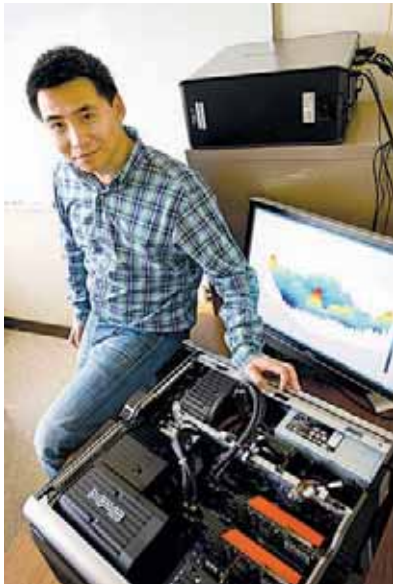


A NEW WAY TO SOLVE CIRCUIT PROBLEMS ON-CHIP POWER AND THERMAL SIMULATIONS ON GPUS

IN ITS SECOND Strategic Faculty Hiring Initiative (SFHI), Michigan Tech hired seven new faculty members to conduct research in computational discovery and innovation. Coming from some of the best research universities across the country



Zhuo Feng

and the world, they have joined six different departments at Michigan Tech.

The University received 329 applications for the seven positions. A committee of faculty representatives from across campus narrowed the pool down to 125. More than 162 University faculty members familiar with the candidates' fields of research and scholarship screened applica-

tions, and seventeen candidates were invited for interviews.

That's how Assistant Professor Zhuo Feng happened to join the ECE department, arriving in July from College Station, Texas. He will explore the emerging parallel computing platforms and methodologies that are becoming increasingly important in integrated circuit computer-aided design.

Feng received a PhD in Electrical and Computer Engineering from Texas A&M University in 2009. He earned a Master of Engineering in Electrical Engineering from the National University of Singapore in 2005 and a BS in Information Engineering from Xi'an Jiaotong University, Xi'an, China, in 2003.

During the past few summers he worked as a summer intern, first at Mentor Graphics Inc, in Wilsonville, Oregon, where he concentrated on the development of a statistical design-dependent interconnect corner extraction program. Next, at Magma Design Automation in Austin, Texas, Feng focused on hardware acceleration of circuit simulations—"using and developing some very new techniques for integrated circuit simulation algorithm development."

Developing parallel simulation methodologies for circuit design could be Feng's strong suit. His goal is to attack the

problem of large-scale circuit simulation using emerging power-efficient parallel computing platforms. Recently, Feng and his doctoral advisor at Texas A&M, Professor Peng Li, proposed a novel graphic processing unit (GPU)-based simulation method for analyzing large on-chip power delivery networks. Their study was published and nominated for the best paper award in a leading conference. "We were first among a very few people looking into the circuit simulation problems on GPUs," he says. "This year we've seen a significant increase of interest in this area, with a number of research works published by universities around the world."

Feng's general research interest involves VLSI computer-aided design, or VLSI CAD. One of his recent research projects includes the development of efficient CAD methodologies specifically for three-dimensional integrated circuit (3D-IC) designs. These methodologies target power and thermal verifications, a key step in 3D-IC design. "It's quite a task to develop efficient algorithms that can verify the large on-chip interconnect network with hundreds of millions of unknowns," he explains. "Many people will need them, especially as the number of on-chip transistors increases to billions-per-square centimeter in the future. Today's chip designs are so complex that highly sophisticated computer simulation techniques are greatly needed to analyze and verify the design before they are manufactured."

Feng will be teaching a new graduate-level course on VLSI simulation and modeling. His goal is to help students better understand and utilize today's VLSI CAD techniques.

"VLSI CAD is a technology that is well-accepted in industry—which will soon need a big team of computer engineers capable of understanding and developing efficient CAD algorithms. This course will help students find a decent job when they graduate—that is my hope," adds Feng.

The course requires a strong math background. "Students need to know how to use math to solve realistic engineering problems—the kind of practical problems they'll encounter in the computer engineering field," he says.

Students will also learn about GPUs—specialized processors that offload 3-D graphics renderings from the microprocessor. Feng will teach students how to accelerate existing algorithms on GPUs. "This is a cost-efficient technology for industry, and there's been a spur of interest that is sure to continue," he says. Widely used in present day personal computers, as well as most gaming consoles, modern GPUs are very efficient at manipulating computer graphics. Their massively parallel computing capability makes them more attractive for a range of computationally-intensive applications.