

## **Recent Advances in Simulation Tools for Wireless Sensor Networks towards Designing Scalable and Energy Efficient Systems and Algorithms for Addressing Real World Applications based on Low Cost Distributed Hardware Implementations: A Layered Approach**

### **abstract**

This plenary lecture will focus on overviewing the state of the art, identify open problems and presenting new designing methods for simulating Wireless Sensor Networks to efficiently address real world applications based on scalable low cost distributed hardware implementations.

The goal is to build a generic and scalable simulation system with the capability to emulate variable MCUs and mote setups, as well as actual code and MCU specific assembly language fitting any microprocessor specifications. An open standard, XML document, is involved to describe MCU and mote processing features. The core of the proposed simulator is the MCU emulator, able to simulate different MCUs and mote setups providing accurate processing metrics.

The MCU emulation engine is based on the fact that every instruction in the MCU's instruction set, actually modifies the contents of a type of memory (registers, special function registers, flags, ports etc) according to a set of Boolean or numeric functions described as data in an XML file. As a result MCU functionality is thoroughly described with Boolean or numeric functions in XML format over the whole WSN.

Elaborating these design issues through the layered WSN architecture offers the capability to support an accurate simulation of the realistic WSN design performance, a topic that will be discussed.