IEEE SEM Spring Conference

April 24th, 2014
4:00PM – 10:00PM
Banquet Rooms at Oakland Center

Event Website http://www.ieee-sem.org/spring

The conference brief outline:

- 4:00 PM – 5:30 PM Registration
  Posters/Display Tables/Networking
- **5:30 PM – 5:40 PM OU Welcome**
- 5:45 PM – 6:30 PM Panel Discussion
- 6:45 PM – 7:30 PM Technical sessions
- 7:30 PM – 8:00 PM Poster Presentations and Student competition
- 8:00 PM – 8:30 PM Dinner and Entertainment
- **8:30 PM – 8:40 PM Remarks by SECS Dean**
- 8:40 PM - 8:45 PM Keynote Announcement
- 8:45 PM - 9:30 PM Keynote Presentation (Dr. Kensall Wise)
- 9:30 PM - 9:45 PM Awards and Recognition

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Panel Discussion: ***"Industry Advancing Technologies for Humanity"***
Moderator: Dr. Hoda S. Abdel-Aty-Zohdy, J. F. Dodge Chair Professor, Oakland University

Panelists:

- **Dr. Hussein Dourra**, Technical Fellow, CHRYSLER.LLC
  "Utilizing Virtual Tools; Physics Based Solutions; Achieving Optimum Results"
- **Dr. Subhendu Guha, Former VP of Uni-Solar**
  ***"**Solar Energy - Coming of age"*

- **Ms. Delia Rodi,** CEO, Owner NIAGARA MURANO ARCHITECTURE
  "Lightning Technology and how it applies to Humanity."
  deliarb@niagaramurano.com

- **Dr. Anthony Cooprider,** Senior Technology Leader, Ford Motor Company
  "Embedded Electronics in Automotives"

- **Dr. Hoda S. Abdel-Aty-Zohdy**, J. F. Dodge Chair Professor, Oakland University
  "Bio-Inspired Integrated Systems Applications"

Keynote Presentation:

Microsystems to Nanosystems:

Meeting the Challenges of the 21st Century

KENSALL D. WISE

William Gould Dow Distinguished University
Professor Emeritus Electrical Engineering and Computer Science
Professor Emeritus of Biomedical Engineering
The University of Michigan, Ann Arbor, MI 48109
wise@umich.edu

Bio:

Kensall D. Wise received the BSEE degree with highest distinction from Purdue University in 1963 and the MS and Ph.D. degrees in electrical engineering from Stanford University in 1964 and 1969, respectively. From 1963 to 1965 and from 1972 to 1974, he was a Member of Technical Staff at Bell Telephone Laboratories, where his work focused on the exploratory development of integrated electronics for use in telephone communications. From 1965 to 1972 he was a Research Assistant and then a Research Associate and Lecturer at Stanford, working on the development of micromachined solid-state sensors. In 1974 he joined the University of Michigan, Ann Arbor, where he is

now the William Gould Dow Distinguished University Professor Emeritus of Electrical Engineering and Computer Science. Dr. Wise was General Chairman of the *1984 IEEE Solid-State Sensor Conference* (Hilton Head) and was Technical Program Chairman (1985) and General Chairman (1997) of the *IEEE International Conference on Solid-State Sensors, Actuators, and Microsystems*. He received the 1990 Paul Rappaport Award from the IEEE Electron Devices Society, the 1995 Distinguished Faculty Achievement Award from the University of Michigan, the 1996 Columbus Prize from the Christopher Columbus Fellowship Foundation, the 1997 SRC Aristotle Award, and the 1999 IEEE Solid-State Circuits Technical Field Award. He held the 2007 Henry Russel Lectureship at the University of Michigan and is a Life Fellow of the IEEE, a Fellow of the AIMBE, and a member of the United States National Academy of Engineering.

ABSTRACT:

Progress in the miniaturization of microelectronic functions has far exceeded anything imagined in the early years of integrated circuits and has revolutionized data processing, communications, control, transportation, and access to information. Although its impact on areas such as health care, security, sustainable energy, and the environment has so far been muted, it is now poised to transform these areas as well, merging very low-power integrated circuits with wireless connectivity and sophisticated sensing technologies. Employing nanotechnology, energy scavenging, heterogeneous integration, and wafer-level packaging, these wireless integrated microsystems will be key in solving some of the most challenging problems of the 21st century. Today, microsystems 1mm^3 in size and dissipating less than 1nW are being realized, while in the future, nanosystems the size of single cells operating at pW levels may be possible. This talk will highlight several emerging devices, including chromatography-based microsystems capable of rapidly analyzing complex gaseous mixtures with sensitivities in the parts-per-trillion range, chronically-implantable neural microsystems for the treatment of deafness, blindness, epilepsy, Parkinson's disease, and perhaps paralysis, and an intraocular microsystem for continuously monitoring eye pressure to improve the treatment of glaucoma.

