

Performance Evaluation of an Indoor Localization Protocol in a 802.15.4 Sensor Network.

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ABSTRACT

In the previous IPIN an energy efficient protocol for localization called “Highly Configurable Protocol” (HCP) was presented. This allows the Mobile Sensor Nodes (MNs) to take different configurations according to the demand/application.

In this work, HCP was implemented in a 802.15.4 test-bed forming a tree topology. Here, two MN’s configurations were deeply investigated: In the first one the MNs broadcast packets and the anchors (fixed nodes with known positions) take Signal Strength (RSSI) samples. Then, the anchors send this information to a central computer (multi-hop communication) for the position estimation. In the second configuration, the anchors broadcast packets and the MNs take RSSI measurements. Then, each MN sends a report with its measurements to a certain Anchor, which sends this information to the central computer. Note, that HCP provides a common framework that supports both MN’s configurations at the same time.

Our goal was to empirically investigate how the limitations of a 802.15.4 sensor network affect the performance of HCP in the localization process, principally in the transmission of localization information across the network.

We have investigated how many packets with location information arrive at the central computer with increasing number of MNs and for different configurations of the network. This information can be used, in a next step, to investigate the corresponding degradation of the position accuracy given certain conditions in the network.

The limitations of HCP were also investigated. We have analyzed in which cases the anchors do not receive an acknowledgment after its transmission, when there are duplicated packets in the network and discarded packets in the MAC layer. It was also investigated how the hierarchical level of the anchors (tree topology) impacts on the communication.

Our results can be used to identify possible improvements to increase the efficiency of HCP and the scalability of the localization system.

KEYWORDS: 802.15.4, Wireless Sensor Network, Mobile Node, Anchor, Localization.