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General

International GPS Service 2001 - 2002 Technical Reports
K. Gowey, R. Neilan, and A. Moore.
Jet Propulsion Lab., California Inst. of Tech. Sep 2004, 374p. Text in English. 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.
N20050192500WTV Price code: PC A17/MF A03

Applications of the Global Positioning System (GPS) to Earth Science are numerous. The International GPS Service (IGS), a federation of government agencies and universities, plays an increasingly critical role in support of GPS-related research and engineering activities. Contributions from the IGS Governing Board and Central Bureau, analysis and data centers, station operators, and others constitute the 2001 / 2002 Technical Reports. Hard copies of each volume can be obtained by contacting the IGS Central Bureau at the Jet Propulsion Laboratory. This report is published in black and white. To view graphs or plots that use color to represent data trends or information, please refer to the online PDF version at http://igscb.jpl.nasa. gov/overview/pubs.html.

JPL IGS Analysis Center Report, 2001-2003
M. B. Heflin, Y. E. Bar-Sever, D. C. Jefferson, Y. Vigue-Rodi, F. H. Webb, J. F. Zumberge, R. F. Meyer, and B. J. Newport.
Jet Propulsion Lab., California Inst. of Tech. Sep 2004, 6p. Text in English. 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.
N20050192521WTV Price code: PC A02/MF A01

Three GPS orbit and clock products are currently provided by JPL for consideration by the IGS. Each differs in its latency and quality, with later results being more accurate. Results are typically available in both IGS and GIPSY formats via anonymous ftp. Current performance based on comparisons with the IGS final products is summarized. Orbit performance was determined by computing the 3D RMS difference between each JPL product and the IGS final orbits based on 15 minute estimates from the sp3 files. Clock performance was computed as the RMS difference after subtracting a linear trend based on 15 minute estimates from the sp3 files.

Online Assessment in Mathematics and Writing: Reports From the NAEP Technology-Based Assessment Project, Research and Development Series
B. Sandene, N. Horkay, R. E. Bennett, N. Allen, and J. Braswell.
National Center for Education Statistics, Washington, DC. Institute of Education Sciences. Aug 2005, 180p, NCES-2005-457. Prepared in cooperation with Educational Testing Service, Princeton, NJ. 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.
PB2005-110150WTV Price code: PC A10/MF A02

This publication presents the reports from two studies, Math Online (MOL) and Writing Online (WOL), part of the National Assessment of Educational Progress (NAEP) Technology-Based Assessment (TBA) project. Funded by the National Center for Education Statistics (NCES), the Technology-Based Assessment project is intended to explore the use of new technology in NAEP. The TBA project focuses on several key questions: 1. What are the measurement implications of using technology-based assessment in NAEP; 2. What are the implications for equity; 3. What are the efficiency implications of using technology-based assessment compared with paper and pencil; 4. What are the operational implications of technology-based assessment. To answer these questions, the NAEP program undertook three empirical studies with students: Math Online (MOL), Writing Online (WOL), and Problem Solving in Technology-Rich Environments (TRE). These studies together address the questions above.

Common Carrier & Satellite

Foreign Technology

Adaptiv Radionod ARN Slutrapport (Adaptive Radio Noe ARN Final Report)

L. Ahlin, P. Johansson, A. Lindblad, S. Linder, and K. Wiklundh.

Foersvarets Forskningsanstalt, Linkoeping (Sweden). Dept. of Command and Control Warfare Technology. Nov 2004, 42p, FOI-R-1429-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.

PB2005-107411WTV Price code: PC A04

The purpose with this report is to summarize the activities within the project Adaptive Radio Node (ARN). The possibilities to obtain adaptive capabilities for radio nodes in a net structure have been studied. The aim has been to obtain knowledge both about what possible gains can be achieved with adaptivity and also about of how new technical methods will work in military environments. With adaptivity we mean that the radio node can adapt to the radio channel, the needs of the users and to the properties of the network. The focus has been to study technical solutions which give adaptivity at the link level by using advanced radio signal processing. A system model based on the modulation method OFDM has been developed. Parts of the system model (OFDM, adaptive modulation, receive diversity) have been implemented in software and constitute the technique kernel in a demonstrator. The purposes with the demonstrator are to be a tool for development and to illustrate the benefits with adaptivity. Field trials have been carried out to investigate the spatial properties of the radio channel. Also, the impact of interference on digital radio systems has been investigated. The project goal to prove the advantages of adaptive capabilities in radio nodes have been reached and the competence will be used in the development of future tactical radio nets.

