

Department of Electrical Engineering and Computer Science



***COL Eugene K. Ressler
Professor and Acting Head of the Department of
Electrical Engineering and Computer Science***

The mission of the Department of Electrical Engineering and Computer Science is to educate cadets to be Army officers who understand, develop, and exploit current and future technologies. We ensure that our highly productive research programs support our curriculum, enhance the professional development of both cadets and faculty, and contribute to the fields of science and engineering important to the Department of Defense. Our 50 faculty members have superb qualifications in computer science, electrical engineering, information systems engineering, and information technology. The Photonics Research Center and the Information Technology and Operations Center have an outstanding track record of finding research opportunities that best support our mission, establishing funding programs, and then inviting faculty to support the project of choice with no overhead requirements or administrative burdens. This approach to department research has resulted in 100% faculty participation and up to 100 publications and presentations in a given year. At the same time, we are making a difference throughout the Defense community as well as in the Federal Government. Of particular note are our contributions to smart pixel technologies, optical and over-sampled analog to digital conversion, image processing, information assurance, science and engineering education, diversity, officer education needs in network-centric warfare, information technology, advanced technology classrooms, high speed communications, fiber optics, and the science and engineering underpinning numerous Army battlefield and automation systems. The quality of our scholarship and service is recognized by peers nationally and internationally.

Through the efforts of the Information Technology and Operations Center, USMA continues to maintain its designation as a Center of Academic Excellence in Information Assurance Education by the National Security Agency (NSA). The Military Academy was the first-ever undergraduate institution to be so designated. The Information Technology and Operations Center also continues to be the driving force behind the annual Cyber Defense Exercise. The Cyber Defense Exercise challenges cadets from all five service academies to design, implement, and protect a sophisticated computer network from attack by a NSA-led red team. The winning academy is awarded the NSA Information Assurance Director's Trophy. This program has significantly raised the level of Information Assurance education and understanding for all participants and is being used as the model for both a multi-national Department of Defense exercise and a competition for civilian universities. Additionally, the Information Technology and Operations Center serves as the lead agency for the Annual IEEE Information Assurance Workshop, which brings together over 100 representatives from academia, industry and the federal government. The electrical engineering and computer science efforts in the Photonics Research Center continue to be singled out for excellence during reviews by outside agencies. Faculty members received several awards for excellence over the past year, while the teaching programs worked hard in completing an excellent accreditation visit.

Fourth Annual IEEE Information Assurance Workshop
LTC Dan Ragsdale, LTC John Surdu, MAJ Ron Dodge, MAJ Scott Lathrop,
COL Clark Ray, Dr. John James

**Sponsors: IEEE Systems, Man, and Cybernetics (SMC) Society and the
National Security Agency (NSA)**

The Department of Electrical Engineering and Computer Science, with support from the IEEE and the National Security Agency, has initiated a national-level series of workshops to provide a forum for discussion of information-assurance-related issues and publication of information-assurance-related research. Information Assurance is a topic that covers not only computer security issues but also incorporates the idea of availability.

The EE&CS Information Technology and Operations Center has played a key role in establishing the workshop as a popular venue for discussion and publication of research results concerning emerging technologies that can affect the security of defense-related computer networks. The Workshop hosted by the Information Technology and Operations Center has brought together people from academia, government and industry to discuss recent IA advances. The Academy has received many accolades and notoriety for the annual workshop.

The Information Technology and Operations Center has hosted a highly regarded workshop on Information Assurance Topics for the previous four years. The workshop

proceedings have been published on compact disk and in book form. The next workshop will be held 10 - 11 June 2004 at West Point.

Proceedings of the Fourth Annual IEEE SMC Information Assurance Workshop, June 18-20 2002, West Point, NY, ISBN: 0-7803-7808.3.

