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General

Adaptive 4-8 Texture Hierarchies
Lawrence Livermore National Lab., CA. 14 Apr 2004, 16p.
DE2005-15014100WCC   Price code: PC A03

For complete citation see Pattern Recognition & Image Processing

AIDA: Adaptive Application Independent Data Aggregation in Wireless Sensor Networks
T. He, B. M. Blum, J. A. Stankovic, and T. Abdelzaher. Virginia Univ., Charlottesville. Dept. of Computer Science. 2005, 24p. Sponsored in part by DARPA. Sponsored in part by Grant CCR- 0098269. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
ADA436798WCC   Price code: PC A03/MF A01

Sensor networks, a novel paradigm in distributed wireless communication technology, have been proposed for use in various applications including military surveillance and environmental monitoring. These systems could deploy heterogeneous collections of sensors capable of observing and reporting on various dynamic properties of their surroundings in a time sensitive manner. Such systems suffer bandwidth, energy, and throughput constraints that limit the quantity of information transferred from end to end. These factors coupled with unpredictable traffic patterns and dynamic network topologies make the task of designing optimal protocols for such networks difficult. Mechanisms to perform data centric aggregation utilizing application specific knowledge provide a means to augmenting throughput, but have limitations due to their lack of adaptation and reliance on application specific decisions. We therefore propose a novel aggregation scheme that adaptively performs application independent data aggregation in a time sensitive manner. Our work isolates aggregation decisions into a module that resides between the network and the data link layer and does not require any modifications to the currently existing MAC and network layer protocols. We take advantage of queuing delay and the broadcast nature of wireless communication to concatenate network units into an aggregate using a novel adaptive feedback scheme to schedule the delivery of this aggregate to the MAC layer for transmission. In our evaluation we show that end-to-end transmission delay is reduced by as much as 80% under heavy traffic loads. Additionally, we show as much as a 50% reduction in transmission energy consumption with an overall negative header overhead. Theoretical analysis, simulation, and a test-bed implementation on Berkeley's MICA motes are provided to validate our claims.

Analysis of Next Generation TCP
K. Halliday, A. Hurst, and J. Nelson. Lawrence Livermore National Lab., CA. 15 Dec 2004, 16p, UCRL-TR-208615. Sponsored by Department of Energy, Washington, DC. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
DE2005-15014756WCC   Price code: PC A03/MF A01

The Transmission Control Protocol (TCP) has been around for around 30 years, and in that time computer networks have increased in speed and reliability many times over. TCP has done very well to maintain stability and avoid collapse from congestion in the Internet with this incredible increase in speed. But as the speed of networks continues to increase, some assumptions about the underlying network that influenced the design of TCP may no longer hold valid. Additionally, modern networks often span many dierent types of links. For example, one end-to-end transmission may traverse both an optical link (high-bandwidth, low-loss) and a wireless

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Prepared by the National Technical Information Service
U.S. Department of Commerce, Technology Administration, Springfield, VA 22161 (703) 605-6000

network (low-bandwidth, high loss). TCP does not perform well in these situations. This survey will examine some of the reasons for this, focusing on high-bandwidth networks, and oer some solutions that have been proposed to fix these problems. This paper assumes basic knowledge of the TCP protocol.

Army Battle Command System Functions, Integration, and Parallel Support of the Military Decision-Making Process

T. R. Frambes.
Army Command and General Staff Coll., Fort Leavenworth, KS. 17 Jun 2005, 80p. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
ADA436662WCC   Price code: PC A06/MF A01

The U.S. Army's doctrinal problem-solving method is the Military Decision Making Process (MDMP). This formal process is tailorable in application and serves as a standard guide for developing solutions to operational and tactical problems by Army organizations. MDMP application requires specific information to make decisions, to develop courses of action, and to issue orders. Because the MDMP relies on information, information management and decision making are critical relative to time. The Army Battle Command System (ABCS) is a suite of networked digital components designed to give commanders a better perspective of their operating environment to make better informed decisions. Current MDMP doctrine does not specifically account for ABCS components populating decision-making tactical operations centers at battalion, brigade, and division or higher levels. ABCS components support deliberate MDMP planning, but may require newly defined decision-making processes to guide how information exploitation can be leveraged over networked battle command systems. Alternate decision-making models may include Recognition Primed Decision Making; Observe, Orient, Decide, and Act (OODA), as defined by Colonel John R. Boyd; or other emerging processes tailorable to the short reaction time required during combat operations in the contemporary operating environment.

Biomarkers of Environmental Health and Safety Risks to Children for Use in a Longitudinal Cohort Study: Update. Final Report

RTI International, Research Triangle Park, NC. 25 Aug 2004, 36p, EPA/600/R-05/021. Sponsored by National Health and Environmental Effects Research Lab., Corvallis, OR. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
PB2005-110254WCC   Price code: PC A04/MF A01

The following report describes a project that continued to develop and populate a bibliographic database in support of the National Children's Study. The purpose of this work assignment was to identify recently published literature that may be relevant to biomarkers and children's health and to add the literature citations to the existing database. Another purpose was to make enhancements to the search capabilities of the database and to update the User's Guide. The database contains literature on biomarkers of exposure, susceptibility, or effect, and an associated health outcome. Literature identified during the search was captured in an electronic database and reviewed for relevance. The final database, called the Biomarkers Database, is a searchable reference tool that scientific investigators may use for future research efforts. The work assignment included a literature search, abstract screening process, revision of a preexisting database, search enhancements to the database, and revision of a User's Guide. We reviewed the search strategy and revised several of the search terms using the terms provided in the Final Report and User's Guide from August 25, 2003. We protected the integrity of the pre-existing data in the Biomarkers Database and only added new records. Previously, the Biomarkers Database contained 4,336 records; after our literature search, the database contains 5,889 records. In addition, new search features were added to the database, providing the ability to search on multiple terms in the majority of the fields. The User's Guide was also added into the database.

Comparison of the National VA Outpatient Database to Electronic Medical Records

L. Ayyangar, J. Trafton, and P. G. Barnett.
Health Economics Resource Center, Menlo Park, CA. 26 Aug 2003, 12p. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
PB2005-109616WCC   Price code: PC A03/MF A01

This technical report compares two sources of information on ambulatory care provided by the U.S. Department of Veterans Affairs (VA). We compared the VA electronic medical record to the VA national outpatient utilization database. We wished to validate data to be used in the economic component of the Multisite Opioid Substitution Treatment (MOST) study. The MOST study is evaluating the effect of adherence to clinical practice guidelines on the cost and outcomes of patients being treated for opiate dependence at seven sites. We looked at a random sample of ambulatory care data for a small sample of patients. We compared the VA medical record, VISTA, to the outpatient events file, a SAS extract of the National Patient Care Database (NPCD).

Computer Viral Infection and the Effect of Immunization

C. Wang, J. C. Knight, and M. C. Elder.
Virginia Univ., Charlottesville. Dept. of Computer Science. 2005, 23p. Sponsored in part by DARPA. The original document contains color images. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
ADA436727WCC   Price code: PC A03/MF A01

Viruses remain a significant threat to modern networked computer systems. Despite the best efforts of those who develop anti-virus systems, new viruses and new types of virus that are not dealt with by existing protection schemes appear regularly. In addition, the rate at which a virus can spread has risen dramatically with the increase in connectivity. Defenses against infections by known viruses rely at present on immunization yet, for a variety of reasons, immunization is often only effective on a subset of the nodes in a network and many nodes remain unprotected.

Little is known about either the way in which a viral infection proceeds in general or the way that immunization affects the infection process. In this paper we present the results of a simulation study of the way in which virus infections propagate through certain types of network and of the effect that partial immunization has on the infection. The key result is that relatively low levels of immunization can slow an infection significantly.

Cryptographic Algorithms and Key Sizes for Personal Identity Verification. Information Security

W. T. Polk, D. F. Dodson, and W. E. Burr.
National Inst. of Standards and Technology (ITL), Gaithersburg, MD. Apr 2005, 22p, NIST/SP-800-78. See also PB2005-110184. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.

PB2005-110185WCC   Price code: PC A03/MF A01

The Homeland Security Presidential Directive (HSPD) 12 mandated the creation of new standards for interoperable identity credentials for physical and logical access to Federal government locations and systems. Federal Information Processing Standard 201 (FIPS 201), Personal Identity Verification (PIV) of Federal Employees and Contractors, was developed to establish standards for identity credentials (FIPS201). This document, Special Publication 800-78 (SP 800-78), specifies the cryptographic algorithms and key sizes for PIV systems and is a companion document to FIPS 201.

Design, Implementation and Optimization of a Parallel Monte Carlo Particle Transport Code

Lawrence Livermore National Lab., CA. 7 Sep 2004, 40p, UCRL-CONF-206425. Sponsored by Department of Energy, Washington, DC. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.

DE2005-15011634WCC   Price code: PC A04

The design, implementation and optimization of a parallel, Monte Carlo particle transport code is presented. MERCURY is a modern Monte Carlo code being developed at the Lawrence Livermore National Laboratory (LLNL). It is capable of modeling the transport of neutrons, gammas, and five light ions through a variety of problem geometries, both combinatorial and mesh based. A key requirement which has driven the design and development of MERCURY is the ability to run on various massively parallel computing platforms. To this end, we have designed and implemented a multifaceted approach to parallelism in MERCURY. This parallel programming model employs both distributed memory message passing and shared memory threading techniques. This allows us to model particle transport through very large meshes or geometries (spatial parallelism), as well as very large particle counts (particle parallelism). Following a detailed discussion of the parallel implementation of MERCURY, we assess the parallel performance of the code on two criticality problems. Particle induced load imbalance will be shown to degrade the parallel efficiency of spatially decomposed calculations. We will present the latest results of our efforts to minimize the load imbalance by (1) varying the number of replicated domains in spatial and particle decomposed calculations and (2) varying the size of each domain via spatial redecomposition.

Enhancement of Robotics Laboratory at Tennessee State University

M. J. Malkani, and S. Zein-Sabatto.
Tennessee State Univ., Nashville. 28 Jul 2005, 7p. The original document contains color images. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.

ADA436386WCC   Price code: PC A02/MF A01

Funding from 2002 DoD Infrastructure support program for HBCU/MI under BAA No, DAAD19-02-R-002 provided support for Tennessee State University to purchase five (5) ATR robots with associated laser scanners, navigation and inertial sensors, communications and speech processing tools to enhance the research capabilities of existing robotics laboratory. The impact of this equipment led to completion of 9 undergraduate senior capstone design projects and 3 masters' theses during 2002-2004. In addition undergraduate research group is formed to enrich the electrical and mechanical engineering curriculum and enhance the career opportunities of our students. The addition of new robots has enhanced our research in the area of cooperative mobile robots. The robots are able to communicate with each other andhumansthroughwirelesscommunication,computersandhand held devices.

FMRI for Functional Localization and Task Difficulty Assessment During Visual Search for Military Vehicles

T. Meitzler, D. Bryk, E. Sohn, and J. Hirsch.
Army Tank-Automotive Command, Warren, MI. 3 Aug 2005, 13p, TACOM-15099. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.

ADA436478WCC   Price code: PC A03/MF A01

Past and current U.S. Army computational vision models designed to determine the difficulty of visual detection of camouflage for military vehicles are extremely limited in the sense that they do not encompass much of the brain outside the retina and visual cortex, and within those areas, do so to a very limited degree. A method and preliminary experiments to obtain the raw data to construct better and more representative models of human vision and cognition is presented. The inclusion of specific neurocircuitry in the computational model as opposed to the 'black box' standard used in psychophysics is now possible. The combination of psychophysics and fMRI has the potential to give a more complete view of the neural systems that are relied on for different perception tasks related to camouflage and deception.

Generic, Agent-Based Framework for Design and Development of UAV/UCAV Control Systems

J. L. Edwards.
ARTIFICIAL INTELLIGENCE MGT AND DEVELOPMENT CORP (AIMDC) TORONTO (ONTARIO). 27 Feb 2004, 65p, AIMDC-AC261, DRDC-TORONTO-CR-2004-062. Product reproduced from digital image. Order this product

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ADA436428WCC   Price code: PC A05/MF A01

Unmanned Air Vehicles (UAVs) and Unmanned Combat Air Vehicles (UCAVs) are being investigated for use as a new Integrated Intelligence, Surveillance, and Reconnaissance (IISR) platform within the Canadian Forces. At the moment UAV/UCAV control is operator intensive and can involve high levels of workload. In an effort to alleviate those conditions and reduce manning requirements, the current project examined a variety of theoretical approaches to construct a comprehensive, integrated approach to the design and implementation of an intelligent, adaptive, agent-based system for UAV/UCAV control. The resulting generic framework was constructed from the elements of the following design approachesCommonKADSMAS-CommonKADSIDEFStandards, Explicit Models Design, Perceptual Control Theory and Ecological Interface Design. This report provides overviews of each of those approaches and highlights common and complementary elements as part of a recommended generic framework. A sequence for applying the generic framework is provided. The proposed integration of the above techniques into a comprehensive, cross- disciplinary design approach will help serve the goals of reducing operator workloads and manning requirements, while generating a robust, maintainable and reliable system.

