's Summer High School Research Program, the FY01 Laser Facility Report, and the National Laser Users' Facility News.
NTIS
Antireflection Coatings; Cleaning; Foams; Ignition; Implosions; Lasers; Polyimides; Polymerization; Reflectance; Substrates; Vapor Deposition

20060009939 Rochester Univ., NY, USA
LLE Review. Quarterly Report. Volume 86 (January-March 2001)
January 2001; 72 pp.; In English
Contract(s)/Grant(s): DE-FC03-92SF19460
Report No.(s): PB2006-106657; DOE/SF/19460-393; No Copyright; Avail.: National Technical Information Service (NTIS)

This volume of LLE Review, covering January-March 2001, includes a report on the characterization of direct-drive implosion core conditions using time-resolved Ar K-shell spectroscopy. This work was carried out by a team that included S. P. Regan, J. A. Delettrez, P. A. Jaanimagi, B. Yaakobi, V. A. Smalyuk, F. J. Marshall, D. D. Meyerhofer, and W. Seka of the Laboratory for Laser Energetics (LLE), University of Rochester; D. A. Haynes, Jr. of the Department of Engineering Physics, University of Wisconsin; and C. F. Hooper, Jr. of the Department of Physics, University of Florida. The experiments involved the implosion of polymer shells filled with Ar-doped deuterium gas driven with up to 24-kJ, 1-ns square laser pulses smoothed with 1-THz, 2-D smoothing by spectral dispersion (SSD) and polarization smoothing (PS). The emissivity-averaged core electron temperature and density were inferred from the measured time-dependent Ar K-shell spectral line shapes. Electron densities in excess of 2.5 OE 1024 cm-3 and electron temperatures approximating 2.5 keV were measured in these experiments. This represents the highest combination of electron temperature and density measured for these types of implosions in laser-driven inertial fusion experiments.
NTIS
Drives; Ignition; Implosions; Mechanical Drives; Pulsed Lasers

20060009940 Rochester Univ., NY, USA
LLE Review. Quarterly Report. Volume 87 (April-June 2001)
January 2001; 74 pp.; In English
Contract(s)/Grant(s): DE-FC03-92SF19460
Report No.(s): PB2006-106658; DOE/SF/19460-397; No Copyright; Avail.: National Technical Information Service (NTIS)

This volume of the LLE Review, covering April-June 2001, features ‘A Self-Calibrating, Multichannel Streak Camera for Inertial Confinement Fusion Applications’ by Dr. W. R. Donaldson, R. Boni, R. L. Keck, and P. A. Jaanimagi. This article describes the 60-beam streak camera system used on OMEGA and focuses on the hardware and software calibration techniques that maximize its utility. The system can diagnose each of the beams on every target shot and can measure beam energies with 8 percent accuracy and timing at 7 ps rms. Beam-to-beam power variations of less than 5 percent can be detected. Additional articles include ‘Evolution of Shell Nonuniformities Near Peak Compression of a Spherical Implosion’, ‘Multibeam Stimulated Brillouin Scattering from Hot Solid-Target Plasmas’, ‘Hot-Electron Effect in Superconductors and Its Applications for Radiation Sensors’, and ‘Scaling Law for Marginal Ignition’.
NTIS
Calibrating; Drives; Hot Electrons; Ignition; Implosions; Laser Plasma Interactions; Lasers; Mechanical Drives; Streak Cameras

20060009944 Rochester Univ., NY, USA
LLE Review. Quarterly Report. Volume 85 (October-December 2000)
January 2000; 58 pp.; In English
Contract(s)/Grant(s): DE-FC03-92SF19460
Report No.(s): PB2006-106656; DOE/SF/19460-378; No Copyright; Avail.: National Technical Information Service (NTIS)

This volume of the LLE Review, covering October-December 2000, features an article that reports on the development of a theoretical model for the deceleration phase of an imploding inertial fusion capsule. Other research highlights presented in this issue include an experimental study of the effects of shock heating on the stability of direct-drive inertial fusion capsules; a report on a new model for material behavior under compression with specific application to fused silica; a description of the design and performance of a new selectable-streak-rate streak-camera deflection ramp generator; a report on the development of a UV fiber-optic beam delivery system for the OMEGA 60-beam laser pulse shape characterization system; a report on the fabrication and characterization of a simple-to-manufacture and simple-to-operate NbN hot-electron photodetector with picosecond response time; and a description of the preliminary design for the National Ignition Facility’s (NIF’s) 2-D SSD beam-smoothing system. LLE has the lead role in defining direct-drive system requirements for the NIF and preparing a preliminary 2-D SSD system design.
NTIS
Deceleration; Deflection; Fiber Optics; Ignition; Photometers; Shock Heating; Silica Glass

20060009951 California Univ., Lawrence Livermore Lab., Livermore, CA, USA
Mismatch Oscillations in High Current Accelerators
Andersen, O. A.; May 2005; 16 pp.; In English
Report No.(s): DE2005-859933; LBNL-58928; No Copyright; Avail.: Department of Energy Information Bridge

When planning the design of high-current FODO transport for accelerators, it is useful to have simple, accurate tools for calculating quantities such as the phase advances (sigma)(sub 0) and (sigma) given the lattice and beam parameters. Along with the KV beam model, the smooth approximation is often used. It is simple but not very accurate in many cases. Although Struckmeier and Reiser showed that the stable oscillation frequencies of mismatched beams could be obtained accurately, they actually used a hybrid approach where (sigma)(sub 0) and (sigma) were already known precisely. When starting instead with basic quantities such as quadrupole dimensions, field strength, beam line charge density and emittance, the smooth approximation gives substantial errors. Here we derive a simple modification of the smooth approximation formula that improves the accuracy of the predicted frequencies by a factor of five at (sigma)(sub 0) = 83(sup o).
NTIS
High Current; Oscillations; Lattice Parameters; Field Strength

20060009955 Fermi National Accelerator Lab., Batavia, IL, USA
MANX, A 6-D Muon Cooling Demonstration Experiment
Roberts, T.; Alsharo'a, M.; Hanlet, P. M.; Johnson, R.; Kuchnir, M.; January 2005; 8 pp.; In English
Report No.(s): DE2005-859151; No Copyright; Avail.: National Technical Information Service (NTIS)

Most ionization cooling schemes now under consideration are based on using many large flasks of liquid hydrogen energy absorber. One important example is the proposed Muon Ionization Cooling Experiment (MICE), which has recently been approved to run at the Rutherford Appleton Laboratory (RAL). In the work reported here, a potential muon cooling demonstration experiment based on a continuous liquid energy absorber in a helical cooling channel (HCC) is discussed. The original HCC used a gaseous energy absorber for the engineering advantage of combining the energy absorption and RF energy regeneration in hydrogen-filled RF cavities. In the Muon And Neutrino eXperiment (MANX) that is proposed here, a liquid-filled HCC is used without RF energy regeneration to achieve the largest possible cooling rate in six dimensions. In this case, the magnetic fields of the HCC must diminish as the muons lose momentum as they pass through the liquid energy absorber. The length of the MANX device is determined by the maximum momentum of the muon test beam and the maximum practical field that can be sustained at the magnet coils. We have studied a 3 meter-long HCC example that could be inserted between the MICE spectrometers at RAL.
NTIS
Cooling; Muons; Neutrinos

20060009958 Washington Univ., Seattle, WA, USA
ZaP Flow Z-Pinch Project. Final Report
Shumlak, U.; Nelson, B. A.; Sep. 2005; 52 pp.; In English
Report No.(s): DE2005-850058; No Copyright; Avail.: National Technical Information Service (NTIS)

