



# VIRGINIA MOUNTAIN SECTION NEWSLETTER

IEEE Region 3, Council 09, Section 65

March 2008

Thursday, March 20, Holiday Inn University, Blacksburg

## *Distributed Data Fusion for Mobile Sensor Networks: Theory and Experiments*

**Dr. Daniel Stilwell, Associate Professor  
Autonomous Systems and Controls Laboratory  
The Bradley Department of Electrical and Computer Engineering  
Virginia Tech, Blacksburg, VA**

### Abstract

For teams of mobile sensors, the performance of distributed data fusion and coordinated motion algorithms is inherently coupled. While it is often acceptable to ignore the coupling that exists between sensing and sensor motion in systems with slow time-constants, such is not the case for systems that are fast or suffer from limited communication bandwidth. Teams of autonomous underwater vehicles are a prime example, and a principal focus of our research activities. Moreover, our recent experiments with systems composed of many air and surface vehicles suggest that even wireless communication systems are easily saturated and that the fundamental results of our research apply to many application domains. In this talk we provide an overview of our contributions to the fundamental theory of distributed data fusion and motion control, including contributions to consensus theory and stochastic graph theory, and we present the results of experiments that we have conducted

with autonomous underwater vehicle systems.



Several Virginia Tech 475 autonomous underwater vehicles (The outside diameter of these AUVs is 4.75 inches.)

### Speaker

Dr. Stilwell is currently an Associate Professor in the Bradley Department of Electrical and Computer Engineering at Virginia Tech. Since arriving at Virginia Tech in 2002, Dr. Stilwell has become a principal contributor to the emerging field of environmental robotics. His research spans the

development of fundamental control and estimation theory for mobile sensors networks to the development of new maritime robots for both underwater and surface applications. Dr. Stilwell's research program is growing rapidly; since 2003, he has been directly responsible for \$2.8 million in sponsored research for projects that total \$5.6 million, and he has published over 40 scientific papers. Dr. Stilwell received the NSF CAREER award and the ONR Young Investigator Program award, both in 2003.

Dr. Stilwell received a BS in Computer Engineering from the University of Massachusetts in 1991; an MS in Electrical Engineering from Virginia Tech in 1993; and a PhD in Electrical and Computer Engineering from Johns Hopkins University in 1999. Prior to joining the faculty at Virginia Tech in 2002, Dr. Stilwell was an Assistant Professor at the United States Naval Academy from August 1998 to December 2001.

**Date: Thursday March 20**  
**Social: 6:30 PM**  
**Dinner: 7:00 PM**  
**Talk: 8:00M**

**Dinner cost:**  
**Member or Guest \$ 20.00**  
**Student \$ 10.00**

**Advance reservations are required.**  
**Please reserve by 5 PM Monday,**  
**March 17 indicating number of**  
**attendees**

**Dr. Wilbur Dale (540) 464-7547**  
**e-mail: [dalewn@vmi.edu](mailto:dalewn@vmi.edu)**

**Directions to**  
**Holiday Inn University**  
**900 Prices Fork Road**  
**Blacksburg**

I-81 to Exit 118B  
 460 W about 8 miles to Prices Fork  
 Road exit (one exit past Virginia Tech  
 exit). Take first Prices Fork Rd. exit  
 (towards Downtown) and the Holiday  
 Inn will be on your left just past the first  
 traffic light.

**Note: This talk was originally**  
**scheduled for January, but that**  
**meeting was cancelled owing to**  
**inclement weather. The talk deals**  
**with the combining of data from**  
**autonomous moving sensors.**  
**Experimental results will be**  
**presented for the case of autonomous**  
**underwater vehicles.**

**Reports from prior meetings**

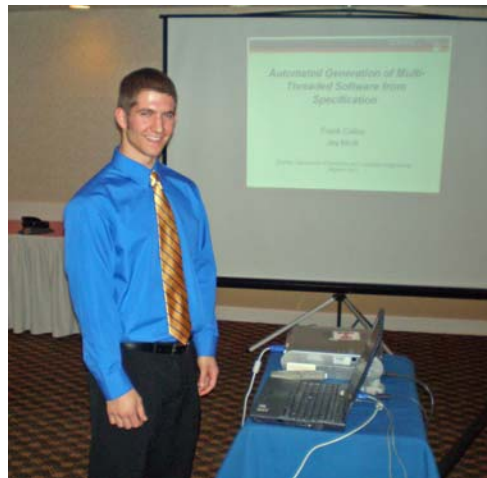
**VMS February Meeting**

The meeting on February 21 was  
 devoted to the annual student paper  
 contest. Attendance was 21. There were  
 two presentations: Cadet Jonathan  
 Ostermann from VMI, who was  
 awarded the \$300 first place cash prize,  
 spoke on *Design of a Controller for a*  
*Robotic Arm*



Jonathan Ostermann

Frank Calise and Jay Modi,  
 undergraduate students from Virginia  
 Tech who were awarded the \$200  
 second place cash prize (\$100 each)  
 spoke on *Automatic Generation of*  
*Multi-Threaded Embedded Control*  
*Software for Multi-Core Processors.*



Frank Calise



Frank Calise and Jay Modi

**VMS Joint Computer, Control, and**  
**Industrial Electronics Chapter**

A Chapter meeting was held at Virginia  
 Tech on February 29, with attendance in  
 excess of 30. The meeting consisted of a  
 panel discussion on *Women in*  
*Computing: Why so few?*

Panelists were:  
 Constance Heitmeyer, NRL  
 Mary Ann Bonadeo, Anderson  
 Associates, and VT ECE faculty  
 Kathleen Meehan, Leyla Nazhandali,  
 and Yaling Yang.

The panelists discussed factors leading  
 to very small enrollments by women in  
 Computer Science and Computer  
 Engineering, and added their personal  
 experiences in choosing an engineering  
 career. This was followed by a very  
 lively discussion involving the audience  
 and panel.

**From IEEE USA**

**New Site Helps Educate High School**  
**Girls About Careers in Engineering**

The Engineer Your Life Web site is the  
 centerpiece of a national campaign to  
 encourage academically prepared girls  
 to enroll in engineering programs. The  
 site, which the IEEE is helping to fund  
 through the United Engineering  
 Foundation, is meant for high school  
 girls and the adults in their lives  
 (parents, counselors, teachers, and other  
 educators) who want to learn more  
 about what life and work are like for  
 engineers. The campaign will:

- Introduce high school girls to young women engineers who embody these messages.
- Showcase engineering careers and illustrate that an education in engineering is both desirable and within their reach.
- Help school counselors and teachers better understand engineering and give them the resources and training they need to advise students.
- Mobilize America's more than one million engineers with compelling resources, training, and messages to use in their ongoing outreach efforts.

Visit: <http://www.engineeryourlife.org>

*Additional photos from February VMS Meeting*



From L-R: Frank Calise, Sandeep Shukla, Mainak Banga, Tridib Dutta, Bijoy Jose, and Jayesh Modi



Cadet Jonathan Ostermann and Dave Livingston



From L-R: Chris Bonadeo, Cadet Brian Corley, and Wilbur Dale



Cadet Jonathan Ostermann, VMI faculty member D.Todd Smith, and Cadet Rachel Toman



Ed Tuttle



Glenn Hammond and Bill Hoffman



Ira Jacobs and Glenn Hammond

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