Department of Engineering
Seminar Program
Wednesday, April 2, 2014
Shanahan Teaching and Learning Center
Lecture Hall 1430, 4:15pm

"The Once and Future Computer"

Matthew Spencer

Summary:

Transistors are the backbone of modern electronics, but recent generations of transistor technology have suffered from high levels of leakage current. This wasted current sets a floor on the energy efficiency of computers and limits the amount of parallelism that can be used in processors. My research asks whether micro-mechanical switches -- a new switch technology with physics that are fundamentally different from transistors -- can be used to build computing systems that significantly improve on today's energy-efficiency limits.

Achieving this energy efficiency improvement requires rethinking the basic building blocks of digital electronics in light of the new physics of mechanical switches. Examples of how mechanical, electrical and system-level effects were co-designed to improve overall performance will be emphasized. These design techniques were applied to simulations which show that functional blocks made of mechanical switches can achieve 10 times lower energy than equivalent transistor blocks. Scaled versions of these blocks were experimentally demonstrated in several test chips.

Bio:

Matthew Spencer received the B.S. and M.Eng. degrees from The Massachusetts Institute of Technology, Cambridge, in 2007 and 2008, respectively and is currently pursuing the Ph.D. degree at the University of California, Berkeley. His research interests are energy-efficient circuits, emerging circuit technologies and, particularly, the integration of the two. His PhD research focuses on modeling new technologies for integrated circuits and doing systems level analysis to determine their efficacy.

Matthew has worked briefly at Texas Instruments and Intel on emerging technology topics. He has been a co-recipient of the ISSCC Outstanding Technical Paper Award and an Intel Fellowship. He also starred as an evil martial artist in a music video.