Cyber Defense Exercise 2003
Mr. Wayne Schepens

Sponsor: Public Key Infrastructure Program Office, National Security Agency

The inter-academy Cyber Defense Exercise (CDX) is a hands-on, competitive real-life learning experience initiated and implemented by faculty and cadets assigned to the US Military Academy, with funding and direction provided by the National Security Agency. The concept of "defending the network" was derived to evaluate cadet skills and the effectiveness of the Information Assurance (IA) education invoked at West Point. The CDX served as the final project for senior-level Computer Science majors enrolled in the IA course. All five service academies and the Naval Postgraduate School and the Air force Institute of Technology accepted the challenge to compete in 2003.

A combined team of analysts from the National Security Agency and the 92nd Aggressor Squadron, US Air Force served as the Red Team. Remote access was provided from a laboratory in Elkridge, MD to each participating school's Cyber Defense Network (CDN) via a Virtual Private Network configured to provide authentication and encryption of all traffic. The team verified the student's efforts to provide security to the CDN while ensuring the predetermined services and applications were available with a baseline set of network resources and operating systems provided by the DoD Public Key Infrastructure Program Management Office. The Red Team then, based on predetermined assessment criteria, designated the school with the strongest information assurance posture the winner of the exercise.

W. J. Schepens, D. J. Ragsdale, and J. R. Surdu, "The Cyber Defense Exercise: An Evaluation of the Effectiveness of Information Assurance Education," *The Journal of Information Security*, Volume 1, Number 2, July, 2002.

R Dodge, D.J. Ragsdale, C. Reynolds, "Organization and Training of a Cyber Security Team", 2003 IEEE International Conference on Systems, Man & Cybernetics, October 5-8, 2003

W. Schepens, J. James, "Architecture of a Cyber Defense Competition", 2003 IEEE International Conference on Systems, Man & Cybernetics, October 5-8, 2003

R Dodge, T. Wilson, "Data trends in malicious activity during a Cyber Defense Exercise", 2003 IEEE International Conference on Systems, Man & Cybernetics, October 5-8, 2003

Military Academy Attack/Defense Network Simulation
MAJ Ronald Dodge, LTC John Hill

Sponsor: National Science Foundation (NSF), Defense Information Systems Agency (DISA)

This complete application simulates all facets of building and managing an information system; combining them into a seamless application that provides an integrated, engaging, challenging, and competitive information assurance learning environment.

The goal of the proposal is to build an information assurance simulation that integrates all the complexities involved in maintaining an information system infrastructure. These complexities include hardware configuration, service requirements, "sizing" the system to the correct capacity, system administrative support, and security configuration.

J. R. Surdu, J. M. D. Hill, R. Dodge, S. Lathrop, and C. A. Carver, Jr. "Military Academy Attack/Defense Network Simulation," *Advanced Simulation Technology Conference: Symposium on Military, Government, and Aerospace Simulation (MGA 2003)*, Orlando, Florida, March 30 - April 3, 2003.

J. M. D. Hill, J. R. Surdu, S. Lathrop, G. Conti, C. A. Carver, Jr., "MAADNET: Toward a Web-Distributed Tool for Teaching Networking and Information Assurance", *Educational Multimedia, Hypermedia and Telecommunications (ED-MEDIA 2003)*, Honolulu, Hawaii, June 23-28, 2003

J.M.D. Hill, Scott Lathrop, J.R. Surdu, "Modeling Network Attacks and Defenses", *12th Conference On Behavior Representation In Modeling and Simulation (BRIMS 2003)*, Scottsdale, Arizona, May 12-15, 2003.

J.M.D. Hill, J. Surdu, "MAADNET NetBuilder: A Service/Demand Focused Network Simulator," *Communication Networks and Distributed Systems Modeling and Simulation Conference (CNDS 2003)*, Orlando, FL, 19-23 January 2003.

Virtual Information Assurance Networks
LTC Daniel Ragsdale, MAJ Ronald Dodge

Sponsor: National Security Agency, 1st Information Operations Command, Microsoft

Providing the capability to rapidly examine and investigate new computer/network exploits often requires a system of computers not easily deployed. The Virtual Information Assurance Network (VIAN) project at USMA uses new technologies to allow for robust testing on a single platform.