——Proceedings, Symposia, Etc.——

High Performance Networks for High-Impact Science
R. Bair, D. Agarwal, G. McDermott, S. Eckstrand, and A. S. Bland.
Department of Energy, Washington, DC. Office of Advanced Scientific Computing. Aug 2004, 122p. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
DE2005-15010109WCC   Price code: PC A07

This workshop was the first major activity in developing a strategic plan for high-performance networking in the Office of Science. Held August 13 through 15, 2002, it brought together a selection of end users, especially representing the emerging, high-visibility initiatives, and network visionaries to identify opportunities and begin defining the path forward.

Inferring Rule-Based Strategies in Dynamic Judgment Tasks: Towards a Noncompensatory Formulation of the Lens Model
L. Rothrock, and A. Kirlik.
Illinois Univ. at Urbana-Champaign, Savoy. Inst. of Aviation. Feb 2003, 34p, AHFD-03-5/NTSC-03-1. Prepared in cooperation with Pennsylvania State University. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
ADA436779WCC   Price code: PC A04/MF A01

Performers in time-stressed, information-rich tasks develop rule- based, simplification strategies to cope with the severe cognitive demands imposed by judgment and decision making. Linear regression modeling, proven useful for describing judgment in a wide range of static tasks, may provide misleading accounts of these heuristics. That approach assumes cue-weighting and cue-integration are well described by compensatory strategies. In contrast, evidence suggests that heuristic strategies in dynamic tasks may instead reflect rule-based, noncompensatory cue usage. We therefore present a technique, called Genetics-Based Policy Capturing (GBPC), for inferring noncompensatory, rule-based heuristics from judgment data, as an alternative to regression. In GBPC, rule-base representation and search uses a genetic algorithm, and fitting the model to data uses multi-objective optimization to maximize fit on three dimensions: (a) completeness (all human judgments are represented); (b) specificity (maximal concreteness); and (c) parsimony (no unnecessary rules are used). GBPC is illustrated using data from the highest and lowest scoring participants in a simulated dynamic, combat information center (CIC) task. GBPC inferred rule-bases for these two performers that shed light on both skill and error. We compare the GBPC results with regression-based Lens Modeling of the same data set, and discuss how the GBPC results allowed us to interpret the high scoring performer's highly significant use of unmodeled knowledge (C=1) revealed by Lens Model analysis. The GBPC findings also allow us to now interpret a similarly high use of unmodeled knowledge (C=1) in a previously published Lens Model analysis of a different data set collected in the same experimental task.

Information Technology: FBI Is Taking Steps to Develop an Enterprise Architecture, but Much Remains to Be Accomplished
Government Accountability Office, Washington, DC. Sep 2005, 52p, GAO-05-363. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
PB2005-109987WCC   Price code: PC A05/MF A01

The Federal Bureau of Investigation (FBI) is attempting to replace much of its 1980s-based information technology (IT) systems environment to better support its plans for an integrated bureauwide approach to performing critical mission operations, including terrorism prevention and federal crime investigation. Our research and experience in reviewing federal agency system modernization programs, including the FBIs, shows that attempting such programs without a well-defined and enforceable enterprise architecture (EA) results in nonintegrated, stand-alone systems that are duplicative and do not effectively and efficiently support mission performance.

——Foreign Technology——

Intrangsdetektering i Mobila ad Hoc-Naet (Intrusion Detection in Mobile ad hoc Networks)
E. Hansson, J. Groenkvist, and J. Nilsson.
Swedish Defence Research Agency, Linkoeping. Command and Control Systems. Nov 2004, 88p, FOI-R-1375-SE. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
PB2005-107449WCC   Price code: PC A06/MF A01

New challenges within the area of security have arisen due to a relative new paradigm called mobile ad hoc networks. A mobile ad hoc network consists of wireless nodes that form a radio network without any pre-existing infrastructure or

centralized servers. However, these networks have inherent vulnerabilities that make them susceptible to malicious attack such as denial of service propagation of incorrect routing information. Current security solutions for tactical radio networks are not sufficient. New solutions for intrusion detection are needed to obtain an acceptable level of security. In this report, we first examine the vulnerabilities of mobile ad hoc networks, the reason why we need intrusion detection, and the reason why current methods for intrusion detection cannot be applied in tactical ad hoc contexts. Thereafter, requirements for intrusion detection in tactical mobile ad hoc networks are explored. We then propose a new architecture for intrusion detection, based on specification-based detection, applicable to a tactical mobile ad hoc network. To illustrate the approach, we present a new specification-based algorithm that detects attacks in protocols based on a set of constraints which describe the correct operation of the protocols. A second approach based on anomalies is also briefly described.

—— *Foreign Technology* ——

Kravhantering foer FMA (Requirements Engineering for FMA)
N. Hallberg, P. Lindell, S. Pilemalm, M. Andersson, and L. Ericson.
Swedish Defence Research Agency, Linkoeping. Command and Control Systems. Dec 2004, 28p, FOI-R-1503-SE. Text in Swedish; summary in English. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
PB2005-107404WCC   Price code: PC A03/MF A01

The Swedish armed forces invest large resources on the development of information systems new as well as modifications of existing systems. The difficulties with development of the adequate systems, to the adequate costs, and in the right time are well-known phenomena caused by, among other things, insufficient requirement engineering. The development of architectures puts larger demand on adequate management of requirements since it will be more difficult to modify after introduction than other kinds of information systems. This report constitutes a basis for the development of a support for management of requirements for FMA. The support consists of four parts, which are a requirements engineering process, a model to describe requirements, a computer based support for management of requirements, and a process for identification of new requirements and validation of existing requirements. The requirement engineering process includes the three sub-processes business analysis, needs analysis, and requirements analysis. The model describes requirement attributes, and relations to sources and needs. The computer support should handle stakeholders, sources, needs and requirements. It should also handle prioritizations of needs and requirements as well as visualization of requirements and generation of reports. The process for identification of new and validation of existing architecture requirements is based on scenarios and prototypes, which have been designed in dose relation to the business oriented development.

Mathematical Models by Quality of Service Driven Routing in Networks
E. Gelenbe.
University of Central Florida, Orlando. Dept. of Computer Science. 31 Jan 2005, 7p, ARO-44978.1-MA. Product reproduced from digital image. Order this product from NTIS

by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
ADA436700WCC   Price code: PC A02/MF A01

Very large networks with varying topologies, unreliable components, and highly time varying traffic, are not amenable to traditional techniques of analysis based on traffic engineering and simulations. Traffic flows in such networks will traverse a number of hops which cannot be determined in advance and encounter traffic conditions that are also unknown. During the flow of a particular traffic stream, the network topology may change (e.g. when wireless links are numerous) and other critical conditions (such as network security) may vary. We address the control of traffic flows in such networks with the objective of meeting the needs of the military end user. Novel results obtained in this research include distributed sensible network techniques that provide a hierarchy of provably better flow control algorithms that apply to any specific QoS metric of interest, and estimates for search times of destinations in highly unknown random environments. We prove the existence and uniqueness of solutions of the non-linear equations for the computation of QoS in the presence of sensible decision algorithms. In addition we compute the average travel time of a packet that is routed in a random environment, with and without time-outs for packet re-transmission when the packet is lost.

Multi-Packet Signature Approach to Passive Operating System Detection
A. De Montigny-Leboeuf.
Defence Research and Development, Ottawa, Canada. (Ontario). Jan 2005, 180p, DRDC-TM-2005-018, CRC-TN-2005-001. The original document contains color images. Prepared in cooperation with Communications Research Centre Canada. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
ADA436420WCC   Price code: PC A10/MF A02

Remote operating system discovery can provide valuable contextual information regarding the computers connected to the network. In particular, operating system discovery can help identify potential vulnerable computers or may help prioritize alarms and responses in times of attack. The Network Security Research Group at the Communication Research Centre (CRC) has developed novel techniques for passive operating system discovery. The methodology developed allows derivation of a signature from a set of packets. The tests are conducted passively on regular traffic. They are non-intrusive and do not rely on access to application or user data. Because they are passive, the techniques do not consume bandwidth and do not disrupt network assets. Over a dozen tests have been developed to analyse headers of packets seen on a network. The tests are conducted on headers of various types of protocols: ARP, IP, ICMP, UDP and TCP. This document describes the tests in detail. They have been implemented in a prototype written in JAVA, which includes a database containing the 'fingerprints' of almost 200 versions of operating systems. The prototype was used to collect these signatures from our testbed and was also used on real user traffic for preliminary evaluation of the tests' performance.

Nearly Optimal Solution of HJB Equation Using Neural Networks: Applications to Control of DoD Systems and MEMS Assembly

F. L. Lewis.
Texas Univ. at Arlington. 25 Jul 2005, 26p, ARO-43795.18-CI. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
ADA436807WCC   Price code: PC A03/MF A01

The goals of this grant were three. All have been accomplished. Goal 1 designed rigorous new nonlinear control schemes based on direct approximate solution of the Hamilton-Jacobi equations using neural networks (NN). On-line NN control techniques were developed that stabilize the system based on NN weight learning to approximate the optimal value function. Computational complexity was confronted using specialized structured NN controllers to provide efficient numerical solution algorithms for nonlinear optimal controllers. Optimal constrained controls were designed that satisfy actuator saturation limitations. Goal 2 proposed new information content and controllers for wireless networked systems. A new matrix-based discrete event controller was designed for wireless sensor networks with some mobile sentry nodes and some unattended ground sensors. The results were implemented on a mobile wireless sensor network testbed built at ARRI. Goal 3 built a prototype precision automated robotic microassembly system for future MEMS sensors and actuators for military networks. Novel control schemes and user interfaces were provided for tele-operated vision-guided microassembly.

Network Centric Warfare Implementation and Assessment

T. K. Braunlinger.
Army Command and General Staff Coll., Fort Leavenworth, KS. 17 Jun 2005, 88p. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
ADA436488WCC   Price code: PC A06/MF A01

This study examines three primary questions: (1) What is the definition of network-centric warfare; (2) Are the military services implementing the network-centric warfare concept; and (3) Is the network-centric warfare concept a new theory of warfare or rather a modification or extension of previous theories. To answer these questions, various publications on network-centric warfare and the various military service transformation plans were reviewed. The definition of network-centric warfare developed is the linkage of people, systems, and platforms to form a self-synchronized networked force that creates shared battlespace awareness for information superiority and speed of command. A review of the services transformation plans showed that the services may not be using the same terms, but they are implementing the concepts of network-centric warfare. The study concludes that network-centric warfare is not a new theory of warfare, but a concept that supports the maneuver theory of warfare, similar to the concept of blitzkrieg developed by Germany prior to World War II. To emphasize this the term 'network-enabled warfare' is suggested as a more appropriate term.

Selective Notification: Combining Forms of Decoupled Addressing for Internet-Scale Command and Alert Dissemination

J. C. Hill, and J. C. Knight.
Virginia Univ., Charlottesville. Dept. of Computer Science. 2003, 23p. The original document contains color images. Sponsored in part by DARPA and the Air Force Research Lab. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
ADA436806WCC   Price code: PC A03/MF A01

By using an information survivability control system, the survivability of critical networked information systems can be enhanced using a variety of fault-tolerance mechanisms. Essential to the effective implementation of such mechanisms is communication from the error detection component to the various application nodes in the network. In this paper, we introduce a technique called Selective Notification for the communication of commands and alerts in very large distributed systems. The technique combines intentional addressing, content addressing and sender qualification in a single decoupled event-delivery mechanism. We show that effective targeted command and alert dissemination is achievable, and that Selective Notification allows systems to apply a wide range of event connectivity policies. We present details of an implementation of Selective Notification and the results of performance assessment experiments. Based on our preliminary performance data, we conclude that Selective Notification can be used to support survivability architectures in Internet-sized systems.

WIDELink: A Bootstrapping Approach to Identifying, Modeling and Linking On-Line Data Sources

C. A. Knoblock, S. Minton, K. Lerman, and C. Gazen.
University of Southern California, Marina del Rey. Information Sciences Inst. Jul 2005, 62p, AFRL-IF-RS-TR-2005-268. Sponsored in part by DARPA. The original document contains color images. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
ADA436343WCC   Price code: PC A05/MF A01

A link discovery system must be able to augment its knowledge base by collecting information from diverse, distributed sources. We have developed a system, WideLink, that can automatically extract data from online sources, integrate it into a domain model by automatically labeling it and automatically link it with facts already stored in a knowledge base. The challenge is to locate, extract, and integrate the data that comes from online sources. We addressed these problems by using a bootstrapping approach where the system leverages previously-gathered data, as well as the underlying structure many online data sources have, in order to identify and incorporate new data sources. WideLink systematically explores the structure of online sites so that it is able to retrieve pages on demand from complex web sites (e.g., sites with forms, embedded navigational structures, etc.). The system uses knowledge derived from previously gathered examples to help analyze new types of pages. Using examples of the type of information it is looking for, and characteristic patterns learned from those examples, WideLink can recognize relevant data from new sources, assign it to semantic categories within the domain model, and link it with

previously learned facts.

