

FALL CONFERENCE

Thursday Evening, November 13, 2014

Best Western PLUS Sterling Inn

34911 Van Dyke Avenue, Sterling Heights, Michigan 48312
Tel: +1 586 979 1400



Keynote Presentation: Emerging Nano Science and Technology For Medicine

Gregory W. Auner

Strauss/TEAMS Endowed Chair and Director,
Smart Sensors and Integrated Microsystems (SSIM) Program
Wayne State University, School of Medicine

The emerging area of micro- and nano- science and engineering is leading to an unprecedented comprehension of the fundamental building blocks of nature. This technology will most profoundly affect the nature of science, engineering and medicine in the 21st century. Device structures with characteristic dimensions significantly below 1 micron have led to the investigation of a whole range of novel physical and chemical phenomena. In turn, these new phenomena promise to give rise to a new generation of materials and devices working on completely different physical and chemical principles. The newest frontier to nanotechnology is in medicine. Development of new and novel devices will impact areas ranging from molecular imaging and detection, to bio implants, diagnostic, and micro robotics. The major technological barrier to fabricate functional nanostructures is the ability to synthesize nano-structures of sufficiently small dimension, specific pattern and uniform size distribution. Most importantly, these structures must be directly fabricated into microsystems to allow functionality of the structures. Therefore, the implementations of these systems require advanced technologies to integrate the nanostructures to microsystems as well. Without such integration, the functionality of the nanosystems cannot be realized. New technology such as laser induced self-assembly of nanoarray platforms (SNAP), novel materials synthesis, and atomic-layer engineering are key for the development of devices for applications in biological and chemical sensing systems, microfluidic drug and chemical delivery systems, micro imaging systems, and chronically implantable micro and nano devices. As an example, materials synthesis, micromachining and nano integration in microsystems will be presented for an array of applications including a neurological implants for the central nervous system, guided growth of neurons for spinal cord injuries, probing systems for pathogen and cancer detection, and artificial skin sensor arrays for robotics with 108 greater sensitivity than human skin to name a few.

Panel Discussion

Moderator:



Dr. Hoda S. Abdel-Aty-Zohdy, J. F. Dodge Chair Professor,
Oakland University

Technical Presentations (after Panel Discussion)

Parallel Presentations Followed by Dinner and Keynote Address



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MEETING AGENDA

<u>DURATION</u>	<u>ACTIVITIES</u>	<u>SPEAKER</u>
4:00 PM – 5:15 PM	Registration and Poster Presentations	Scott Lytle, Chaitanya Setti
5:15 PM – 5:30 PM	Overview of Conference and Recognitions	Raju Brahmandhabheri
5:30 PM – 6:00 PM	Panel Discussion	Dr. Hoda S. Abdel-Aty-Zohdy
6:00 PM – 7:00 PM	Breakout Sessions – 2 Speakers per session	
	• Sensing & Measuring	Dr. Nicholas Langhals Dr. Junghoon Yeom
	• Computing & Systems	Dr. S. Ramesh Jacob Beningo
	• Power & Energy	Dr. Feng Lin Kevin Taylor
	• Vehicular Technology	Dr. Yi Lu Murphey Dr. Weidong Xaing
	• Technology Management	Gary L. Gruenberg Nestor Rychtyckyj
	• Education & Management	Thelma Dobson Sanjay Dhall
7:00 PM – 7:45 PM	Dinner	All
7:45 PM – 8:45 PM	• Keynote Speaker	Dr. Gregory W. Auner
8:45 PM – 9:00 PM	Awards Presentation	Dr. Mohamad Berri
9:00 PM	Adjourn	

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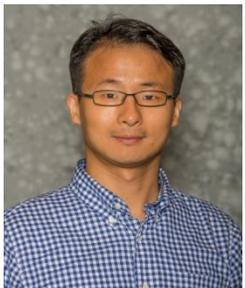
Regenerative Peripheral Nerve Interfaces for Prosthetic Control and Sensory Feedback



Dr. Nick B. Langhals

Optimal prosthetic interfaces which give patients high-fidelity control of these artificial limbs are limited. We have developed a novel Regenerative Peripheral Nerve Interface (RPNI), which consists of a unit of free muscle that has been neurotized by a transected peripheral nerve. In conjunction with a biocompatible electrode on the muscle surface, the RPNI facilitates signal transduction from a residual peripheral nerve to a neuroprosthetic limb. We have successfully constructed viable RPNIs out of both predominately motor peripheral nerves (peroneal and tibial) and sensory nerves (sural) in rodent model. Electrodes are then implanted as a signal interface. Acellular extracellular matrix is then used to secure the electrode to the muscle and isolated the RPNI from surrounding tissues. Lastly, insulating materials may be wrapped around the RPNI to isolate signals from the surrounding tissues. This presentation will highlight the background research leading to this original technology as well as recent advances in the development of our interface.

Micro/Nanotechnology-Enabled Gas Sensing and Nanomanufacturing



Dr. Junghoon Yeom

Timely identification and measurement of gas constituents are essential in many areas of science and technology, and the micro gas chromatograph (μ GC) analyzer are being developed around the world for myriad applications ranging from detecting undesirable compounds in air for security and safety, facilitating process control in industry, and sensing compounds in breadth for health monitoring and diagnosis. Key drivers for the miniaturization efforts include speed (less than a few seconds), cost ($< \$1000$), portability (PDA size), energy consumption (< 10 J), sensitivity (< 1 ppb), and reduction in false positives (< 1 in 106). This presentation will discuss at the system level the design, fabrication, and assembly of the UIUC μ GC system and the characterization of the individual components (micro preconcentrator, microvalves, microcolumns, and micro/nano gas sensors). An emphasis will be placed on how the micro/nanotechnologies help us to improve the device performance and address the challenges associated with the scale-up fabrication.