This is the Final Report covering the period of January 1, 1998 through December 31, 2004 for the ZaP experiment at the University of Washington, Seattle, DOE Grant No. DE-FG03-98ER54460. The ZaP experiment has achieved excellent results, maintaining a Z-pinch equilibrium for approximately 2000 MHD growth times. This equilibrium has a flow shear in the range predicted by theory to provide stabilization. These results are published in Physical Review Letters, Fusion Science and Technology and Physics of Plasmas, (included in an Appendix) and presented at the meetings including the APS Division of Plasma Physics, AIAA, IEEE ICOPS, and the IAEA Fusion Energy Conferences.
NTIS
Plasmas (Physics); Zeta Pinch; Plasma Physics; Magnetohydrodynamics

20060009959 California Inst. of Tech., Pasadena, CA, USA
Final Technical Report for DOE Grant DE-FG03-97ER54438
Bellan, P. M.; Dec. 21, 2004; 14 pp.; In English
Contract(s)/Grant(s): DE-FG03-97ER54438
Report No.(s): DE2005-843023; No Copyright; Avail.: National Technical Information Service (NTIS)

Laboratory experiments using technology developed for fusion research created replicas of solar prominences. These solar coronal loops exhibited dynamic behavior similar to what is observed on the sun. Diagnostics included high-speed

photography, and x-ray detectors. In addition to the experiments, two related theoretical investigations were undertaken: (i) a three-dimensional numerical model of coronal mass ejections, and (ii) a model of the plasma jet flow and collimation resulting from an electric current flowing along a magnetic flux tube.
NTIS
Solar Prominences; Physics; Solar Corona; Magnetohydrodynamic Flow; Dynamic Characteristics; Coronal Mass Ejection

20060009966 Fermi National Accelerator Lab., Batavia, IL, USA
2004 Fermilab Fall Shutdown P-Bar Water Issues
Dyer, A.; Schneider, F.; January 2005; 10 pp.; In English
Report No.(s): DE2005-15017020; FERMILAB-TM-2281; No Copyright; Avail.: Department of Energy Information Bridge

I was assigned to Frank Schneider, who works within the Accelerator Division Water Group. Frank would educate me with issues pertaining to water flow cooling at the P-Bar facility. Also during the shutdown period, water issues in the Pre-Vault Stub Room would be addressed. Week one was primarily used to familiarize and understand the tasks Frank and I were charged with. Operation of equipment as well as an overview of safety issues was presented by Frank. Once the equipment was positioned into place, 'hands-on' examples to further enforce instructions given by Frank were reviewed.
NTIS
Shutdowns; Water

20060009967 Fermi National Accelerator Lab., Batavia, IL, USA
Sub-Microsecond Beam Notching at Low Energy
Moehs, D. P.; January 2005; 18 pp.; In English
Report No.(s): DE2005-15020396; FERMILAB-CONF-05-389; No Copyright; Avail.: National Technical Information Service (NTIS)

A technique for creating a burst of 100 ns notches (beam extinctions) in an H- beam at 454 kHz has been developed at less than or equal to 20 keV utilizing a Magnetron ion source with a slit extraction system and a split extractor. Each half of the extractor is treated as part of a 50 ohm transmission line which can be pulsed at plus or minus 700 volts creating a 1400 volt gradient across the extractor. A beam current reduction of better than 95% has been observed at the end of the Fermilab 400 MeV Linac. Notched multi-turn charge-exchange injection into the Booster, a 400 MeV to 8 GeV synchrotron, has been demonstrated with a charge reduction in the resulting beam gap of 83%. Presently, the trailing edge of the notch may be adversely affected by space charge resulting in a beam recovery with two different time constants. Efforts to minimize this effect are discussed.
NTIS
Beam Currents; Ion Sources; Extraction; Charge Transfer

20060009968 Fermi National Accelerator Lab., Batavia, IL, USA
MiniBooNE Primary Beamline
Kobilarcik, T. R.; Jul. 07, 2005; 16 pp.; In English
Report No.(s): DE2005-15020241; No Copyright; Avail.: National Technical Information Service (NTIS)

No abstract available
Neutrinos; High Energy Interactions

20060009973 European Organization for Nuclear Research, Geneva, Switzerland
Commissioning of the LHC Beam Transfer Line TI 8
Uythoven, J.; Arduini, G.; Goddard, B.; Jacquet, D.; Kain, V.; January 2005; 8 pp.; In English
Report No.(s): DE2005-861086; No Copyright; Avail.: National Technical Information Service (NTIS)

The first of the two LHC transfer lines was commissioned in autumn 2004. Beam reached an absorber block located some 2.5 km downstream of the SPS extraction point at the first shot, without the need of any threading. The hardware preparation and commissioning phase will be summarized, followed by a description of the beam tests and their results regarding optics and other line parameters, including the experience gained with beam instrumentation, the control system and the machine protection equipment.
NTIS
Extraction; Beams (Radiation); Transport Properties

20060009974 Argonne National Lab., IL USA
Review of a Spoke-Cavity Design Option for the Ria Driver LINAC
Ostroumov, P. N.; Shepard, K. W.; Delayen, J. R.; January 2005; 8 pp.; In English
Report No.(s): DE2005-861170; No Copyright; Avail.: Department of Energy Information Bridge

A design option for the 1.4 GV, multiple-charge-state driver linac required for the U. S. Rare Isotope Accelerator Project based on 345 MHz, 3-cell spoke-loaded cavities has been previously discussed. This paper updates consideration of design options for the RIA driver, including recent results from numerically-modeling the multi-charge-state beam dynamics and also cold test results for prototype superconducting niobium 3-cell spoke-loaded cavities.
NTIS
Linear Accelerators; Charged Particles

20060009975 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
RF Conditioning and Testing of Fundamental Power Couplers for SNS Superconducting Cavity Production
Stirbet, M.; Stirbet, K. M.; Wilson, K. M.; Wisemen, M.; Henry, J.; January 2005; 8 pp.; In English
Report No.(s): DE2005-861044; No Copyright; Avail.: Department of Energy Information Bridge

The Spallation Neutron Source (SNS) makes use of 33 medium beta (0.61) and 48 high beta (0.81) superconducting cavities. Each cavity is equipped with a fundamental power coupler, which should withstand the full klystron power of 550 kW in full reflection for the duration of an RF pulse of 1.3 msec at 60 Hz repetition rate. Before assembly to a superconducting cavity, the vacuum components of the coupler are submitted to acceptance procedures consisting of preliminary quality assessments, cleaning and clean room assembly, vacuum leak checks and baking under vacuum, followed by conditioning and RF high power testing. Similar acceptance procedures (except clean room assembly and baking) were applied for the airside components of the coupler. All 81 fundamental power couplers for SNS superconducting cavity production have been RF power tested at JLAB Newport News and, beginning in April 2004 at SNS Oak Ridge. This paper gives details of coupler processing and RF high power-assessed performances.
NTIS
Cavities; Couplers; Neutron Sources; Radio Frequencies; Spallation; Superconducting Cavity Resonators; Superconductivity

20060009976 European Organization for Nuclear Research, Geneva, Switzerland
Optics Studies of the LHC Beam Transfer Line TI 8
Wenninger, J.; Arduini, G.; Goddard, B.; Jacquet, D.; Kain, V.; January 2005; 8 pp.; In English
Report No.(s): DE2005-861088; No Copyright; Avail.: National Technical Information Service (NTIS)

