Demo Abstract: The REKF Localization System: Node Localization Using Mobile Robots

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ABSTRACT

Localization of small wireless sensor devices, with the deployment of the minimal infrastructure or hardware, has been the topic of significant research over the past few years. We have developed the Robust Extended Kalman Filter (REKF) localization system[1], which enables a mobile, data gathering robot to localize static sensor devices, by combining the RSSI data received from the motes, with estimates of its trajectory. The REKF localization system is particularly well suited to delay-tolerant sensor networks, where node positions need not be known in real time. We have observed accuracies ranging from approximately 30cm to 1m in practice.

Categories and Subject Descriptors

C.2 [**Computer Systems Organization**]: Computer Communication Networks

General Terms

Algorithms, Measurement, Design, Experimentation

Keywords

Robust Extended Kalman Filter, Localization, Mobile Robot, Wireless Sensor Networks

1. DEMONSTRATION OVERVIEW

In this demonstration, we will show how a mobile Lego robot, with the knowledge of its initial position and velocity parameters, can localize a group of static motes from which it collects data while in motion, by combining the radio signal strength (RSSI) of the received data packets with its trajectory information.

The robot is equipped with an onboard Crossbow Stargate gateway which includes:

a) A mote radio with which it communicates with the other motes

b) A WiFi radio with which it communicates to a laptop. The data collected is processed at the laptop using the Robust Extended Kalman Filter algorithm. Users will see the mobile robot collecting the RSSI data from the motes while roaming and the playback of the estimated results of the localization. The visualization simultaneously plots the trajectory of the mobile robot, and the convergence in localization estimates of individual sensors to the actual sensor positions with time.

The demonstration is intended to enable viewers to draw specific insights about the system, for example, the impact of the robot's trajectory and the environment on the localization error; as well as general insights about multi-modal localization systems (in this case, the combination of RSSI and acceleration as the sensing modalities). We will also have a video demonstration of our localization system on computer, and archived data for playback.

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3. REFERENCES

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