CECS eNEWS

Gabor Madl wins 2008 Frank Anger Memorial Award.

Gabor Madl, a CECS graduate student pursuing a PhD in Computer Science, received the 2008 ACM SIGBED/SIGSOFT Frank Anger Memorial Award at the 2007 Embedded Systems Week Conference held in Salzburg, Austria. This award recognizes one student researcher from each of the professional societies (ACM SIG-BED and ACM SIGSOFT), promoting the crossover of ideas between the embedded software and software engineering research communities. Gabor's research focuses on applying formal methods to enable analysis and evaluation of embedded computer systems.

Highlights

- Gabor Madl wins Frank Anger Award

- CECS papers praised

- Nikil Dutt selected as ACM Distinguished Scientist

- CECS Open House

Two CECS Papers Acclaimed Decade's Most Influential

The Design, Automation and Test in Europe (DATE) conference celebrated in 2007 its tenth anniversary. As a tribute to the chip and system-level design and design technology community, a compilation of most influential papers from the past 10 years of DATE conference is being published. Two papers by CECS researchers were chosen in the filed of System Level Design while the introduction has been written Prof. Daniel Gajski, the director of CECS. The papers chosen are "EXPRESSION: A language for architecture exploration through compiler/ simulator retargetability" published by A.Halambi et al. in 1999 and "RTOS Modeling For System Level Design" by A.Gerstlauer et al. in 2003. "This provides an excellent historical overview

Nikil Dutt selected as an ACM Distinguished Scientist

CECS affiliate Prof. Nikil Dutt has been selected as an ACM distinguished scientist for the year 2007. The ACM Distinguished Scientist recognizes members that have made significant accomplishments or achieved a significant impact on the computing field. Nikil D. Dutt is a Chancellor's Professor at the University of California, Irvine. Professor Dutt's research interests are in embedded systems, electronic design automation, computer architecture, optimizing compilers, system specification techniques, and distributed systems. Professor Dutt currently serves as Editor-in-Chief of A C M
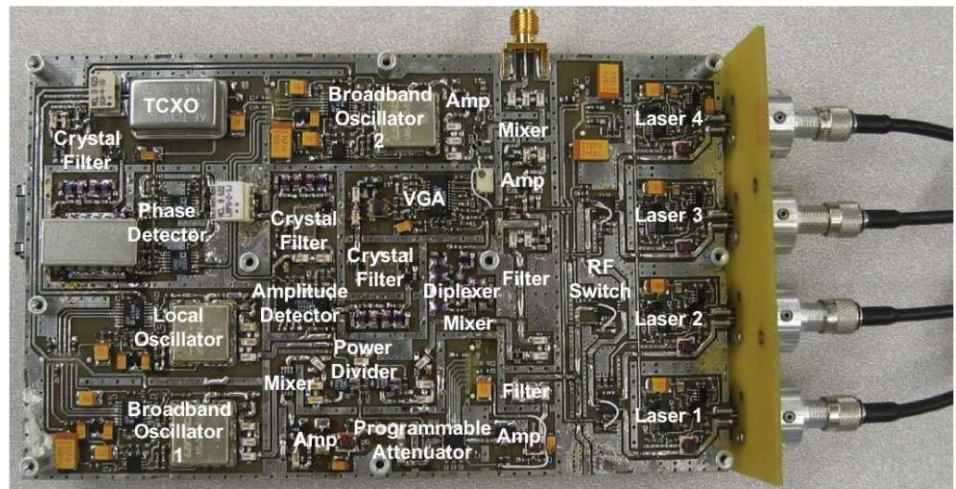
PROJECT PROFILE

HBS: a Handheld Non-invasive Breast Cancer Detector

The goal of the HBS project is to build a miniature non-invasive breast cancer detector based on the principles of Frequency Domain Photon Migration (FDPM). Previously, researchers at the Beckman Laser Institute (BLI), UCI, have constructed an FDPM instrument called the Laser Breast Scanner (LBS). The LBS has uses near-infrared light and is thus non-invasive. However, the LBS is large, bulky, expensive, and consumes high power.

Both the LBS and HBS emit broadband modulated, near-infrared laser light into the tissue and measures backscattered light. Specifically, it measures the amplitude and phase shift relative to a reference signal. To achieve miniaturization, the HBS exploits new off-the-shelf components for broadband communication and optics. This system incorporates not only traditional homodyne and heterodyne techniques, but also novel circuitry to enhance sensitivity, selectivity, and performance.