Computer Hardware

Efficient Implementation of Query/Advertise
Colorado Univ. at Boulder. Dept. of Computer Science. 31 Mar 2003, 15p.
ADA436796WCC   Price code: PC A03/MF A01

For complete citation see Computer Software

RAP: A Real-Time Communication Architecture for Large-Scale Wireless Sensor Networks
C. Lu, B. M. Blum, T. F. Abdelzaher, J. A. Stankovic, and T. He.
Virginia Univ., Charlottesville. Dept. of Computer Science. 2002, 13p. The original document contains color images. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
ADA436746WCC   Price code: PC A03/MF A01

Large-scale wireless sensor networks represent a new generation of real-time embedded systems with significantly different communication constraints from traditional networked systems. This paper presents RAP, a new real-time communication architecture for largescale sensor networks. RAP provides convenient, highlevel query and event services for distributed microsensing applications. Novel location-addressed communication models are supported by a scalable and light-weight network stack. We present and evaluate a new packet scheduling policy called velocity monotonic scheduling that inherently accounts for both time and distance constraints. We show that this policy is particularly suitable for communication scheduling in sensor networks in which a large number of wireless devices are seamlessly integrated into a physical space to perform real-time monitoring and control. Detailed simulations of representative sensor network environments demonstrate that RAP significantly reduces the end-to-end deadline miss ratio in the sensor network.

Computer Software

Alternative to EPA Method 9 -- Field Validation of the Digital Opacity Compliance System (DOCS)
S. L. Rasmussen, and D. A. Stone.
15 Mar 2005, 76p, CP-200119, AFRL-ML-TY-TR-2005-4569. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
ADA436252WCC   Price code: PC A06/MF A01

The Digital Opacity Compliance System (DOCS) software translates images from a commercial digital camera into visual plume opacity measurements, and is proposed as an alternate reporting method to EPA Method 9. Field tests confirmed that, under fair weather conditions, DOCS consistently met prescribed standards for quantitative accuracy and reliability. At real-world industrial operations, accuracy of DOCS's opacity measurements was comparable to Method-9- certified human observers'. Under dark, overcast skies, both DOCS and human readers were less accurate, but DOCS opacity measurements were less compromised, supporting a claim that DOCS is more reliable than Method 9 for all types of stationary sources and under all weather conditions. DOCS will (1) improve measurement objectivity and reliability, (2) lower deployment and maintenance costs and (3) provide permanent digital images of visible opacity--evidence in regulatory enforcement actions. Economic analysis projects $9,011.82 (stateside) and $15,650.10 (remote facilities) annual savings per pair of trained users. DoD certifies 3,400+ Method 9 readers, so DoD-wide adoption of DOCS could decrease compliance costs $15.3M annually, payback occurring in months. Life-cycle cost analysis projects savings of $40,118.82 (stateside) and $69,671.12 (remote) per pair of users, and aggregate DoD financial benefit of $68.2M (assuming five years useful life). Necessary for implementation is concurrence by regulators, which process is underway.

Automatically Hardening Web Applications Using Precise Tainting
A. Nguyen-Tuong, S. Guarnieri, D. Greene, and D. Evans.
Virginia Univ., Charlottesville. Dept. of Computer Science. Dec 2004, 14p, CS-2004-36. The original document contains color images. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
ADA436667WCC   Price code: PC A03/MF A01

Most web applications contain security vulnerabilities. The simple and natural ways of creating a web application are prone to SQL injection attacks and cross-site scripting attacks (among other less common vulnerabilities). In response, many tools have been developed for detecting or mitigating common web application vulnerabilities. Existing techniques either require effort from the site developer or are prone to false positives. This paper presents a fully automated approach to securely hardening web applications. It is based on precisely tracking taintedness of data and checking specifically for dangerous content in only in parts of commands and output that came from untrustworthy sources. Unlike previous work in which everything that is derived from tainted input is tainted, our approach precisely tracks taintedness within data values. We describe our results and prototype implementation on the predominant LAMP (Linux, Apache, MySQL, PHP) platform.

Building Certified Libraries for PCC: Dynamic Storage Allocation
D. Yu, N. A. Hamid, and Z. Shao.
Yale Univ., New Haven, CT. Dept. of Computer Science. 6 May 2003, 23p, YALEU/DCS/TR-1247. Sponsored in part by Defense Advanced Research Projects Agency (DARPA) and by National Science Foundation (NSF) under grants CCR-0081590 and CCR-0208618. The original document contains color images. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
ADA436475WCC   Price code: PC A03/MF A01

Proof-Carrying Code (PCC) allows a code producer to provide

to a host a program along with its formal safety proof. The proof attests a certain safety policy enforced by the code, and can be mechanically checked by the host. While this language-based approach to code certification is very general in principle, existing PCC systems have only focused on programs whose safety proofs can be automatically generated. As a result, many low-level system libraries (e.g., memory management) have not yet been handled. In this paper, we explore a complementary approach in which general properties and program correctness are semi-automatically certified. In particular, we introduce a low- level language CAP for building certified programs and present a certified library for dynamic storage allocation.

Combustor Simulation
A. Norris.
NASA Glenn Research Center. Aug 2003, 11p. Publicly available Unlimited. CASI. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
N20030068078WCC   Price code: PC A03/MF A01

The goal was to perform 3D simulation of GE90 combustor, as part of full turbofan engine simulation. Requirements of high fidelity as well as fast turn-around time require massively parallel code. National Combustion Code (NCC) was chosen for this task as supports up to 999 processors and includes state-of-the-art combustion models. Also required is ability to take inlet conditions from compressor code and give exit conditions to turbine code.

Control Systems Architecture, Navigation, and Communication Research Using the NPS Phoenix Underwater Vehicle
D. B. Marco, A. J. Healey, R. B. McGhee, D. P. Brutzman, and R. Cristi.
NAVAL POSTGRADUATE SCHOOL MONTEREY CA CENTER FOR AUTONOMOUS UNDERWATER VEHICLE RESEARCH. 2005, 35p. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
ADA436439WCC   Price code: PC A04/MF A01

While there has always been a need to determine the global position of an underwater vehicle, in some missions involving search, mapping, and intervention with objects, navigation to local area landmarks is more appropriate and precise. All aspects of autonomous search have been of interest to us for some time now, and we have recently developed and extended our robot control system architecture using Prolog as a rule based mission specification language to drive vehicle missions involving motion around targets of interest. In particular, we have studied the use of onboard scanning sonar to perform local area navigation. Additionally, we have installed a new low cost short / long baseline acoustic communications / navigation system called DiveTracker, and are developing filtering software that would combine inputs from several sources having different update rates and levels of precision to produce high update rate navigational information with the precision afforded by the low update rate reference. Also, the DiveTracker system affords a low cost acoustic communications system that can be used for low

rate message sending and retrieval from autonomous vehicles.

Direction of Arrival Estimation Using a Reconfigurable Array
D. L. Adams.
Naval Academy, Annapolis, MD. 6 May 2005, 70p, USNA-TSPR-329(2005). The original document contains color images. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
ADA436608WCC   Price code: PC A05/MF A01

The goal of this project was to create a reconfigurable array that can determine the direction of arrival of a target. This goal was accomplished by using existing algorithms, in conjunction with redefining the assumed geometry of the array. These algorithms were modified to work with arrays that have the ability to move or change shape. The project investigated the effect of array rotation on the size of the data needed for the algorithm. It also examined the effect of changing the geometry from a purely linear array to an array that has two linear parts. For demonstration purposes, ultrasonic sensors were used. Prior to implementing them, the proposed modifications to the geometry were simulated using a computer model. After the simulations were complete, the modifications were tested on the actual array. The first geometry examined with actual sensors was the linear array. The geometries investigated were those consisting of half of the array rotating such that the array formed an angle. These geometries were tested using the modifications made to the assumed geometry of the array within the algorithm. The modification of the assumed geometry allowed for different geometries to be tested.

Dismal: A Spreadsheet for Sequential Data Analysis and HCI Experimentation
F. E. Ritter, and A. B. Wood.
PENNSYLVANIA STATE UNIV UNIVERSITY PARK SCHOOL OF INFORMATION SCIENCES AND TECHNOLOGY. 24 Jan 2002, 19p, ACS-2002-1. The original document contains color images. Sponsored in part by the Avionics Laboratory, Wright Research and Development Center, Wright- Patterson AFB, OH. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
ADA436412WCC   Price code: PC A03/MF A01

Dismal is a spreadsheet that works within the GNU Emacs editor, a widely available programmable editor. Dismal has three particular features of interest to those interested in studying behavior: (a) the ability to manipulate and align sequential data, (b) an open architecture that allows users to expand it to meet their particular needs, and (c) an instrumented and accessible interface for studies of human-computer interaction (HCI). Example uses of these capabilities are provided including two cognitive models that have had their behavior aligned with protocols, extensions useful for teaching and doing HCI design, and studies using keystroke logs from the timing package in Dismal. Dismal is distributed with the help of the Free Software Foundation.

Efficient Implementation of Query/Advertise

D. Heimbigner.
Colorado Univ. at Boulder. Dept. of Computer Science. 31
Mar 2003, 15p, CU-CS-948-2003.
ADA436796WCC   Price code: PC A03/MF A01

It is demonstrated how a publish/subscribe system can be
extended to support the efficient distribution of queries to
relevant sites. Queries are encoded as messages that are
efficiently distributed to sites providing advertisements,
which are special queries that describe the data sets
available at each site. An important aspect of this research
is to provide a sufficiently powerful language for expressing
queries. It is shown how adding a form of constraint to the
system as a first class class object can support expressive
queries. A query system is constructed on top of the Siena
wide-area publish/subscribe system, and it is shown how to
optimize the distribution of queries.

Feasibility Study of Integrating IDELIX's Pliable Display Technology into the COPlanS Technology Demonstration Software

IDELIX SOFTWARE INC VANCOUVER
(BRITISHCOLUMBIA). 31 Mar 2005, 43p.
ADA436384WCC   Price code: PC A04/MF A01

This document examines the potential for enhancement of
Defence Research and Development Canada's Collaborative
OperationsPlanningSystem(COPlanS)technologydemonstration
software in the areas of collaboration and data visualization
using IDELIX's Pliable Display Technology. In particular, it
begins by outlining several possible forms of general
collaboration that apply to the application and then defines
a number of areas within the application with collaboration
and data visualization improvement potential. Each of these
areas is subsequently analyzed in depth with specific details
of how enhanced collaboration and data visualization can be
attained with PDT. Finally, rough orders of magnitude are
provided for all defined features and potential
implementation approaches.

Fully Reflexive Intensional Type Analysis

B. Saha, V. Trifonov, and Z. Shao.
Yale Univ., New Haven, CT. Dept. of Computer Science.
2005, 35p, YALEU/DCS/TR-1194.
ADA436483WCC   Price code: PC A04/MF A01

Compilers for polymorphic languages can use runtime type
inspection to support advanced implementation techniques such
as tagless garbage collection, polymorphic marshalling, and
flattened data structures. Intensional type analysis is a
type-theoretic framework for expressing and certifying such
type-analyzing computations. Unfortunately, existing
approaches to intensional analysis do not work well on types
with universal, existential, or fixpoint quantifiers. This
makes it impossible to code applications such as garbage
collection, persistency, or marshalling which must be able to
examine the type of any runtime value. We present a typed
intermediate language that supports fully reflexive
intensional type analysis. By fully reflexive, we mean that
type-analyzing operations are applicable to the type of any
runtime value in the language. In particular, we provide both
type-level and term-level constructs for analyzing quantified
types. Our system supports structural induction on quantified
types yet type checking remains decidable. We show how to use
reflexive type analysis to support type-safe marshalling and
how to generate certified type analyzing object code.

Fully Reflexive Intensional Type Analysis in Type Erasure Semantics

B. Saha, V. Trifonov, and Z. Shao.
Yale Univ., New Haven, CT. Dept. of Computer Science.
2005, 13p.
ADA436474WCC   Price code: PC A03/MF A01

Compilers for polymorphic languages must support runtime type
analysis over arbitrary source language types for coding
applications like garbage collection, dynamic linking,
pickling, etc. On the other hand, compilers are increasingly
being geared to generate type-safe object code. Therefore, it
is important to support runtime type analysis in a framework
that generates type correct object code. In this paper we
show how to integrate runtime type analysis over all types of
a higher order typed source language, including quantified
types, into a system that can propagate type information
through all compilation phases.

