Distributed and Operating Systems Group

Integration of geographical routing into the FAMOUSO Middleware on top of an 802.15.4 compatible sensor network

---

Type of work:	Team project
Estimated work time:	180 hours
Advisor:	Christoph Steup

---

1 Introduction

The emergence of 802.14.5-compatible wireless sensor network(WSN) technologies strengthen the vision of intelligent building, streets and other environments, which are able to supply users with specific up-to-date information. These systems will provide an immersive integration of the human and it's environment, but to achieve this vision the networks themselves need a lot of information.
One basic information the networks absolutely need is time, since time can be used to define the order of events, the age of other information and synchronization points in time between different nodes of the network. Therefore time has gotten a lot of attention from the scientific community.
However there is another very basic information, that is location. Location defines the placement of sensor nodes in the environment. This information again provides means to define detection ranges and further enhance the sensor data that is delivered by the network. The location information can also be used for routing in the network. In this case the location enables a user to exactly define an area of interest in a geographical manner. This user provided information enables the network to efficiently deliver the data from the specified area of interest to the user.
Another dissemination mechanism uses knowledge on the content of the data stream. The data streams are tagged with a topic to which users can subscribe and to which nodes can publish. This communication mechanism is known as Publish/Subscribe. The network tries to efficiently deliver the data to all users, who subscribed on the appropriate topic.
The combination of both mechanism is not yet well discussed in the scientific community. Therefore an evaluation of synergy effects may show further optimization options for WSN.

2 Related Work

In the scientific there exists a lot of publications on geographical routing, which originated with a paper of Navas et al.[2] on geographical routing in IP-Networks. For the case WSN there exists papers like the one of Lee et al.[1] on geographical multi-hop routing in wireless ad-hoc networks and the one of Saeda et al.[4] on energy efficient geographical routing.

3 Detailed task description

The task of this work will be to integrate and evaluate a geographical routing algorithm within the existing Publish/Subscribe middleware of the work group FAMOUSO[3]. The geographical information will be provided as a static map of node locations. To achieve this goal it is necessary to:

1. Review existing geographical routing algorithms
2. Compare the reviewed algorithms based on parameters like: compatibility to the middleware or energy efficiency
3. Create a concept to integrate the algorithm in the middleware
4. Implement the concept into a prototype
5. Evaluate the prototype based on a test application

References

[1] Seungjoon Lee, Bobby Bhattacharjee, and Suman Banerjee. Efficient geographic routing in multihop wireless networks. In *Proceedings of the 6th ACM international symposium on Mobile ad hoc networking and computing*, MobiHoc '05, page 230–241, New York, NY, USA, 2005. ACM.

[2] Julio C. Navas and Tomasz Imielinski. GeoCast - geographic Addressing and Routing. In *Proceedings of the 3rd annual ACM/IEEE international conference on Mobile computing and networking*, MobiCom '97, page 66–76, New York, NY, USA, 1997. ACM.

[3] Michael Schulze. FAMOUSO project website. http://famouso.sourceforge.net, 2008-2012. [(online), as at: 24.10.2012].

[4] Karim Seada, Marco Zuniga, Ahmed Helmy, and Bhaskar Krishnamachari. Energy-efficient forwarding strategies for geographic routing in lossy wireless sensor networks. In *Proceedings of the 2nd international conference on Embedded networked sensor systems*, SenSys '04, page 108–121, New York, NY, USA, 2004. ACM.