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.

ADA436798WTV 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.

DE2005-15014756WTV 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 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.

ADA436662WTV 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.

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.

ADA436439WTV 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.

Demonstration of Record BER and Number of Users for Optical CDMA (O-CDMA), with Implications to Secure Communications

A. J. Mendez, V. J. Hernandez, C. V. Bennett, R. M. Gagliardi, and W. J. Lennon.

Lawrence Livermore National Lab., CA. 1 Mar 2005, 10p, UCRL-CONF-210103. 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.

DE2005-15011507WTV Price code: PC A02

We demonstrate a BER of 10(sup -11) for 16 simultaneous users, using wavelength/time O-CDMA. We show the extent to which severe multi-access interference can be used to mask and/or degrade the signal from an intruder.

Error Control Coding Techniques for Space and Satellite Communications

D. J. Costello, O. Y. Takeshita, H. A. Cabral, J. He, and G. S. White.

Notre Dame Univ., IN. Dept. of Aerospace and Mechanical Engineering. 1 Dec 1997, 85p, NAS 1.26:206425, NASA/CR-97-206425, REPT-97-002. 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.

N19980001206WTV Price code: PC A06/MF A01

Turbo coding using iterative SOVA decoding and M-ary differentially coherent or non-coherent modulation can provide an effective coding modulation solution: (1) Energy efficient with relatively simple SOVA decoding and small packet lengths, depending on BEP required; (2) Low number of decoding iterations required; and (3) Robustness in fading with channel interleaving.

——*Foreign Technology*——

Foerstudie Telekrig i Urban Miljoe (Prestudy of EW in Urbanized Terrain)

L. Berglund, J. Arnsby, M. Hoeijer, N. U. Jonsson, and P. Klum.

Swedish Defence Research Agency, Linkoeping. Command and Control Systems. Nov 2004, 64p, FOI-R-1386-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.

PB2005-106401WTV Price code: PC A05

The report describes technical and tactical need for electronic warfare (EW) in urbanized terrain. The pre-study has a focus on the small front units. Studies and discussions in this report have been concentrated at systems that can be used directly of the front units. This pre-study suggests (even if it is not within the task for the pre-study) that the first thing to do is to make sure every rifleman has his/her own communication radio. The research areas of interest for EW in urban environment are: location of communications in urbanized terrain by using Electronic Support; Short range communication based on an miniaturized EW-system; protection against remote controlled IED (Improvised Explosive Devices); EW-suite in urbanized terrain; HPM0-UWB; HPM-Effects when used in urbanized terrain; and HPM-Effects on simple generic civilian objects. Suggestions for activities in other research areas than EW are given in the report.

——*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.
PB2005-107404WTV 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.
ADA436700WTV 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.

Networking and Information Technology Research and Development Supplement to the President's Budget for Fiscal Year 2006
National Science and Technology Council, Washington, DC. Feb 2005, 34p. 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.
PB2005-109858WTV Price code: PC A04/MF A01

This Supplement to the Presidents Budget for Fiscal Year 2006 offers a brief technical outline of the 2006 budget request for the Networking and Information Technology Research and Development (NITRD) Program. Now in its 14th year, the NITRD Program is a unique collaborative enterprise of Federal agencies engaged in long-term R&D in information technology (IT) to support Federal missions and help sustain U.S. leadership in cutting-edge science, engineering, and technology. NITRD is the Nations primary source of fundamental breakthroughs in IT R&D and advanced education and training for the new generations of IT researchers, educators, and entrepreneurs required to maintain U.S. innovation and economic prosperity.