Session Chapter(s) Speakers:

For CHAPTER-I: Signal Processing:

- **Dr. Dan Aloi,** Proferssor, Chair of ECE Department, Oakland University

"The Importance of Electromagnetics in the Automotive Industry as a Result of Telematics and Infotainment"

Abstract

Wireless technologies have proliferated onto automotive platforms as part of infotainment, telematics and active safety initiatives. These wireless solutions present engineers design challenges in the area of applied electromagnetics in terms of antenna design, antenna placement, electromagnetic compatibility and wave propagation. The Applied EMAG and Wireless Lab at Oakland University possesses an outdoor vehicle-level antenna range (80 MHz - 6,000 MHz) and full-wave electromagnetic field solvers with high end computers to solve these issues. A background will be provided on the wireless technologies on automotive platforms followed by past industry relevant research in these areas relating to antenna design, antenna measurement and antenna placement.

Bio: Daniel N. Aloi, Ph.D. received his B.S. (1992), M.S. (1996) and Ph.D. (1999) degrees in electrical engineering from Ohio University, located in Athens, Ohio, USA.

He served as a Research Assistant from 1995-1999 in the Avionics Engineering Center within the School of Engineering and Computer Science at Ohio University; Summer Intern at Rockwell International in Cedar Rapids, Iowa, and Senior Project Engineer at OnStar, Incorporated, a subsidiary of General Motors from 2000-2002. He has been employed in the Electrical and Computer Engineering Department at Oakland University in Rochester, Michigan from 2002 until present. During this time he has held the following titles: Assistant Professor (2002-2007), Associate Professor (2007-2012), Professor (2012-present) and Chair (2010-present). In addition, he is the Founder and Director of the Applied EMAG and Wireless lab at Oakland University. Dr. Aloi's research interests reside in the areas of applied electromagnetics and global navigation satellite systems.

Dr. Aloi is a member of the Institute of Navigation. He has been a member in the institute of electrical and electronics engineers (IEEE) since 1996 and a senior member since 2005. He is the Technical Editor in the area of navigation for the IEEE Transactions on Aerospace and Electronic Systems. He has received in excess of $3M in research funding from a variety of federal and private entities including the Federal Aviation Administration, Defense Advanced Research Program Agency (DARPA) and the National Science Foundation (NSF). He has authored/co-authored over 80 technical papers and is an inventor on 5 patents.

Robert G. Reynolds Professor Computer Science, College of Engineering, Wayne State University, Detroit, Michigan 48202

Chapter X Topic: USING CYBER-PHYSICAL SYSTEMS TO EXPLORE ANCIENT SITES UNDERNEATH LAKE HURON WITH CULTURAL ALGORITHMS

ABSTRACT

Most of the Grand Challenge questions that remain about human evolution can only be addressed by accessing sites that are now under water. In this talk we discuss a Cyber-Physical System developed in conjunction with the University of Michigan-Ann Arbor Museum of Anthropological Archaeology and the Department of Oceanographic and Atmospheric Engineering. The system is used to help identify and explore ancient occupational sites currently found in over 100 feet of water underneath Modern Lake Huron. The contribution of Virtual World modelling and Machine Learning using Cultural Algorithms will be highlighted. The potential for applying such techniques to explore other ancient sites will be explored.

Dr. Robert G. Reynolds received his Ph.D. degree in Computer Science, specializing in Artificial Intelligence, in 1979 from the University of Michigan, Ann Arbor. He is currently a professor of Computer Science and director of the Artificial Intelligence Laboratory at Wayne State University. He is an Adjunct Associate Research Scientist with the Museum of Anthropology at the University of Michigan-Ann Arbor, a member of the Complex Systems Group at the University of Michigan-Ann Arbor, and is a participant in the University of Michigan –Wayne State University NSF IGERT program on Incentive-Based Design. His interests are in the development of computational models of cultural evolution for use in the simulation of complex organizations and in computer gaming applications. Dr. Reynolds produced a framework, Cultural Algorithms, in which to express and computationally test various theories of social evolution using multi-agent simulation models. He has applied these techniques to problems concerning the origins of the state in the Valley of Oaxaca, Mexico, the emergence of prehistoric urban centers, the origins of language and culture, and the disappearance of the Ancient Anazazi in Southwestern Colorado using game programming techniques. He has co-authored three books; *Flocks of the Wamani* (1989, Academic Press), with Joyce Marcus and Kent V. Flannery; *The Acquisition of Software Engineering Knowledge* (2003, Academic Press), with George Cowan; and *Excavations at San Jose Mogote 1: The Household Archaeology* with Kent Flannery and Joyce Marcus (2005, Museum of Anthropology-University of Michigan Press).