Design and Verification Challenges of Automotive Embedded Systems



Dr. S. Ramesh

Embedded applications like automotive control software are becoming complex: from single to multiple functions and features, from centralized to distributed, federated to integrated architecture, from passive to active control, simple to safety-and business-critical applications, closed to open systems, from single party to multi-party development, from isolated to connected components and so on. Rigorous software engineering of Automotive Control Systems is an important area of research requiring significant involvement of software engineering researchers, domain experts and practitioners. It is a big challenge to build effective methods and tools for developing such systems. In this talk, some of the challenges are highlighted in the context of automotive embedded systems and a few preliminary solutions methods developed by our team are discussed.

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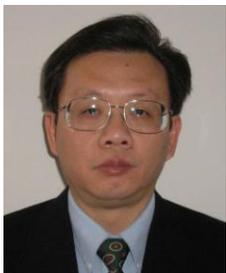
Embedded Software Basics



Jacob Beningo

The successful launch of an embedded software project requires an expert understanding of the basics. Without a solid foundation on which to build the result is a house of cards that collapses at the slightest change. In this session we will examine fundamental concepts of embedded software that are often overlooked, forgotten or flat out misunderstood. A brief look topics such as assertions, code reuse and task scheduling will be examined. Common development techniques such as agile will be presented in addition to tips and tricks to develop robust embedded software.

Power Distribution Network Management Using Networked Control of Timed Discrete Event Systems



Dr. Feng Lin

Control and management of power distribution networks modeled as timed and networked discrete event systems are presented assuming the controller (the supervisor) communicates with the system to be controlled via a shared communication network, and that this network experiences bounded delays and losses that impact the controller. Under these assumptions, the necessary and sufficient condition for the existence of a controller is expressed as network controllability and network observability, which we define in the paper. We apply these results to a power distribution network, the IEEE 33-node (bus) test system, where the objective is to ensure the total substation transformer power stays within the given safety limits.

IEEE Power & Energy Society Scholarship Plus Program



Kevin Taylor

Power and energy engineers work with some of today's most exciting technologies, developing solutions to problems that affect our lives and lifestyles. The PES Scholarship Plus Initiative provides scholarships and real world experience to undergraduates interested in power and energy engineering careers.

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Intelligent Energy Control and Management in Hybrid Electric Vehicles (HEVs)



Dr. Yi Lu Murphey

This presentation will discuss research in intelligent energy management for Hybrid Electric Vehicles (HEV) and a machine learning framework, ML_EMO_HEV, developed for the optimization of energy management in an HEV, machine learning algorithms for predicting driving environments and generating optimal power split for a given driving environment. The effectiveness of predicting roadway type, traffic congestion levels, driving trends, and learning optimal engine speed and battery power from Dynamic Programming using neural networks trained under the ML_EMO_HEV framework are presented using results from experiments conducted on a simulated Ford Escape Hybrid vehicle model provided by Argonne National Laboratory's PSAT (Powertrain Systems Analysis Toolkit).



Weidong Xiang

High-speed at high-speed (HaH): Research and Prototyping on Dedicated Short Range Communications (DSRC) For Connected and Automated Vehicles

This presentation will present our research and prototyping of dedicated short range communications (DSRC) for connected and automated vehicles. The contents will cover the latest progress in related areas ranging from channel modeling, baseband algorithms, prototyping and vehicular network simulator, system level channel emulator and field testing.



Gary Gruenberg, P.E.

US Commercial Nuclear Power

US nuclear power plants have racked up an impressive 50 years of operation without one fatality. Compare this fact with the other major sources of electric generation. It makes you wonder why commercial nuclear power is not booming in the US as it is in China. This presentation will discuss the current state of the US nuclear power industry and its future.

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Applying Semantic Technologies in Industry



Dr. Nestor Rychtyckyj

In a world overflowing with big data, semantic technologies are rapidly becoming a significant factor to help increase understanding and reasoning with different types of data. Semantic technologies include knowledge representation languages such as OWL/RDF as well as tools to create ontologies and support reasoning and inference. They provide significant advantages in terms of flexibility, performance and expressiveness when dealing with disparate data from different locations. This presentation will discuss the use of semantic web technologies in several different industrial applications and show how effective this approach can be.

Mobile technologies for homebuilt aircrafts and drones



Sanjay Dhall

Amateur homebuilt aircraft are an inexpensive alternative for average people to enter the field of aviation. However, certified aviation related autopilot systems tend to be expensive. Meanwhile, rapid advances being made in mobile electronic technologies are enabling availability of dynamic positioning and orientation data. Combining these with off the shelf electromechanical servo devices and display tools, has the potential to offer amateur aircraft builders access to sophisticated control and monitoring technologies without significant costs. This presentation offers some personal experiences of migrating mobile technologies for use in amateur aviation.

Enhanced women's persistence in the fields of engineering



Thelma Dobson

Have you ever wondered what life would be like if more women were attracted to engineering and persisted in the field? With over 30 years of professional and leadership experience at DTE Energy, Thelma Dobson will discuss how women can combine their natural capabilities with their technical competencies to chart exciting career paths for themselves. She will share lessons learned and time tested techniques from her personal experience to enhance women's persistence in the fields of engineering. She will also explore some of the many career options available to IEEE WIE members.