



# Spring 2011 Colloquium

## Temple University

### Computer and Information Sciences

#### ***SUNSHINE: A Cross-Domain Simulator for Sensor Networks***

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#### **Abstract**

Simulators are important tools for analyzing and evaluating different design options for wireless sensor networks (sensornets) and hence, have been intensively studied in the past decades. However, existing simulators only support evaluations of protocols and software aspects of sensornet design. They cannot accurately capture the significant impacts of various hardware designs on sensornet performance. As a result, the performance/energy benefits of customized hardware designs are difficult to be evaluated in sensornet research. In this talk, we will describe the design and implementation of SUNSHINE, a novel hardware-software cross domain simulator for sensornet applications. SUNSHINE is the first sensornet simulator that effectively supports joint evaluation and design of sensor hardware and software performance in a networked context. SUNSHINE captures the performance of network protocols, software and hardware up to cycle-level accuracy through its seamless integration of three existing sensornet simulators: a network simulator TOSSIM, an instruction-set simulator SimulAVR and a hardware simulator GEZEL. SUNSHINE solves challenging design problems, including data exchanges and time synchronizations across different simulation domains and simulation accuracy levels. SUNSHINE also provides hardware specification scheme for simulating flexible and customized hardware designs. Several experiments are given to illustrate SUNSHINE's cross-domain simulation capability, demonstrating that SUNSHINE is an efficient tool for software-hardware codesign in sensornet research.

#### **Bio:**

Yaling Yang is currently an assistant professor in Virginia Tech. She received her doctorate in computer science in the summer of 2006 from the University of Illinois at Urbana-Champaign. She has concentrated her research on the combination of system analysis with the design of communication protocols and infrastructures. She is currently the principle investigator of four NSF funded projects and is leading the thrust area of "Autonomous and Secure Communications" at the Institute of Critical Technology and Applied Science at Virginia Tech.