Kurdahi and Nassar Receive ASP-DAC 2016 Best Paper

The 21st Asia and South Pacific Design Automation Conference (ASP-DAC 2016) opened on January 25, 2016, in Macao, China. ASP-DAC is an annual international conference on VLSI design automation in Asia and South Pacific regions, one of the most active regions of design and fabrication of silicon chips in the world. The conference aims at providing the Asian and South Pacific CAD/DA and Design community with opportunities of presenting recent advances and with forums for future directions in technologies related to Electronic Design Automation (EDA). CECS Director, Prof. Fadi Kurdahi and his graduate student Ahmed Nassar won the ASP-DAC best paper award for their paper titled, "Lattice-Based Boolean Diagrams: Canonical, Order-Independent Graphical Representations of Boolean Functions".

The paper presents lattice-based Boolean diagrams (LBBDs), a graphical representation of Boolean functions that is not derived from binary decision diagrams (BDDs), as well as symbolic manipulation algorithms. It also identifies a class of Boolean functions where LBBDs are demonstrably more efficient to construct, and reason with, when compared to BDDs. The case studies include ITC99 and MCNC benchmarks, randomly generated cube covers or sum-of-products (SOP) formulas as well as multi-level Boolean formulas. Finally, LBBDs proved to be instrumental to the efficient runtime verification of software over distributed multiprocessor systems.
ASP-DAC Best Paper (cont. from pg 1)

Boolean functions, widely used to describe digital circuits and a large family of problems in computer science, have been successfully represented graphically as binary decision diagrams (BDDs) and its derivatives. This triggered a revolution in logic synthesis, equivalence checking and symbolic model checking. However, Boolean functions lack a universally efficient representation and it is widely believed that none exists. In an attempt to explore the vast Boolean function space beyond the capabilities of BDDs, this paper on Lattice-based Boolean diagrams (LBBDs) proposes a new family of graphical representations by focusing on the lattice structure over Boolean variables. More refined versions of the algorithms and generalizations even beyond Boolean functions are now in the making.

CECS had a successful year at the 2016 Design, Automation & Test in Europe Conference & Exhibition (DATE 2016). The four-day event was held in Dresden, Germany on March 14-18, 2016, with 1400 participants and exhibitors from 50 countries.

For the 19th successive year, DATE is the main European technical event which bringing together designers and design automation users, researchers and vendors, as well as specialists in the hardware and software design, test and manufacturing of electronic circuits and systems. It puts strong emphasis on both ICs/SoCs, reconfigurable hardware and embedded systems, including embedded software.

Congratulations to Prof. Mohammad Al Faruque and his graduate student Korosh Vatapavar for receiving the best paper award for their research, titled "OTEM: Optimized Thermal and Energy management for Hybrid Electrical Storage in Electric Vehicles".
Their paper presents a new technique for optimizing the utilization of the batter/ultracapacitor and the battery temperature in a hybrid vehicle’s system to extend driving range and improve battery life.

More from DATE 2016

CECS-affiliated researcher, Prof. Wolfgang Nebel served on the Executive Committee as the EDAA (European Design and Automation Association) Liaison, and Prof. Yuko Hara-Azumi, who was a CECS visiting scholar from July-December 2010, served as the ASPDAC (Asia and South Pacific Design Automation Conference) Representative. Prof. Nikil Dutt co-chaired the Technical Committee on System Design, High-Level Synthesis and Optimization with Prof. Andreas Herkersdorf from Technical University of Munich.

The following 13 technical papers were accepted and presented by CECS research affiliates:

"ADVOCAT: Automated Deadlock Verification for On-Chip Cache Coherence and Interconnects," Freek Verbeek, Pooria M. Yaghini, Ashkan Eghbal, Nader Bagherzadeh

"PAIS: Parallelization Aware Instruction Scheduling for Improving Soft-Error Reliability of GPU-Based Systems," Haeseung Lee, Hsinchung Chen, Mohammad Abdullah Al Faruque

"Resistive Bloom Filters: From Approximate Membership to Approximate Computing with Bounded Errors," Vahideh Akhlaghi, Abbas Rahimi, Rajesh K. Gupta

"Topza: Mining High-Level Safety Properties from Logic Simulation Traces," Ahmed Nassar, Fadi J. Kurdahi, Salam R. Zantout

"Resitive Configurable Associative Memory for Approximate Computing," Mohsen Imani, Abbas Rahimi, Tajana S. Rosing


"GLAsT: Learning Formal Grammars to Translate Natural Language Specifications into Hardware Assertions," Christopher B. Harris, Ian G. Harris

"Path Selection and Sensor Insertion Flow for Age Monitoring in FPGAs," Mohammad Ebrahimi, Zana Ghaderi, Eli Bozorgzadeh, Zain Navabi

Professor Mohammad Al Faruque's research team has discovered that captured sounds from 3-D printers will allow the reverse engineering of source code, leading to a cyber-security threat to manufactures. Prof. Al Faruque said the emissions produced by 3-D printers are acoustic signals that contain a lot of information, adding: “Initially, we weren’t interested in the security angle, but we realized we were onto something, and we’re seeing interest from other departments at UCI and from various U.S. government agencies.”

