Models and Languages
for Wireless Sensor Networks
(proposal for a Module for SEMT)

Luís Lopes

`lblopes@dcc.fc.up.pt`

April 2008

Context and Justification

Wireless sensor networks, made of tiny, low-cost devices capable of sensing the physical world and communicating over radio links are significantly different from other wireless networks: (a) the design of a sensor network is strongly driven by its particular application, (b) sensor nodes are highly constrained in terms of power consumption and computational resources (CPU, memory), and (c) large-scale sensor applications require self-configuration and distributed software updates without human intervention.

This technology is at the cutting edge of the current research and there is a strong need for computational models that capture the inherent processing, memory constraints and the massively parallel nature of the sensor nodes' in-network processing. If well adapted to the specific characteristics of sensor networks, a formalism of this kind is likely to have a strong impact on the design of operating systems, communication protocols, and programming languages for this class of distributed systems.

Objectives

Expose the students to state of the art research in the area of computational models and programming languages for wireless sensor networks.

Expected Results

The students are expected to identify the major abstractions underlying the current programming languages and systems for wireless sensor networks. They should also recognize the benefits of mathematical frameworks for modeling these systems and for promoting the robust programming of large scale applications.

Program

Introduction to wireless sensor networks. Main programming abstractions for wireless sensor networks. Step by step development of a model for wireless sensor networks using a process calculus.

Teaching Methods

Talks in which the material is exposed. Students are provided with bibliography and specific papers covering the each topic before each talk.

Evaluation

The preferred evaluation method would be to have the each student write an essay on one of a series of topics suggested by the teacher. In practice the evaluation method may have to be concerted with the other teachers in SEMT.

Bibliography

- *Communicating and Mobile Systems: the Pi-Calculus*, R. Milner, Cambridge University Press, 1999.

- *A Survey on Sensor Networks*, I. Akyildiz, W. Su, Y. Sankarasubramaniam and E. Cayirci, IEEE Communications Magazine 40(8), pp. 102-114, 2002.

- a selection of papers on the state of the art on computational models and programming languages for wireless sensor networks.

Publications by the Proponent

A compilation of the proponent's most relevant publications in this and related areas can be found at:

http://www.dcc.fc.up.pt/~lblopes/publications/