The Virtual Information Assurance Network solution has been demonstrated to several Federal Agencies and is currently in use by the 1st Information Operations Command and the State Department. The agencies use the system for both live exploit experimentation and for education. VIAN provides a "real" network using only one machine. In this machine, virtual networks can be rapidly configured to most any configuration. The project provides the Army with the capability to analyze malicious Virus/Trojan/Worms in mobile isolated environments.

D. Ragsdale, R. Dodge, and S. Lathrop, "The Educational Virtual Information Assurance Network (EVIAN) ," *Proceedings of the 4th Annual IEEE Information Assurance Workshop*, West Point, NY, June 17-19, 2003.

L. J. Hoffman, R. Dodge, T Rosenberg and D. J. Ragsdale "Information Assurance Laboratory Innovations," *7th Colloquium for Information Systems Security Education* Washington, DC, June 2-6, 2003.

L. J. Hoffman, R. Dodge, T Rosenberg, and D. J. Ragsdale, "Novel Approaches for Information Assurance Laboratories," *Journal of Information Security*, May 2003.

D. J. Ragsdale, S. D. Lathrop, and R. C. Dodge" Enhancing Information Warfare Education Through the Use of Virtual and Isolated Networks , " *The Journal of Information Warfare*, June 2003.

Information Assurance Education and Curriculum Development
LTC Daniel Ragsdale

Sponsor: National Science Foundation (NSF)

Our nation's economy and our military are becoming increasingly dependent on information systems. Assuring the confidentiality, integrity, and availability of these systems is a national security issue. A significant effort is being expended to develop information assurance curriculum for use in undergraduate programs. Objectives include:

- Develop consistent IA curriculum criteria for all undergraduate universities to employ
- Share advances in IA education with other universities as well as industry by facilitating technology transfer

- Work with the NSA and other organizations to continue to expand cadet and faculty internships
- Ensure IA education is conducted employing a multi-disciplinary approach
- Identifying means for those universities resource bound to influence IA into existing curriculum

D. W. Welch, M. S. Thibodeaux, and D. J. Ragsdale, "A Framework for Due Diligence in Information Assurance Education," Conditionally accepted for publication in the *Journal of Computer Education*, Jan. 2003.

D. Ragsdale, D. Welch, and R Dodge, "Information Assurance the West Point Way," *IEEE Security and Privacy*, winter 2003

R Dodge, D Ragsdale, "State of the Art Information Warfare Training", *IA Newsletter*, July 2003

D. J. Ragsdale, S. Lathrop, R. Dodge, and G. Conti," Information Warfare In The Trenches," *Journal of Information Warfare*, May 2003.

G. Conti, J. M. D. Hill, S. Lathrop, K. Alford, and D. J. Ragsdale, "Towards A Comprehensive Undergraduate Information Assurance Program," *Security Education and Critical Infrastructure*, C. Irvine and H. Armstrong, Editors, Kluwer Academic Publishers, Norwell, Massachusetts, 2003, pp. 243-260, 2003.

S. D. Lathrop, G. J. Conti, and D. J. Ragsdale, "Information Warfare In The Trenches: Experiences from the Firing Range ," *Security Education and Critical Infrastructure*, C. Irvine and H. Armstrong, Editors, Kluwer Academic Publishers, Norwell, Massachusetts, 2003, pp. 19-40, 2003.

Intrusion Detection and Response
MAJ Dodge and LTC Dan Ragsdale

Sponsor: Information Assurance Directorate, Director of Information Systems for Command Control, Communications, and Computers (DISC4)

The purpose of this research is to investigate and apply intelligent methods and Agent-based approaches to provide adaptive intrusion detection and intrusion response. The objectives of this research are:

- Investigate data reduction methods to possibly find key variables in the data set.
- Apply and assess the accuracy of several types of neural networks regarding the classification of intrusive behavior.
- Develop appropriate metrics and tolerance levels associated with the operation of a given classification system.
- Assess the risk associated with malicious intrusive behavior versus the resources and time consumed by given classification systems

Information Assurance Vulnerability Alert (IAVA) Compliance
MAJ Ronald Dodge

Sponsor: National Security Agency (NSA)