The HBS has been evaluated and shown to match the accuracy of the LBS as a gold reference. A wide range of solid and liquid phantoms with known optical properties has been tested with the HBS for calibration and for validation. More recently, the HBS was used in clinical trial on a real patient. It clearly and accurately identifies the cancer tumor that is several centimeters below surface.

The HBS is making several important contributions. For about 1/100 the cost of the LBS, the HBS achieves accurate results that are within 4% from the LBS. More importantly, the entire HBS system is small and can be battery powered, making it much easier to transport between medical sites. The low cost and portability means it may make its way into individual homes for self monitoring. More importantly, the fast speed and networking capabilities of the HBS are making it an ideal platform for the next generation of new medical devices.

Welcome New Students!

CECS has always attracted the finest talent from around the world. This Fall quarter five new students joined CECS. We extend our hearty welcome to them.

- **Arup Chakraborthy,** from India, received his masters degree from IIT Bombay and has three years of industry experience. He is pursuing his Ph. D. with Prof. Nikil Dutt. His research interests are computer architecture, embedded systems and performance analysis.

- **Weiwei Chen,** from China, is working on her Ph. D. with Prof. Rainer Doemer. Her areas of interest are system-level design and embedded systems research.

- **Jesse Dannenbring** received her bachelors degree from the University of Washington. She is pursuing her masters degree with Prof. Nikil Dutt

- **Siwen Sun,** from China, is pursuing his Ph. D with Prof. Rainer Doemer. His research interests are system-level design and embedded systems.

- **Bin Zhang,** also from China, is working on his Ph.D with Prof. Rainer Doemer. His areas of interest are embedded systems research and system-level design.

CECS Open House Welcomes New Grads in New Office

This year's welcome event for our new graduate students served a dual purpose. We all had the opportunity to meet and mingle during an open house for the new CECS offices! The new administration office in 2010 AIRB served as a warm and welcoming space for faculty, students, staff and visitors to enjoy good food and good company.

Intern Experience - Aseem Gupta

This summer I went for my internship to Freescale Semiconductor in Austin, TX. I was working in their Technology Solutions Organization (TSO).The internship provided me with the opportunity to research on Temperature Aware Design of SoCs. Close interaction with industry people is very helpful in identifying research challenges. My mentors at Freescale Semiconductor were Dr. Magdy Abadir and Dr. Kamal Khouri. We also had regular teleconference meetings with Prof. Nikil Dutt and Prof. Fadi Kurdahi who are my advisors. We explored at the problem of reliability of interconnects. The interconnect reliability decreases exponentially with temperature. A major cause for interconnect failure is electro-migration which is the transport of material caused by the gradual movement of the ions in a conductor due to the momentum transfer between conducting electrons and diffusing metal atoms. An interconnect designed to have a mean time to failure of 5 years at 50 degree Celsius will have an expected lifetime of only 20 days at 100 degree Celsius. We proposed doing

global routing of interconnects so that we can minimize the number of interconnects in the hot regions of the chip. On this work our paper titled "TAGORE - Thermal Aware Global Routing of VLSI Chips for Enhanced Reliability" has been accepted at International Symposium Quality Electronic Design 2008 (ISQED-2008).

Apart from research, the Freescale internship experience has been valuable to learn about the American corporate culture. Interns are
encouraged to attend various group meetings. The TSO group in Freescale is responsible for developing EDA tools for in-house use. I learned how much thought and consideration about cost and benefits goes behind tool development.

Visitor Profile

Shinichi Shibahara is visiting CECS for one year, starting September 2007. He is from Renesas Technology Corporation, a merger between Hitachi, Ltd. and Mitsubishi Electric Corp.'s Semiconductor Division established in 2003. He is studying system level design and design methods for MPSoC considering performance and power consumption. At Reneses, their team is currently starting to use system level design. "I hope to develop an efficient development method to incorporate into our design flow" says Shinichi.

Shinichi acquired a masters degree from Osaka University in 2000. While in the university, he studied under Prof. Takeuchi, who also ia CECS visitor in the past. After graduation, he joined Hitachi Ltd. and developed H8 Series (8/16/32-bit Micro-controller) and SH-X Series (32-bit Micro-processor) CPU Core for SoCs. Especially, he was working on specification consideration, RTL design, and verification.

