CECS at Design Automation Conference ‘05

The latest in design methodologies and Electronic Design Automation (EDA) tool developments are presented each year at the Design Automation Conference. The four day event, held in 2005 at the Anaheim Convention Center in Anaheim, CA from June 13-17, showcases research done by companies and universities world-wide for the advancement of technology related to electricity, silicon solutions, and the development of new tools for designing and producing electronic systems. Research affiliates and graduate students from the Center of Embedded Computer Systems (CECS) at the University of California, Irvine (UCI) presented three technical papers and received two major awards at the 42nd Design Automation Conference.

Papers

The following papers were presented by CECS research affiliates (with the cited pages from the conference proceedings). They discuss dynamic slack reclamation techniques, tools and methods to support design space exploration and specialization of embedded computing systems, floorplan-aware synthesis of communication architectures, and new ideas for energy management in a wide variety of scenarios, respectively.

- **Dynamic Slack Reclamation with Procrastination Scheduling in Real-Time Embedded Systems**, Ravindara Jejurikar, pp. 111-116
- **Floorplan-Aware Automated Synthesis of Bus-based Communication Architectures**, Sudeep Pasricha, Nikil Dutt, and Elaheh Bozorgzadeh, pp. 565-570
- **Application/Architecture Power Co-Optimization for Embedded Systems Powered by Renewable Sources**, Dexin Li and Pai H. Chou, pp.618-623

Awards

- **IEEE Circuits & Systems Society 2005 Darlington Award**
  Payam Heydari for his Analysis of the PLL Jitter Due to Power/Ground and Substrate Noise
- **2005 IEEE Fellows**
  Fadi Joseph Kurdahi for his contributions to design automation of digital systems and to reconfigurable computing.

Committees

- **Technical Program Committee**
  Professor Pai Chou

CECS Grads Awarded Nicholas Fellowship

The Henry T. Nicholas, III Research Fellowship has been awarded to CECS graduate students Keun-sik No and Pramod Chandraiah for the 2005-2006 academic year. The prize is administered by the California Institute for Telecommunications and Information Technology (Cal-IT2) and is funded by The Nicholas Foundation, an organization committed to enhancing quality of life by providing grants to non-profit organizations. This

Continued on page 2
Dr. Dirk Jansen hails from the University of Offenburg in the south of Germany and has been on sabbatical at UC Irvine since 18 March 2005 researching System-on-Chip design and production. His research will aid in building more efficient systems that can be housed on smaller and smaller chips, which will eventually lead to better product design and a fluency in system to system compatibility.

“It's an ongoing, scientific relationship,” Dr. Jansen says of his connection with CECS at UC Irvine. The relationship was bridged five years ago when Dr. Jansen was invited to UCI to participate in researching SW/HW co-design for medical applications; the hospitality with which he was received at the university then fostered the friendly relations that exist informally between the University of Offenburg and UC Irvine now. “I would come back every year if that was the situation,” Dr. Jensen says of UC Irvine, “Irvine is a great place for living, a great place for research too.”

During his stay here, Dr. Jansen has made some significant advantages in the field of compiler design for small embedded systems and has enjoyed discussing his interests with people working in similar fields. He spoke at a seminar on Friday, July 22, about the systems his research has aided CECS in developing, the graphical representation of complex behavioral systems, and about the way the average compiler is designed. Dr. Jansen has enjoyed his stay at CECS and is very thankful for the kindness and hospitality that the department and the university have shown him.
COMMEX: SoC Communication Architecture Modeling, Exploration and Synthesis

Communication architectures are responsible for supporting the ever-increasing data traffic in modern embedded systems. They form a backbone in these designs through which processors, memories and other system components are inter-connected and act cohesively to fulfill application requirements. Most importantly, communication architectures have an enormous impact on the performance, cost and time-to-market of embedded systems, which makes them a very relevant topic in embedded systems research.