The Information Assurance Vulnerability Alert (IAVA) program was instituted by the Department of Defense (DoD) in 1998 to provide positive control of vulnerability notifications and corresponding corrective actions within the DoD. In accordance with this program, whenever a critical vulnerability that poses an immediate threat to DoD is identified, an alert has been issued to major commands for dissemination. The alerts include corrective action to be taken to eliminate or mitigate the vulnerability. Because of the immediate threat associated with the vulnerabilities identified in IAVAs, compliance with the directed corrective action is of paramount concern to DoD leadership. An automated tool that checks for compliance would be especially useful for this purpose. This tool would be especially useful for local system administrators to check their own compliance.

The "Nessus" Project provides powerful, secure, and easy to use remote security scanning capability. It is already being used by organizations throughout the DoD and it is ideally suited for the construction of an IAVA compliance tool. The benefits of Nessus are that it is free, reliable, and has a modular architecture. As new vulnerabilities are identified, new "plugins" can be written to determine if the

vulnerabilities exist on any of the system in a particular network. The research goals for this project are:

- Gain a thorough understanding of IAVA process
- Gain a thorough understanding the capability provided by the Nessus remote security scanning system.
- Develop simple and complex plugins using the Nessus Attack Scripting Language (NASL) to determine compliance with issued IAVAs.
- Identify any security vulnerabilities that the use of Nessus might introduce.
- Preparation of user documentation
- Preparation of a paper for submission to the National Conference on Undergraduate Research

CDT A. Leaman, CDT D. Mauceri, CDT B. Merkl, and CDT J. Stout, "Information Assurance Vulnerability Alert Compliance Tool", *Proceeding of The National Conference on Undergraduate Research (NCUR) 2003*, University of Utah Salt Lake City, Utah, March 13 – 15, *Cadet Paper!*

The Dynamic Planning and Assessment Support System
LTC Dan Ragsdale, MAJ Morel

Sponsor: Joint Forces Command

A decision support planning tool that correlates all tasks and mission requirements into a single view to aid decision making was needed by the Coalition Joint Task Force 180 (CJTF 180).

The Dynamic Planning and Assessment Support System (D-PASS) was created to aid Coalition Joint Task Force 180 (CJTF 180) in the Future Operations planning for the Operation Enduring Freedom campaign in the Coalition Joint Operations Area, Afghanistan. It was developed by a team of officers who augmented the CJTF Plans section at Bagram Air Base, Afghanistan. The application is integral to ongoing operations and is under continuing development through coordination with the Joint Forces Command

Dismounted Warrior Palmtop Forward Observer System
LTC Buck Surdu

Sponsor: Program Manager, Effects and Fires Command and Control System

The purpose of this project is to construct a prototype Hand-held Terminal Unit (HTU) using off-the-shelf hardware and Open Systems software. Since no COTS hardware is available to act as an HTU, the focus of this project is on the software so that when hardware is available, the system can be quickly constructed. Objectives include:

- Identify the best open standards for software and hardware.
- Construct prototype hardware link between a COTS palmtop device and SINCGARS radio.
- Build a completely platform and architecture independent HTU replacement prototype.

J.R. Surdu, E. Watson, Z. Miller, A. Peplinski, A. Adas, P. Manz "Wireless Data Entry for Forward Observers," *Crosstalk: The Journal of Defense Software Engineering*, July 2003, Vol. 16 No. 7, page 31.

NETFIRES

LTC John Surdu and MAJ Fernando Maymi

Sponsor: Program Manager, Effects and Fires Command and Control System

The ability exists for airborne missiles to loiter in a given area or use by soldiers on the ground. This has been demonstrated using a Hellfire missile mounted on an unmanned aerial vehicle. The drones provide a target that can be easily attacked by enemy ground forces and lead to the destruction of a valuable resource.

In this project, we propose a solution where multiple airborne missiles loiter over a given target area and through a process of either ground intervention or self-nomination attack a specified target on the ground either by laser designation or coordinate target marking.