Shinchi says, "I'm very proud of studying with Prof. Dutt and his lab members. I'm always surprised that everyone is highly motivated and energetic. Also, discussion in the meeting (even in group lunch) is very active. Moreover, everyone is so kind (and friendly) that everyone helps me while in trouble at all times. I'm trying to get skills from them during my stay in UCI."

Apart from research Shicnichi enjoys visiting places and experience different cultures. "I got excited by seeing a series of beautiful coasts and great mountains every time I drove. Also, I'm enjoying American culture and nationality which Japanese doesn't have. Each family has a party and decolates illuminations outside every event like Halloween, Thanksgiving, and Christmas. I realized a melting pod; I can experience many cultures in one place."

PUBLICATIONS

The following papers were published by CECS affiliates during Fall 2007 quarter

Focus	Title, Author, Publication
Performance Analysis	Alex Nicolau, Arun Kejariwal, Xinmin Tian, Milind Girkar, Wei Li, Sergey Kozhukhov, Utpal Banerjee, Alexander V. Veidenbaum, Constantine D. Polychronopoulos, "Tight analysis of the performance potential of thread speculation using spec CPU 2006", Proc. PPOPP 2007: 215-225, June 2007.
Algorithms	Alex Nicolau, P.D'Alberto, "Adaptive Strassen's Matrix Multiplication", Proc. ACM 21th International Conference on Supercomputing, June 2007.
Vision Systems	A Brain Derived Vision System Accelerated by FPGAs. Alex Nicolau, Furlong, J., A. Felch, J. Nageswaran, N. Dutt, A. Veidenbaum, A. Chandrashekar, and R. Granger). Proc. ParaFPGA: Parallel Computing with FPGA's, September 4-7, 2007.
Java Compilation	A Simplified Java Bytecode Compilation System for Resource-Constrained Embedded Processors, Alex Nicolau, Carmen Badea, Alexander V. Veidenbaum, Proc. IEEE CASES'07, Salzburg, Austria September 30–October 3, 2007.
Cache Performance	Using a Way Cache to Improve Performance of Set-Associate Caches, Alex Nicolau, D. Nicolaescu & A. Veidenbaum, 6th International Symposium on High Performance Computing (ISHPC-VI), Lecture Notes on Computer Science, Springer Verlag Pub. (to appear) October 2007.
Cache Power Consumptions	Reducing Power Consumption in Peripheral Circuits of L2 caches, Houman Homayoun and Alexander V. Veidenbaum. Proc. IEEE Intl. Conference on Computer Design, Lake Tahoe, Oct. 2007
UWB Receivers	"A Current-Equalized Distributed Receiver Front-End for UWB Direct Conversion Receivers," Aminghasem Safarian, Lei Zhou, and Payam Heydari, IEEE Custom Integrated Circuits Conference (CICC), Sept. 2007
UWB Pulse-Radars	"A CMOS 22-29GHz Receiver Front-End for UWB Automotive Pulse-Radars," Vipul Jain, Sriramkumar Sundararaman, and Payam Heydari, IEEE Custom Integrated Circuits Conference (CICC), Sept. 2007
Bandwidthe enhancement	"A Synthesis-based Bandwidth Enhancing Technique for CML Buffers/Amplifiers," Deyi Pi, Byung-Kwan Chun, and Payam Heydari, IEEE Custom Integrated Circuits Conference (CICC), Sept. 2007 [nominated for Best Paper Award]
Varactor-Less LC-VCO	Deyi Pi, Byung-Kwan Chun, and Payam Heydari, "A 2.5-3.2GHz Continuously-Tuned Varactor-Less LC-VCO," IEEE Asian Solid-State Circuits Conference (A-SSCS), Nov. 2007
Brain-Derived Algorithms	J. Furlong, A. Felch, J. Moorkanikara, N. Dutt, A. Nicolau, A. Veidenbaum, A. Chandrashekar, R. Granger, "Novel Brain-Derived Algorithms Scale Linearly with Number of Processing Elements," Proceedings of the 2007 Symposium on Parallel Computing with FPGA's (ParaFPGA), Juelich, Germany, September 2007.
Memory Layout	D.Cho, I. Issenin, N.D. Dutt, and Y. Paek, "Software Controlled Memory Layout Reorganization for Irregular Array Access Patterns," Proc. Of the 2007 International Conference on Compilers, Architectures and Synthesis for Embedded Systems (CASES-2007), Salzburg, Austria, October 2007.