Herbal Tutorial

M. A. Cohen, and F. E. Ritter.
PENNSYLVANIA STATE UNIV UNIVERSITY PARK
SCHOOL OF INFORMATION SCIENCES AND
TECHNOLOGY. 9 May 2005, 42p, TR-ACS-2004-2.
ADA436399WCC   Price code: PC A04/MF A01

To accommodate this wide range of users, and to promote the
use of cognitive systems, it is essential that tools such as
high-level languages and development environments are created
to allow the modeler to focus more on the problem domain, and
less on the nuances of a particular architecture. This
tutorial introduces an integrated development environment and
high-level behavior representation language called Herbal
that represents a step towards creating tools to support a
wide range of cognitive model users. This tutorial instructs
users how to install Herbal, and describes how to develop two
models, including a blocks-world model and a dTank model.

Information Environments
G. J. Follen, and C. Naiman.
NASA Glenn Research Center. Aug 2003, 19p. Publicly available Unlimited. CASI. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
N20030068082WCC   Price code: PC A03/MF A01

The objective of GRC CNIS/IE work is to build a plug-n-play infrastructure that provides the Grand Challenge Applications with a suite of tools for coupling codes together, numerical zooming between fidelity of codes and gaining deployment of these simulations onto the Information Power Grid. The GRC CNIS/IE work will streamline and improve this process by providing tighter integration of various tools through the use of object oriented design of component models and data objects and through the use of CORBA (Common Object Request Broker Architecture).

Intensional Analysis of Quantified Types
B. Saha, V. Trifonov, and Z. Shao.
Yale Univ., New Haven, CT. 2005, 52p. Sponsored in part by National Science Foundation ITR grant CCR-0081590. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
ADA436494WCC   Price code: PC A05/MF A01

Compilers for polymorphic languages can use run-time type inspection to support advanced implementation techniques such as tagless garbage collection, polymorphic marshalling, and flattened data structures. Intensional type analysis is a type-theoretic framework for expressing and certifying such type-analyzing computations. Unfortunately, existing approaches to intensional analysis do not work well on quantified types such as existential or polymorphic types. This makes it impossible to code (in a type-safe language) applications such as garbage collection, persistency, or marshalling which must be able to examine the type of any run-time value. We present a typed intermediate language that supports the analysis of quantified types. In particular, we provide both type-level and term-level constructs for analyzing quantified types. Our system supports structural induction on quantified types yet type checking remains decidable. We also show that our system is compatible with a type-erasure semantics.

Interfacing Hoare Logic and Type Systems for Foundational Proof- Carrying Code
N. A. Hamid, and Z. Shao.
Yale Univ., New Haven, CT. Dept. of Computer Science. 2005, 19p. Sponsored in part by the National Science Foundation grant CCR-9901011, CCR-0081590, and CCR-0208618. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
ADA436479WCC   Price code: PC A03/MF A01

In this paper, we introduce a Foundational Proof-Carrying Code (FPCC) framework for constructing certified code packages from typed assembly language that will interface with a similarly certified runtime system. Our framework permits the typed assembly language to have a 'foreign function' interface, in which stubs, initially provided when the program is being written, are eventually compiled and linked to code that may have been written in a language with a different type system, or even certified directly in the FPCC logic using a proof assistant. We have increased the potential scalability and flexibility of our FPCC system by providing a way to integrate programs compiled from different source type systems. In the process, we are explicitly manipulating the interface between Hoare logic and a syntactic type system.

Intrusion Management Using Configurable Architecture Models
D. Heimbigner, and A. Wolf.
Colorado Univ. at Boulder. Dept. of Computer Science. 5 Apr 2002, 12p, TR-929-02. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
ADA436737WCC   Price code: PC A03/MF A01

Software is increasingly being constructed using the component-based paradigm in which software systems are assembled using components from multiple sources. Moreover, these systems are increasingly dynamic; a core set of components is assembled and then new functionality is provided as needed by dynamically inserting additional components. A newer trend closely associated with the use of component-based software is the post development use of configurable run-time architecture models describing the structure of the software system. These models are coming out of the software engineering community and are being used to manage component-based systems at deployment and operations time. The key aspect of this trend is that these models accompany the software system and provide the basis for defining and executing run-time monitoring and reconfiguration of these systems. We believe that these models have the potential for providing a new and important source of information that can be exploited to improve the management of intrusions directed against these software systems. Our hypothesis is that they can provide a common framework for integrating and managing all phases of intrusion defenses: phases including intrusion detection, response, and analysis. We will show how these models can provide a framework around which to organize intrusion-related data. We will also show how architecture-driven reconfiguration can provide improved response, and how inconsistencies between the models and the actual system state can support application-level anomaly detection and computer forensics analysis. Our approach directly challenges the existing practice of basing intrusion management on low level features such as network packets or system call traces. The former is too far removed from the operation of application software, and the latter provides at best limited insight into the operation of the application.

Lightweight Infrastructure for Reconfiguring Applications
M. Castaldi, A. Carzaniga, P. Inverardi, and A. L. Wolf.
Colorado Univ. at Boulder. Dept. of Computer Science. Dec 2002, 13p, CU-CS-943-02. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-

NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.

ADA436788WCC   Price code: PC A03/MF A01

We describe Lira, a lightweight infrastructure for managing dynamic reconfiguration that applies and extends the concepts of network management to component-based, distributed software systems. Lira is designed to perform both component-level reconfigurations and scalable applicationlevel reconfigurations, the former through agents associated with individual components and the latter through a hierarchy of managers.Agentsareprogrammedonacomponent-by-component basis to respond to reconfiguration requests appropriate for that component. Managers embody the logic for monitoring the state of one or more components, and for determining when and how to execute reconfiguration activities. A simple protocol based on SNMP is used for communication among managers and agents.

NASA-Langley Research Center's Aircraft Condition Analysis and Management System Implementation
M. W. Frye, R. M. Bailey, and A. D. Jessup.
NASA Langley Research Center. Oct 2004, 15p, NASA/TM-2004-213276, L-18388. Publicly available Unlimited. CASI. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.

N20040170449WCC   Price code: PC A03/MF A01

This document describes the hardware implementation design and architecture of Aeronautical Radio Incorporated (ARINC)'s Aircraft Condition Analysis and Management System (ACAMS), which was developed at NASA-Langley Research Center (LaRC) for use in its Airborne Research Integrated Experiments System (ARIES) Laboratory. This activity is part of NASA's Aviation Safety Program (AvSP), the Single Aircraft Accident Prevention (SAAP) project to develop safety-enabling technologies for aircraft and airborne systems. The fundamental intent of these technologies is to allow timely intervention or remediation to improve unsafe conditions before they become life threatening.

NPSS Space Team
T. Lavelle.
NASA Glenn Research Center. Aug 2003, 13p. Publicly available Unlimited. CASI. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.

N20030068086WCC   Price code: PC A03/MF A01

The objective is to increase the usability of the current NPSS code/architecture by incorporating an advanced space transportation propulsion system capability into the existing NPSS code and begin defining advanced capabilities for NPSS and provide an enhancement for the NPSS code/architecture.

Phase II-SOF Knowledge Coupler-Based Phase I XML Schema
W. L. Whitlock.
SOUTHEASTERN REGIONAL MEDICAL COMMAND FORT

GORDON GA. Mar 2005, 9p. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.

ADA436520WCC   Price code: PC A02/MF A01

The 2002 digital version of the Special Operations Forces Medical Handbook (SOFMH) includes a comprehensive, searchable database of injuries and illnesses. While it is a complete digital reference source, its utility would be greatly enhanced if a healthcare provider could enter a patient's signs and symptoms into the SOFMH search template and access a list of diagnostic choices in an XML-tagged database. An analysis of the search function indicates that the native search capability of the SOFMH does not inherently contain the requirements to sustain a diagnostic tool. Current search technologies can locate text or indexes, ranked by the frequency a term appears in a document, but not the term's relevance to a set of symptoms. Current search technologies operate by diagnosis category, key words, indices, and content text. The program ranks matches by frequency, index, and content. A medical knowledge coupler requires more sophisticated associations to link a diagnosis to the symptom. XML tagging was selected as the method to identify and assign significance to portions of text information. Initial tagging of the SOFMH did not enable the level of detail required for the diagnostic process. The next step towards a reliable diagnostic tool is establishing the relationships between the symptoms and the diagnosis. A diagnostic tool cannot automatically make these associations; it must be provided the information. Keywords will be used prescribe a certain intuitiveness in the application. A keyword can be significant in many different diagnoses, but will have different weighted values depending on its association with other keywords in a symptom set. Further, the overall weight or ranking of a particular diagnosis in relation to other diagnoses may change or be thrown out completely due to other factors. Collaboration with the Stanford University School of Medicine Department of Medical Information on the Stanford XML Tagging Tool generated a web-based architecture, b7.

Precision in Practice: A Type-Preserving Java Compiler
C. League, Z. Shao, and V. Trifonov.
Long Island Univ., Brooklyn, NY. 2005, 16p. Sponsored in part by the National Science Foundation Grants CCR-9901011 and CCR-0081590. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.

ADA436468WCC   Price code: PC A03/MF A01

Popular mobile code architectures (Java and .NET) include verifiers to check for memory safety and other security properties. Since their formats are relatively high level, supporting a wide range of source language features is awkward. Further compilation and optimization, necessary for efficiency, must be trusted. We describe the design and implementation of a fully type- preserving compiler for Java and ML. Its strongly-typed intermediate language provides a low-level abstract machine model and a type system general enough to prove the safety of a variety of implementation techniques. We show that precise type preservation is within reach for real-world Java systems.

Prediction and Improvement of Safety in Software Systems

S. A. Jones.
Naval Academy, Annapolis, MD. 9 May 2005, 74p, USNA-TSPR-337 (2005). The original document contains color images. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.

ADA436650WCC   Price code: PC A05/MF A01

The modern military's ability to fight depends heavily on complex software systems, making the safety of such of software of paramount importance. The transformation of the military's analog combat systems to computer-based systems has been plagued by software problems ranging from benign flight simulator issues to 'smart' ships finding themselves dead in the water. The military's interest in increasing automation in order to reduce manpower requirements makes even trivial software safety issues a serious concern. The software engineering community is not well equipped to reduce the safety risks incurred through use of such systems, and stands to benefit from metrics, analysis tools, and techniques that address software system safety from a design perspective. The purpose of this research project was to propose and develop tools that software engineers can use to address the issue of software safety. The project focused on safety prediction and improvement through the use of software fault trees coupled with 'key nodes,' or fault tree- based safety metric, and an algorithm for estimating the improvement costs necessary to achieve a targeted level of software safety. The safety prediction metric uses the key node property of fault trees while the improvement algorithm is based on the mathematical relationship between nodes in a fault tree, and yields an estimate of the man-hours necessary to improve a system to a targeted safety value based on cost functions supplied by a component s developer. These metrics and algorithms allow designers to measure and improve the safety of software systems early in the design process, allowing for a reduction in costs and an improvement in resource allocation.

Primer and Guide to Modeling for Operators

J. L. Jansons.
Air Force Inst. of Tech., Wright-Patterson AFB, OH. School of Engineering and Management. 3 Jun 2005, 84p, AFIT/GOS/ENS/05-09. The original document contains color images. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.

ADA436561WCC   Price code: PC A06/MF A01

Operators rely more and more on models to accomplish their work. Examples of this include the weapons employment zone displays in cockpits, logistics models for deployment, and battle simulations to decide courses of action. They often do not have much exposure to modeling, and the products they are using do not always supply adequate documentation. The first portion of this paper serves as a primer on modeling for operators. It then proposes a matrix of questions that an operator should know to ask about any model he is using. The next section contains several examples to illustrate the discussion. The last section includes a proposal to use the matrix as a standard format for modelers to pass relevant information to users. If the operators know which questions to ask, and modelers can embed that information inside the models, then overall effectiveness should increase.

Range-Free Localization Schemes for Large Scale Sensor Networks

T. He, C. Huang, B. M. Blum, J. A. Stankovic, and T. Abdelzaher.
Virginia Univ., Charlottesville. Dept. of Computer Science. 1 Mar 2003, 17p, TR-CS-2003-06. The original document contains color images. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.

ADA436740WCC   Price code: PC A03/MF A01

Wireless Sensor Networks have been proposed for a multitude of location-dependent applications. For such systems, the cost and limitations of hardware on sensing nodes prevent the use of range-based localization schemes that depend on absolute point-to-point distance estimates. Because coarse accuracy is sufficient for most sensor network applications, solutions in range- free localization are being pursued as a cost-effective alternative to more expensive range-based approaches. In this paper, we present APIT, a novel localization algorithm that is range-free. We show that our APIT scheme performs best when an irregular radio pattern and random node placement are considered, and low communication overhead is desired. We compare our work via extensive simulation, with three state-of-the-art range-free localization schemes to identify the preferable system configurations of each. In addition, we study the effect of location error on routing and tracking performance. We show that routing performance and tracking accuracy are not significantly affected by localization error when the error is less than 0.4 times the communication radio radius.

Safe and Principled Language Interoperation

V. Trifinov, and Z. Shao.
Yale Univ., New Haven, CT. Dept. of Computer Science. 2005, 20p. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.