F. Maymi, "An OPNET Model of the On-Demand Multi-Cast Routing Protocol (ODMRP)," *OPNETWORK* Summer 2002.

Land Warrior Network Simulation

LTC John Surdu and MAJ Fernando Maymi

Sponsor: Program Manager, Soldier Systems

PM Soldier Systems has been developing the Land Warrior system of systems for the integration of infantry soldier combat capabilities into a war fighting system optimized for close combat. Once Land Warrior infantry squad and platoon soldiers are equipped with a variety of subsystems, the soldiers will need to be networked together to facilitate situational awareness and command and control. In this project, we are building a network simulation of the proposed system as a baseline. Once this is done, we will conduct experiments to determine the sensitivity of the system to interruption and degradation. In addition, we will be able to use this model to help determine whether new technologies, protocols, or organizations will have any effect on the overall system.

F. Maymi, J. Surdu, A. Hall, R. Beltramini, "Modeling the Wireless Network Architecture of Land Warrior" to *Winter Simulation Conference*, San Diego, CA, 8-11 December 2002.

A.E. Henninger, G. Taylor, J.R. Surdu, and C. Jacquet, "Using COTS Software to Capture Deliberate and Reactive Weapons Firing Behavior: Lessons Learned in Knowledge Acquisition", *12th Conference On Behavior Representation In Modeling and Simulation (BRIMS 2003)*, Scottsdale, Arizona, May 12-15, 2003.

J. Surdu, Corrigan, "Simulating the communications network of land warrior," *IEEE Winter Simulation Conference*, 9-11 December 2002.

Palm Device Application Development
MAJ Fernando Maymi

Sponsor: CECOM RDEC, FT Monmouth

Palm computing devices are both easy to use and affordable. The ability to share files, store large amounts of data, and communicate with other information systems provides a resource that can be used to great benefit by leaders at all levels.

In this project, we propose to develop a suit of application tools that can be used by a robust group of leaders. This development will be a multi-disciplinary effort involving input from many departments at USMA. The effort will also include coordination with the CompanyCommander.com and PlatoonLDR.org existing programs.

Classroom XXI
MAJ Edward Mattison

Sponsor: TRADOC

Provide technical expertise and maintain the test-bed laboratory for the TRADOC multimedia classroom of the 21st Century. Evaluate and recommend proposed technologies. Perform government test and acceptance of Classroom XXI implementations and conduct courseware development training. Objectives include:

- Determine benefits and limitations of student computer management tools.
- Evaluate collaborative tools and other methods to enhance student learning.
- Evaluate and test hardware, software, and audio-visual equipment for possible use in future Classroom XXI implementations.
- Assess knowledge/learning management systems to enhance school administrator ability to conduct soldier Human Capital Management

Additionally, MAJ Mattison made several presentations to senior TRADOC leadership, including the CG, TRADOC, on the future of Army Distance Learning and the feasibility of combining several technology driven, Army education programs.

R Dodge, E Mattison, "Advanced Technologies in the Classroom", *National Conference on Undergraduate education (poster)*, April 2003

Analysis and Classification of Multispectral Imagery
MAJ Ronald Dodge

Sponsor: US Army Topographic Engineering Center (TEC)

Compare the effectiveness of machine learning methods, geostatistical methods, and traditional human (parametric) methods in the extraction and classification of terrain features using various sources of data. Research objectives include:

- Select the best combinations of different bands from the hyperspectral image.
- Apply both a backpropagation neural network and competitive network using Learning Vector Quantization (LVQ) to evaluate classification
- Assess the impact of ancillary information, such as a digital elevation model.

E. Simental, R. Dodge Jr., E. Bosch, D. J. Ragsdale, and R. Pazak, "Hyperspectral Dimension Reduction and Elevation Data For Supervised Image Classification," *Proceedings of the 14th Annual American Society for Photogrammetry & Remote Sensing (ASPRS) Conference*, Anchorage, AK, May 3-9, 2003.