Non-Stationary Signal Classification Using Joint Frequency Analysis
S. Sukittanon, L. E. Atlas, J. W. Pitton, and J. McLaughlin.
Washington Univ., Seattle. Applied Physics Lab. 2003, 5p. Sponsored in part by the Air Force Research Laboratory (AFRL). 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.
ADA436792WTV Price code: PC A01/MF A01

Time-varying short-term spectral estimates have been successfully applied in many classification tasks. However, they are still insufficient for many non-stationary signals where time-varying information is useful. In this paper, we propose to improve the deficiencies of current short-term feature analysis by adding information to describe the time-varying behavior of the signals. Our proposed method, which is motivated by the human auditory system, can be applied to several non-stationary signal types. Real world communication signals were used for experimental verification. These experimental results, assessed with a conventional probabilistic classifier, showed significant improvement when the new features were added to short-term spectral estimates.

Outcome Analysis Tool for Army Refractive Surgery Program
K. S. Bower.
Walter Reed Army Medical Center, Washington, DC. Mar 2005, 6p. 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.
ADA436518WTV Price code: PC A02/MF A01

The primary objective of this project has been to develop a

web- based outcome analysis application to work with an existing electronic medical record database in the Army's Warfighter Refractive Eye Surgery Program (WRESP). The application, web-based Refractive Surgery Information System (webRSIS), is based on a precursor client/sever version previously developed and deployed. The availability of the outcomes information will ultimately improve the safety and efficacy of excimer laser keratorefractive surgery in U.S. Army personnel by conducting a statistical analysis from the data collected in an electronic format. The patient population initially will include U.S. Army service members treated under the WRESP.

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.

ADA436740WTV 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.

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.

ADA436746WTV 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.

SPEED: A Real-Time Routing Protocol for Sensor Networks

T. He, J. A. Stankovic, C. Lu, and T. Abdelzaher.

Virginia Univ., Charlottesville. Dept. of Computer Science. 1 Mar 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.

ADA436724WTV Price code: PC A03/MF A01

In this paper, we present a real-time communication protocol, called SPEED, for sensor networks. The protocol provides three types of real-time communication services, namely, real-time unicast, real-time area-multicast and real-time area-anycast. SPEED is specifically tailored to be a stateless, localized algorithm with minimal control overhead. End-to-end real-time communication guarantees are achieved using a novel combination of feedback control and non-deterministic QoS-aware geographic forwarding with a bounded hop count. SPEED is a highly efficient and scalable protocol for the sensor networks where node density is high while the resources of each node are scarce. Theoretical analysis and simulation experiments are provided to validate our claims.

SPEED: A Stateless Protocol for Real-Time Communication in Sensor Networks

T. He, J. A. Stankovic, C. Lu, and T. Abdelzaher.

Virginia Univ., Charlottesville. Dept. of Computer Science. 2003, 11p. Prepared in cooperation with Washington University, St. Louis , MO. Additional contract no. CCR-0098269. Pub. in International Conference on Distributed Computing Systems ICDCS ,2003. 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.

ADA436741WTV Price code: PC A03/MF A01

In this paper, we present a real-time communication protocol for sensor networks, called SPEED. The protocol provides three types of real-time communication services, namely, real-time unicast, real-time area-multicast and real-time area-anycast. SPEED is specifically tailored to be a stateless, localized algorithm with minimal control overhead. End-to-end soft real-time communication is achieved by maintaining a desired delivery speed across the sensor network through a novel combination of feedback control and non- deterministic geographic forwarding. SPEED is a highly efficient and scalable protocol for sensor networks where the resources of each node are scarce. Theoretical analysis, simulation experiments and a real implementation on Berkeley motes are provided to validate our claims.

Foreign Technology

Systemvaerdering SAT (System Assessment of Signature Management Technologies)
P. Klum, C. Nelsson, S. Nyberg, P. Hermansson, and G. Bolander.
Swedish Defence Research Agency, Linkoeping. Sensor Technology. Dec 2004, 48p, FOI-R-1480-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.
PB2005-107408WTV Price code: PC A04/MF A01

This report describes methodology and technology required for system assessment of signature management technologies. A number of assessment issues have been identified through scenario based discussions. These issues are presented together with their implicated requirements of knowledge, assessment methodology, simulation environments and simulation models. The report concludes with descriptions of primary requirements and recommendations for further efforts. A conclusion from the report is that system assessment should be conducted in a broader sense and not solely focused on signature management technologies. The report recommends that future work focus on improved signature models to complement methods and models developed within the electronic warfare community. By combining assessment of signature management technologies and electronic warfare, further technical and tactical combat situations can be assessed. The report also describes the need for planning tools where use of signature management technologies and electronic warfare can be balanced and conducted effectively. Command and control should provide support, adapted to the existing situation, for a well balanced, operational, use of signature management technologies and electronic warfare. For this purpose, signature-and-electronic warfare models must be developed further and made fit for operational use.