The optics of the newly commissioned LHC beam transfer line TI 8 was studied with beam trajectories, dispersion and profile measurements. Steering magnet response measurements were used to analyze the quality of the steering magnets and of the beam position monitors. A simultaneous fit of the quadrupole strengths was used to search for setting or calibration errors. Residual coupling between the planes was evaluated using high statistics samples of trajectories. Initial conditions for the optics at the entrance of the transfer line were reconstructed from beam profile measurements with Optical Transition Radiation monitors. The paper presents the various analysis methods and their errors. The expected emittance growth arising from optical mismatch into the LHC is evaluated.
NTIS
Beams (Radiation); Optical Transition; Emittance

20060009977 Oak Ridge National Lab., TN USA, Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
Status of the Cryogenic System Commissioning at SNS
Casagrande, F.; Campisi, I.; Gurd, P.; Hatfield, D.; Howell, M.; January 2005; 8 pp.; In English
Report No.(s): DE2005-861043; No Copyright; Avail.: National Technical Information Service (NTIS)

The Spallation Neutron Source (SNS) is under construction at Oak Ridge National Laboratory. The cold section of the Linac consists of 81 superconducting radio frequency cavities cooled to 2.1K by a 2400 Watt cryogenic refrigeration system. The major cryogenic system components include warm helium compressors with associated oil removal and gas management, 4.5K cold box, 7000L liquid helium dewar, 2.1K cold box (consisting of 4 stages of cold compressors), gaseous helium storage, helium purification and gas impurity monitoring system, liquid nitrogen storage and the cryogenic distribution transfer line system. The overall system commissioning strategy and status will be presented.
NTIS
Cryogenics; Neutron Sources; Spallation

20060009978 Lawrence Livermore National Lab., Livermore, CA USA
Preliminary assessment of the electron cloud effect for the FNAL main injector upgrade
Furman, M. A.; Sep. 19, 2005; 12 pp.; In English
Report No.(s): DE2005-861024; No Copyright; Avail.: National Technical Information Service (NTIS)

We present results from a preliminary assessment, via computer simulations, of the electron cloud density for the FNAL main injector upgrade at injection energy. Assuming a peak value for secondary emission yield (delta)(sub max) = 1.3, we find a threshold value of the bunch population, N(sub b,th) (approx) 1.25 x 10(sup 11), beyond which the electron-cloud density (rho)(sub e) reaches a steady-state level that is (approx)10(sup 4) times larger than for N(sub b) \h N(sub b,th), essentially neutralizing the beam, and leading to a tune shift (approx)0.05. Our investigation is limited to a field-free region and to a dipole magnet, both of which yield similar results for both N(sub b,th) and the steady-state value of (rho)(sub e). Possible dynamical effects from the electron cloud on the beam, such as emittance growth and instabilities, remain to be investigated separately.
NTIS
Electron Clouds; Injectors

20060009988 Stanford Linear Accelerator Center, Stanford, CA, USA, California Univ., Los Angeles, CA, USA, California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
LCLS X-Ray FEL Output Performance in the Presence of Highly Time-Dependent Undulator Wakefields
Bane, K. L.; Emma, P.; Huang, Z.; Nuhn, H. D.; January 2005; 8 pp.; In English
Report No.(s): DE2005-860382; No Copyright; Avail.: National Technical Information Service (NTIS)

Energy loss due to wakefields within a long undulator, if not compensated by an appropriate tapering of the magnetic field strength, can degrade the FEL process by detuning the resonant FEL frequency. The wakefields arise from the vacuum chamber wall resistivity, its surface roughness, and abrupt changes in its aperture. For LCLS parameters, the resistive-wall component is the most critical and depends upon the chamber material (e.g., Cu) and its radius. Of recent interest(1) is the so-called ''AC'' component of the resistive-wall wake which can lead to strong variations on very short timescales (e.g., (approx) 20 0fs). To study the expected performance of the LCLS in the presence of these wakefields, we have made an extensive series of start-to-end SASE simulations with tracking codes PARMELA and ELEGANT, and time-dependent FEL simulation codes GENESIS1.3 and GINGER. We discuss the impact of the wakefield losses upon output energy, spectral bandwidth, and temporal envelope of the output FEL pulse, as well as the benefits of a partial compensation of the time-dependent wake losses obtained with a slight z-dependent taper in the undulator field. We compare the taper results to those predicted analytically.
NTIS
Free Electron Lasers; Time Dependence; X Rays

20060009989 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Controlled Electron Injection into Plasma Accelerators and Space Charge Estimates
Fubiani, G. J.; Sep. 2005; 268 pp.; In English
Report No.(s): DE2005-860349; LBNL-57514; No Copyright; Avail.: National Technical Information Service (NTIS)

Plasma based accelerators are capable of producing electron sources which are ultra-compact (a few microns) and high energies (up to hundreds of MeVs) in much shorter distances than conventional accelerators. This is due to the large longitudinal electric field that can be excited without the limitation of breakdown as in RF structures.The characteristic scale length of the accelerating field is the plasma wavelength and for typical densities ranging from 1018 - 1019 cm-3, the accelerating fields and scale length can hence be on the order of 10-100GV/m and 10-40 mu m, respectively. The production of quasimonoenergetic beams was recently obtained in a regime relying on self-trapping of background plasma electrons, using a single laser pulse for wakefield generation. In this dissertation, we study the controlled injection via the beating of two lasers (the pump laser pulse creating the plasma wave and a second beam being propagated in opposite direction) which induce a localized injection of background plasma electrons. The aim of this dissertation is to describe in detail the physics of optical injection using two lasers, the characteristics of the electron beams produced (the micrometer scale plasma wavelength can result in femtosecond and even attosecond bunches) as well as a concise estimate of the effects of space charge on the dynamics of an ultra-dense electron bunch with a large energy spread.
NTIS
Estimates; Injection; Plasma Accelerators; Space Charge

20060009994 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
QGP and Modified Jet Fragmentation
Wang, X. N.; January 2005; 12 pp.; In English
Report No.(s): DE2005-860340; No Copyright; Avail.: Department of Energy Information Bridge

Recent progresses in the study of jet modification in hot medium and their consequences in high-energy heavy-ion collisions are reviewed. In particular, I will discuss energy loss for propagating heavy quarks and the resulting modified fragmentation function. Medium modification of the parton fragmentation function due to quark recombination are formulated within finite temperature field theory and their implication on the search for deconfined quark-gluon plasma is also discussed. NTIS

Fragmentation; Heavy Ions

71
ACOUSTICS

Includes sound generation, transmission, and attenuation. For noise pollution see *45 Environment Pollution*. For aircraft noise see also *02 Aerodynamics* and *07 Aircraft Propulsion and Power*.

