USC Viterbi School of Engineering
Ming Hsieh Department of Electrical Engineering

Ming Hsieh Institute Seminar Series
Ming Hsieh Department of Electrical Engineering

Integrated Systems

Breaking from Tradition: New Approaches in CMOS Wireline Transceivers for 28-56Gb/s Serial Links

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Date: Friday, March 10th, 2017
Time: 2:30pm Location: EEB 248

Abstract: The past decade has seen data rates in serial communication links rise from 10Gb/s per lane to 28Gb/s. Wireline transceivers have been implemented in CMOS technologies that can enable 28Gb/s signaling across channels with up to 40dB loss at the Nyquist rate. These transceivers have mainly relied on "traditional" I/O approaches that have been common for more than 10 years: NRZ signaling combined with analog/mixed signal equalizers such as baud-spaced feed-forward equalization and decision-feedback equalization. In the first part of this talk we will discuss these "traditional" equalization approaches and review the design of a 28Gb/s backplane transceiver to show how these are implemented. As data rates ramp up to 56Gb/s, departures from these "traditional" approaches are being seen. PAM4 is replacing NRZ to improve the spectral efficiency at the expense of SNR. New analog/mixed signal approaches to wireline transceivers are needed in response. In the second part of this talk, we will focus on two of these new approaches. The first is the use of fractionally-spaced feed forward equalizers to improve equalizer bandwidth, as demonstrated in a 14nm CMOS 56Gb/s PAM4 transmitter. The second is the shift to 'digital' approaches for wireline transceivers: DAC and ADC-based designs to enable digital equalizer implementation. A 25Gb/s ADC-based serial receiver in 32nm SOI CMOS will be described. At the end of the talk, we will explore future directions including the role optics can play to improve bandwidth density.

Biography: Timothy (Tod) Dickson received the Bachelor of Science and Master of Engineering degrees in Electrical Engineering from the University of Florida, and the Ph.D. degree from the University of Toronto. Since 2006, he has been with the IBM T.J. Watson Research Center in Yorktown Heights, NY. He is currently a Research Staff Member leading serial transceiver research projects in 14nm CMOS technologies for electrical and optical communication links. He is also an Adjunct Associate Professor at Columbia University in New York City, where he teaches graduate-level courses in analog and mixed-signal circuits and systems. Tod has been a recipient or co-recipient of several best paper awards, including the 2009 IEEE Journal of Solid-State Circuits Best Paper Award, the 2009 ISSCC Beatrice Winner Award, and the 2004 VLSI Circuits Symposium Best Student Paper Award. He is a Senior Member of the IEEE.

Hosted by Prof. Hossein Hashemi, Prof. Mike Chen, Prof. Dina El-Damak, and Prof. Mahta Moghaddam.
Organized and hosted by Jae-Won Nam.