Foreign Technology

Underlagsbehob vid Signaturanpassning foer Internationella Insatser En Foerstudie (Prerequisites for Signature Management in International Operations A Preliminary Study)
S. Nilsson, A. Hagard, C. Nelsson, J. Rahm, S. Nyberg, and R. Persson.
Swedish Defence Research Agency, Linkoeping. Sensor Technology. Sep 2004, 66p, FOI-R-1325-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.
PB2005-107443WTV Price code: PC A05

The Swedish armed forces are being more and more oriented towards international operations. This implies that the signature solutions of Swedish equipment must be adapted to international environments. The purpose of this preliminary study is to determine the need for information, knowledge and development of new methods for signature management for international operations. The report contains a review of the conditions for signature management (environment, weather, sensor threat and background) and how they can be characterized. Then the different steps for signature work are described: measurements, modeling, analysis and finally the design of the low signature solutions. The report concludes with a proposal for future work.

Use of GCCS in the Canadian Navy and its Relationship to C2IEDM
A. E. Isenor, and E. Dorion.
DEFENCE RESEARCH AND DEVELOPMENT ATLANTIC DARTMOUTH (CANADA). Feb 2005, 46p, DRDC-TM-2004-197. 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.
ADA436415WTV Price code: PC A04/MF A01

The Canadian Forces is currently investigating numerous technologies that support data exchange. Within the Canadian navy, the Global Command and Control System (GCCS) represents an important system in use on all Canadian Frigates. The GCCS is also used extensively throughout the United States navy (USN) and thus the Canadian use also provides interoperability with the USN. Within the Canadian army, considerable resources and intellectual effort has been dedicated to the development of a semantics basis, shared among the NATO allies, called the Command and Control Information Exchange Data Model (C2IEDM). Since the Canadian forces also seek interoperability among its own services (air, navy and land), information exchange between the GCCS and C2IEDM- based systems like the Land Forces Command and Control Information System (LFC2IS) needs to be explored. Furthermore, this information exchange must take place in such a way to minimize semantic loss between systems. This report outlines both GCCS and C2IEDM and suggests a way forward for information exchange while maintaining semantic integrity. In the short term, it is suggested that C2IEDM be mapped to the messaging structure used by GCCS. In the long term, it would be advisable to have C2IEDM as an integrated ontological basis for the next generation of the supporting environment, namely the Net Centric Enterprise Services (NCES).

Communication & Information Theory

AIDA: Adaptive Application Independent Data Aggregation in Wireless Sensor Networks
Virginia Univ., Charlottesville. Dept. of Computer Science. 2005, 24p.
ADA436798WTV Price code: PC A03/MF A01

For complete citation see Common Carrier & Satellite

Verbal

Speech Articulator and User Gesture Measurements Using Micropower, Interferometric EM-Sensors
J. F. Holzrichter, and L. C. Ng.
Lawrence Livermore National Lab., CA. 6 Feb 2001, 12p. 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.
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Very low power, GHz frequency, 'radar-like' sensors can measure a variety of motions produced by a human user of machine interface devices. These data can be obtained 'at a

distance' and can measure 'hidden' structures. Measurements range from acoustic induced, 10-micron amplitude vibrations of vocal tract tissues, to few centimeter human speech articulator motions, to meter-class motions of the head, hands, or entire body. These EM sensors measure 'fringe motions' as reflected EM waves are mixed with a local (homodyne) reference wave. These data, when processed using models of the system being measured, provide real time states of interface positions or other targets vs. time. An example is speech articulator positions vs. time in the user's body. This information appears to be useful for a surprisingly wide range of applications ranging from speech coding synthesis and recognition, speaker or object identification, noise cancellation, hand or head motions for cursor direction, and other applications.

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