ADA436481WCC   Price code: PC A03/MF A01

Safety of interoperation of program fragments written in different safe languages may fail when the languages have different systems of computational effects: an exception raised by an ML function may have no valid semantic interpretation in the context of a Safe-C caller. Sandboxing costs performance and still may violate the semantics if effects are not taken into account. We show that effect annotations alone are insufficient to guarantee safety, and we present a type system with bounded effect polymorphism designed to verify the compatibility of abstract resources required by the computational models of the interoperating languages. The type system ensures single address space interoperability of statically typed languages with effect mechanisms built of modules for control and state. It is shown sound for safety with respect to the semantics of a

language with constructs for selection, simulation, and blocking of resources, targeted as an intermediate language for optimization of resource handling.

Scalable Coupling of Multiscale AEH and PARADYN Analyses for Impact Modeling

R. R. Valisetty, P. W. Chung, and R. R. Namburu.
Army Research Lab., Adelphi, MD. Computational and Information Sciences Directorate. Jun 2005, 44p, ARL-TR-3512. The original document contains color images. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
ADA436404WCC   Price code: PC A04/MF A01

This report describes scalable coupling of two stand-alone computer codes for a multiscale impact analysis of composites. An asymptotic expansion homogenization (AEH)-based microstructural model available for modeling microstructural aspects of modern armor materials is coupled with PARADYN, a parallel explicit Lagrangian finite-element code. The first code enables modeling of a material microstructure and provides material response in terms of global structural response at a material integration point. Microstructural codes such as this one are typically used in stand-alone form and applied in simple loading situations. The coupling provided here enables a micro/macro type multiscale analysis under generalized three-dimensional loading conditions. Three sets of results are presented to demonstrate: (1) the verification of the AEH-PARADYN model coupling to PARADYN, (2) the scalability of the coupled model, and (3) an application for modeling the impact response of armor materials. In the present work, a consistent AEH numerical formulation was selected that was earlier shown to be scalable on different computing architectures. In conjunction with a second-order accurate velocity-based explicit time integration method, the formulation is coupled within the message- passing interface scheme of PARADYN. PARADYN is a scalable version of the Lawrence Livermore National Laboratory s serial DYNA3D explicit Lagrangian finite-element code used for obtaining large deformation, elastic/plastic response of structures.

Study to Uncover the Microstructural Basis for the Intrinsic Toughness of Interfaces and Its Relation to the Plastic Work That Accompanies Interface

V. Gupta.
California Univ., Los Angeles. Dept. of Mechanical and Aerospace Engineering. 20 Jul 2005, 30p, ARO-40925.1-MS. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
ADA436647WCC   Price code: PC A03/MF A01

A fundamental relationship between intrinsic and total toughness of tantalum/sapphire, Al/epoxy, and Si/epoxy joints is established using several novel interface characterization tools. The focus of research was to understand issues related to size effects, energy absorption capacity, and reliability, of joints. A double cantilever beam experiment equipped with a cryogenic cell, and a lasergenerated stress wave technique was used to measure the strength and toughness of interfaces, respectively. Although not part of the original proposal, experimental procedures to determine interfacial moisture content were established and then related to the measured interface strength. This was demonstrated for a polymer/nitride interface. This allows quantitative prediction of the durability of epoxy joints in service. The experimental procedures are general and applicable to epoxy/Al joints of direct interest to the Army. In addition, a novel application of laser-generated stress waves was developed which involved their use in releasing stiction in MEMS devices. Finally, during the execution of the above research objectives, discovery of glass modified stress waves with rarefaction shocks was made. The technological importance of such waves in measuring the interfacial tensile strength of ultrathin films was demonstrated. The ability of the glass to modify the rise time of the stress pulse from 1-2 ns to almost 50 ns points to an interesting effect that is worthy of further inquiry for defeating shock fronts for the purposes of designing armors.

Supporting Binary Compatibility with Static Compilation

D. Yu, Z. Shao, and V. Trifonov.
Yale Univ., New Haven, CT. Dept. of Computer Science. 2005, 17p. Sponsored in part by Defense Advanced Research Projects Agency (DARPA) and by National Science Foundation (NSF) under grants CCR- 9901011 and CCR-0081590. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
ADA436477WCC   Price code: PC A03/MF A01

There is an ongoing debate in the Java community on whether statically compiled implementations can meet the Java specification on dynamic features such as binary compatibility. Static compilation is sometimes desirable because it provides better code optimization, smaller memory footprint, more robustness, and better intellectual property protection. Unfortunately, none of the existing static Java compilers support binary compatibility, because it incurs unacceptable performance overhead. In this paper, we propose a simple yet effective solution which handles all of the binary-compatibility cases specified by the Java Language Specification. Our experimental results using an implementation in the GNU Java compiler shows that the performance penalty is on average less than 2%. Besides solving the problem for static compilers, it is also possible to use this technique in JIT compilers to achieve an optimal balance point between static and dynamic compilation.

Test Results for Software Write Block Tools: RCMP HDL VO.5

National Inst. of Standards and Technology, Gaithersburg, MD. Aug 2004, 86p, NCJ-206232. See also VO.7, PB2005-109640. Sponsored by National Inst. of Justice, Washington, DC. Office of Justice Programs. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
PB2005-109641WCC   Price code: PC A06/MF A01

The Computer Forensics Tool Testing (CFTT) program is a joint project of the National Institute of Justice (NIJ), the research and development organization of the U.S. Department of Justice, and the National Institute of Standards and Technologys (NISTs) Office of Law Enforcement Standards

(OLES) and Information Technology Laboratory (ITL); The program is supported by other organizations, including the Federal Bureau of Investigation, the U.S. Department of Defense Cyber Crime Center, the U.S. Department of Homeland Securitys Bureau of Immigration and Customs Enforcement and the U.S. Secret Service. The objective of the CFTT project is to provide measurable assurance for practitioners, researchers, and other applicable users that the tools used in computer forensics investigations provide accurate results. Accomplishing this requires the development of specifications and testing methods for computer forensics tools and subsequent testing of specific tools against those specifications.

Type-Directed Continuation Allocation

Z. Shao, and V. Trifonov.
Yale Univ., New Haven, CT. Dept. of Computer Science.

Suppose we translate two different source languages, L(sub1) and L(sub2), into the same intermediate language; can they safely interoperate in the same address space and under the same runtime system; If L(sub1) supports first-class continuations (call/cc) and L(sub2) does not, can L(sub2) programs call arbitrary L(sub1) functions; Would the fact of possibly calling L(sub1) impose restrictions on the implementation strategy of L(sub2); Can we compile L(sub1) functions that do not invoke call/cc using more efficient techniques orrowed from the implementation; Our view is that the implementation of a common intermediate language ought to support the so-called pay-as-you-go efficiency: first-order monomorphic functions should be compiled as efficiently as in C and assembly languages, even though they may be passed to arbitrary polymorphic functions that support advanced control primitives (e.g. call/cc). In this paper, we present a typed intermediate language with effect and resource annotations, ensuring the safety of inter-language calls while allowing the compiler to choose continuation allocation strategies.

Type-Preserving Compilation of Featherweight Java

C. League, V. Trifonov, and Z. Shao.
Yale Univ., New Haven, CT. Dept. of Computer Science.

We present an efficient encoding of core Java constructs in a simple, implementable typed intermediate language. The encoding, after type erasure, has the same operational behavior as a standard implementation using vtables and self application for method invocation. Classes inherit super-class methods with no overhead. We support mutually recursive classes while preserving separate compilation. Our strategy extends naturally to a significant subset of Java, including interfaces and privacy. The formal translation using Featherweight Java allows comprehensible type-preservation proofs and serves as a starting point for extending the translation to new features.

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Type-Preserving Compiler Infrastructure

C. A. League.
Defense Advanced Research Projects Agency, Arlington, VA.

Many kinds of networked devices receive and execute new programs from various sources. Since we may not fully trust the producers of these programs, we must take measures to ensure that such code does not misbehave. Currently deployed mobile code formats can be checked for memory safety and other security properties, but they are relatively high-level. A type- preserving compiler generates lower-level, more optimized code that is still verifiable. This increases assurance by reducing the trusted computing base; we need not trust the compiler anymore. Moreover, lower-level representations naturally support a wider variety of source languages. Previous research on type-preserving compilation focused on functional languages or safe subsets of C. How to adapt this technology to more widely-used object-oriented languages was unknown. This dissertation explores techniques that enable a single strongly-typed intermediate language to certify programs in two very different programming languages: Java and ML. The major contribution is an efficient new encoding of object-oriented constructs into a typed intermediate language. I give a complete formal translation of a Java-like source calculus into a typed lambda calculus. I prove that both languages are sound and decidable, and that the translation preserves types. I also address many

practical concerns, moving beyond the formal model to include most features of the Java language. To stage the translation, I developed lambda JVM, a novel representation of Java bytecode that is simpler to verify. I describe a prototype compiler that supports both Java and ML, sharing the same typed intermediate language, optimizers, code generator, and runtime system.

Type System for Certified Binaries

Z. Shao, V. Trifonov, B. Saha, and N. Papaspyrou.
Yale Univ., New Haven, CT. Dept. of Computer Science.
ADA436484WCC   Price code: PC A04/MF A01

A certified binary is a value together with a proof that the value satisfies a given specification. Existing compilers that generate certified code have focused on simple memory and control-flow safety rather than more advanced properties. In this paper, we present a general framework for explicitly representing complex propositions and proofs in typed intermediate and assembly languages. The new framework allows us to reason about certified programs that involve effects while still maintaining decidable typechecking. We show how to integrate an entire proof system (the calculus of inductive constructions) into a compiler intermediate language and how the intermediate language can undergo complex transformations (CPS and closure conversion) while preserving proofs represented in the type system. Our work provides a foundation for the process of automatically generating certified binaries in a type-theoretic framework.

Type System For Certified Runtime Type Analysis

B. Saha.
Defense Advanced Research Projects Agency, Arlington, VA.
ADA436489WCC   Price code: PC A11/MF A03

Modern programming paradigms are increasingly giving rise to applications that require type information at runtime. For example, services like garbage collection, marshalling, and serialization need to analyze type information at runtime. When compiling code which uses runtime type inspections, most existing compilers use untyped intermediate languages and discard type information at an early stage. Unfortunately, such an approach is incompatible with type-based certifying compilation. A certifying compiler generates not only the code but also a proof that the code obeys a security policy. Therefore, one need not trust the correctness of a compiler generating certified code, instead one can verify the correctness of the generated code. This allows a code consumer to accept code from untrusted sources which is specially advantageous in a networked environment. In practice, most certifying compilers use a type system for generating and encoding the proofs. These systems are called type-based certifying compilers. This dissertation describes a type system that can be used for supporting runtime type analysis in type-based certifying compilers. The type system has two novel features. First, type analysis can be applied to the type of any runtime value. In particular quantified types such as polymorphic and existential types can also be analyzed, yet type-checking remains decidable. This allows the system to be used for applications such as a copying garbage collector. Type analysis plays the key role in formalizing the contract between the mutator and the collector. Second, the system integrates runtime type analysis with the explicit representation of proofs and propositions. Essentially, it integrates an entire proof language into the type system for a compiler intermediate language. Existing certifying compilers have focused only on simple memory and control-flow safety.

Typed Regions

S. Monnier, and Z. Shao.
Yale Univ., New Haven, CT. Dept. of Computer Science.
ADA436492WCC   Price code: PC A03/MF A01

Standard type systems are not sufficiently expressive when applied to low-level memory-management code. Such code often uses some form of strong update (i.e. assignments that change the type of the affected location) and needs to reason about the relative position of objects in memory. We present a novel type system which, like alias types 20, provides a form of strong update, but with the advantage that it does not require the aliasing pattern to be statically described. It also provides operations over sequential memory locations and allows covariant reference casts. We then show how this new type system can be used to implement a type-safe stop garbage collector that can properly collect cyclic datastructures. More specifically, we show how to write a two-generations collector for a language with mutable ref cells.

User Documentation for CVODE v2.2.O

A. C. Hindmarsh, and R. Serban.
Lawrence Livermore National Lab., CA.
DE2005-15014778WCC   Price code: PC A07/MF A02

No abstract available.

Using Event-Based Parsing to Support Dynamic Protocol Evolution

N. D. Ryan, and A. L. Wolf.
Colorado Univ. at Boulder. Dept. of Computer Science.
ADA436739WCC   Price code: PC A03/MF A01

All systems built from distributed components involve the use of one or more protocols for intercomponent communication. Whether these protocols are based on a broadly used 'standard' or are specially designed for a particular application, they are likely to evolve. The goal of the work described here is to contribute techniques that can support protocol evolution. We are concerned not with how or why a protocol might evolve, or even whether that evolution is in some sense correct. Rather, our concern is with making it possible for applications to accommodate protocol changes dynamically. Our approach is based on a method for isolating the syntactic details of a protocol from the semantic concepts manipulated within components. Protocol syntax is formally specified in terms of tokens, message structures, delivery modes, and message sequences. Eventbased parsing techniques are used in a novel way to present to the application the semantic concepts embodied in these syntactic elements. We illustrate our approach by showing how it would support an HTTP 1.1 client interacting with an HTTP 1.0 server.

