

Digital, Analog, MEMS Systems-on-Chips

Prof. Richard B. Brown

The microprocessor design activities and solid-state sensor and actuator work done in Prof. Brown's group at the University of Michigan have been brought together in mixed-signal microcontrollers, that are designed to operate from a single battery cell (0.9V at end of life) in a 180 nm bulk process. A brief review of sensor operation and prior microprocessor design projects will serve as background for the discussion of these microsystems-on-chips, which include programmable gain amplification, analog-to-digital conversion, a custom processor core, memory, peripherals, and an on-chip MEMS-based clock generator. The microcontrollers are being developed for remote environmental sensors and for biomedical implants in an NSF 'Wireless Integrated Microsystems' Engineering Research Center. The seminar will touch on integration issues and design flow for such chips. The availability of these low power microsystems will facilitate the expansion of data collection and control in applications ranging from the monitoring of pollutants in the environment to deep brain implants for epilepsy and Parkinson's disease.

Bio:

Richard B. Brown received B.S. (with Highest Honors) and M.S. degrees in electrical engineering (computer emphasis) from Brigham Young University in 1976. From 1976 to 1981, he worked in computer design as Vice-President of Engineering at Holman Industries, Oakdale, CA, and then as Manager of Computer Development at Cardinal Industries, Webb City, MO. Richard returned to school at the University of Utah in 1981 and received an electrical engineering Ph.D. (solid-state) in 1985. His dissertation work included development of a junction-isolated epi-nMOS fabrication process and the design of a mixed-signal integrated circuit, to which chemical-selective polymeric membranes were applied to form an array of potentiometric solid-state liquid chemical sensors. In September 1985, he joined the faculty of the University of Michigan Department of Electrical Engineering and Computer Science (EECS). Prof. Brown developed the highly respected integrated circuit design (VLSI) program at U. of M. He introduced and taught both the Introductory and Advanced VLSI Design courses. He was an early proponent of the use of commercial electronic CAD tools in the curriculum, and worked with tool vendors to develop university programs. He managed a student VLSI design contest, which has now become an international competition with awardees being honored at the Design Automation Conference and International Solid-State Circuits Conference.

Prof. Brown has conducted major research projects in the areas of solid-state sensors; high temperature CMOS; gallium-arsenide and silicon-on-insulator circuits; mixed-signal circuits; clock generation; interface circuits; low-voltage analog circuits; electronic design automation; and high performance, radiation-tolerant, and low-power microprocessors. His research group has designed eight microprocessors in CMOS and GaAs technologies, plus four mixed-signal microcontrollers, and solid-state sensors of many kinds. He is the Micropower Electronics task leader in the University of Michigan NSF Wireless Integrated Microsystems Engineering Research Center.

At the University of Michigan, Prof. Brown served as Associate Chair for the Electrical Engineering Division of EECS for four years and then as Interim Chair of EECS from July 2001 through May 2003. As chairman of the MOSIS Advisory Council for Education, he raised funds to continue the educational program which fabricates integrated circuits designed in U.S. university courses. He has served on ARVLSI and GaAs IC Symposium executive committees, and as Chairman of the 1997 Conference on Advanced Research in VLSI, and of the 2001 Microelectronic System Education Conference. He has served as associate editor of IEEE Transactions on VLSI Systems, and as guest editor of the IEEE Journal of Solid-State Circuits and of the Proceedings of the IEEE. Prof. Brown holds eight patents, and consults in the areas of solid-state sensor and microprocessor design. He has been supportive of entrepreneurial activities and personally involved in technology transfer. He is a founder of Sensicore, i-sens, and Mobius Microsystems.