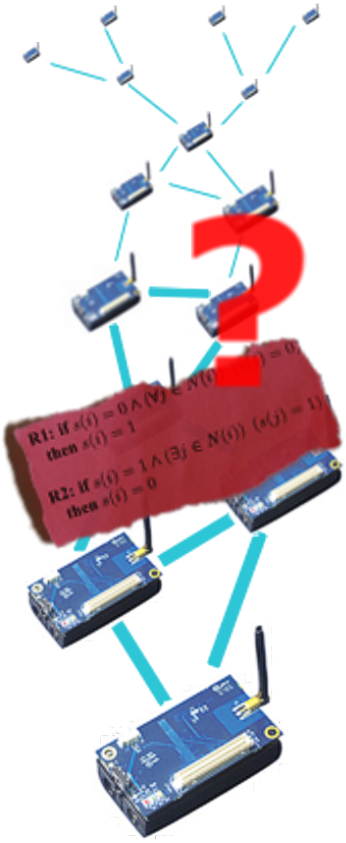
Bachelor Thesis

« Convergence Evaluation of Different Self-Stabilizing Algorithms »

Background

Self-stabilizing algorithms provide non-masking approach for achieving fault-tolerance in distributed systems. Nowadays, applying such techniques in the area of wireless sensor networks (WSNs) is a hot research topic. 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. SelfWISE is a framework, developed at the Institute of Telematics, to support the usage of self stabilizing algorithms in WSNs. It provides a programming abstraction that allows the formal specification of algorithms.



Work Description

The SelfWISE framework supports the development of self-stabilizing algorithms in two different ways. It provides a high-level programming abstraction that allows the specification of the algorithm in a formal description language, which is transformed into C code by a compiler. The generated C code uses the second possibility to specify self-stabilizing algorithms by utilizing the programming interfaces provided by the framework. The goal of this Bachelor thesis is to implement and evaluate different existing self-stabilizing algorithms. These algorithms should be classified by there allowed concurrency of execution, a priori knowledge or assumptions about the network structure (e.g., unique node identifiers), and other characteristics. The influence of network topology and initialization strategy to the convergence speed of the algorithms should be evaluated. The algorithms should be implemented by using the formal description language and by utilizing provided programming interfaces. How the hand-written code does differ from the generated one? The milestones of this work are as follows:

- Choose different self-stabilizing algorithms and classify them.
- Implement these algorithms by using the SelfWISE framework.
- Perform a detailed evaluation by choosing appropriate simulation settings.

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