20060009037 NASA Langley Research Center, Hampton, VA, USA, Lockheed Martin Engineering and Science Services, Hampton, VA, USA
Finite and Boundary Element Modeling of the NASA Langley Aluminum Testbed Cylinder (ATC)
Grosveld, Ferdinand W.; March 2006; 77 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAS1-00135; 23-781-10-13
Report No.(s): NASA/CR-2006-214283; No Copyright; Avail.: CASI: A05, Hardcopy

The NASA Langley Aluminum Testbed Cylinder (ATC) was designed to serve as a universal structure for evaluating structural acoustic codes, modeling techniques and optimization methods used in the prediction of aircraft interior noise. Finite element models were developed for the components of the ATC based on the geometric, structural and material properties of the physical test structure. Numerically predicted modal frequencies for the longitudinal stringer, ring frame and dome component models, and six assembled ATC arrangements were in good agreement with experimental modal survey data. Finite element modal analyses were performed for 3 psi and 6 psi internal pressurization conditions. Acoustic cylinder modes for the interior of the ATC were calculated with an acoustic finite element model. Frequency transfer functions between a unit force on the structure and the acoustic response inside the ATC cylinder were measured and were compared with predictions based on a boundary element model. Comparisons between predicted and experimental results are presented and discussed. Author

Acoustics; Aluminum; Finite Element Method; Mathematical Models; Circular Cylinders

20060009062 Center for Development of Advanced Computing, Mumbai, India
Robust Volume Control Technique for Mobile Phones using Fuzzy Logic
Raj, Amit; Moinuddin; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2005 USA Cambridge); [2005]; 8 pp.; In English; See also 20060009039; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In this paper, we propose a robust technique for volume control in cellular phones using fuzzy logic. The proposed technique uses background noise information and the current volume level to decide the volume level adjustments required in the presence of background noises. The robust controller obtains a consistent volume level and improves the quality of speech in the presence of background noises. The controller is targeted for mobile phone applications. The proposed controller is simulated in Simulink version 5.0 (Release 13)/ Matlab 6.5. Results validated the control action of the controller. Author

Fuzzy Systems; Mobile Communication Systems; Controllers; Background Noise

20060009154 Lawrence Livermore National Lab., Livermore, CA USA
Model-Based Acoustic Array Processing
Sullivan, E. J.; Candy, J. V.; Persson, L.; Mar. 14, 2005; 14 pp.; In English
Report No.(s): DE2005-859380; UCRL-CONF-210525; No Copyright; Avail.: Department of Energy Information Bridge

Model-Based Processing is essentially a way of incorporating physics into the processing scheme in a self-consistent

manner. This work presents some of the techniques that have been applied to acoustic array problems. Three situations are addressed. The first is the bearing estimation problem. It is shown that if the forward motion of a towed array is incorporated into the signal model, the performance, as measured by the variance of the estimate, is significantly improved. The second problem treated is that of range estimation. Here it is shown that, by modeling the signal as a cylindrical wavefront, and including the forward motion of the array, the range of an acoustic source can be estimated with an array whose physical aperture is short as compared to the range of the source. The third problem addressed is that of model-based localization of a source using a fixed vertical array. In this case, the signal is represented by a normal-mode propagation model. This differs from matched field processing in that it includes the propagation model parameters themselves in the scheme, thereby dealing with the so-called mismatch problem, i.e., the problem that arises when the model parameters are not well-known. It also differs from the matched-field approach in that it does not require an exhaustive search over the parameters of interest to obtain a solution. The performance improvements that Model-Based Processing is capable of are demonstrated using experimental results.
NTIS
Acoustic Measurement; Arrays; Mathematical Models

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*.

20060009011 NASA Johnson Space Center, Houston, TX, USA
Motion Sickness Treatment Apparatus and Method
Reschke, Millard F., Inventor; Somers, Jeffrey T., Inventor; Ford, George A., Inventor; August 23, 2005; 14 pp.; In English; Original contains black and white illustrations
Patent Info.: Filed 6 Feb. 2003; US-Patent-6,932,090; US-Patent-Appl-361046; NASA-Case-MSC-23444-1; No Copyright; Avail.: CASI: A03, Hardcopy

Methods and apparatus are disclosed for treating motion sickness. In a preferred embodiment a method of the invention comprises operating eyewear having shutter lenses to open said shutter lenses at a selected operating frequency ranging from within about 3 Hz to about 50 Hz. The shutter lenses are opened for a short duration at the selected operating frequency wherein the duration is selected to prevent retinal slip. The shutter lenses may be operated at a relatively slow frequency of about 4 Hz when the user is in passive activity such as riding in a boat or car or in limited motion situations in a spacecraft. The shutter lenses may be operated at faster frequencies related to motion of the user's head when the user is active.
Official Gazette of the U.S. Patent and Trademark Office
Motion Sickness; Equipment; Eye (Anatomy)

20060009113 Brookhaven National Lab., Upton, NY, USA
Vacuum Window Design for High Power Lasers
Shaftan, T.; Aug. 2005; 14 pp.; In English
Report No.(s): DE2005-861055; BNL-73614-2005-CP; No Copyright; Avail.: National Technical Information Service (NTIS)

One of the problems in the high-power lasers design is in outcoupling of a powerful laser beam out of a vacuum volume into atmosphere. Usually the laser device is located inside a vacuum tank. The laser radiation is transported to the outside world through the transparent vacuum window. While considered transparent, some of the light passing through the glass is absorbed and converted to heat. For most applications, these properties are academic curiosities; however, in multi-kilowatt lasers, the heat becomes significant and can lead to a failure. The absorbed power can result in thermal stress, reduction of light transmission and, consequently, window damage. Modern optical technology has developed different types of glass (Silica, BK7, diamond, etc.) that have high thermal conductivity and damage threshold. However, for kilo- and megawatt lasers the issue still remains open. In this paper we present a solution that may relieve the heat load on the output window. We discuss advantages and issues of this particular window design.
NTIS
High Power Lasers; Lasers; Vacuum

75
PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

20060009300 NASA Glenn Research Center, Cleveland, OH, USA
METHOD of PRODUCING and ACCELERATING AN ION BEAM
Foster, John E., Inventor; November 2005; 12 pp.; In English
Patent Info.: Filed 5 Jan. 2004; US-Patent-6,960,888; US-Patent-Appl-SN-753183; US-Patent-Appl-SN-215129; NASA-Case-LEW017230.2; No Copyright; Avail.: CASI: A03, Hardcopy

A method of producing and accelerating an ion beam comprising the steps of providing a magnetic field with a cusp that opens in an outward direction along a centerline that passes through a vertex of the cusp: providing an ionizing gas that sprays outward through at least one capillary-like orifice in a plenum that is positioned such that the orifice is on the centerline in the cusp, outward of the vortex of the cusp; providing a cathode electron source, and positioning it outward of the orifice and off of the centerline; and positively charging the plenum relative to the cathode electron source such that the plenum functions as m anode. A hot filament may be used as the cathode electron source, and permanent magnets may be used to provide the magnetic field.
Official Gazette of the U.S. Patent and Trademark Office
Electron Sources; Ion Beams; Cathodes; Anodes; Magnetic Fields

20060009928 Rochester Univ., NY, USA
LLE Review. Quarterly Report. Volume 104 (July-September 2005)
January 2005; 101 pp.; In English
Report No.(s): PB2006-108481; DOE/SF/19460-643; No Copyright; Avail.: National Technical Information Service (NTIS)

This volume of the LLE Review, covering July through September 2005, features a report on backlit optical shadowgraphy, the primary diagnostic for D2 ice layer characterization of cryogenic targets for the OMEGA Laser System. Measurement of the position of the most prominent rings, caused by the reflection and refraction of light in the ice layer, in conjunction with model predictions allows constructions of a 3-D ice layer representation suitable for implosion modeling. Another highlight is a description of velocity interferometry and optical self emission measurements from shock waves in polystyrene targets. The velocity histories, coalescence times, and transit times are unambiguously observed and are in good agreement with 1-D code predictions. The timing of multiple shock waves is crucial to the performance of inertial confinement fusion ignition targets.
NTIS
Confinement; Inertial Confinement Fusion; Interferometry; Cryogenics

20060009931 Rochester Univ., NY, USA
LLE 2004 Annual Report, October 2003-September 2004
Jan. 2005; 347 pp.; In English
Report No.(s): PB2006-106680; DOE/SF/19460-583; No Copyright; Avail.: National Technical Information Service (NTIS)