Pictured from left to right are graduate student, Sujit Rokka Chhetri, Prof. Al Faruque, and graduate student Jian Wan, with the 3-D printer used in the test. As it moves, the device makes unique sounds that a computer algorithm can recognize and translate into usable code. This research finding has received prominent media coverage and is being followed closely by science publications, which include Newsweek, Los Angeles Times, Science, Communications of the ACM, and Additive Manufacturing. These articles may be found at the following links:

http://www.newsweek.com/stealing-3d-printer-designs-sound-433147
http://science.sciencemag.org/content/352/6282/132.full

This research study, "Cybermanufacturing: Defending Side Channel Attacks in Cyber-Physical Additive Layer Manufacturing Systems," is funded by a cyber-physical systems research grant from the National Science Foundation and is administered by CECS.
CECS Director Fadi Kurdahi hosted the EECS Distinguished Seminar on February 5th with invited speaker, Distinguished Professor Edward A. Lee from UC Berkeley. The title of his talk was "The Internet of Important Things".

In this talk, Prof. Lee analyzed how emerging technologies could translate into better models and better engineering methods for this evolving internet of important things. After the seminar, Prof. Al Faruque gave him a tour of the Advanced Integrated Cyber-Physical Systems (AICPS) lab, and he also met with EECS Chair Kumar Wickramashinghe, CS and EECS Professors Nalini Venkatasubramanian, Payam Heydari, Eli Bozorgzadeh and Nader Bagherzadeh.

Professor Peter Marwedel from the Technical University of Dortmund, Germany visited CECS on February 4-5, 2016.

During his two-day visit, he met with CS and EECS Professors Eli Bozorgzadeh, Pai Chou, Nikil Dutt, Tony Givargis, Ian Haris, Brian Demsky, Ardalan Sani, Harry Xu, Mohammad Al Faruque. He also gave a Mini-Tutorial on the topic of "Cyber-Physical Systems: Opportunities, Problems and (Some) Solutions".

Prof. Marwedel’s visit was hosted by CECS Founding Director, Daniel Gajski.
Khaled N. Salama from King Abdullah University of Science and Technology (KAUST), Saudi Arabia, gave a talk titled, "Energy-Efficient Capacitance-to-Digital Converters for Low-Energy Sensor Nodes," on February 18, 2016, which was hosted by CECS Director Fadi Kurdahi and Prof. Ahmed Eltwail. During the visit, Prof. Salama and Prof. Fadi Kurdahi discussed a collaborative research plan on the topic of, "Deep Neural Network Learning on a Budget using Resistive Associative Processing Accelerators".

Ing-Chao Lin, from National Cheng Kung University, Taiwan gave a talk on "Mitigating BTI-induced Device Degradation: A Circuit and System Perspective", February 8, 2016, which was hosted by Prof. Nikil Dutt.
Professor Yi Li

Visiting scholar from September 2015 to August 2016, hosted by Prof. Fadi Kurdahi. She is an Assistant Professor in the School of Electronic Information Engineering at Tianjin University. She was an intern at Motorola for one year and worked with companies such as ST etc on various projects. Her previous projects included Digital TV Set-Top-Box, Safe transmission System and Voyage Data Recorder etc which has already been used in China. Her former research was the Channel Model and Related Technologies based on Internet of Things. Her main research interests include communication, embedded system and distributed system. Currently she is working with Prof. Fadi Kurdahi and graduate student Davit Hovhannisyn, in collaboration with Dr. Osama Algahtani, the Dean of Salman Bin Abdulaziz University on the project, “Leakage detection in urban water distribution network”.

Eltawil and Krichmar Win Seed Funding

CECS-affiliated researchers, Professor Ahmed Eltawil and Jeffrey Krichmar were among the nineteen winners of the first round of the inaugural Research Seed Funding Program and the Technology Development Innovation Fund, a collaboration of the Office of the UCI Provost, Vice Chancellor for Research, Vice Chancellor for Health Affairs and the University's Applied Innovation Center. Prof. Eltawil was awarded $50,000 for his project on self-interference cancellation in full-duplex system. Prof. Krichmar received $25,000 for his innovation on neuromorphic robot that interacts with people through tactile sensing and bi-directional learning.
Professor Mohammad Al Faruque and his student, Sujit Rokka Chhetri, have received the Distinguished Poster Award in the Network and Distributed System Security (NDSS) Symposium, 2016. They have received this award for their poster “Exploiting Acoustic Side-Channel for Attack on Additive Manufacturing Systems”. NDSS is one of the most influential conferences in the area of security. ISOC NDSS fosters information exchange among researchers and practitioners of network and distributed system security. The target audience includes those interested in practical aspects of network and distributed system security, with a focus on actual system design and implementation. For more information about NDSS, please visit http://www.internetsociety.org/events/ndss-symposium-2016

CECS member, Professor Al Faruque, and Tim Schmidt, a CECS doctoral candidate were recently honored by the Henry Samueli School of Engineering's Engineering Student Council (ECS) for their teaching excellence with the awards of EECS Professor of the Year 2015-16 and EECS Graduate Student of the Year 2015-16, respectively.

These are the only official engineering awards given at UC Irvine which recognize outstanding professors, TAs, and students from each department. The award banquet was held on Friday, February 26th, 2016 at the Newkirk Alumni Center. It is part of the weeklong celebration for National Engineering Week (E-Week) aimed at increasing public awareness and appreciation for the engineering
The following papers were published by CECS affiliates from Jan 2016 through March 2016 (and unreported papers from previous eNews).

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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.

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