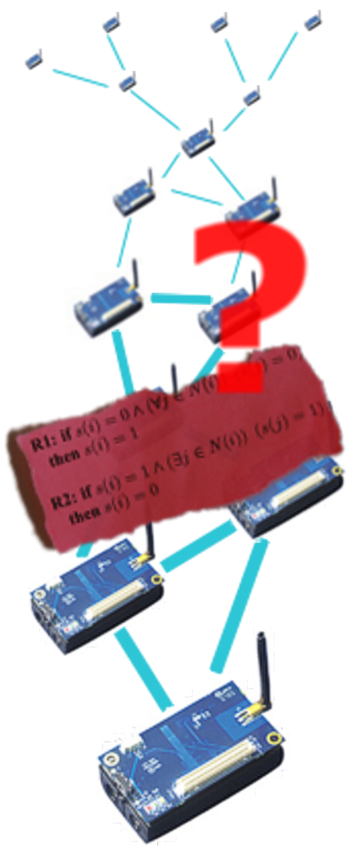
Master's Thesis

« Programming Self-Stabilizing Algorithms in Real Sensor Network Deployments »

Background

Wireless sensor networks (WSNs) consist of small, battery-operated sensor nodes, which collaborate on a global sensing task. The characteristics of the wireless communication medium and other environmental influences (natural as well as artificial) lead to the frequent occurrence of transient faults. Therefore, algorithms for wireless sensor networks need to be fault-tolerant especially against this kind of faults; otherwise operation over longer periods is not feasible. Self-stabilizing techniques provide non-masking fault-tolerance in a self-contained manner. The applicability of these techniques to WSNs has therefore been a hot research topic in recent years. To use self-stabilizing algorithms in sensor networks it is necessary to adapt them to a suitable model. SelfWISE is a framework, developed at the Institute of Telematics, to support the adaptation of self-stabilizing algorithms to the realm of WSNs. It provides a programming abstraction that allows the formal specification of algorithms. These are automatically compiled into WSN applications.



Work Description

Currently the SelfWISE framework is available for the TinyOS integrated simulator TOSSIM. To gather first impressions about the performance of self-stabilizing algorithm in real sensor network deployments, the SelfWISE framework must be ported to a hardware platform. At the Hamburg University of Technology, wireless sensor nodes, such as the XBow Iris nodes, are subject to extensive research. They are used for amongst others in a real-world deployment within the research cluster SomSeD. The goal of this thesis is to port the SelfWISE framework to the Iris hardware platform and to perform first evaluations in real deployments. The milestones of this work are as follows:

- Port the simulation independent parts for the Iris platform.
- Create a neighborhood management that supports predefined or dynamic neighborhoods.
- Integrate an existing time synchronization protocol.
- Develop a deployment support concept for automated experiments.

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