

EE Department Seminars

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Yorgo I Stefanopulos Meeting Lounge

COMPUTING WITH NANO-CROSSBAR ARRAYS

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The main goal of this study is developing a complete synthesis and optimization methodology for switching nano-crossbar arrays that leads to the design and construction of an emerging nanocomputer. New computing models for diode, FET, and four-terminal switch based nano arrays are developed. The proposed methodology implements Boolean functions with nano-crossbar arrays considering performance parameters such as area, delay, power dissipation, and reliability. For evaluations, benchmarking and simulations are performed. With combination of arithmetic and memory elements a synchronous state machine (SSM), representation of a computer, is realized. The proposed methodology targets variety of emerging technologies including nanowire/nanotube crossbar arrays, magnetic switch-based structures, and crossbar memories. The results of this study will be a foundation of nano-crossbar based circuit design techniques and greatly contribute to the construction of emerging computers beyond CMOS.

Short Bio:

Mustafa Altun received his BSc and MSc degrees in electronics engineering at Istanbul Technical University in 2004 and 2007, respectively. He received his PhD degree in electrical engineering with a PhD minor in mathematics at the University of Minnesota in 2012. Since 2013, he has served as an assistant professor of electrical engineering at Istanbul Technical University. Dr. Altun runs the Emerging Circuits and Computation (ECC) Group in the same university; the group focuses on circuit design and computing models for emerging nanoscale technologies. They also have an interest in electronics reliability and reversible quantum computing. Dr. Altun is currently serving as a principal investigator/coordinator of various projects including EU H2020 RISE, TUBITAK Career, and TUBITAK University-Industry Collaboration projects. He is an author of more than 30 peer reviewed papers and a book chapter, and the recipient of the TUBITAK Success, TUBITAK Career, and Werner von Siemens Excellence awards.