

# Optimization of Rank Based Fingerprinting Localization Algorithm

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## ABSTRACT

The paper will deal with optimization of the Rank Based Fingerprinting (RBF) algorithm, which was previously proposed by the author. Results achieved in real world experiments showed that RBF can achieve better accuracy compared to some of traditional fingerprinting algorithms. Impact of device change is the main drawback of many existing positioning algorithms; RBF algorithm achieved very promising results from this point of view. Accuracy of RBF algorithm seems to be less affected by change of mobile device. Previously proposed RBF algorithm has one drawback, the high computational complexity. In the paper optimization algorithm is proposed to decrease computational complexity of RBF localization algorithm. This optimization algorithm reduces radio map based on previous estimated position of mobile device using some additional information about localization area. Proposed optimization consists of the two main parts. The first part, represented by adaptive range estimation algorithm, is used to estimate range, from which reference points will be chosen for the position estimation. In the second part, reference points are chosen and extracted from database, using data about the estimated range and localization area. Proposed optimization algorithm was firstly implemented and tested in simulations using Matlab environment. Computational time was measured to compare results of optimized and original RBF algorithm. Impact of optimization algorithm on localization accuracy of the RBF algorithm was also investigated. Real world measurements were performed to validate results achieved in the simulations. Achieved results show, that optimization algorithm decreases computational complexity of RBF algorithm and localization accuracy was almost the same compared to originally proposed RBF algorithm. Proposed optimization algorithm seems to significantly improve computational complexity of the RBF algorithm and allows use of the algorithm in applications, where short computation time of position estimation is needed e.g. tracking or navigation applications.

**KEYWORDS:** Optimization, Rank-based fingerprinting, indoor localization, positioning.