The COMMEX project was started back in the summer of 2003 in Professor Dutt’s laboratory, with Sudeep Pasricha as the lead researcher collaborating with Conexant Inc. The primary objective of the collaboration was to model and explore bus-based communication architectures, such as the ARM AMBA bus architecture. Early work in this project dealt with creating a convenient modeling abstraction to capture embedded systems for the purpose of communication architecture exploration. The result of this work was the development of a new modeling abstraction model called CCATB, presented at the DAC 2004 and CODES-ISSS 2004 conferences. This new development allowed designers to capture an embedded system design with a high level language quickly, accurately, and with faster simulation performance than existing abstractions used for communication architecture exploration. Subsequently, Dutt’s and Pasricha’s work evolved to look at the problem of generation (or synthesis) of bus-based communication architectures. The two CECS affiliates presented a comprehensive, fully automated bus-architecture synthesis approach at ASPDAC 2005, which intelligently pruned the design space to generate bus architecture topology and parameter values in a matter of a few hours, instead of the days or even weeks it would normally take for the enormous exploration space created in the complex embedded systems of today.

A major project milestone was the development of the FABSYN methodology, which not only automated hierarchical bus-based communication architecture synthesis, but also made the process physical implementation aware. Bus cycle timing violations, which are an artifact of deep submicron effects caused by shrinking process technology, are normally detected during the physical implementation phase of the design and can take several weeks or even months to detect and eliminate. FABSYN enabled the detection and elimination of bus-cycle timing violations early in the design flow, thus drastically cutting down design time of modern embedded designs. FABSYN was presented and received a Best Paper Award Nomination at DAC 2005.

This research project illustrates the cut-
The International Embedded Systems Symposium (IESS) 2005, sponsored by the International Federation for Information Processing (IFIP), was held in Manaus, Brazil, from August 15 to 17, 2005. The conference theme addressed issues on the specification, design, and validation of embedded systems, including modeling, synthesis, and architectures for dependability and reconfigurability. This year the focus of IESS was on automotive applications emphasizing safety, reliability, and functionality. The symposium included 30 papers in 10 sessions presented by speakers from four continents and covering a wide variety of topics ranging from software via hardware to mechatronics.

After a 30 hour trip by plane, bus, and boat Gunar and I reached the conference location, the Ariau Amazon Towers Hotel. We had the opportunity to see sneaky snakes, huge bugs and beetles, freely flying parrots, and monkeys stealing food from tourists. We also went crocodile hunting where, after an hour of canoeing in the dark, we caught a caiman, one of the smaller reptiles in the Amazon region.

In summary, we have presented 3 papers, chaired 2 technical sessions, and received 1 best paper award.

Finally, mark your calendars for the next IESS which will be organized by CECS and is planned to take place in Irvine, California, in 2007.

Submitted by Rainer Doemer and Gunar Schirner

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**Papers Presented**

"Abstract Communication Modeling: A Case Study Using the CAN Automotive Bus", G. Schirner, R. Dömer


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**Project Profile, continued from page 3**

Ting-edge research being conducted by the Architectures and Compilers for Embedded Systems (ACES) labs as part of the Center for Embedded Computer Systems (CECS), together with funding from a CPCC, UC Micro and SRC. To keep up to date with the latest developments in the COMMEX project, track their web site at [http://www.cecs.uci.edu/~aces](http://www.cecs.uci.edu/~aces). For questions, comments or feedback on the project, send email to sudeep@cecs.uci.edu
The following were published by CECS faculty affiliates from June 1, 2005 to September 30, 2005

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<th>Focus</th>
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<td><strong>NISC Technology</strong></td>
<td>&quot;NISC Technology and Preliminary Results&quot;, M. Reshadi, B. Gorjiara, and D. Gajski, UCI CECS Technical Report 05-11, August 2005</td>
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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.

CECS Research Advisory Board

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CECS would like to say good bye to Bob Larsen. Bob diligently put out the CECS eNews and contributed to this column for the duration of his time with CECS; he retired from CECS in June of 2005 and is now raising his eleven year old grandson, Matthew.

Bob was a CECS member for close to a decade and a Rockwell Fellow prior to that. He is spoken of most highly in the department and is wished a happy and cheerful retirement from his friends and colleagues at CECS.

Sudeep Pasricha will be carrying on Bob’s column. Sudeep Pasricha is a fourth year graduate student affiliated with the Center for Embedded Computer Systems. He has written several articles for computer magazines in the past, and is currently a regular contributor to an online gaming magazine. He is especially interested in the more glamorous side of embedded systems - mp3 players, digital cameras, cell phones, portable gaming devices and any other sleek and shiny new gadgets he comes across during his regular sojourns to Gmodo or Engadget. He looks forward to contributing to the CECS newsletter.