

Adding Link Quantity Information to Redundant RF Signal Strength Estimates for Improved Indoor Positioning

Andreas Fink and Helmut Beikirch

Dept. of Computer Science and Electrical Engineering
Rostock University
Rostock, Germany
andreas.fink@uni-rostock.de

ABSTRACT

The reliable positioning of people and materials in heavy-obstructed indoor environments is an ongoing and challenging research issue. Range-based methods can use the received strength of RF signals from several anchor nodes to compute their distances to a mobile emitter with unknown position. The range-based weighted centroid localization (WCL) approaches are known to be more accurate than range-free centroid localization (CL) methods using only the radio link information according to the cell of origin principle.

With the combining of redundant RF channels using spatial and frequency diversity the WCL position estimation is proved to be even more reliable, although the received signal strength (RSS)-based distance estimations of a single RF channel are known to be error-prone in multipath indoor environments.

A novel range-free approach using the exact number of available diversity channels – the link quantity information – is proposed. It needs no more infrastructural effort or processing power and can easily be applied to the range-based WCL estimation technique with redundant sensor information. Especially the combining of the redundant RSS-based distance estimations together with the link quantity information leads to a more accurate position estimation. Experimental results in an office building and in a real-life tracking application for maintenance staff in the underground coal mining show the improvements of the additional range-free approach.

KEYWORDS: Centroid Localization, Indoor Positioning, Link Quantity Information, Received Signal Strength, RF Channel Diversity