The fiscal year ending in September 2004 concluded the second year of the second five-year renewal of cooperative agreement DE-FC03-92SF19460 with the U.S. Department of Energy (DOE). This report summarizes research at the Laboratory for Laser Energetics (LLE) conducted during the year, operation of the National Laser Users Facility (NLUF), a status report of the new OMEGA Extended Performance (EP) laser project, and programs concerning the education of high school, undergraduate, and graduate students during the year. The prime thrust of LLEs ICF research is the validation of capsule designs that are hydrodynamically equivalent to the baseline cryogenic direct-drive ignition design for the National Ignition Facility (NIF). In FY04, layered and characterized cryogenic deuterium capsules were imploded using both high adiabat (approx. 25) and low-adiabat (approx. 5) shaped pulses. These experiments measured the sensitivity of the direct-drive implosion performance to parameters such as the inner-ice-surface roughness, the adiabat of the fuel during the implosion, the positioning precision of the capsules, and the laser power balance. Direct measurements of the compessed cryogenic deuterium capsule core temperature-density profiles were carried out using the measured primary deuteriumdeuterium (DD) and secondary deuteriumtritium (DT) neutron yields, neutron-averaged ion temperature, and x-ray images at peak neutron production.
NTIS
Confinement; Inertial Confinement Fusion; Cryogenics

20060009932 Rochester Univ., NY, USA
LLE 2003 Annual Report, October 2002-September 2003
Jan. 2004; 313 pp.; In English
Report No.(s): PB2006-106679; DOE/SF/19460-510; No Copyright; Avail.: National Technical Information Service (NTIS)

The fiscal year ending September 2003 concluded the first year of the second five-year renewal of cooperative agreement DE-FC03-92SF19460 with the U.S. Department of Energy (DOE). This report summarizes research at the Laboratory for Laser Energetics (LLE) conducted during the year, the operation of the National Laser Users Facility (NLUF), the status of the new OMEGA Extended Performance (EP) laser project, and programs concerning the education of high school, undergraduate, and graduate students during the year. The prime thrust of LLEs ICF research is the validation of capsule designs that are hydrodynamically equivalent to the baseline cryogenic direct-drive-ignition design for the National Ignition Facility (NIF). In FY03, neutron yields were measured on OMEGA from cryogenic capsules, with high-adiabat drive pulses, that were close to those calculated by 1-D hydrocodes. Near-2-D hydrocode performance was measured on similar capsules with low-adiabat drive pulses. Improved direct-drive capsule performance was demonstrated using adiabat shaping with a high-intensity picket pulse in front of the main-drive pulse. The report also contains an account of the seminal work to experimentally validate the reduction in the Rayleigh Taylor growth rate using a picket pulse in planar-target experiments. The results suggest that the acceleration-phase RT growth rates for short-wavelength, laser-induced imprint perturbations may be virtually eliminated by using such picket pulses. Other related work reported in this volume includes polar direct drive (PDD)a new topic of research this year which examines the feasibility of using the x-ray-drive configuration at the NIF to achieve direct-drive ignition and work target fabrication, characterization, and experimental implementation of cryogenic targets on OMEGA. These results are all key to the early demonstration of ignition with cryogenic direct-drive capsules on the NIF. Progress on the OMEGA EP project is also reported in this volume. Initial funding, NNSA approval of Mission Need, University of Rochester authorization of funding for the building construction, NNSA decision to proceed with the design and construction of the first two beams of the EP system, and start of building construction all occurred during FY03. OMEGA EP will couple short-pulse technology with the 60-beam compression facility by the end of FY07. This project will modernize OMEGA and significantly expand the range of high-energy-density (HED) physics experiments carried out during the second half of this decade and beyond. In addition to accounts of the progress made in the Laboratorys primary research and development areas, this report also includes a summary of experiments conducted on OMEGA by teams of scientists from other universities, private industry, and government laboratories including Lawrence Livermore National Laboratory (LLNL), Los Alamos National Laboratory (LANL), and Sandia National Laboratory (SNL), More than half of the total target shots on OMEGA during FY03 were dedicated to these external users. Finally, the report includes a summary of the LLE education programs in FY02. LLE is the only major university participant in the National ICF Program, and education is an important mission of the Laboratory.
NTIS
Confinement; Cryogenics; Inertial Confinement Fusion

20060009933 Rochester Univ., NY, USA
LLE 2002 Annual Report, October 2001-September 2002
Jan. 2003; 240 pp.; In English
Report No.(s): PB2006-106678; DOE/SF/19460-468; No Copyright; Avail.: National Technical Information Service (NTIS)

The LLE 2002 Annual Report is an account of the Laboratorys work during FY02 under Cooperative Agreement DE-FC03-92SD19460 with the Department of Energy (DOE). The report summarizes the progress made by the Laboratory for Laser Energetics (LLE) in the following areas: inertial confinement fusion (ICF) research; work in support of the Stockpile Stewardship Program (SSP); laser and optical materials research; advanced technology development; operation of the OMEGA facility; the National Laser Users Facility (NLUF), and external users programs; and several educational initiatives ranging from a high school student research program to advanced graduate education and research. A focus of this years ICF research program was cryogenic target implosion experiments on OMEGA. These experiments comprise the scientific research base leading to direct-drive-ignition implosions planned for the National Ignition Facility (NIF). The initial results of these experiments, including measurements of primary fusion yield as well as secondary proton and neutron yield, burn history, and x-ray imaging, are described in this report. The results are encouraging for future cryogenic implosions on both OMEGA and the NIF. Significant advances in fusion target fabrication technology and science underpin the cryogenic target implosion effort. Several accounts are offered in this report on the progress made in the fabrication, characterization, and experimental implementation of cryogenic targets on OMEGA, including polyimide shell fabrication, development of the requisite tritium handling and recovery systems, and cryogenic target characterization. Experiments that control all aspects of nonuniformities in target manufacture, irradiation, and precision direct-drive conditions are required to prepare for direct-drive

ignition on the NIF. Recent experiments with warm (i.e., gas-filled) targets on OMEGA tested the ability of the laser pulse shape (using a picket pulse) to vary the adiabat within an imploding direct-drive capsule. This approach is deemed critical to the demonstration of direct-drive ignition on the NIF. In addition to accounts of the progress made in the Laboratorys primary research and development areas, this report also includes a summary of experiments conducted on OMEGA by teams of scientists from other universities, private industry, and government laboratories including Lawrence Livermore National Laboratory (LLNL), Los Alamos National Laboratory (LANL), and Sandia National Laboratory (SNL). Approximately half of the record 1428 target shots taken on OMEGA in FY02 were devoted to external users of OMEGA.
NTIS
Confinement; Inertial Confinement Fusion; Cryogenics