Verification of Safety Properties for Concurrent Assembly Code
D. Yu, and Z. Shao.
Yale Univ., New Haven, CT. Dept. of Computer Science. 2004, 15p. Sponsored in part by National Science Foundation Grant Nos. CCR-0081590 and CCR-0208618. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
ADA436482WCC   Price code: PC A03/MF A01

Concurrency, as a useful feature of many modern programming languages and systems, is generally hard to reason about. Although existing work has explored the verification of concurrent programs using high-level languages and calculi, the verification of concurrent assembly code remains an open problem, largely due to the lack of abstraction at a low-level. Nevertheless, it is sometimes necessary to reason about assembly code or machine executables so as to achieve higher assurance. In this paper, we propose a logic-based 'type' system for the static verification of concurrent assembly programs, applying the 'invariance proof' technique for verifying general safety properties and the 'assume-guarantee' paradigm for decomposition. In particular, we introduce a notion of 'local guarantee' for the thread-modular verification in a non-preemptive setting. Our system is fully mechanized. Its soundness has been verified using the Coq proof assistant. A safety proof of a program is semiautomatically constructed with help of Coq, allowing the verification of even undecidable safety properties. We demonstrate the usage of our system using three examples, addressing mutual exclusion, deadlock freedom, and partial correctness respectively.

VisIt Python Interface Manual
B. J. Whitlock.
Lawrence Livermore National Lab., CA. 10 Feb 2005, 280p, UCRL-SM-209589. Sponsored by Department of Energy, Washington, DC. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
DE2005-15014671WCC   Price code: PC A14

VisIt is a distributed, parallel, visualization tool for visualizing data defined on two and three-dimensional structured and unstructured meshes. VisIts distributed architecture allows it to leverage both the compute power of a large parallel computer and the graphics acceleration hardware of a local workstation. Another benefit of the distributed architecture is that VisIt can visualize the data where it is generated, eliminating the need to move data. VisIt can be controlled by a Graphical User Interface (GUI) or through the Python scripting language. More information about VisIts Graphical User Interface can be found in the VisIt Users Manual.

WIDELink: A Bootstrapping Approach to Identifying, Modeling and Linking On-Line Data Sources
University of Southern California, Marina del Rey. Information Sciences Inst. Jul 2005, 62p.
ADA436343WCC   Price code: PC A05/MF A01

For complete citation see General

Information Processing Standards

Common Methods for Security Risk Analysis
S. Malboeuf, W. Sandberg-Maitland, W. Dziadyk, and E. Bacic. CINNABAR NETWORKS INC OTTAWA (ONTARIO). 12 Jan 2005, 74p, DRD-4-011, DRDC-OTTAWA-CR-2004-247. The original document contains color images. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
ADA436397WCC   Price code: PC A05/MF A01

This document is the result of a study conducted to document the state of Canadian risk management. The study provides a history of Canada's initiatives with respect to risk management and investigates how Canada can augment the Working Group with its experiences and its future initiatives and opportunities. In addition, the study presents a comparison between the prevalent Canadian threat and risk assessment methodology (ITSG 04) and the recommendations of the National Institute of Standards and Technology Risk Management Guide for Information Technology Systems (NIST 800-30). Substantial evolution of risk management has occurred in the past few years, but the tools and documentation have been a significant impediment on further development. There is a definite need to standardize the TRA process and provide system owners with a useful and consistent tool to evaluate the risks to information and IT systems. The approach to a common framework is emphasized by the need for a common language. The provision of a shared set of concepts and vocabulary can only help unify the disparate terminologies that variant TRA approaches and methodologies have engendered. Equally valuable is the prospective TRA automation or partial automation. Automated tools were premature in the early days when risk management was first introduced. Practitioners have gained expertise and experience in the conduct of TRA. It is recognized that human intervention will most likely be required in any automated TRA, however partial automation may be an initial step toward a common framework.

Cryptographic Algorithms and Key Sizes for Personal Identity Verification. Information Security

National Inst. of Standards and Technology (ITL), Gaithersburg, MD. Apr 2005, 22p.
PB2005-110185WCC   Price code: PC A03/MF A01

For complete citation see General

——*Proceedings, Symposia, Etc.*——

Syntactic Approach to Foundational Proof-Carrying Code
N. A. Hamid, Z. Shao, V. Trifonov, S. Monnier, and Z. Ni.
Yale Univ., New Haven, CT. Dept. of Computer Science.
2002, 45p. Presented at the Annual IEEE Symposium (17th) on Logic in Computer Science (LICS'02), Jul 2002. Pub. in IEEE Symposium v17 n39 p1-44, 17 Jul 2002. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
ADA436619WCC   Price code: PC A04/MF A01

Proof-Carrying Code (PCC) is a general framework for verifying the safety properties of machine-language programs. PCC proofs are usually written in a logic extended with language-specific typing rules; they certify safety but only if there is no bug in the typing rules. In Foundational Proof-Carrying Code (FPCC), on the other hand, proofs are constructed and veri ed using strictly the foundations of mathematical logic, with no type-specific axioms. FPCC is more flexible and secure because it is not tied to any particular type system and it has a smaller trusted base. Foundational proofs, however, are much harder to construct. Previous reports on FPCC all required building sophisticated semantic models for types. Furthermore, none of them can be easily extended to support mutable fields and higher-order polymorphism. In this article, we present a syntactic approach to FPCC that avoids all of these difficulties. Under our new scheme, the foundational proof for a typed machine program simply consists of the typing derivation plus the formalized syntactic soundness proof for the underlying type system. The former can be readily obtained from a type-checker while the latter is known to be much easier to construct than the semantic soundness proofs. We give a translation from a typed assembly language into FPCC and demonstrate the advantages of our new system via an implementation in the Coq proof assistant.

Pattern Recognition & Image Processing

Adaptive 4-8 Texture Hierarchies
L. M. Hwa, M. A. Duchaineau, and K. I. Joy.
Lawrence Livermore National Lab., CA. 14 Apr 2004, 16p, UCRL-TR-203514. Sponsored by Department of Energy, Washington, DC. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
DE2005-15014100WCC   Price code: PC A03

We address the texture level-of-detail problem for extremely large surfaces such as terrain during realtime, view-dependent rendering. A novel texture hierarchy is introduced based on 4-8 refinement of raster tiles, in which the texture grids in effect rotate 45 degrees for each level of refinement. This hierarchy provides twice as many levels of detail as conventional quadtree-style refinement schemes such as mipmaps, and thus provides per-pixel view-dependent filtering that is twice as close to the ideal cutoff

frequency for an average pixel. Because of this more gradual change in low-pass filtering, and due to the more precise emulation of the ideal cutoff frequency, we find in practice that the transitions between texture levels of detail are not perceptible. This allows rendering systems to avoid the complexity and performance costs of per-pixel blending between texture levels of detail. The 4-8 texturing scheme is integrated into a variant of the Realtime Optimally Adapting Meshes (ROAM) algorithm for viewdependent multiresolution mesh generation.

——*Foreign Technology*——

Optroniska sensorsystem foer Oekad Spaningsfoermaga (Optronic Sensor Systems for Enhanced Reconnaissance Capabilitites)
L. Klasen, T. Svensson, I. Renhorn, T. Carlsson, and H. Larsson.
Swedish Defence Research Agency, Linkoeping. Sensor Technology. Dec 2003, 70p, FOI-R-1104-SE. Text in Swedish; summary in English. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
PB2005-106475WCC   Price code: PC A05

This project studies how future optronic systems should be designed and operated in order to develop new and improved reconnaissance abilities in the future defense. Novel imaging systems like multi/hyperspectral sensors and 1D, 2D and 3D imaging laser radar have been studied. The sensor technology, together with signal and image processing methods, has been studied and also modeling of the underlying physical principles on which the sensor data is based. All together this creates premises for evaluating of the performance. The project has lead to grown abilities within sensor development for multispectral, hyperspectral, 2D and 3D laser radar and vibrometry, methods for characterizing of scene elements, algorithms and image-and-signal processing of data from the specific types of sensors and sensor systems. The result is demonstrated by an example showing how future sensor systems my work by coordinating the functions in order to be used in an optimally efficient way. The result indicates a substantial potential for detection and identification of hidden targets by the use of coordinated multispectral technique and laser radar.

Applications Software

C-MAN and Buoy Reports and Summarized Elements, Version 1.0 (on CD-ROM)
National Climatic Data Center, Asheville, NC. Mar 1996, two CD-ROM discs. System Requirements: IBM 286, 386, 486, Pentium, or compatible PC; EGA or VGA graphics card; 420K RAM; MS-DOS version 5.0 or higher; Microsoft CD extensions (MSCDEX). Available on two (2) CD-ROM discs. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
PB2005-500044WCC   Price code: CD-ROM CP D02

This CD-ROM set contains data, summary tables, and access software for 197 Buoy and C-MAN sites managed by the National Data Buoy Center. Hourly data, including air/sea temperatures, wind, pressure, wave height/period, are for the period of record through 1993. Both volumes contain summary

tables for all 197 sites. Volume 1 also contains hourly data for the North Atlantic and Gulf of Mexico sites. Volume 2 also contains hourly data for the North and South Pacific, Gulf of Alaska, and Great Lakes sites.

Engineering Weather Data, Version 1.0 (on CD-ROM)
National Climatic Data Center, Asheville, NC. Global Analysis Branch. 2000, one CD-ROM disc. System Requirements: Windows 95, 98, or Windows NT 4.0; minimum 16 MB RAM; Adobe Acrobat Reader; 100 Mghz processor or better; SVGA monitor. Available on one (1) CD-ROM disc. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
PB2005-500040WCC   Price code: CD-ROM CP D01

This CD-ROM contains updated meteorological tables, new summarized paramaters, and graphical displays. Approximately 800 worldwide stations have been summarized. For each station, the data nad information on this CD-ROM include: summarized design criteria data for dry and wet bulb temperatures and humidity ratios, average annual climate summaries, psychrometric summaries, binned temperature data, annual temperature and humidity summaries, heating and cooling degree day summaries for building envelop loads, ventilation and infiltration loads, solar radiation data, and seasonal wind direction and wind speed summaries.

Global Daily Summary, Version 1.0 (on CD-ROM)
National Climatic Data Center, Asheville, NC. Global Analysis Branch. Mar 1994, one CD-ROM disc. System Requirements: IBM 386, 486, or compatible PC; EGA or VGA graphics card; 4MB RAM or greater; MS-DOS 4.01 or higher; CD-ROM drive with minimum of 5MB of space for GDS system files. Customer must provide own search and retrieval software. Available on one (1) CD-ROM disc. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
PB2005-500041WCC   Price code: CD-ROM CP D01

This CD-ROM contains daily summaries as close to Local Standard Time day as the reporting practices permit. The tables show the 12- or 24-hour period for which maximum temperature, minimum temperature, and daily precipitation are summarized for various global areas.

Global Tropical/Extratropical Cyclone Climatic Atlas, Version 2.0 (on CD-ROM)
National Climatic Data Center, Asheville, NC. 1996, one CD-ROM disc. This CD-ROM runs in MS-DOS and requires 520K RAM memory. Available on one (1) CD-ROM disc. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
PB2005-500056WCC   Price code: CD-ROM CP D01

This single volume CD-ROM contains all global historic tropical storm track data available for five tropical storm basins. Periods of record vary for each basin with the beginning as early as the 1870's and with 1995 as the latest year. Northern hemispheric extratropical storm track data are included from 1965 to 1995. Tropical track data includes time, position, storm stage (and maximum wind, central pressure when available). The user has the capability to display tracks, and track data for any basin or user-selected geographic area. The user is also able to select storm tracks passing within a user-defined radius of any point. Narratives for all tropical storms for the 1980-1995 period are included along with basin-wide tropical storm climatological statistics.

Global Upper Air Climatic Atlas, Version 1.0 (on CD-ROM)
National Climatic Data Center, Asheville, NC. Global Analysis Branch. Apr 1993, two CD-ROM discs. System Requirement: IBM 286 or higher or compatible PC; EGA graphics card; 470K RAM or greater; MS-DOS version 3.21 or higher; CD-ROM Drive with Microsoft CD extensions (MSCDEX). Available on two (2) CD-ROM discs. Volume 1, 1980-1987, and Volume 2, 1985-1991, Programs run in MS-DOS. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
PB2005-500039WCC   Price code: CD-ROM CP D02

This two-volume CD-ROM set from the National Climatic Data Center (NCDC) uses 2.5 degree gridded, upper air climatic summaries derived from the European Centre for Medium Range Weather Forecasts (ECMWF) model analyses. It uses data from selected upper air stations from all over the world for the 12-year period (1980-1991), including individual months. The CD-ROMs present upper air statistics for 15 different vertical levels for for dry bulb and dew point temperature, geopotential height, air density, and vector and scalar wind speed. They also provide access/display software for gridpoint data, contouring capability for user-defined areas, and vertical profiles.

