CS Seminar Series
Overview of Seminar by Prof. Frank Vahid

"Building Fake Body Parts: Real-Time Digital Mockups of Physiological Systems"

Prof. Frank Vahid
Department of Computer Science & Engineering
University of California, Riverside

Abstract

Abstract: Designing computer-based medical devices like pacemakers or ventilators is hard, in part because testing can't be done on real humans. PC-based simulations are slow and inaccurate. Using physical mockups, like connecting a ventilator device to a balloon acting as a lung, can't support sufficiently diverse scenarios, like fluid in the lungs. This talk describes joint UCR/UCI work on developing "digital mockups" -- models of physiological systems that execute in real-time, supporting thorough testing of device software. We show that FPGAs (field-programmable gate arrays) -- widely-available programmable chips having a unique execution approach that we'll describe -- are an excellent match for executing physiological models, yielding order-of-magnitude speedups over PCs, GPUs, and other computing approaches. The talk describes the synthesis approach to automatically converting models, consisting of thousands of differential equations, into networks of processing elements on FPGAs. Real-time execution of physiological models can also be useful in building complete human simulators, used today medical and nursing schools. More broadly, real-time execution of physical systems (chemical, biological, mechanical, physiological, etc.) can be useful in the design of a wide variety of what today are called cyber-physical systems – systems where computers interact closely with the physical world – including automobiles, aircraft, medical equipment, military equipment, manufacturing systems, and much more.

Biography

Frank Vahid is a Professor of Computer Science and Engineering at the University of California, Riverside (B.S. 1988 Univ. of Illinois in 1988, M.S./Ph.D. 1990/1994 Univ. of California, Irvine. He is author of several textbooks on embedded systems and digital design. His current research interests include creating technologies for cyber-physical systems http://www.cs.ucr.edu/~vahid/digitalmockups/), developing customizable assistive monitoring systems for home-alone aging/disabled persons and their caretakers http://www.cs.ucr.edu/~vahid/assistivemonitoring/, and creating the next generation of online interactive animated learning material (http://pcpp.zyante.com).

Friday, October 26, 2012
11:00-12:00PM
6011 Donald Bren Hall
Host: Professor Eli Bozorgzadeh at eli@ics.uci.edu

UNIVERSITY OF CALIFORNIA, IRVINE