Fall Quarter Publications

Distributed Real-Time Systems
G. Madl, S. Abdelwahed, and N. Dutt, "Performance Estimation of Distributed Real-time Embedded Systems by Discrete Event Simulations," Proceedings of the 7th Annual ACM Conference on Embedded Software(EMSOFT'07) , October 2007.

Formal Verification
M. Kim, M. Stehr, C. Talcott, N. Dutt and N. Venkatasubramanian, "Combining Formal Verification with Observed System Execution Behavior to Tune System Parameters," Proceedings of the 5th International Conference on Formal Modelling and Analysis of Timed Systems (FORMATS'07), Salzburg, Austria, October 2007.

Power Estimation
Y. Park, S. Pasricha, F.J. Kurdahi, N. Dutt, "System Level Power Estimation Methodology with H.264 Decoder Prediction IP Case Study," International Conference on Computer Design (ICCD 2007), Lake Tahoe, October 2007.

Definitvie MPSoc Models
P. Chandraiah, R. Dömer: "Pointer Re-coding for Creating Definitive MPSoC Models",Proceedings of the International Conference on Hardware/Software Codesign and System Synthesis, Salzburg, Austria, September 2007.

MPSoc: Comm. Architecture
S. Pasricha, N. Dutt, M. Ben-Romdhane, "BMSYN: Bus Matrix Communication Architecture Synthesis for MPSoC", IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems, (TCAD), vol.26, no.8, pp.1454-1464, Aug 2007

MPSoC Design
Yu, L. & Abdi, S. Automatic TLM Generation for C-Based MPSoC Design Proceedings of the 2007 IEEE International High-Level Design, Validation and Test Workshop, November 2007

Optimization of Nanocoded IPs
B. Gorjiara, D. Gajski, "A Novel Profile-Driven Technique for Simultaneous Power and Code-size Optimization of Nanocoded IPs", International Conference on Computer Design (ICCD), October 2007.

Intern Experience - Aseem Gupta

There were a total of about 25 interns from different universities. Freescale organized intern events on a fortnight basis. On one of these events, we went to Lake Austin on a party barge. Austin includes a mix of university professors, students (from UT-Austin), politicians (it is the state capital), lobbyists, musicians, state employees, high-tech workers, blue-collar workers, and white-collar workers. The city is home to enough large sites of major technology corporations to have earned it the nickname 'Silicon Hills'. Austin is also known as 'The Live Music Capital of the World', a reference to its status as home to many musicians and music venues. We attended some shows by popular local bands. In summary, this summer was a good mix of research and fun!

CECS Papers Acclaimed Most Influential

of the evolution of a domain that contributed substantially to the growth and competitiveness of the circuit electronics and systems industry" say the DATE 2007 committee. This book is published through Springer and will be available for purchase in March 2008. (ISBN: 978-1-4020-6487-6)

Nikil Dutt ACM Distinguished Scientist

Transactions on Design Automation of Electronic Systems (TODAES) and as Associate Editor of ACM Transactions on Embedded Computer Systems (TECS) and of IEEE Transactions on VLSI Systems (TVLSI). He coauthored five books including "SPARK: A Parallelizing Approach to the High-Level Synthesis of Digital Circuits", Kluwer Academic Publishers, 2004, and "Functional Validation of Programmable Embedded Architectures: A Top-Down Approach", Springer-Verlag, 2005.

CECS—*promoting creativity and pursuing discovery!*

Center for Embedded Computer Systems, University of California, Irvine

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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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CECS Welcomes New Director of Development

Hideo (Mike) Sato

Hideo (Mike) Sato has been appointed to the position of Director of Development for CECS. His responsibilities include building new relationships with industry and government agencies to promote our technologies and support our research. Mike has a BS in Computer Science and an MBA with concentration in Information Systems from Webster University. He is a retired Marine Officer with a varied background who specialized in computer systems, application development, and telecommunications. His last position was Director of Information Systems for a company in Huntington Beach, CA. We are very happy to welcome Mike to CECS and UCI!

Congratulations Prof. Dutt !

Professor Nikil Dutt has been elevated to the member grade of Fellow, by the IEEE Computer Society. This honor is reserved for less than one tenth of one percent of the membership in any year. CECS congratulates Prof. Dutt on this memorable achievement.