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CECS eNEWS



Center for Embedded and Cyber-physical Systems, University of California, Irvine

CECS Director Kurdahi named Associate Dean

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CECS Director and Computer Science and Electrical Engineering Professor Fadi Kurdahi has agreed to serve as the inaugural Associate Dean for Graduate and Professional Studies for the Henri Samueli School of Engineering. In his new role, Kurdahi will oversee policies and procedures for graduate and professional student education and supporting the school's strategic goals, recruitment, and establishing self-supporting and certification programs.

As CECS Director, Kurdahi was instrumental in developing a new master's degree program in Embedded and Cyber-Physical Systems that is set to begin in the Fall of 2017. In addition, has directed or co-directed several multiyear programs with Saudi Arabia, France and Korea. He has served as a consultant for the United Nations Development Program and has collaborated with researchers and educators from around the world. He is a Fellow of the Institute of Electrical and Electronics Engineers (IEEE) and a recipient of multiple best paper awards.

Kurdahi received his PhD from the University of Southern California in 1987. Since then, he has been a faculty at the Department of Electrical & Computer Engineering at UCI, where he conducts research in the areas of Computer Aided Design of VLSI circuits, high-level synthesis, and design methodology of large scale systems.

His primary research interests are in design and automation of system-on-chip reconfigurable computing and the applications of cyber-physical systems to sustainability.

Congratulations Professor Kurdahi!

Awards and Honors

CECS Professor Amiri Sani awarded NSF Grants

CECS affiliated Professor Ardalan Amiri Sani has been awarded two National Science Foundation grants for his research totaling almost \$750,000. For his first proposal, “Enhancing the Security and Performance of GPU Access in Web Browsers” , Amiri Sani intends to work on developing system techniques to improve the security of GPU-based graphics for web applications, and mitigating performance issues that may arise.

The second project, “Taming Mobile Hardware & OS Diversity for comprehensive software Analysis” is a joint project between Amiri Sani’s team and UC Riverside researchers detailing the problem of Android OS’s on hand-held devices. This project aims to improve the quality and security of software on mobile systems by utilizing a cloud-based mobile farm service by leveraging virtual machines running on servers to provide a lower cost to providers and in turn, lower prices for users.

Amiri Sani joined the CS department at UC Irvine in July 2015. His primary research involves building efficient and trustworthy systems and he enjoys solving operating system problems related to both mobile devices and datacenters.



National Science Foundation
WHERE DISCOVERIES BEGIN



Tsudik’s research paper featured in February issue of CACM

CECS faculty, Chancellor's Professor Gene Tsudik’s biometrics security research paper was featured in the February issue of *Communications of the ACM* (CACM). The featured paper titled “Authentication Using Pulse-Response Biometrics” originally appeared at the 2014 Network and Distributed System Security Symposium proposing a new biometric based on the human body’s response to an electric square pulse signal and how it can be utilized to bolster security.

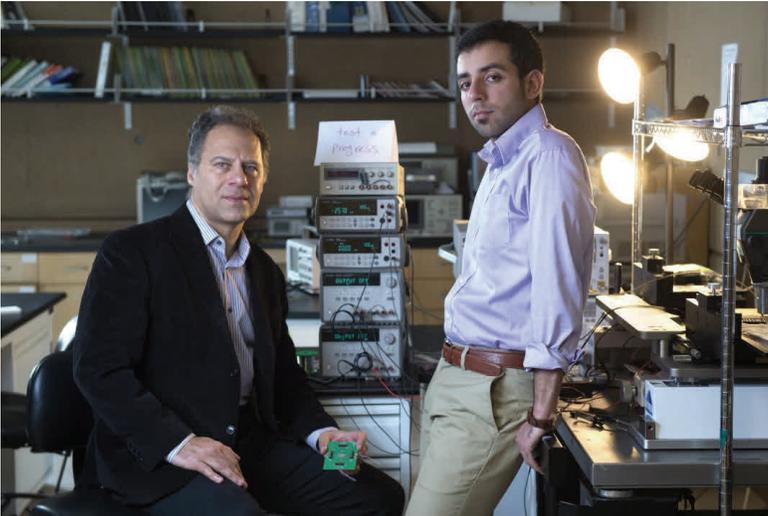
CACM is the monthly flagship publication of the Association for Computing Machinery circulated to over 90,000 ACM members.



COMMUNICATIONS
OF THE
ACM

Awards (cont.) and Visitor Profile

NCIC Labs have developed a novel sub-terahertz radiator



In February, CECS professor Payam Heydari (left) of electrical engineering & computer science and grad student researcher Peyman Nazari unveiled a novel sub-terahertz radiator with highest efficiency and radiated power that may have widespread applications.

