
Cooperative Target Tracking and Signal Propagation Learning Using Mobile Sensors

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Background

“Target tracking” refers to the positioning of mobile objects over time. The targets may be hospital patients, park visitors, mall shoppers, warehouse assets, etc. We consider a novel cooperative system for tracking targets, wherein each target carries a low-cost RF tag that not only beacons its own ID, but also receives and rebroadcasts the beacons of tags within a certain number of hops. Mobile sensors equipped with localisation and communication modules are used to capture and forward the beacons to a server to track the targets. This multi-hop approach greatly extends the sensing range of the mobile sensors or, equivalently, the beaconing range of the tags, leading to cost-effective deployment.

Technology Overview

Mosent is a highly accurate multi-hop system of mobile sensors that allows for the tracking of targets. To account for complex signal propagation in different indoor and outdoor environments, we represent a received signal strength (RSS) matrix that overcomes the assumptions of propagation models. Given the sensor locations, beacons detected by the sensors and RSS matrix, Mosent uses both temporal and spatial information to track targets with a modified particle filter. Mosent has an optional independent and offline module for learning spatial signal propagation in terms of the RSS matrix, using cooperative mobile sensors equipped with beaconing transceivers.

Market Analysis

Many companies currently offer products and/or software designed to track assets indoors. Assets may include goods or people. Tracking is achieved through various means, such as Bluetooth, GPS, Wi-Fi and radio antennas. Google is working on a product that uses virtual reality to determine a user’s position. However, the majority of companies in this field are smaller than Google and specialise in asset tracking technology. Origin, Celab, TRX, Navigine, IndoorAtlas, Accuware, Telit, Senion, Zebra and Pigeon are just a few examples. Most of these companies use Bluetooth/Wi-Fi for tracking, and offer navigation as an additional service. Many provide not only hardware but also software, analytics and platforms for app building.¹

¹ Inventor Evaluation Report – Invention Evaluator Analysis of Cooperative Target Tracking and Signal Propagation Learning Using Mobile Sensors (TTC.PA.1186) (inventionevaluator.com, 2018).

Benefits

- Reduces the cost of infrastructure, as relatively few sensors are installed.
- Increases the range of sensors and beacons (via the multi-hop system).
- Increases the battery life of tags for high mobility targets (e.g. children/the elderly).

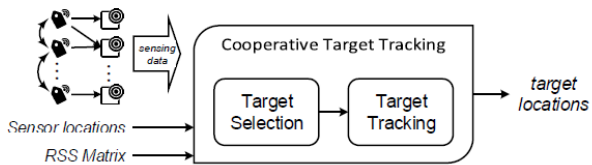
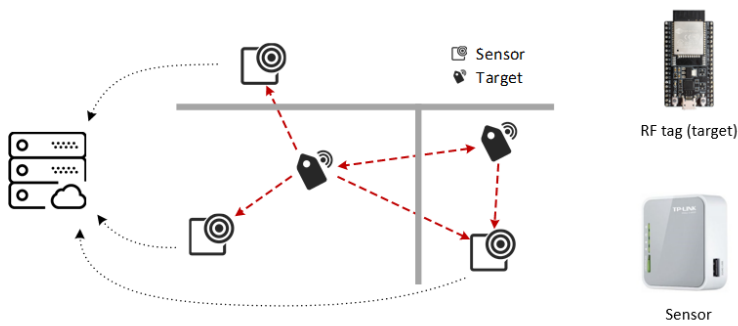
Applications

- Tracking children and elderly people
- Object tracking in hospitals and warehouses

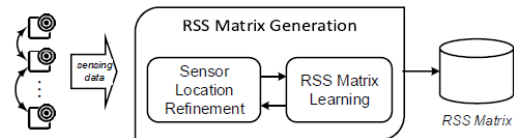
Patents

- US Patent Pending: -
- China Patent Pending: -

Figures



(a) Cooperative Target Tracking.



(b) RSS Matrix Generation.

The major components of Mosent