Middle Mississippi River Decision Support System (on CD-ROM)
Geological Survey, La Crosse, WI. Upper Midwest Environmental Sciences Center. Aug 1999, two CD-ROM discs. System Requirements: Microsoft Windows/NT 95 and higher, 1.2 GB hard drive space. Evnironmental Systems Research Institute's (ESRI; Redlands, CA) ArcView 3.x software. This software will not work within ArcView versions 8.x and 9.x, or ArcGIS. Documentation is included or may be ordered separately as PB2005-100027. Available on two (2) CD-ROM discs. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
PB2005-500030WCC   Price code: CD-ROM CP D01

The Middle Mississippi River Decision Support System(MMRDSS) provide a framework to assist decision makers regarding natural resources issues in the Middle Mississippi River floodplain. The MMRDSS is designed to provide users with a spatially explicit tool for tasks, such as inventory existing knowledge, developing models to investigate the potential effects of management decisions, generating hypotheses to advance scientific understanding and developing scientifically defensible studies and monitoring. The product includes 2 CD-ROM discs and a users' manual which describes the MMRDSS and gives detailed examples on its use. The MMRDSS also includes advanced tools to assist users in evaluating differences in complexity, connectivity and

structure of aquatic habitats among river reaches.

Probabilities of Temperature Extremes in the USA, Version 1 (on CD-ROM)
National Climatic Data Center, Asheville, NC. Global Analysis Branch. Feb 1999, one CD-ROM disc. System Requirements: IBM compatible PC 486 or higher; Windows 95/98 or Windows NT 3.51/4.0; recommended small fonts, 800 x 600 resolution display settings. Available on one (1) CD-ROM disc. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
PB2005-500042WCC   Price code: CD-ROM CP D01

This CD-ROM provides the capability to estimate the probability for 332 locations in the U. S. states, that an extreme temperature will occur for 1 or more consecutive days and/or for any number of days in a given month or season, based on statistics from the observed climate. It also provides the capability to examine how the probabilities might change given a monthly forecast of above or below normal temperatures or even to examine climate change scenarios. This can be done by modifying the normal statistics through adjustment of any or all 4 statistics that describe the daily temperatures. It then estimates the scenario probabilities as well. Normal and scenario probabilities are shown as graphs for both consecutive days and any days. Scenario adjustments can be user supplied or calculated from climate model (GFDL, UKMO) projections.

Data Files

Application of Electromagnetic Geophysics (EMG) Technology to Subsurface Investigations (on CD-ROM)
Federal Highway Administration, Madison, WI. Wisconsin Div. Jun 2005, one CD-ROM disc, WHRP-05-09-CD. System requirements: Windows/NT 95 and higher, Adobe Acrobat Reader 5.0 or higher, Microsoft Word. Documentation is included or may be ordered separately as PB2005-102756. Prepared in cooperation with Department of Civil Engineering, University of Kentucky Lexington, KY. Sponsored by Wisconsin Highway Research Program, Madison, WI. Available on one CD-ROM disc. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
PB2005-500173WCC   Price code: CD-ROM CP D01

This report includes one CD-ROM disc with EMG consultants SOQs, equipment Manufacturer Information and providing a comprehensive overview of Electromagnetic Geophysics (EMG) in terms of description of methods, synopsis of consultant capabilities and a summary of available EMG equipment. A study was performed to investigate current methods for using EMG technology to assess the capabilities, limitations, and cost associated with these methods, and to identify EMG consultants and equipment that may be of benefit to WisDOT for performing site investigations in Wisconsin. Based on the results of this study, six EMG methods were identified and described. Based on the information provided by 10 consultants, several consultants who may be attractive candidates for providing EMG services to WisDOT were identified. Information was also compiled on 17 pieces of EMG equipment manufactured by 7 companies.

Arctic and Antarctic Sea Ice Data 1972-1994, Version 1.0 (on CD-ROM)
National Climatic Data Center, Asheville, NC. Jul 1996, one CD-ROM disc. DOS ASCII format. Customer must provide own search and retrieval software. Available on one (1) CD-ROM disc. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
PB2005-500048WCC   Price code: CD-ROM CP D01

This CD-ROM contains digital sea ice data from 1972-94 NIC Arctic and Antarctic analysis charts. NIC 1995 sea ice data are currently unavailable (in digital format) at the time of this publication. CD-ROM directories contain weekly sea ice data files separated by area of interest: Arctic East, Arctic West and Antarctica. Charts were manually digitized and translated into the international format for archival and exchange of sea ice data (SIGRID) by the National Climatic Data Center (NCDC) in Asheville, NC. These digitized data, in a compacted raster format, contain information on total ice concentration, partial concentrations of ice type or stage of development and in some cases the form of ice. Location of the ice edge, ice extent, ice coverage and distribution of level ice thickness categories can be derived from these data. The level of analysis detail varies from year to year based on availability of remotely sensed and 'in-situ' oceanographic data. During 1995, SIGRID files on this CD-ROM underwent an extensive quality control and correction process. Section 4 of this document describes this process and details the types of errors leading to the reprocessing of the data set. Files on this CD-ROM should be used to replace all previous versions of JIC/NIC SIGRID data.

Climate Atlas of the United States, Version 2.0 (on CD-ROM)
National Climatic Data Center, Asheville, NC. Sep 2002, one CD-ROM disc. Windows 98, 2000, XP, or Windows NT 4.0; Pentium 233 MHz; and 128 MB RAM recommended. Available on one (1) CD-ROM disc. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
PB2005-500045WCC   Price code: CD-ROM CP D01

This new CD-ROM version of the Climate Atlas of the United States was developed by NOAA's National Climatic Data Center. It is comprised of 2023 maps that show the spatial distribution of major climatic elements. The Climate Atlas will serve the interests of commercial, industrial, agricultural, research, and educational institutions, as well as those from the general public. Its primary purpose is to show the normal spatial patterns for a variety of temperature, precipitation, snow, and other parameters. This atlas replaces the previous Climatic Atlas of the United States, which was published in 1968. The new CD-ROM version offers many advantages over the previous hardcopy version including over 1700 more maps and some basic interactive mapping tools such as zoom and query features. The new atlas was developed using innovative technology and easy to use Geographic Information Systems (GIS) to objectively generate the maps. The analytical model, PRISM (Parameter-elevation Regressions on Independent Slopes Model), which was developed at the Oregon Climate Service (OCS) at Oregon State University, was used to generate 936 different map products. An additional 1077 maps were generated by NCDC using ESRI's (Environmental Systems Research Institute, Inc.)

ArcView 3.1. The three Night Lights images were generated by the National Geophysical Data Center in Boulder, Colorado. The four Seasonal Vegetative Index images were generated by the EROS Data Center in Sioux Falls, SD. The three Hurricane images were generated by NCDC. Most atlas products are derived from the 1961-1990 period of record.

Engineering Weather Data Supplement (on CD-ROM)
National Climatic Data Center, Asheville, NC. Dec 1999, one CD-ROM disc. The CD-ROM contains the 2000 interactive edition. It has Excel files and graphs of Cooling degree Days for identifier sites. Available on one (1) CD-ROM disc. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
PB2005-500049WCC   Price code: CD-ROM CP D01

This CD-ROM contains an update of a very popular publication that was first printed by the Air Force in 1967 and republished in 1978. As compared to the Engineering Weather Data publication, the new interactive CD-ROM data base contains updated meteorological tables, new summarized parameters, and graphical displays. Approximately 800 worldwide stations have been summarized. The period of record summarized for most stations is 1973-1996. For each station, the data and information on this CD-ROM include: summarized design criteria data for dry and wet bulb temperatures and humidity ratios, average annual climate summaries, psychrometric summaries, binned temperature data, annual temperature and humidity summaries, heating and cooling degree data summaries for building envelop loads, ventilation and infiltration loads, solar radiation data, and seasonal wind direction and wind speed summaries.

Global Climate Normals (CLINO) 1961-1990 (on CD-ROM)
National Climatic Data Center, Asheville, NC. 1998, one CD-ROM disc. Program runs in MS-DOS. Available on one (1) CD-ROM disc. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
PB2005-500057WCC   Price code: CD-ROM CP D01

This CD-ROM contains a collection of DOS files which describe the 1961 - 1990 global standard climate normals for over 4000 stations worldwide computed by more than 135 countries and territories. The files include ASCII data files (file extension .dat), documentation files (file extension .txt), eye-readable ASCII table files (file extension .txt in subdirectories of the TABLES directory), graphics files (file extension .pcx), and limited extraction software (file extension .exe).

Global Daily Climatology Network (GDCN), Version 1.0
National Climatic Data Center, Asheville, NC. Global Analysis Branch. Jul 2002, two CD-ROM discs. IBM PC or compatible, or Unix/Linux workstation; CD-ROM drive; Hard Drive at least 7GB of free space; 16 MB RAM. Available on two (2) CD-ROM discs. Documentation is included on the CD-ROM's. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.

PB2005-500038WCC   Price code: CD-ROM CP D02

The Global Daily Climatology Network (GDCN) represents a compilation of global daily timescale data into a single and consistent format. The data set will serve the needs of researchers, weather-sensitive businesses, agriculture, and policy makers whose are dependent upon complete and accurate analysis of daily temperature and precipitation. Data within the GDCN have been extensively checked through a series of quality control procedures to ensure erroneous values have been removed and/or identified. The GDCN currently has over 800 million days of weather data and that number is expected to increase as the GDCN expands in the future.

Historical U.S. Climatic Data CLIVUE/CLISNOOP, Version 1.0 (on CD-ROM)
National Climatic Data Center, Asheville, NC. 1992, one CD-ROM disc. System Requirements: IBM-PC or compatilbe; EGA/VGA graphics card; minimum 470K RAM; MS-DOS 3.21 or higher; Customer must provide own search and retrieval software. Available on one (1) CD-ROM disc. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
PB2005-500050WCC   Price code: CD-ROM CP D01

The National Climatic Data Center (NCDC) developed a CD-ROM in support of a museum exhibit which traveled across the U.S. The CD-ROM contains a 1,500-station subset of NCDC's nearly 8,000 U.S. daily cooperative stations. The user selects a date and area of the U.S. and the CD-ROM database is queried for stations within the specified domain having data. Then, the system displays daily maximum and minimum temperatures, precipitation, and snowfall for the site. Graphs showing 7 years, 21 years, and the full period of record (varies by station) for the station(s) are available. Visual displays allow users to view trends, variability, and extremes.

Home Mortgage Disclosure Act (HMDA) Aggregate Tables and Print Image File, 2001
Federal Financial Institutions Examination Council, Washington, DC. 2001, one CD-ROM disc. See also PB2004-500143, PB2005-500175, PB2005-500176, PB2005-500177, and PB2005-500179. Raw data file is available on (1) CD-ROM ($400.00) or (2) 3480 cartridges ($440.00). Documentation included. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
PB2005-500178WCC
Price: Mag Tape $400.00

The HMDA Aggregate Reports are prepared annually by the FFIEC on behalf of institutions that report HMDA data. HMDA requires lending institutions to annually disclose their home mortgage and home improvement lending activity. The Aggregate Reports could consist of 33 tables per metropolitan statistical area (MSA) showing a summation of the mortgage lending activity of all institutions subject to HMDA in each MSA. The tables indicate the number and dollar amounts of lending, cross-tabulated by loan, applicant, and geographic characteristics. The Aggregate Reports data cannot be manipulated nor can the user add additional fields of

reported HMDA data to customize specific reports. In addition, individual institution's data cannot be identified in the aggregated MSA tables. Aggregate Reports prior to 1996 included only mortgage lending data on applications/loans for properties that were located in MSAs where the institutions had home or branch offices. This data may be of interest to community groups, bank examiners, researchers, financial institutions, think tanks, the public, government agencies and non-profits. Some users analyze and monitor the data to ensure that the reporting institutions are serving the needs of their communities. Government officials use the data to make public sector investments and indicate to private investors the neighborhoods where their efforts are needed. The data can also help identify possible discriminatory lending patters and assist regulatory agencies in enforcing compliance with anti-discrimination statues. Other users perform market trend analysis and monitor the lending patters of HMDA reporting institutions.

