

CENTER FOR SECURE CYBERSPACE



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Development of Chipless RFID Sensor System

A chipless RFID sensor system platform consisting of passive chipless RFID sensor tags and specialized reader has been developed for cyber centric monitoring applications. Working on this project at Louisiana Tech were Sudhir Shrestha and Mercyma Balachandran, Ph.D. students in Engineering, Dr. Mangilal Agarwal, a research scientist at the Institute for Micromanufacturing, Dr. Vir Phoha, Professor of Computer Science and PI on the Center for Secure Cyberspace grant, and Dr. Kody Varahramyan, Entergy/LP&L/NOPSI Professor of Electrical Engineering and Director of the Institute for Micromanufacturing.

The chipless passive RFID sensor system is designed to be safe from alteration of sensor information by attackers and capable of operating in hostile environments. As the need for secure cyber centric monitoring is ever growing, the chipless passive RFID sensor system developed will assist in the collection of environmental information through sensors and provide secure means of data access and monitoring through different forms of local and global communication networks.

Deployment, Coverage Control and Optimal Control of Wireless Sensor Networks

Dr. Rastko Selmic is conducting research in the area of deployment, coverage control and optimal control of wireless sensor networks. His group studies how to optimally position and deploy a large number of sensors to cover an area of interest, while providing

extensive coverage of specific targets. The technology will help to solve sensor network deployment problems, such as where and how to deploy thousands of small wireless sensor nodes in order to cover the area of interest and still be able to efficiently track targets of interest, how to move sensor nodes in the real-time, and how to report results to the base station or central command.

Results also affect numerous civilian applications such as chemical agent monitoring, weather and hurricane tracking and monitoring, explosive detection at the battlefield, and even broader problems in operations research.

The group also mathematically studies the problem of sensor network deployment, placement, and control (collaborative work with Louisiana Tech mathematics professor Dr. Jinko Kanno), and aims to develop

Welcome to the first edition of the CSC quarterly newsletter. This publication is intended as means of providing research updates and keeping you informed of the activities at the Center for Secure Cyberspace at Louisiana Tech. We invite you to visit our website at <http://www.csc.latech.edu>. This edition provides an overview of some of the projects being conducted at the Center as well as an introduction to our team. We hope you find this information useful.

Vir V. Phoha, PI

Research Team

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(continued from page 1) a simulation software for use with similar type of problems. Dr. Selmic and Dr. Kanno study completeness of the sensor node coverage using graph theory and algebraic topology where they investigate when the network has a full coverage and when there are holes in the coverage. Location of the holes and the possibility repairing them is the next step in this research area.















Anomaly Detection

Work by Kiran Balagani focuses on developing a feature selection algorithm to detect anomalies in computer network traffic. Anomaly detection in network traffic demands that feature selection algorithms are (1) non-parametric and (2) robust to class-skews. He has identified Discrete Maximum Relevance Minimum Redundancy (DMRMR) feature selection algorithm for optimal characterization of features for anomaly detection. DMRMR optimizes mutual information criterion between features and classes and mutual information is known to be non-parametric and robust to class skews in discrete space. His current research focuses on exploring the theoretical aspects of DMRMR feature selection, specifically in establishing the relationship between Bayes error rate and DMRMR feature selection criterion.

DoD DEPSCoR Grant Awarded

“Secure and Survivable Cyber-Centric Sensor Networks: Algorithms and Architecture Research” has been funded by DoD DEPSCoR for additional research in the area of secure cyberspace. The PI on the grant is Dr. S.S. Iyengar with Co-PIs Dr. Park, Dr. Hsiao-Chun Wu, Dr. Peter Chen and Dr. Phoha. The amount of funding is \$761,000 for 3 years (starting from July 1, 2008).

Meet the Center for Secure Cyberspace Team

 Vir V. Phoha La Tech	 S. S. Iyengar LSU	 K. Varahramyan La Tech	 Peter Chen La Tech	 Gabrielle Allen LSU
Spatial-temporal Pattern Detection and Event Recognition	Information Sensing and Fusion in Sensor Networks	Micro-sensor Fabrication and Field Testing	Data Modeling, Cyber Forensics and Cyber Security	HPC for Grid-based Data Drive Applications
 Les Guice La Tech	 Rastko Selmic La Tech	 Christian Duncan La Tech	 Tevfik Kosar LSU	
V.P. Research & Development Chair, Research and Industry Advisory Board PKSFI Research Grant	Sensor Placement and Protocol Development	Geometric Algorithms and Information Visualization	Distributed Systems, Grid and Collaborative Computing	
 Asok Ray Penn State	 Enamul Karim La Tech	 Kiran Balagani La Tech	 Stan Finley La Tech	
Fault Detection and Mitigation and Sensor Networks for Urban Warfare	Detection and Control of Adversarial Codes and Psycho-computing	Classification and Feature Selection for Anomaly Detection	Technology Coordinator	
			 Tina Allen La Tech	
			Administrative Support	