

Combining similarity functions and majority rules for multi-building, multi-floor, WiFi Positioning

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ABSTRACT

During the last decade, researchers have made many efforts to improve the accuracy with which it is possible to determine the position of persons or objects in indoor environments. Fingerprint is one of the most widely used methods for locating devices in indoor wireless environments and, due to technological progress, we have witnessed the emergence of several positioning systems aimed for indoor environments. However, developing a WiFi based positioning system with a good performance still has a high cost, not just because of the presence of multipath and interference, but also due to reflections and changes in indoor environments.

Therefore, additional efforts are required in order to improve the performance of these systems so that applications that are highly dependent on user location can provide better services to its users.

In this work we present an improvement to the positioning accuracy of the fingerprint algorithm. Our algorithm ranks the information about the location in a hierarchical way by identifying the building, the floor, the room and the geometric position.

The proposed fingerprint method has been designed based on the similarity of RSSI radio signatures stored on a database. The fingerprint method uses a previously stored map of signal strength at several positions and determines the position using similarity functions and majority rules. In particular, we compare different similarity functions to understand their impact on the accuracy of the positioning system.

The experimental results confirm the possibility of correctly determining the building, the floor and the room where the persons or the objects are at with high rates, and with an average error less than 3 meters. The results also show the influence of the similarity function on the accuracy. Moreover, detailed statistics about the errors are provided, showing that the average error metric, often used by many authors, hides many aspects on the system performance.

KEYWORDS: Fingerprint, Indoor Positioning, RSSI, WLAN, Mobile Computing.