EE 298-12
Solid State Technology and Devices Seminar

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1-2pm
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Carbon Nanotube Computer: Transforming Scientific Discoveries into Working Systems

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Abstract

Carbon Nanotube Field Effect Transistors (CNFETs) are excellent candidates for building highly energy-efficient future electronic systems. Unfortunately, carbon nanotubes (CNTs) are subject to substantial inherent imperfections that pose major obstacles to the design of robust and very large-scale CNFET digital systems:

• It is nearly impossible to guarantee perfect alignment and positioning of all CNTs. This limitation introduces stray conducting paths, resulting in incorrect circuit functionality.

• CNTs can be metallic or semiconducting depending on chirality. Metallic CNTs cause shorts resulting in excessive leakage and incorrect circuit functionality.

A combination of design and processing technique overcomes these challenges by creating robust CNFET digital circuits that are immune to these inherent imperfections. This imperfection-immune design paradigm enables the first experimental demonstration of the carbon nanotube computer, and, more generally, arbitrary digital systems that can be built using CNFETs. Demonstration of monolithically integrated three-dimensional CNFET circuits will also be discussed.

This research was performed at Stanford University in collaboration with Prof. H.-S. Philip Wong and several Ph.D. students.