He has received funding from both government and industry to support his work. He has published over 250 papers on the evolution of social intelligence in journals, book chapters, and conference proceedings. The journals include IEEE Computer, IEEE

Computational Intelligence, Complexity, Scientific American, IEEE Transactions of Evolutionary Computation, IEEE Transactions on Systems, Man, and Cybernetics, IEEE Software, Communications of the ACM, and the Proceedings of the National Academy of Sciences. He is also co-editor of four books on evolutionary computation.

Dr. Reynolds. is an IEEE Senior Member and currently the head of the IEEE Task Force on Cultural Algorithms. He is also an associate editor for the IEEE Transactions on Artificial Intelligence in Games, IEEE Transactions on Evolutionary Computation, International Journal of Swarm Intelligence Research, International Journal of Artificial Intelligence Tools, International Journal of Computational and Mathematical Organization Theory, International Journal of Software Engineering and Knowledge Engineering, and the Journal of Semantic Computing. He serves on the IEEE Technical Committee on Evolutionary Computation, the IEEE Neural Networks Technical Committee, the IEEE Technical Committee on Computational Intelligence in Games, and the IEEE Systems, Man, and Cybernetics Technical Committee on Soft Computing.

Dr. Reynolds AI group has won several prizes in IEEE Competitions including: first place in the 2013 Computational Intelligence Society International Video Competition; second place in the IEEE Congress on Evolutionary Computation World in a Word Competition; second place in the IEEE 2013 World Congress first place in the IEEE World Congress Super Mario Competition in 2010; second place in the 2008 IEEE World Congress Racing Controller Competition, and third place in the 2012 IEEE Turing Competition. In addition his group has won several best paper awards including: the Best Overall paper at the 2013 International Congress on Evolutionary Computation; the Best Paper of 2008 in the International Journal of Intelligent Computing and Cybernetics; and the best student paper at the 2010 IEEE World Congress on Computational Intelligence in Barcelona, Spain.

Dr. Reynolds currently teaches courses on Cultural Algorithms, Computational Intelligence in Games, Artificial Intelligence, and Game Programming at Wayne State in the Department of Computer Science. In addition, he has given over twelve tutorials on Cultural Algorithms, including a tutorial at the.2013 IEEE Congress on Computational Intelligence in 2014 in Beijing, China.

Dr. Fayez Guibaly: *Professor, ECE Department Chairman,* P.Eng., Senior Member IEEE, University of Victoria, Canada

"Performance Analysis of Adders over Fp for Cryptographic Applications"

Abstract

Cryptographic applications require fast finite field arithmetic operations. FIPS 186-2 and NIST
recommend ten fields for elliptic curve cryptography, five are prime Fp where the number of bits
m needed to represent the prime span the range m = 192, 224, 256, 384, and 521. The prime
moduli p are chosen of a special type of numbers called generalized Mersenne numbers. This
report provides a comprehensive study of several performance requirements such as area, delay,
static and dynamic energy consumption.

Biograph

Fayez Gebali (S75, M79, SM93) received the BSc degree in electrical engineering (first class
honors) from Cairo University, the BSc degree in mathematics (first class honors) from Ain Shams University, and the PhD degree in electrical engineering from the University of British Columbia where he was a holder of the NSERC postgrad- uate scholarship. Dr. Gebali is a professor of computer engineering and Chair of Electrical & Computer Engineering Department at University of Victoria. His research interests include par- allel algorithms, 3D IC design, hardware verification and security, and wireless communications.

