

Macquarie University Engineering Research Seminar Series

Lecture 1: Promising Low Power Reusable Solutions

by

Professor Hyung Hoon Sunwoo

IEEE Circuits and Systems Society Distinguished Lecturer
School of Electrical & Computer Engineering, Anjou University, Suwon, Korea

Lecture 2: Industry Oriented Research in Multi-User Systems and Wireless Sensor Networks

by

Dr Stevan Berber

School of Electrical & Computer Engineering, Auckland University, NZ

Venue: Macquarie University, Building E6A Room 102

Time: Friday, 19 February, 1st lecture: 2-3pm, Tea : 3-3.30pm, 2nd lecture: 3.30-4.30pm

Contact: Prof Karu Esselle (karu@ieee.org) or Dr Venkata Gutta (vgutta@ics.mq.edu.au).

No prior registration required. All are welcome.

Additional Info: <http://www.engineering.mq.edu.au/colloquia/> (Please check this site for last minute announcements or changes.)

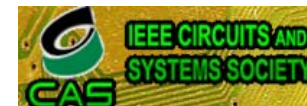
A map from Macquarie University train station to the campus is found at http://www.ofm.mq.edu.au/maps_campus.htm .

To reach Macquarie University from city, take a “Hornsby via Macquarie Park” train. Timetable:
http://www.cityrail.info/timetables/timetables_by_line.htm?line=nt&dir=2#landingPoint .

Parking fees apply within Macquarie University; coins required and visitor parking is allowed only in designated areas. Free parking up to 3 hours is available in Macquarie Shopping Centre next to the University.

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Lecture 1: Promising Low Power Usable Solutions

Custom ASIC solutions face several limitations such as lack of flexibility and high development costs. In contrast, general DSP-based solutions require large die size and high power consumption. Hence, system design methods have been changed to application-specific instruction-set processor (ASIP) based design compromising advantages of both ASIC (optimization) and DSP (flexibility). The talk presents three implemented ASIPs. Signal Processor for OFDM Communication Systems (SPOCS) is implemented for OFDM systems that require FFT, scrambling/descrambling, etc. SPOCS can dramatically reduce the number of cycles and memory access. The implemented SPOCS can meet various standards, such as WLAN, WiMAX, etc.

Digital Audio Specific Instruction-set Processor (DASIP) implemented for high-quality audio algorithms employs the optimized instruction set and architecture for the Inverse Modified Discrete Cosine Transform (IMDCT), the dedicated Huffman accelerator, etc. Video Specific Instruction-set Processor (VSIP) implemented for H.264/AVC has a special instruction set for intra-prediction, integer transform, etc. and employs hardware accelerators for motion estimation/compensation and entropy coding. VSIP can give flexibility and low power consumption. These efficient ASIPs can significantly reduce the number of cycles and memory access and the computation complexity, and thus, they can dramatically save power consumption.

Biography of the Speaker

Myung H. Sunwoo is a Distinguished Lecturer of the IEEE Circuits and Systems Society since 2009. He received the B.S. degree from the Sogang University in 1980, the M.S. degree from the Korea Advanced Institute of Science and Technology in 1982, and the Ph.D. degree in Electrical and Computer Engineering from the University of Texas at Austin in 1990.

He worked for Electronics and Telecommunications Research Institute in Daejeon, Korea from 1982 to 1985, and Motorola in Austin, Texas from 1990 to 1992. Since 1992, he has been Professor in the School of Electrical and Computer Engineering, Ajou University in Suwon, Korea. In 2000, he was Visiting Professor in the Department of Electrical and Computer Engineering, the University of California, Davis, CA, USA.

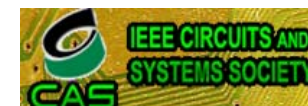
He has authored over 350 papers and also holds 43 patents. He received 28 research awards including Best Paper Awards from the IEEE Workshop on Signal Processing Systems (SiPS) in 2005, International SOC Conference (ISOCC) in 2003, 2005, 2008, 2009, and IEEE Seoul Section in 2004. His research interests include SOC architectures, SOC design for multimedia and communications, and application-specific design.

He will serve as General Chair of ISCAS2012 in Incheon, Korea. He served as Technical Program Chair (IEEE SiPS 2003) and General Co-Chair (IEEE ISOCC 2008). He has been a member of TPC for numerous conferences and societies (IEEE SiPS, Cool Chips, DATE, A-SSCC, APCCAS, BioCAS, VLSI-DAT), Associate Editor (IEEE Trans VLSI systems, 2002-2003), Guest Editor (Journal of VLSI Signal Processing Systems, Springer, 2004, 2010) and Vice President of the Institute of Electronics Engineers of Korea (IEEK) Semiconductor Society. He is listed in MARQUIS Who's Who in the World, in Science and Engineering, in Asia and International Biographical Centre.

He has been Director of the National Research Laboratory sponsored by the Ministry of Science and Technology, Director of the New Growth Engine Semiconductor Center, Executive Director of IEEK, and Chair of the IEEK SOC Technical Committee. Currently, he has been an honorary ambassador of Korean Tourism Organization. He is a Senior Member of IEEE and Chair of the IEEE CAS Society Seoul Chapter.

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Lecture 2: Industry Oriented Research in Multi-User Systems and Wireless Sensor Networks

We are entering the 21st century with demands for wideband wireless services that include a high-speed Internet access, video/image transmission and much more than that. In addition to this trend, a new technology, called wireless sensor networks, is considered to be one of the main technologies of this century.

This presentation includes some introductory words about the Faculty of Engineering and the University of Auckland, New Zealand, including research and teaching activities at the Department of Electrical and Computer Engineering. In particular, the presenter will address his approach to teaching and industry oriented research activities and benefits of his approach that was used in the last 7 years.

The presentation will be focused on the industry oriented research activities in the field of multiuser systems starting with general problems in the design and implementation of digital communication systems. In particular, some experience in using methods of artificial intelligence in coding and modulation theory and practice, primarily neural networks and support vector machines, will be presented and discussed from the practical application point of view. In this direction, some results obtained by theoretical analysis, simulation and design of CDMA systems will be presented. In particular, the advantages of these systems, which are based on application of non-binary signals like chaotic and random sequences, will be pointed out, and experience gained from theoretical analysis and practical design in DSP and FPGA technology will be presented.

The second part of the presentation will be focused on the presenter's experience in the development of wireless sensor networks and their industrialization. This part will include design and development issues related to the networks prototyping and manufacturing. Example networks for environmental, medical and networks for building industry applications will be discussed. In addition, the main theoretical problems that are subject of presenter's research activities will be addressed in detail. The concluding part of the presentation will include some observations related to the future development of multi-user systems and wireless sensor networks and their importance for the global development in wideband communications systems and networks.

Biography of the Speaker

Dr Stevan Berber, a senior member of IEEE and a member on New Zealand Scientists Association, is a senior lecturer at the University of Auckland in New Zealand. His research interests are in the field of digital communication systems (modulation and coding theory and applications), with particular focus on CDMA systems and wireless computer and sensor networks. His teaching interests are in communication systems, information and coding theory, wireless networks and digital signal processing. He is an author of more than 70 referred journal and international conference papers, 7 books and 4 book chapters. Before joining academia, Stevan has been leading or working on a large number of research and industry projects. During his sabbatical leaves he was visiting professor at Novi Sad University and visiting scholar at the University of Sydney. He serves as a consultant for industry and a referee for leading journals and conferences in the fields of communications, wireless networks, signal processing and artificial intelligence.

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