Localization with Context-Awareness in Dynamic Wireless Sensor Networks

Dominik Lieckfeldt, Jiaxi You, Dirk Timmermann

Institute of Applied Microelectronics and Computer Engineering
Department of Computer Science and Electrical Engineering
University of Rostock
{dominik.lieckfeldt, jiaxi.you }@uni-rostock.de

Abstract – In sensor networks for life science automation applications, sensor nodes are usually named by their attributes, for example by position information. One major approach to estimate the position of sensor nodes is to localize them via some dedicated beacons nearby. Beacons are nodes with known positional information which are the reference points when performing localization for nodes in range. Thus, accuracy of beacon position significantly impacts the result of localization. Like other sensor nodes, beacons can also be mobilized or moved by environmental force. Therefore, repeated re-estimation of their positions is necessary.

In large sensor deployments, emerging events are usually limited to certain regions. In order to guarantee optimal observation of these regions of interest, some parts of the network are required to have higher accuracy of positional information and will perform more communication while other parts can remain idle along with only coarse positional information. Accurate estimation and frequent refreshment of the position of beacons are particularly important in the regions of interest.

We consider a scalable localization algorithm that provides adaptation to activity rate and residual energy of sensor nodes. In our approach, refreshment is triggered locally based on context. A beacon will quit the localization service when its energy level goes below a predefined threshold thus prolonging node life time. Furthermore, with a number of beacons available, only a subset of them will be needed to achieve a certain degree of accuracy for localization while others can be sent to sleep in order to save energy. We also investigate intelligent heuristics to perform the selection of a subset of beacons based on local knowledge.