

11th Swedish System-on-Chip Conference Sponsored by SSCS-Sweden in May

Invited Speakers Explore Processor-Centric Digital System Design

In a change from its recent focus on radio, the Swedish Chapter of the IEEE Solid-State Circuits Society (SSCS) and the Departments of Microtechnology and Nanoscience (MC2) and Computer Science and Engineering (CSE) at Chalmers University of Technology selected “Future Processor-Centric Electronic Systems” as the theme of the 11th Swedish System-on-Chip Conference (SSoCC’11) on 2–3 May. The meeting featured 47 papers and brought together 80 participants, including members of SSCS-Sweden, which held its annual chapter meeting during the conference.

Four invited speakers presented different views on digital design from academic and industrial perspectives, locally and internationally.

Keynoter Mladen Berekovic (Braunschweig University of Technology in Germany) began his talk “Power-Efficient Processor Design for Future Systems-on-Chip” by pointing out how our needs for computing power in mobile applications are growing significantly faster than technology can supply mobile power; yet, at the same time, we expect improved power (energy) efficiency as most of the applications are battery powered.

Although Moore’s law has greatly helped, we cannot rely indefinitely on smaller geometries and faster transistors. Likewise, the parallelism of the multicore processors that is used today to continue the increase

in performance after gigahertz-clock scaling hit the wall a couple of years ago will soon be limited by power consumption.

Thus, the most important figure-of-merit may be power consumption per instruction. Among various methods in the areas of circuit design and architectures that are well known today, Prof. Berekovic particularly studied reconfigurability “on the fly” during his time at the research institute IMEC, Belgium. Although there is a general contradiction between flexibility and efficiency, by using an architecture that very rapidly is reconfigurable at different levels in the architecture, both flexibility and efficiency can be reached simultaneously. This architecture has been licensed by several companies, exemplified by commercially available solutions for flexible processors (e.g., Videantis, TI DaVinci, NXP EVP, Tensilica ASIP).

Jiri Gaisler (of Gothenburg-based Aeroflex Gaisler) described how the LEON processor was developed for critical space purposes by the European Space Agency (ESA) and released as open source. Today it is part of a larger IP library, GRLIB, that can be implemented in both field programmable gate arrays (FPGAs) and ASIC hardware. The processor, now in its fourth generation, is used not only in space (the design is insensitive to radiation) but also in consumer electronics and in research and student projects due to its open nature.

Frode Pedersen (Development Director of Atmel in Trondheim,

Norway) provided insight into something that is everywhere, but forgotten even by electronics engineers and scientists: the microcontroller. This very competitive product with short development times may be general or optimized for a particular application together with a customer. Since the key parameter is often low power, Dr. Pedersen presented a number of techniques to reduce power consumption, such as advanced sleep functions that can be tailored for each application.

Finally, Dr. Ioannis Sourdis (Chalmers), in a talk about system-on-chip and reconfigurable hardware, pointed out the limitations of technology scaling, but remained positive since resources on the chip level are increasing constantly; the problem, he said, is to use them! FPGAs are very flexible (but can use a large chip area), and there are applications in which they can be several hundred times more powerful than a general processor (e.g., x86 architecture) and solve all problems in the software, as exemplified by the recently started project “DeSyRe,” in which Chalmers participates. By using a general framework for an embedded system-on-chip, where the chip is partitioned into different blocks depending on requirements for processing/reliability margins, it is possible to make an extremely flexible and inexpensive chip. The technology will be demonstrated by designing an artificial pancreas on a chip and the design of a chip to replace damaged parts of the cerebellum in the brain, he said.



The 11th annual SSoCC in May brought together 80 participants.



Best Student Paper Award winner for digital design, Deepak Dasalukunte of Lund University, receiving his prize from Prof. Lars Svensson. (Photo by Kjell Jeppson.)



Best Student Paper Award winner for analog/RF design, Timmy Sundström of Linköping University, receiving his prize from Prof. Svante Signell. (Photo by Kjell Jeppson.)

Best Student Paper Award

This year the prize was divided into two parts, one for digital design and one for analog/RF.

Deepak Dasalukunte from Lund University won the award for best digital design paper with “Improved Memory Architecture for Multicarrier Faster-than-Nyquist Iterative Decoder” (coauthors Fredrik Rusuk and Viktor Öwall).

Timmy Sundström from Linköping University won the second prize in the analog/RF category for the second year in a row with the paper “A Power Efficient 1-GS/s Single-Channel Pipeline ADC in 65 nm CMOS Utilizing Analog Gain Trimming” (coauthors Christer Svensson and Atila Alvandpour).

The criteria for winning entries are good scientific results, a good oral presentation, and a well-written four-page paper for the conference.

SSoCC History

First held in 2001 and organized annually since 2006 by the Swedish Chapter of SSCS, the SSoCC has become the venue where the majority of university researchers and Ph.D. students in analog/RF and digital circuit design in Sweden meet, enjoy, and network. Local arrangements rotate between four large universities in Sweden.

Chalmers University of Technology, Gothenburg, the site of this year’s conference, is a well-reputed technical university with around

11,000 students, 1,100 Ph.D. students in different technical areas, and a strong history in electronic devices and microwaves. Many local companies focus on applications in microwave technology, both large companies like Ericsson AB and Ruag Space AB and several successful spin-offs from Chalmers in the electronics area.

Next year’s conference will be held near Stockholm with local support from the Royal Institute of Technology.

—Ted Johansson
Linköping University
Information Officer
IEEE SSCS Sweden