Home Mortgage Disclosure Act (HMDA) Census File, 2001

Federal Financial Institutions Examination Council, Washington, DC. 2001, one CD-ROM disc. See also PB2004-500144, PB2005-500175, PB2005-500176, PB2005-500177, and PB2005-500178. Raw data file is available on (1) CD-ROM ($250.00) or (1) 3480 cartridge ($275.00). Documentation included. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
PB2005-500179WCC
Price: Mag Tape $250.00

The Census Data file consists of geographic information (metropolitan statistical area, state, county, census tract or block numbering area (where available) and demographic information for the collection, reporting, and analysis of HMDA/CRA data. For years 1990-1995, the Census Data contained information used strictly for HMDA data collection and reporting. For years 1996-1999, the Census Data file became a combined CRA/HMDA file used for HMDA data collecting and reporting as well as CRA, which consisted of small business and farm lending, and community development data. The Census Data is most often used for reporting, verification, and analysis purposes. For instance HMDA reporting institutions and vendors use the geographical information (MSA/state/county/census tract and block numbering areas) shown on the Census to ensure that they are using the correct Census information for a particular year and to verify that the geographical information reported for each record is a valid combination. The demographic data are used to help reporting institutions target the various income levels in determining whether they are serving the needs of their communities. Public organizations, researchers, community groups, and government agencies used the demographic data for analyzing income and racial compositions. Bank examiners also use several of the Census data fields in analyzing an institution's data to ensure that they are meeting the 'purpose' of HMDA collection and reporting.

Home Mortgage Disclosure Act (HMDA) National Aggregate Report, 2001

Federal Financial Institutions Examination Council, Washington, DC. 2001, one CD-ROM disc. See also PB2004-500142, PB2005-500175, PB2005-500176, PB2005-500178, and PB2005-500179. Raw data file is available on (1) CD-ROM ($89.00) or (2) 3480 cartridges ($97.00). Documentation included. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
PB2005-500177WCC
Price: Mag Tape $89.00

The HMDA National Aggregate Reports are prepared annually by the FFIEC on behalf of institutions reporting HMDA data. They are facsimile reports of HMDA data in table format. Depending on the reported data, there can be up to 33 tables, showing the number and dollar amount of lending, cross-tabulated by loan, applicant, and geographic characteristics. The number of loans and dollar values in some of the tables are too large to fully appear in the provided space. In these cases, scientific notation is used to present the data. For instance, if a value is shown as 2.045E7, this is equivalent to 20,450,000. The reports' data cannot be manipulated nor can the user add additional fields of reported HMDA data to customize specific reports. In addition, individual institution's data cannot be identified in the National Aggregate Report. For years 1997-1999, Table 3 was expanded to two pages in order to show the full values of the number of loans sold and the corresponding dollar amount to those sold loans. The Table 3 data were placed on a separate tape (one tape per year). In addition, Table 3 with the scientific notations remained on the 'universe' tapes for 1997-1999. The HMDA National Aggregate Reports are most often used for analyzing HMDA data. Financial institutions and government agencies more commonly use the software to perform market trend analysis and monitor lending patterns.

Home Mortgage Disclosure Act (HMDA) Reporter Panel 2001

Federal Financial Institutions Examination Council, Washington, DC. 2001, one CD-ROM disc. See also PB2004-500141, PB2005-500176, PB2005-500177, PB2005-500178, and PB2005-500179. Raw data file is available on (1) CD-ROM ($150.00) or (1) 3480 cartridge ($165.00). Documentation included. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
PB2005-500176WCC
Price: Mag Tape $150.00

The reporter panel contains the universe of all institutions that were expected to report HMDA data for a specified year. The reporter panel includes the respondent identification number and agency code along with the name, city and state of the reporting institution. In addition, it includes an institution's parent information (where available) and the Metropolitan Statistical Areas (MSAs) where an institution is considered to have home or branch offices. Since the MSAs are included in the panel, the users can determine, along with the HMDA TS and LAR raw data, whether they are serving the needs of their communities and identify possible discriminatory lending practices. This data may be useful for community groups, bank examiners, researchers, financial institutions, think tanks, the public, government agencies and non-profits. This data can help identify institutions using discriminatory lending patterns and assist regulatory agencies in enforcing compliance with anti-discrimination statutes.

Hourly United States Weather Observations, 1990-1995 (on CD-ROM)
National Climatic Data Center, Asheville, NC. 1996, one CD-ROM disc. System requirements: IBM 386, 486, 586, or compatible PC; EGA graphics card; 470K RAM; MS-DOS version 3.0 or higher; and Windows 95. Customer must provide own search and retrieval software. Available on one (1) CD-ROM disc. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
PB2005-500058WCC   Price code: CD-ROM CP D01

The CD-ROM contains over 12 million hourly weather observations from 262 National Weather Service stations nationwide. This updates an earlier set of CD's (SAMSON) covering the period 1961-1990. It has a map interface and station list for data selection, or the user can copy the data files direct from the CD-ROM (without using the interface). The elements included are: Total and opaque sky cover, temperature and dew point, relative humidity, station pressure, wind direction (true north) and speed, visibility, ceiling height, present weather, ASOS cloud layer data, snow depth, and hourly precipitation. Data can be output in either English or metric units.

International Station Meteorological Climate Summary, Version 4.0 (on CD-ROM)
National Climatic Data Center, Asheville, NC. Sep 1996, one CD-ROM disc. System requirements: IBM-compatible desk top using MS-DOS 4.01 or higher. Documentation included on CDROM. Available on one (1) CD-ROM disc. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
PB2005-500059WCC   Price code: CD-ROM CP D01

This CD-ROM gives detailed climatological summaries for 2600 locations worldwide. These locations include National Weather Service stations, domestic and overseas Navy and Air Force sites, and numerous foreign stations. Limited summaries are also given for approximately 4000 additional worldwide sites. This version also contains year/month and long term mean precipitation data for 1000 foreign locations. Tabular or statistical data can be exported to a printer or spreadsheet. The product has been expanded to include station climatic summary tables and station narratives for Navy and National Weather Service stations and is considered a stand alone publication. Revised production methodology incorporates two computerized editing phases after the initial processing stage and a manual review and intervention of suspect data prior to the print phase. Every effort has been made to produce at least a 99.9 percent data perfect product based on the stations observation data.

Long-Term Data Sets About Freezing Rain and Ice Storms in the United States (on CD-ROM)
National Climatic Data Center, Asheville, NC. Global Analysis Branch. 2001, one CD-ROM disc. System Requirements: Customer must provide own search and retrieval software. Dates of coverage: 1948-2001. Available on one (1) CD-ROM disc. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
PB2005-500043WCC   Price code: CD-ROM CP D01

This project developed historically reliably data sets on freezing rain occurrences and ice storm losses. The specific objectives were to develop enhanced climatological data sets and make these data available to the scientific, government and business communities. This project was done in cooperation with the National Climatic Data Center (NCDC). Also includes ASCII tables for Hourly and Daily counts.

Maury Collection Global Ship Observations 1792-1910, Version 1.0 (on CD-ROM)
National Climatic Data Center, Asheville, NC. Feb 1998, one CD-ROM disc. MS-DOS ASCII format, Windows, UNIX. Customer must provide own search and retrieval software. Available on one (1) CD-ROM disc. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
PB2005-500047WCC   Price code: CD-ROM CP D01

The CD-ROM contains ASCII data files consisting of ship observations of weather conditions for the period 1792-1910. It also includes observations for the elements such as wind direction and speed, air/sea temperature, and barometric pressure.

National Climatic Data Center Periodical Publications April 1998 through June 1998
National Climatic Data Center, Asheville, NC. Dec 1998, one CD-ROM disc. System Requirements: IBM 386, 486, or compatible PC; 520K RAM; Microsoft Windows 95 or higher. Available on one (1) CD-ROM disc. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
PB2005-500054WCC   Price code: CD-ROM CP D01

The CD-ROM contains National Climatic Data Center periodical publications including annual Local Climatological Data (LCD), monthly editions of Climatological Data (CD), Hourly Precipitation Data (HPD), Storm Data (SD), and Monthly Climatic Data for the World (MCDW).

National Climatic Data Center Periodical Publications January 1998 through March 1998
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U.S. Divisional and Station Climatic Data and Normals, Volume 1 (on CD-ROM)
National Climatic Data Center, Asheville, NC. Dec 1994, one CD-ROM disc. DOS-ASCII format; web browser. Customer must provide own search and retrieval software. Available on one (1) CD-ROM disc. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
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This CD-ROM contains a collection of ASCII data files and associated documentation that pertains to U.S. climatic normals and byproducts of the normals. Climatic variables include temperature, precipitation, degree days, and Palmer Drought Index. The information is derived from the archive files at NOAA's National Climatic Data Center. The current normals period is 1961-90; the earlier data are provided for comparison and research applications. Documentation is included within this CD-ROM.

U. S. Hourly Precipitation Data, Volumes 1 and 2 (on CD-ROM)
National Climatic Data Center, Asheville, NC. Jul 1998, two CD-ROM discs. UNIX platform required. Customer must provide own search and retrieval software. Available on two (2) CD-ROM discs. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
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The data files contain hourly precipitation amounts for more than 2500 active stations and close to 7000 total stations. The period of record is 1948 through June 1998 although some stations begin in 1900. Access software, available for most UNIX and DOS platforms, is included to extract data from the CDROM archive and, if needed, can be used to summarize the data into daily or monthly precipitation quantities. Display software (java-enabled web browser required) will generate zoomable map and time seriesgraphics.

U. S. Monthly Climate Normals 1971-2000 (on CD-ROM)
National Climatic Data Center, Asheville, NC. Dec 2002, one CD-ROM disc. System Requirements: Web browser and Adobe Acrobat Reader. Available on one (1) CD-ROM disc. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161,

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This product includes normals of average monthly and annual maximum, minimum, and mean temperature (degrees F), monthly and annual total precipitation (inches), and heating and cooling degree days (base 65 degrees F) for individual locations for the 1971-2000 period. There are temperature, precipitation, and/or degree day data for 7937 stations. The locations represent sites that are part of the Cooperative Network, National Weather Service offices, and principal climatological stations in the 50 states, Puerto Rico, Virgin Islands, and Pacific Island locations.

NTiS

21ST Century Agriculture: A Critical Role for Science and Technology

New USDA report addresses issues of technology transfer to developing countries

The future of agriculture increasingly is being determined by technology and innovation. A new report from the U.S. Department of Agriculture – *21st Century Agriculture: A Critical Role for Science and Technology* – illustrates the opportunities and challenges of using science and technology to strengthen global food security and reduce hunger. Printed copies of the report are available from the National Technical Information Service.

The report was prepared especially for the *International Ministerial Conference and Expo on Agricultural Science and Technology* held June 2003 in Sacramento CA. The conference was attended by agricultural and other ministers from more than 100 countries. The goal was to provide a supportive policy environment to discuss methods to increase agricultural productivity, spur economic growth and help alleviate world hunger and poverty.

The report showcases a broad range of conventional and emerging technologies that can

- increase farm productivity,
- enhance the nutrient content of foods, and
- utilize new processing and marketing strategies for crops and livestock.

It also discusses advances in soil, water nutrient, pest, and risk management, and ways to improve food safety and nutrition. It emphasizes key issues of technology transfer, and the need for sustainable agricultural systems that can remain productive in the long run.

Twenty-First Century Agriculture: A Critical Role for Science and Technology is available from NTIS, call 1-800-553-6847 or (703) 605-6000, for $25.50 plus $5 handling fee, no additional charge for shipping; quote order number PB2003-105830KSS. Most major credit cards accepted. Fax orders to (703) 605-6900. Order online at http://www.ntis.gov/products/specialty/usda/usdapubs.asp.

Other USDA products available from NTIS include *Amber Waves, AgExporter and World Agricultural Production*. For more information about USDA products, visit the NTIS web site at http://www.ntis.gov/products/specialty/usda/

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NT/S

A Guide to Creating Vernal Ponds

All the Information You Need to Build and Maintain an Ephemeral Wetland

Vernal ponds are a type of seasonal or temporary wetland. They were once common, naturally occurring features on the landscape. For a variety of reasons vernal ponds are not as common as they once were. Many natural vernal pond wetlands have been claimed by society and are now covered by infrastructure such as roads, buildings, and parking lots. Discover how to make a vernal pond that looks and functions like a natural wetland with *A Guide to Creating Vernal Ponds*. The Guide is now available from the National Technical Information Service.

The techniques described in the publication have been used successfully in Kentucky, Ohio, and Minnesota. They draw from basic pond building principles and are coupled with the concepts of vernal pond ecology. The author, Tom Biebighauser began making wetlands in 1982 on the Superior National Forest in Minnesota, and has since moved on to the Daniel Boone National Forest in Kentucky where he has established over 700 seasonal, permanent, emergent and forest wetlands throughout Kentucky and Ohio. The Guide is divided into four chapters that give detailed information on:

- Background about Vernal Ponds
- Planning a Vernal Pond Construction Project
- Constructing a Vernal Pond
- Reference Materials

A Guide to Creating Vernal Ponds is designed to help private landowners, teachers and biologists establish vernal ponds or ephemeral wetlands. They will find out how to establish a wetland that contains water long enough for aquatic plants, hydric-soils and amphibian larvae to develop.

A Guide to Creating Vernal Ponds is available from NTIS, call 1-800-553-6847 or (703) 605-6000, for $12 plus $5 handling fee, no additional charge for shipping; quote order number PB2003-106610KST. Most major credit cards accepted. Fax orders to (703) 605-6900. Order online at http://www.ntis.gov/products/vernalponds.asp

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