The Nanoscale Communication IC lab engineers who developed this new device revealed that tests in their lab have revealed it to have the highest efficiency ever recorded out of a radiating element while exhibiting the

lowest interference from other sources of radiation. Peyman Nazari, designed the device as an octagonal semiconductor chip with a unique cavity structure that allows for the emission of circularly polarized radiation. Most transmitters now generate linearly polarized signals, which can get “lost” when antennas and receivers are out of alignment.

Heydari said his group’s invention will be particularly beneficial in biomedical applications, as it will give doctors a way to differentiate tumor masses from healthy tissue. It could also be used in genomic research, equipping scientists with an instrument that can be so precisely tuned as to enable the excitation, or lighting up, of individual proteins.

Visitor Profile—Yonghui Xu



Yonghui Xu is an Assistant Professor from Harbin Institute of Technology (HIT) in China. Xu earned his Ph.D in Signal and Information Processing with an emphasis on Image Processing.

Dr. Xu was a senior researcher with Automatic Test and Control Laboratory, School of Electrical Engineering and Automation, HIT, since 2002. He hosted more than 10 research projects supported by the Chinese government. Now he is a team leader managing image processing, audio processing and automatic test technology, supported by research funds of four million per year.

Dr Xu received financial support from China Scholarship Council (CSC) to pursue further research in the USA as a visiting scholar from Oct 2016 to Oct 2017. At the present, he is collaborating with Professor Kurdahi’s research group on image processing on the topic of irrigation system in the Center for Embedded and Cyber-Physical Systems, UCI.

Conferences and Events

Graduate Student Presentation at ASP-DAC 2017

The 22nd Asia and South Pacific Design Automation Conference 2017 took place on January 16th to January 19th in Chiba/Tokyo, Japan. ASP-DAC 2017 is the twenty-second annual international conference on VLSI design automation in Asia and South Pacific region, one of the most active regions of design and fabrication of silicon chips in the world.

Graduate student Tim Schmidt presented a research paper entitled, "Hybrid analysis of SystemC models for fast and accurate parallel simulation." The paper proposes a solution for a fast and reliable parallel SystemC simulation that overcomes the pertaining limitations of a) all the source code must be available and b) the entire design must be statically analyzable. Their results revealed a promising 100% accuracy in execution and also a speedup of 6.39× for a Network-on-Chip particle simulator.



Northrop Grumman Corporation Meet and Greet

CECS faculty in cooperation with the Northrop Grumman Corporation held a meet and greet with students on January 24th. Professor Nikil Dutt hosted the welcoming introducing the CECS research portfolio and addressing NGC's areas of interests. Key representatives of NGC John C. Lee (Software Manager), Bill Sebring (Snr. Engineer), Prakash Sarathy (Senior Program Manager) and CECS Professors met with students to discuss research and career goals offering valuable advice for the future. This engagement event provided a great opportunity for students to meet with professionals and spur interest in research, career, and internship prospects.

NORTHROP GRUMMAN

CECS Lectures and Seminars

CECS Seminar—Francesco Regazzoni

On February 1st, 2017, Professor Nikil Dutt hosted a CECS Seminar featuring guest speaker Dr. Francesco Regazzoni from the ALaRI Institute in Lugano, Switzerland. The talk was titled “Low Energy, a New Trend for Lightweight Cryptography” and detailed the several approaches for reducing the energy consumption of existing block ciphers. It also touched on the design space of the AES algorithm to which few algorithmic optimizations are applied and also the design of Midori, the first block cipher designed to optimize the energy consumed per bit in encryption of decryption operation.



Dr. Francesco Regazzoni is a senior researcher at the ALaRI Institute of Università della Svizzera italiana (Lugano, Switzerland). He received his Master of Science degree from Politecnico di Milano and his PhD degree at the ALaRI Institute. He was an assistant researcher at the Université catholique de Louvain and Technical University of Delft, and visiting researcher at several institutions, including NEC Labs America, Ruhr University of Bochum, EPFL, and NTU Singapore.

His research interests are mainly focused on embedded systems security, covering in particular side channel attacks, electronic design automation for security, hardware Trojans, low energy cryptography, and post quantum security. He has published more than 70 journal and conference papers in the area of security and design automation, and has been in the technical program committee of top conferences of the area. Francesco is the principal investigator and project leader at the Università della Svizzera italiana for the projects SAFECrypto (exploring lattice-based constructions as building blocks for quantum resistant cryptography) and CERBERO (design tools for Cyber-Physical Systems).