20060009934 Rochester Univ., NY, USA
LLE 2001 Annual Report, October 2000-September 2001
Jan. 2002; 249 pp.; In English
Report No.(s): PB2006-106677; DOE/SF/19460-405; No Copyright; Avail.: National Technical Information Service (NTIS)
The LLE 2001 Annual Report is a summary of the Laboratory's work during fiscal year 2001 in support of direct-drive inertial fusion research, participation in the Department of Energy's Stewardship Science Program (SSP), operation of the National Laser Users' Facility (NLUF), and programs involving education of high school, undergraduate, and graduate students. Highlights of this year's effort include significant improvements in direct-drive capsule implosion performance with full beam smoothing on OMEGA; measurements to assess the effects of shock heating on the stability of direct-drive inertial fusion capsules; the development of a measurement-based model of the stagnated core and fuel-pusher mix; the development of a model, including hot-spot dynamics, to predict the minimum drive-energy requirements to achieve direct-drive ignition on the NIF; the measurement of the highest combination of electron density and temperature in Ar-doped deuterium-filled gas capsules; test of the feasibility of using extended x-ray absorption fine structure (EXAFS) to characterize the properties of solid materials shocked at pressures up to a few Mbar; multibeam laser-plasma interaction experiments designed to resemble future direct-drive laser fusion implosions on the NIF; and the development of improved plasma diagnostic capabilities for OMEGA and for future NIF experiments including the implementation of an improved-spatial-resolution neutron imaging system on OMEGA in collaboration with Commissariat a l'Energie Atomique (CEA) of France and scientists from Los Alamos National Laboratory (LANL). In addition, this annual report includes a summary of experiments conducted on OMEGA by teams from Lawrence Livermore National Laboratory, LANL, Sandia National Laboratory (SNL), CEA, and teams from several universities and private industry under the NLUF Program. Also included are LLE's laser and optical materials research and development activities, i.e., the development of a UV fiber-optic beam delivery system for OMEGA beam diagnostics; preliminary work on NIF's 2-D SSD beam smoothing system; and the modeling of the beam-smoothing performance of ultrafast picket-fence pulses for the NIF. Finally, this report summarizes LLE's education programs, which range from high school summer internships to graduate student research. As the only major university participant in the National ICF Program, education continues to be an important mission for the Laboratory.
NTIS
Confinement; Education; X Ray Absorption; Optical Materials; Research and Development; Schools

20060009937 Rochester Univ., NY, USA
LLE 2000 Annual Report, October 1999-September 2000
Jan. 2001; 251 pp.; In English
Report No.(s): PB2006-106676; DOE/SF/19460-380; No Copyright; Avail.: National Technical Information Service (NTIS)
LLE's 2000 Annual Report, which summarizes the Laboratory's work for fiscal year 2000 (FY00), reports significant progress toward the development of the direct-drive approach to inertial confinement fusion. Highlights of the effort include implementation of the OMEGA Cryogenic Target Handling System (CTHS), enhanced beam smoothing using polarization smoothing (PS) as well as 1-THz 2-D smoothing by spectral dispersion (SSD), experiments showing significantly improved capsule implosion performance with enhanced smoothing on OMEGA, target design calculation that predicts moderate gain (approx. 30) for the NIF using the direct-drive approach, the development of energy-scaled OMEGA cryogenic capsule designs that are hydrodynamically equivalent to NIF ignition capsules, the implementation of a new technique to characterize laser beam imprinting at early times during a capsule implosion, experimental measurements of the effect of laser beam prepulses on capsule implosions, and the application of charged-particle spectroscopy to characterize fuel and shell areal densities, and fuel-shell mix in direct-drive capsule implosions. This Annual Report includes an update on laser and optical materials technology developments within the laboratory. Research carried out on the OMEGA laser under the National Laser Users' Facility (NLUF) Program is summarized along with that of other scientific teams from Lawrence Livermore National

Laboratory, Los Alamos National Laboratory, Sandia National Laboratory, Nuclear Weapons Effects Testing, and Commissariat a l'Energie Atomique (France). Also included in this volume is a report on LLE's educational programs ranging from high-school student summer internships to graduate research advanced degree programs.
NTIS
Confinement; Smoothing; Inertial Confinement Fusion; Education; Charged Particles; Cryogenics

20060009952 Princeton Univ., NJ USA, California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Development of a One-Meter Plasma Source for Heavy Ion Beam Charge Neutralization
Efthimion, P. C.; Gilson, E. P.; Grisham, L.; Davidson, R. C.; January 2005; 10 pp.; In English
Report No.(s): DE2005-859926; No Copyright; Avail.: Department of Energy Information Bridge

Highly ionized plasmas are being employed as a medium for charge neutralizing heavy ion beams in order to focus to a small spot size. Calculations suggest that plasma at a density of 1-100 times the ion beam density and at a length (approx) 0.1-1 m would be suitable for achieving a high level of charge neutralization. A radio frequency (RF) source was constructed at the Princeton Plasma Physics Laboratory (PPPL) in support of the joint Neutralized Transport Experiment (NTX) at the Lawrence Berkeley National Laboratory (LBNL) to study ion beam neutralization. Pulsing the source enabled operation at pressures (approx) 10(sup -6) Torr with plasma densities of 10(sup 11) cm(sup -3). Near 100% ionization was achieved. The plasma was 10 cm in length, but future experiments require a source 1 m long. The RF source does not easily scale to the length. Consequently, large-volume plasma sources based upon ferroelectric ceramics are being considered. These sources have the advantage of being able to increase the length of the plasma and operate at low neutral pressures. The source will utilize the ferroelectric ceramic BaTiO(sub 3) to form metal plasma. A 1 m long section of the drift tube inner surface of NTX will be covered with ceramic. A high voltage ((approx) 1-5 kV) is applied between the drift tube and the front surface of the ceramic by placing a wire grid on the front surface. Plasma densities of 10(sup 12) cm(sup -3) and neutral pressures (approx) 10(sup -6) Torr are expected. A test stand to produce 20 cm long plasma is being constructed and will be tested before a 1 m long source is developed.
NTIS
Beam Neutralization; Ion Beams; Plasmas (Physics)

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*.

20060009947 Geological Survey, Menlo Park, CA, USA
Geologic Database for Digital Geology of California, Nevada, and Utah: An Application of the North American Data Model
Bedford, D. R.; Ludington, S.; Nutt, C. M.; Stone, P. A.; Miller, D. M.; January 2003; 40 pp.; In English
Report No.(s): PB2006-105316; USGS/OFR-03-135; No Copyright; Avail.: CASI: A03, Hardcopy

The USGS is creating an integrated national database for digital state geologic maps that includes stratigraphic, age, and lithologic information. The majority of the conterminous 48 states have digital geologic base maps available, often at scales of 1:500,000. This product is a prototype, and is intended to demonstrate the types of derivative maps that will be possible with the national integrated database. This database permits the creation of a number of types of maps via simple or sophisticated queries, maps that may be useful in a number of areas, including mineral-resource assessment, environmental assessment, and regional tectonic evolution. This database is distributed with three main parts: a Microsoft Access 2000 database containing geologic map attribute data, an Arc/Info (Environmental Systems Research Institute, Redlands, California) Export format file containing points representing designation of stratigraphic regions for the Geologic Map of Utah, and an ArcView 3.2 (Environmental Systems Research Institute, Redlands, California) project containing scripts and dialogs for performing a series of generalization and mineral resource queries.
NTIS
Data Bases; Derivation; Digital Data; Geology; Maps

85
TECHNOLOGY UTILIZATION AND SURFACE TRANSPORTATION

Includes aerospace technology transfer; urban technology; surface and mass transportation. For related information see also *03 Air Transportation and Safety, 16 Space Transportation and Safety*, and *44 Energy Production and Conversion*. For specific technology transfer applications see also the category where the subject is treated.

20060009084 NASA Johnson Space Center, Houston, TX, USA
SAE Mil-1394 For Military and Aerospace Vehicle Applications
Dunga, Larry; Wroble, Mike; Kreska, Jack; [2004]; 33 pp.; In English; SAE World Aviation Congress (WAC), 3-4 Nov. 2004, Reno, NV, USA; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Unique opportunity to utilize new technology while increasing vehicle and crew member safety. Demonstration of new technology that can be utilized for Crew Exploration Vehicle and other future manned vehicles. Future work for other cameras in the vehicle that can be IEEE1394 based without major vehicle modifications. Demonstrates that LM can share information and knowledge between internal groups and NASA to assist in providing a product in support of the NASA Return to Flight Activities. This upgrade will provide a flight active data bus that is 100 times faster than any similar bus on the vehicle.
Derived from text
Aerospace Vehicles; Cameras; Channels (Data Transmission); Flight Crews

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ASTRONOMY

Includes observations of celestial bodies; astronomical instruments and techniques; radio, gamma-ray, x-ray, ultraviolet, and infrared astronomy; and astrometry.