Trafficability Analysis

LTC Surdu

Sponsor: US Army Topographic Engineering Center

Design and implementation of a prototype system to determine military trafficability of terrain under a variety of weather conditions. The system must take into account weather, soil type, slope, vegetation, and cultural features, as well as other information. Research objectives include:

- Investigating the viability of a rule-based expert system for this prototype
- Determining the most effective method of displaying the resulting trafficability analysis.

J.R. Surdu, C. Gates, J. Sullivan, M. Rudak, N. Colvin, and K. Slocum, "Trafficability Analysis Engine, " *Crosstalk: The Journal of Defense Software Engineering*, June 2003, Vol. 16 No. 6, page 28-30.

Efficient Algorithms for Problems Modeled by Graphs

Dr. Jean R. S. Blair and LTC Steven B. Horton

Sponsor: Faulty Development and Research Fund

In FY 2003, we were awarded an FDRF grant to study algorithms on graphs. As a result of this support, we worked with two groups of world-class researchers; one group in the computer science department at Clemson University (Hedetniemi, Hedetniemi, and Goddard), and one in the informatics department at Bergen University (Heggernes and Manne) in Bergen, Norway. Each effort has resulted in a manuscript for publication (see references below), and has also strengthened ties between our departments, between institutions, and between nations. This work was supported again in FY 2004.

J.R.S. Blair, W. Goddard, S.M. Hedetniemi, S.T. Hedetniemi and S.B. Horton, "Dominance equivalence in graphs." Submitted in August 2003 to *Nordic Journal of Computing*.

J.R.S. Blair, P. Heggernes, S.B. Horton and F. Manne, "Broadcast domination problems for interval graphs, series-parallel graphs and trees," to be submitted to *35th Southeastern International Conference on Combinatorics, Graph Theory, and Computing*, to be held March 2004, Boca Raton, FL.

Photonics Research Center Projects

The following Department of Electrical Engineering and Computer Science projects are described in the Photonics Research Center section.

Photonic Analog-to-Digital Conversion and Image Processing Applications of the Error Diffusion Neural Network

COL Barry L. Shoop, Ph.D., COL Eugene K. Ressler, Ph.D., LTC Brian Gollsneider, Dr. Thomas D. Wagner, Dr. Jean R. S. Blair, LTC David A. Nash, Ph.D., LTC Robert W. Sadowski, Ph.D., COL Glen P. Dudevoir, Ph.D., COL Andre H. Sayles, Ph.D., Dr. Wenli Huang, LTC George Nowak, Ph.D., Department of Electrical Engineering and Computer Science Dr. Pankaj K. Das, University of California at San Diego, La Jolla, California Dr. Liu Jaing, Dr. Joseph N. Mait, Dr. George Simonis, U.S. Army Research Laboratory, Adelphi, Maryland

Sponsors: U.S. Army Research Office (ARO) and Defense Advanced Research Projects Agency (DARPA)

R. Lynch, B. Bailey, J. DeLottinville, D. Downs, B. L. Shoop, and G. A. Nowak, "Free-space optical interconnects for communications and neural interconnect weighting," Proceedings of the Seventeenth National Conference on Undergraduate Research, (Salt Lake City, Utah), April 2003.

Photonic Analog-to-Digital Conversion Using Spatial Oversampling and Spectral Noise Shaping

COL Barry L. Shoop, Ph.D., COL Eugene K. Ressler, Ph.D., LTC Robert W. Sadowski, Ph.D., COL Glen P. Dudevoir, Ph.D., COL Andre H. Sayles, Ph.D., LTC George Nowak, Ph.D., Department of Electrical Engineering and Computer Science Dr. Pankaj K. Das, University of California at San Diego, La Jolla, California

Sponsor: Defense Advanced Research Projects Agency (DARPA) and Army Research Office (ARO)

B. L. Shoop, "Photonic Analog-to-Digital Conversion Based on Oversampling Techniques," Final Report, DARPA Photonic Analog-to-Digital Conversion Technology (PACT) Program, Report EECS-DARPA-PACT-2003-1, July 25, 2003.

B. L. Shoop, " Photonic Analog-to-Digital Conversion, " in *The Wiley Encyclopedia of Telecommunication*, J. G. Proakis, Ed., John Wiley & Sons, Inc., New York, NY (2002).