CECS Lectures and Seminars

PhD Defense—Wael Elsharkasy

On February 15th, 2017, graduate student Wael Elsharkasy, pictured fourth from the left, conducted his PhD Defense titled “Low Power Reliable Design using Pulsed Latch Circuits”. He was advised by Prof. Fadi Kurdahi and Prof. Ahmed Eltawil. The committee overseeing the defense included Elsharkasy’s advisors and Prof. Rainer Doemer.

Elsharkasy’s thesis proposed a methodology to study the reliability of pulsed latches using it to evaluate the effect of PVT variations on their behavior. In addition, novel approaches to enhance the reliability of pulsed latches without

significant degradation in performance, area or power are presented. According to the presented results, the proposed implementation is proved to highly reduce the significant overhead in area, power and latency associated with the traditional way of designing multiport register files.



Elsharkasy received his Bachelors of Science and Masters of Science at Alexandria University, Egypt. He received his Doctor of Philosophy in Electrical and Computer Engineering here at UCI. He was an intern at Broadcom as well as ClariPhy Communications. At present, Elsharkasy is now employed as a Staff Engineer for the Inphi Corporation in Irvine.



Publications

Publications

The following papers were published by CECS affiliates from Jan 2017 through Mar 2017 (and unreported papers from previous eNews).

- | Author, Title, Publication | Conference Proceedings |
|---|------------------------|
| S. Chhetri, J. Wan, M. A. Al Faruque, " Cross-Domain Security of Cyber-Physical Systems ", published in the IEEE/ACM 21st Asia and South Pacific Design Automation Conference (ASP-DAC'17), Tokyo, Japan, January 2017 | |
| Tim Schmidt, Guantao Liu, Rainer Dömer, " Hybrid analysis of SystemC models for fast and accurate parallel simulation ", (ASP-DAC '17): 226-231 | |
| Sabur Baidya, Marco Levorato, " Content-based interference management for video transmission in D2D communications underlying LTE ", (ICNC '17): 144-149 | |
| Zonglin Guo, Ian G. Harris, Yutong Jiang, Lih-feng Tsaur, " An efficient approach to prevent Battery Exhaustion Attack on BLE-based mesh networks ", (ICNC '17): 1-5 | |
| Peizhao Ou and Brian Demsky, " CDSSPEC: Checking Concurrent Data Structures Under the C/C++11 Memory Model ", (PPoPP'17), Austin, Texas, USA, February 2017 | |
| Peyman Nazari, Sam Jafarlou, and Payam Heydari, " A Fundamental Frequency 114GHz Circular-Polarized Radiating Element with 14dBm EIRP, -99.3 dBc/Hz Phase-Noise at 1MHz Offset and 3.7% Peak Efficiency ", IEEE Int'l Solid-State Circuits Conference (ISSCC '17), February 2017 | |
| Brian Ginsburg, Payam Heydari, Piet Wambacq, " Session 17 overview: TX and RX building blocks ", (ISSCC '17), February 2017: 290-291 | |
| Zongheng Ma, Saeed Mirzamohammadi, Ardalan Amiri Sani, " Understanding Sensor Notifications on Mobile Devices ", in Proc. ACM Int. Workshop on Mobile Computing Systems and Applications (HotMobile '17), February 2017. | |
| R. Rudd, R. Skowyra, D. Bigelow, V. Dedhia, Th. Hobson, S. Crane, Ch. Liebchen, P. Larsen, L. Davi, M. Franz, A.-R. Sadeghi, and H. Okhravi, " Address Oblivious Code Reuse: On the Effectiveness of Leakage Resilient Diversity ", accepted for publication in 2017 Network and Distributed System Security Symposium (NDSS '17), San Diego, California; February/March 2017. | |
| Alex D. Edgcomb, Frank Vahid, Roman Lysecky, Susan Lysecky, " Getting Students to Earnestly Do Reading, Studying, and Homework in an Introductory Programming Class ", (SIGCSE '17): 171-176 | |
| S. Chhetri, S. Faezi, M. A. Al Faruque, " Fix the Leak! An Information Leakage Aware Secured Cyber-Physical Manufacturing System ", accepted to be published in the IEEE/ACM Design Automation and Test in Europe (DATE'17), Lausanne, Switzerland, March, 2017. | |

CECS—promoting creativity and pursuing discovery!

Center for Embedded and Cyber-Physical Systems, University of California, Irvine

CECS Mission Statement:

To conduct leading-edge interdisciplinary research in embedded systems emphasizing automotive, communications, and medical applications, and to promote technology and knowledge transfer for the benefit of the individual and society.



CECS eNews

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