Dr. Guoming (George) Zhu is a Professor of mechanical engineering and electrical/computer engineering at Michigan State University

"Model based Control application to powertrain systems"

With the growing concern of global warming and energy crisis, many new technologies are used in modern powertrain and engine systems. Variable valve-train, electronic throttle, exhaust-gas-recirculation, variable geometry turbo and waste gate, super charger, new after-treatment systems, and hybrid powertrain system add additional degrees of freedom to powertrain and engine control systems. The conventional single-input-single-output control technique cannot provide precise powertrain and engine control under either steady state or transient operations and model-based multi-input-multi-output control becomes a necessity. This talk presents some model-based control applications to powertrain and engine system at the Energy and Automotive Research Lab of the Michigan State University, which includes crank-resolved engine model for hardware-in-the-loop (HIL) simulations, hybrid powertrain HIL simulation and control, model-based combustion mode transition control, gain-scheduling control for the bio-fuel after-treatment system, linear parameter varying (LPV) control of engine throttle and cam phasing system, and so on.

Short bio:

Dr. Guoming (George) Zhu is a professor of mechanical engineering and electrical/computer engineering at Michigan State University. Prior to joining the ME and ECE departments, he was a technical fellow in advanced powertrain systems at the Visteon Corporation. He also worked for Cummins Engine Co. as a technical advisor. Dr. Zhu earned his PhD (1992) in aerospace engineering at Purdue University. His BS and MS degrees (1982 and 1984 respectively) were from Beijing University of Aeronautics and Astronautics in China. His current research interests include closed-loop combustion control, adaptive control, closed-loop system identification, LPV control of automotive systems, hybrid powertrain control and optimization, and thermoelectric generator management system. Dr. Zhu has over 30 years of experience related to control theory and applications. He has authored or co-authored more than 140 refereed technical papers and received 40 US patents. He was an associate editor for ASME Journal of Dynamic Systems, Measurement and Control and a member of editorial board of International Journal of Powertrain. Dr. Zhu is a Fellow of SAE and ASME.

Dr. Satyendra Rana, Visiting Professor and founding CoDirector of the Big Data & Business Analytics Group, Wayne State University, College of Engineering, Detroit, Michigan

"Getting arms around Big Data with Systems Thinking"

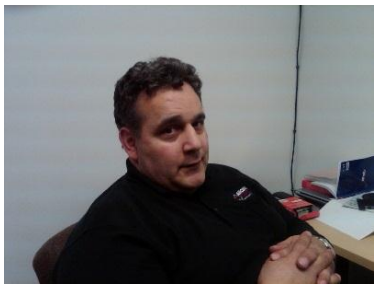
Abstract of Presentation: Whether we like it or not, we are all deluged with data. Furthermore, we are obligated to respond to concerns and hopes that accompany data deluge. This talk will describe a systems thinking based framework to get arms around Big Data. This framework serves as a guidance system to make the most out of Big Data efforts regardless of Big Data maturity level or role or whether the context is that of an individual or an organization.

Satyendra Rana is a Visiting Professor and founding Co-Director of the Big Data & Business Analytics Group in the College of Engineering at Wayne State University in Detroit, Michigan

He is an award winning entrepreneur and a veteran of the information technology industry with over 30 years of IT experience in various capacities. Dr. Rana brings a unique perspective and expertise that spans technology strategy development, global program implementations, customer relationships, business process innovation, enterprise architectures, IT governance, executive leadership, entrepreneurship, and academia and research. The companies founded by him have won many awards including a company of the year award by National Business Incubators Association of America. As a former educator and researcher in Computer Science, Dr. Rana supervised over 10 doctoral students and 50 masters dissertations on various topics in Computer Science, published over 50 articles in international journals and conferences, organized conferences and sessions, and delivered many invited talks. Because of the diversity and richness of his experience, Dr. Rana has development keen insight into both business and technology perspectives and has an innate ability to align them effectively for achieving business goals by creating viable strategy and efficient implementation paths.

<u>Mr. Albert Ancona,</u> Vice President Operations and Owner of Ancona controls, Inc.

"Reverse Power Flow (RPF)in the SG environment with applications"



Abstract of Presentation: There is an increasing interest with smart grid (SG) preservation within the US and Globally. There are a number of problems associated with future power loading without the use of observing the grid in a SG mentality. It is important that electric supply to customers is optimize and maintain a low cost of operation. One of the problems with SG is the development of Plug in Electric Vehicles (PEV).

The Electric Vehicle Supply Equipment (EVSE) is a concept that will help supplement in the protection of the power infrastructure and shield the network thru smart grid technologies. The grid is a power disbursement network; once it is produced it is consumed immediately. There is no way at this time to hold it economically for a later moment when the demand increases. With the smart grid, we are able to manage it and maintain a level absent from overloading. The demand for power is only going to increase with the push for (PEV). The Government is pushing this as part of the Green initiative, so demand for more power is not going away, it is already here. This is why the EVSE can be an asset that shows promise in giving back.