Mixed Signal Applications of Smart Pixel Technology

LTC Robert W. Sadowski, COL Barry L. Shoop, COL Glen P. Dudevoir, COL Andre H. Sayles, LTC Brian Gollsneider and Dr. Wenli Huang, Department of Electrical Engineering and Computer Science Dr. Pankaj K. Das, University of California at San Diego, La Jolla, California Dr. George Simonis, US Army Research Laboratory

Sponsor: Defense Advanced Research Projects Agency (DARPA) and Army Research Office (ARO)

Extensions of the Error Diffusion Neural Network: Partitioning and Multigrid Methods

Dr. Jean R. S. Blair, LTC David A. Nash, COL Eugene K. Ressler, COL Barry L. Shoop, Dr. Thomas D. Wagner, Department of Electrical Engineering and Computer Science

Dr. Pankaj K. Das, University of California at San Diego, La Jolla, California

Sponsor: Defense Advanced Research Projects Agency (DARPA) and Army Research Office (ARO)

A. Berry, J. R. S. Blair, and P. Heggernes, "Maximum cardinality search for computing minimal triangulations," *Proceedings of the 28th International Workshop on Graph Theoretical Concepts in Computer Science* (WG 2002), Cesky Krumlov, Czech Republic, June 13-15 2002.

Biologically Motivated Analog-to-Digital Conversion

COL Eugene K. Ressler and COL Barry L. Shoop, Department of Electrical Engineering and Computer Science

Dr. Pankaj K. Das and Dr. Brian Watson, University of California at San Diego, La Jolla, California

Sponsor: Defense Advanced Research Projects Agency (DARPA) and Army Research Office (ARO)

E. K. Ressler, B. L. Shoop, B. C. Watson, and P. K. Das, "Biologically motivated analog-to-digital conversion," *Proceeding of the SPIE*, vol. 5200, 2003.

Army Transformation: The Educational Imperative

COL Barry L. Shoop

Department of Electrical Engineering and Computer Science

Sponsor: Army Research Office (ARO)

G. A. Nowak, B. L. Shoop, and G. P. Dudevoir, "Teaching research to undergraduate engineers," *Proceedings of the 2003 Education and Training in Optics and Photonics Conference*, (Tucson, Arizona) Paper ETuB2, October 2003.

J. M. Gaines-Walker, A. Gibbons, G. G. Putnam, and B. L. Shoop, "Optics education: A blueprint for the 21st century," Invited Paper, *Proceedings of the SPIE*, vol. 4588, pp. 201-212, 2002.

B. L. Shoop, "Officer Education Transformation: The Need for Technical Competency," Invited Presentation, Transformation and Education Workshop, National Defense University, September 25, 2002.

The Uniformed Army Scientist and Engineer (UAS&E)
COL Barry L. Shoop
Department of Electrical Engineering and Computer Science

Sponsor: Army Material Command (AMC) and Army Research Office (ARO)

B. L. Shoop, Master of Ceremony, Inaugural Ceremony, 1 October 2003, West Point, New York.

Additional Department Research Papers

Books and Book Chapters:

Robin Burk, the Polish translation of "UNIX Unleashed: Internet," Publisher: the SAMS imprint, Macmillan Computer Press, July 2002.

Chris Okasaki, "Fun with binary heap trees," Book chapter of *The fun of programming*, March 2003, pages 1-16.

Lisa A. Shay and Kenneth S. Vastola, "Technology-Independent Link Sensing in Wireless Ad-Hoc Networks: Benefits and Challenges," Chapter 14 in *Mobile and Wireless Internet: Protocols, Algorithms and Systems*, Kia Makki, Niki Pissinou, Kami (Sam) Makki, E.K. Park (Eds.), Kluwer, 2003, pp. 365-382.

B. Shoop, A. Sayles and D. Litynski, "New Devices for Optoelectronics: Smart Pixels," Book chapter of *Fiber Optic Data Communication: Technological Trends and Advances*, Academic Press, 2002, pages 352-421.

