Testing, Hardware Security, and Quantum-dot Cellular Automata

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Abstract:

This presentation will briefly cover three different research areas: Testing of Digital/VLSI circuits, Hardware Security using Physically Unclonable Functions (PUFs), and an emerging nano technology known as Quantum-dot Cellular Automata (QCA).

Device testing represents the single largest manufacturing expense in the semiconductor industry. It has been known for quite some time that tackling the problems associated with testing semiconductor circuits at earlier design levels significantly reduces testing costs and time. Thus, it is important for designers to be exposed to the concepts in testing which can help them design better and reliable products. Novel techniques based on Built in Self-Test (BIST) for both logic and memory will be discussed.

Trustworthy authentication of a device is of extreme importance for secure protocols. Methodologies for preventing IC piracy have been developed that require a unique signature key. Physically Unclonable Functions (PUFs) can be used for such signature generation. A key generation process using a novel Ring Oscillator PUF (ROPUFs) design followed by an error correcting code will be discussed in the seminar.

As CMOS technology reaches its physical limits, new technologies such as QCA, SET and TPL are being proposed as alternatives to CMOS. These technologies use either majority or minority logic to implement logic functions. A novel synthesis method for implementing majority/minority logic with applications to QCA nano circuits will also be presented.

Speaker Biography:

Dr. Niamat received his Ph.D. degree from the University of Toledo in 1989. He received his Master’s in Electrical Engineering from the University of Saskatchewan, Canada; and the Bachelor’s in Electrical Engineering from the Aligarh Muslim University, India. Before coming to Canada, he worked as an Assistant Engineer with the U.P. State Electricity Board. Dr. Niamat was a Visiting Associate Professor at the Center for Reliable Computing at Stanford University during AY 1996-97, where he worked with world-renowned Prof. Edward McCluskey in the area of testing. Dr. Niamat has supervised over 50 graduate students. He is currently the focus group leader for the High Performance Computing research group.