20060009024 NASA Johnson Space Center, Houston, TX, USA
Ground-Based VIS/NIR Reflectance Spectra of 25143 Itokawa: What Hayabusa will See and How Ground-Based Data can Augment Analyses
Vilas, Faith; Abell, P. A.; Jarvis, K. S.; [2004]; 1 pp.; In English; International Symposium Sample Returns from Solar System, 20-22 Oct. 2004, Tokyo, Japan; No Copyright; Avail.: Other Sources; Abstract Only

Planning for the arrival of the Hayabusa spacecraft at asteroid 25143 Itokawa includes consideration of the expected spectral information to be obtained using the AMICA and NIRS instruments. The rotationally-resolved spatial coverage the asteroid we have obtained with ground-based telescopic spectrophotometry in the visible and near-infrared can be utilized here to address expected spacecraft data. We use spectrophotometry to simulate the types of data that Hayabusa will receive with the NIRS and AMICA instruments, and will demonstrate them here. The NIRS will cover a wavelength range from 0.85 m, and have a dispersion per element of 250 Angstroms. Thus, we are limited in coverage of the 1.0 micrometer and 2.0 micrometer mafic silicate absorption features. The ground-based reflectance spectra of Itokawa show a large component of olivine in its surface material, and the 2.0 micrometer feature is shallow. Determining the olivine to pyroxene abundance ratio is critically dependent on the attributes of the 1.0- and 2.0 micrometer features. With a cut-off near 2,1 micrometer the longer edge of the 2.0- feature will not be obtained by NIRS. Reflectance spectra obtained using ground-based telescopes can be used to determine the regional composition around space-based spectral observations, and possibly augment the longer wavelength spectral attributes. Similarly, the shorter wavelength end of the 1.0 micrometer absorption feature will be partially lost to the NIRS. The AMICA filters mimic the ECAS filters, and have wavelength coverage overlapping with the NIRS spectral range. We demonstrate how merging photometry from AMICA will extend the spectral coverage of the NIRS. Lessons learned from earlier spacecraft to asteroids should be considered.
Author
Asteroids; Mineralogy; Reflectance; Spectra; Near Infrared Radiation; Space Missions; Light (Visible Radiation)

20060009115 Brookhaven National Lab., Upton, NY USA
Computational Science Center
Davenport, D. J.; Nov. 2005; 76 pp.; In English
Report No.(s): DE2005-861053; BNL-72286-2005; No Copyright; Avail.: Department of Energy Information Bridge

The Brookhaven Computational Science Center brings together researchers in biology, chemistry, physics, and medicine with applied mathematicians and computer scientists to exploit the remarkable opportunities for scientific discovery which have been enabled by modern computers. These opportunities are especially great in computational biology and nanoscience,

but extend throughout science and technology and include, for example, nuclear and high energy physics, astrophysics, materials and chemical science, sustainable energy, environment, and homeland security. To achieve our goals we have established a close alliance with applied mathematicians and computer scientists at Stony Brook and Columbia Universities.
NTIS
Analysis (Mathematics); Astrophysics; Computers; Chemical Energy

20060009459 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
A Broadband Superconducting Detector Suitable for Use in Large Arrays
Day, Peter K.; LeDuc, Henry G.; Mazin, Benjamin A.; Vayonakis, Anastasios; Zmuldzinas, Jonas; Letters to Nature; 2003; Volume 425, pp. 817-821; In English
Contract(s)/Grant(s): NAG5-10358; Copyright; Avail.: Other Sources

Cryogenic detectors are extremely sensitive and have a wide variety of applications (particularly in astronomy), but are difficult to integrate into large arrays like a modern CCD (charge-coupled device) camera. As current detectors of the cosmic microwave background (CMB) already have sensitivities comparable to the noise arising from the random arrival of CMB photons, the further gains in sensitivity needed to probe the very early Universe will have to arise from large arrays. A similar situation is encountered at other wavelengths. Single-pixel X-ray detectors now have a resolving power of (Delta)E \h 5 eV for single 6-keV photons, and future X-ray astronomy missions anticipate the need for 1,000-pixel arrays. Here we report the demonstration of a superconducting detector that is easily fabricated and can readily be incorporated into such an array. Its sensitivity is already within an order of magnitude of that needed for CMB observations, and its energy resolution is similarly close to the targets required for future X-ray astronomy missions.
Author
Superconductivity; X Ray Detectors; Broadband; CCD Cameras; Cryogenics; Photons; Cosmic Microwave Background Radiation

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ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

20060009463 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Using an MHD simulation to interpret the global context of a coronal mass ejection observed by two spacecraft
Riley, Pete; Linker, J. A.; Mikic, Z.; Odstrcil, D.; Zurbuchen, T. H.; Lario, D.; Lepping, R. P.; Journal of Geophysical Research; July 8, 2003; ISSN 0148-0227; Volume 108, No. A7; 11 pp.; In English; Original contains color illustrations; Copyright; Avail.: Other Sources

In late February 1999 the ACE spacecraft observed a coronal mass ejection (CME) at 1 AU, in the ecliptic plane. Thirteen days later, Ulysses observed a CME at 5 AU and 22‘s. We present a detailed analysis of the plasma, magnetic field, and composition signatures of these two events. On the basis of this comparison alone, it is not clear that the two spacecraft observed the same solar event. However, using a generic MHD simulation of a fast CME initiated at the Sun by magnetic flux cancellation and propagated out into the solar wind, together with additional evidence, we argue that indeed the same CME was observed by both spacecraft. Although force-free models appear to fit the observed events well, our simulation results suggest that the ejecta underwent significant distortion during its passage through the solar wind, indicating that care should be taken when interpreting the results of force-he models. Comparison of composition measurements at the two spacecraft suggests that significant spatial inhomogeneities can exist within a single CME.
Author
Coronal Mass Ejection; Magnetohydrodynamics; Simulation; Space Plasmas; Magnetic Fields; Solar Wind; Interplanetary Gas; Plasma Composition; Plasma Interactions

91
LUNAR AND PLANETARY SCIENCE AND EXPLORATION

Includes planetology; selenology; meteorites; comets; and manned and unmanned planetary and lunar flights. For spacecraft design or space stations see *18 Spacecraft Design, Testing and Performance*.

