Fuzzy rank cluster top k Euclidean distance and triangle based algorithm for magnetic field indoor positioning system

ABSTRACT

The indoor localisation based on indoor magnetic field (MF) has drawn much research attention since they have a range of applications field in science and industry. The position estimation is generally based on the Euclidean distance (ED) between compared data points. Commonly, the state-of-the-art k-nearest neighbour (KNN) algorithm is used to estimate the test point (TP) position by considering the average location of the closest estimated K reference points (RPs). However, the problem of using the KNN algorithm is the fixed K value does not guarantee accurate estimation at every position. In this study, we first optimise the MF RPs database using the clustering method. Each trained RP and other nearby RPs are clustered together at a certain distance. Then, we create a rank cluster algorithm where we match the top 10 ranks RPs with the nearest Euclidean distance to the TP with the RPs cluster. For the proposed fuzzy algorithm, a condition is applied to choose whether the triangle area or average Euclidean algorithm is used to find the final estimated position. Experiments show a localisation accuracy of 5.88 m, which is better than KNN with an improvement of 31 %.

Keyword: Indoor localization; Magnetic field; Euclidean; Triangle