B. Shoop, "Photonic Analog-to-Digital Converters," Book chapter of *Wiley Encyclopedia of Telecommunications*, Wiley-Interscience, 2003, pages 1960-1970.

Journal Publications:

Ken Alford, Fernando Maymi, Rachel Borhauer, "Software Engineering Education at West Point," *The DoD software Tech News*, May 2003 Vol. 6, page 9-11.

N.C. Das, B. Gollsneider, P. Newman and W. Chang, "Lateral oxidation kinetics of Al_xGa_{1-x} As layer by capacitance technique," *Applied Physics Letters*, Vol. 81, 16 August 2002, page 1600.

D. J. Ragsdale, S. D. Lathrop, and R. C. Dodge" Enhancing Information Warfare Education Through the Use of Virtual and Isolated Networks , " accepted by *The Journal of Information Warfare*, June 2003.

Conference Publications:

K. Alford and J. Surdu. "Using In-Class Debates as a Teaching Tool" *Frontiers in Education (FIE02)*, Boston, MA , 6-9 November 2002.

Ashly Albritton, Keith Benedict, Ken Alford and Wayne Schepens, "American politics and economics," *Software Technology Conference* in Salt Lake City, UT, 28-30 April 2003.

D. A. Barlow, V. Vassiliou, and H. L. Owen, "A Cryptographic Protocol to Protect MPLS Labels," *4th Annual IEEE Information Assurance Workshop*, West Point, New York, June 2003.

V. Vassiliou, H. L. Owen, D. A. Barlow, J Grimminger, H-P Huth, and J. Sokol, " M-MPLS: Micromobility-enabled Multiprotocol Label Switching," *IEEE International Conference on Communications (ICC)*, Anchorage, Alaska, May 2003.

Sven Krasser, H. L. Owen, D. A. Barlow, J Grimminger, H-P Huth, and J. Sokol, "Evaluation of the Local State Fair Share Bandwidth Algorithm , " *10th International Conference on Telecommunications*, Papeete, French Polynesia, February 2003.

D. A. Barlow, H. L. Owen, V. Vassiliou, J Grimminger, H-P Huth, and J. Sokol, "Simulating Router-Based Traffic-Engineering in Radio Access Networks Using NS-2," *IASTED International Conference on Communications, Internet, and Information Technology (CIIT)*, St. Thomas, US Virgin Islands, November 2002.

B. Koehler, D. A. Barlow, H. L. Owen, and J. Sokol, "Traffic Engineering Communication Protocols for Best Effort Traffic," *IASTED Communications Systems and Networks (CSN)*, Benalmadena Costa, Malaga, Spain, September 2002.

V. Vassiliou, H. L. Owen, D. A. Barlow, J Grimminger, H-P Huth, and J. Sokol, "A Radio Access Network for Next Generation Wireless Networks Based on MPLS and Hierarchical Mobile IP," *IEEE Vehicular Technology Conference (VTC)*, Vancouver, Canada, September 2002.

D. A. Barlow, H. L. Owen, V. Vassiliou, J Grimminger, H-P Huth, and J. Sokol, "Router-based Traffic-Engineering in MPLS/DiffServ/HMIP Radio Access Networks," *IASTED International Conference on Wireless and Optical Communications (WOC)*, Banff, Canada, July 2002.

Anne Berry, Jean Blair, Pinar Heggernes, "Maximum cardinality search for computing minimal triangulations," *Graph Theoretical Concept in Computer Science- WG 2002*, editor L. Kucera, LNCS 2573, Springer Verlag, June 2002, pp. 1-12.

J. Blair and F. Manne, " Efficient self-stabilizing algorithms for tree networks,"

Proceedings of the 23rd International Conference on Distributed Computing System-ICDCS 2003, IEEE Computer Society, May 2003, pp. 20-26.

C. A. Carver, S. A. Hamilton, and J. M. D. Hill. "Integrating Heterogeneous Systems for Real-time Distributed Command and Control," *International Symposium on Collaborative Technologies and Systems (CTS 2003)*, Orlando, Florida, January 19-23, 2003.

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