20060009305 NASA Langley Research Center, Hampton, VA, USA
Mars Science Laboratory Launch-Arrival Space Study: A Pork Chop Plot Analysis
Cianciolo, Alicia Dwyer; Powell, Richard; Lockwood, Mary Kae; [2006]; 11 pp.; In English; 2006 IEEE Aerospace Conference, 4-11 Mar. 2006, Big Sky, TM, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 464.02.07.07; No Copyright; Avail.: CASI: A03, Hardcopy

Launch-Arrival, or 'pork chop', plot analysis can provide mission designers with valuable information and insight into a specific launch and arrival space selected for a mission. The study begins with the array of entry states for each pair of selected Earth launch and Mars arrival dates, and nominal entry, descent and landing trajectories are simulated for each pair. Parameters of interest, such as maximum heat rate, are plotted in launch-arrival space. The plots help to quickly identify launch and arrival regions that are not feasible under current constraints or technology and also provide information as to what technologies may need to be developed to reach a desired region. This paper provides a discussion of the development, application, and results of a pork chop plot analysis to the Mars Science Laboratory mission. This technique is easily applicable to other missions at Mars and other destinations.
Author
Mars Missions; Descent Trajectories; Atmospheric Entry; Launching

20060010018 Lunar and Planetary Inst., Houston, TX, USA
Distribution and stratigraphy of basaltic units in Maria Tranquillitatis and Fecunditatis: A Clementine perspective
Rajmon, D.; Spudis, P.; Meteoritics and Planetary Science; 2004; Volume 39, No. 10, pp. 1699-1720; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NCC5-679
Report No.(s): LPI-Contrib-1210; Copyright; Avail.: Other Sources

Maria Tranquillitatis and Fecunditatis have been mapped based on Clementine image mosaics and derived iron and titanium maps. Impact craters served as stratigraphic probes enabling better delineation of compositionally different basaltic units, determining the distribution of subsurface basalts, and providing estimates of total basalt thickness and the thickness of the surface units. Collected data indicate that volcanism in these maria started with the eruption of low-Ti basalts and evolved toward medium- and high-Ti basalts. Some of the high-Ti basalts in Mare Tranquillitatis began erupting early and were contemporaneous with the low- and medium-Ti basalts; these units form the oldest units exposed on the mare surface. Mare Tranquillitatis is mostly covered with high- Ti basalts. In Mare Fecunditatis, the volume of erupting basalts clearly decreased as the Ti content increased, and the high-Ti basalts occur as a few patches on the mare surface. The basalt in both maria is on the order of several hundred meters thick and locally may be as thick as 1600 m. The new basalt thickness estimates generally fall within the range set by earlier studies, although locally differ. The medium- to high-Ti basalts exposed at the surfaces of both maria are meters to tens of meters thick.
Author
Clementine Spacecraft; Lunar Maria; Stratigraphy; Basalt; Craters; Volcanology

20060010021 NASA Johnson Space Center, Houston, TX, USA
Trade Space Assessment for Human Exploration Mission Design
Joosten, B. Kent; January 2006; 1 pp.; In English; 1st Space Exploration Conference: Continuing the Voyage of Discovery, 30 Jan. - 1 Feb 2005, Orlando, FL, USA
Contract(s)/Grant(s): 7611002E0566; No Copyright; Avail.: Other Sources; Abstract Only

Many human space exploration mission architecture assessments have been performed over the years by diverse organizations and individuals. Direct comparison of metrics among these studies is extremely difficult due to widely varying assumptions involving projected technology readiness, mission goals, acceptable risk criteria, and socio-political environments. However, constant over the years have been the physical laws of celestial dynamics and rocket propulsion systems. A finite diverse yet finite architecture trade space should exist which captures methods of human exploration - particularly of the Moon and Mars - by delineating technical trades and cataloging the physically realizable options of each. A particular architectural approach should then have a traceable path through this 'trade tree'. It should be pointed out that not every permutation of paths will result in a physically realizable mission approach, but cataloging options that have been

examined by past studies should help guide future analysis. This effort was undertaken in two phases by multi-center NASA working groups in the spring and summer of 2004 using more than thirty years of past studies to 'flesh out' the Moon-Mars human exploration trade space. The results are presented, not as a 'trade tree', which would be unwieldy, but as a 'menu' of potential technical options as a function of mission phases. This is envisioned as a tool to aid future mission designers by offering guidance to relevant past analyses.
Author
Mission Planning; Mars Exploration; Technology Assessment; Space Exploration

92
SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots. For related information see *93 Space Radiation*.

20060009195 Delaware Univ., Newark, DE, USA
Spatial Correlation of Solar-Wind Turbulence from Two-Point Measurements
Matthaeus, W. H.; Milano, L. J.; Dasso, S.; Weygand, J. M.; Smith, C. W.; Kivelson, M. G.; Physical Review Letters; December 2, 2005; Volume 95; 5 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): PC251459; UBACYT-X329; PIP-6220; PICT-14163; NAG5-12121; NAG5-8134; NAG5-11603; NAG5-6912; NSF ATM-01-05254; Copyright; Avail.: Other Sources

Interplanetary turbulence, the best studied case of low frequency plasma turbulence, is the only directly quantified instance of astrophysical turbulence. Here, magnetic field correlation analysis, using for the first time only proper two-point, single time measurements, provides a key step in unraveling the space-time structure of interplanetary turbulence. Simultaneous magnetic field data from the Wind, ACE, and Cluster spacecraft are analyzed to determine the correlation (outer) scale, and the Taylor microscale near Earth's orbit.
Author
Correlation; Magnetic Fields; Solar Wind; Plasma Turbulence

20060009936 Science Applications International Corp., San Diego, CA, USA
EVIDENCE of POSTERUPTION RECONNECTION ASSOCIATED WITH CORONAL MASS EJECTIONS IN the SOLAR WIND
Riley, Pete; Linker, J. A.; Mikic, Z.; Odstracil, D.; Pizzo, V. J.; Webb, D. F.; The Astrophysical Journal; October 20, 2002; Volume 578, pp. 972-978; In English
Contract(s)/Grant(s): NASW-02027; NAG5-10833; NSF ATM-96-13834; Copyright; Avail.: Other Sources

Using a coupled 2.5-dimensional, time-dependent MHD model of the solar corona and inner heliosphere, we have simulated the eruption and evolution of a coronal mass ejection containing a flux rope all the way from the Sun to 1 AU. Although idealized, we find that the simulation reproduces many generic features of magnetic clouds. In this paper we report on a new, intriguing aspect of these comparisons. Specifically, the results suggest that jetted outflow, driven by posteruptive reconnection underneath the flux rope, occurs and may remain intact out to 1 AU and beyond. We present an example of a magnetic cloud with precisely these signatures and show that the velocity perturbations are consistent with reconnection outflow. We suggest that other velocity and/or density enhancements observed trailing magnetic clouds may be signatures of such reconnection and, in some cases, may not be associated with prominence material, as has previously been suggested.
Author
Solar Wind; Coronal Mass Ejection; Magnetic Clouds; Magnetohydrodynamics; Solar Corona; Perturbation

20060010025 Science Applications International Corp., San Diego, CA, USA
KINEMATIC TREATMENT of CORONAL MASS EJECTION EVOLUTION IN the SOLAR WIND
Riley, Pete; Crooker, N. U.; The Astrophysical Journal; January 10, 2004; Volume 600, pp. 1035-1042; In English
Contract(s)/Grant(s): NASW-02027; NAG5-10881; Copyright; Avail.: Other Sources

We present a kinematic study of the evolution of coronal mass ejections (CMEs) in the solar wind. Specifically, we consider the effects of (1) spherical expansion and (2) uniform expansion due to pressure gradients between the interplanetary CME (ICME) and the ambient solar wind. We compare these results with an MHD model that allows us to isolate these effects h m the combined kinematic and dynamical effects, which are included in MHD models. They also provide compelling evidence that the fundamental cross section of so-called 'force-free' flux ropes (or magnetic clouds) is neither circular or elliptical, but rather a convex-outward, 'pancake' shape. We apply a force-free fit to the magnetic vectors from the MHD

simulation to assess how the distortion of the flux rope affects the fit. In spite of these limitations, force-free fits, which are straightforward to apply, do provide an important description of a number of parameters, including the radial dimension, orientation, and chirality of the ICME. Subject headings: MHD - solar wind - Sun: activity - Sun: corona - Sun: coronal mass ejections (CMEs) - On-line material color figures Sun: magnetic fields
Author
Coronal Mass Ejection; Solar Wind; Kinematics; Magnetohydrodynamics; Distortion; Force-Free Magnetic Fields; Magnetic Clouds

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