Albert Ancona is the Vice President Operations and Owner of Ancona Controls Inc.

He has a BSEE from Lawrence Technological University, MSEE from Wayne State University and a PE from the state of Michigan. He also has both Commercial IFR Multi & Single Engine Land Pilot License. He has worked in the field of Power Electronics for the past 15 years and has established a multi-million dollar business base of power protection services.

<u>Mr. Rajkumar Bhojan,</u> Test Architect,Wipro Technologies Detroit,MI, USA

"Cloud based Mobile Application Testing"

Abstract of Presentation:

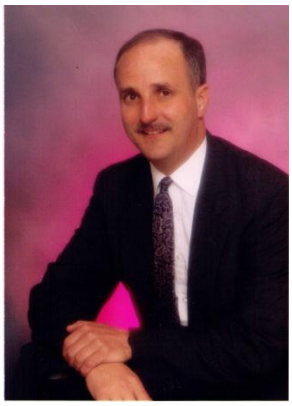
As mobile applications are becoming increasingly sophisticated, they significantly increase the requirement for functional and non-functional tests. Academicians and testing experts have to come up with effective verification techniques to ensure reliability of these mobile applications. One of the ways to test mobile applications is Cloud based mobile application testing which helps to develop and execute automation scripts on real devices. This seminar focuses on mobile testing, multiple/cross device execution and parallel execution.

Rajkumar Bhojan, is a Test Architect, Wipro Technologies Detroit, MI, USA.

He has over 20 years of experience in both IT and Academics. He holds M.Sc., (Phy), MCA, and M.Phil (CS). Currently he is pursuing Ph.D. (Computer Science) from Bharathiar University, India. He has executed IT projects in diverse geographies including India, APAC & USA. He is a Certified Scrum Master and has rich experience in Agile/scrum Methodologies. He is a member in IEEE and ACM.

Mr. Kevin Taylor

Chapter VII Title: IEEE Power & Energy Society Scholarship Plus Program



Abstract: 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 who are interested in power and energy engineering careers.

Speaker Biography: Kevin Taylor been IEEE member since January 2005, and member of IEEE's Power & Energy Society, Industry Applications, Power Electronics, and Industrial Electronics Societies. 2008-2009 IEEE S.E Michigan Section Treasurer, and Current Chairman of IEEE SEM PE/IA technical chapter. Chairman of IEEE Career Work Force Committee, and member at large of IEEE Energy Policy Committee. 2009 IEEE-USA Annual Meeting energy track chair. 2008-2010 IEEE's Power & Energy Society Distinguished Lecturer Coordinator. 2006 Secretary of the IEEE IAS I&CPS Conference. 2011 General Chairman of the IEEE's Power & Energy Society General Meeting Detroit. Chairman of the 2012 IEEE Metro Detroit Area Workshop. 2008 IEEE-USA Professional Achievement Award for an Individual and 2010 IEEE-USA Professional Achievement Award. Member of IEEE Power & Energy Society Scholarship Plus Program committee. Bachelors of Science Degree with Major in Chemistry; Oakland University, Rochester Michigan.

Mr. Rich Scholer

Topic: Electric Vehicle Charging

Abstract of Presentation:

This presentation is intended to identify the requirements and progress on Plug-in Electric Vehicle (PEV) charging. It will provide an overview of the current Utility Grid and incites on how this will evolve as the population of PEVs continue to expand.

Discussions will include existing tools the Utilities employ to customers and how we have added new ones to our standards that are being demonstrated for effectiveness. Combining these will provide a seamless approach for these additional loads while maintaining the existing Grid distribution and transformer loading.

Rich Scholer received a B.S. degree in mechanical engineering from Purdue University, then later in electrical engineering from Lawrence Tech University and a M.S. degree is in electrical engineering from Wayne State University. He has 40 years of electrical system design with the last 22 years designing Electric, Hybrid, Fuel Cell and Plug-in Hybrid vehicles. Previous experience includes 13 years with Heavy & Medium duty trucks plus 10 years on military wheeled and tracked vehicles and communication equipment for both ground and airborne vehicles.

He is also Chair of the SAE J2836™/J2847/J2931/J2953 Task Force for communication between Plug-In Vehicles and the Utility Grid. Active member of the Hybrid Committee & J1772™ Task Force along with the Fuel Cell Committee and Fuel Cell Vehicle Safety Task Forces. Member of ISO/TC 22/SC3/JWG communication task force to harmonize SAE standards with ISO/IEC.