

Development of a Wi-Fi-Fingerprinting for Position Determination by Mean of Probabilistic Methods

Soeren Leitz, Friedrich Keller, Thomas Willemsen, Harald Sternberg and Steffen Kagerah
(Germany)

Key words: Positioning; Location Based Services (LBS); WiFi-Fingerprinting; Probabilistics Methods; Indoor Navigation

SUMMARY

Caused by the rapid technical development in the recent 30 years the question relating to position specification and navigation of pedestrians in the outside location could nearly be solved. GNSS-systems are working on almost all transportable devices, e.g. smartphones or tablets – consequently they can be used at any time, at any location. But this solution is restricted to outdoor areas, within buildings the GNSS-systems are only of limited use. Due to this fact other approaches need to be found for the interior area. Here, positions can be determined by infrared-, ultrasonic- or radio-contacts, whereby in these cases investigations in infrastructure are often needed. Another alternative is the position determination by on wireless-LAN-signals. Mobile LAN access points are existing in considerable numbers in a lot of public buildings and therefore they are very attractive for real-time tracking. Based on this knowledge, the Hafen-City-University Hamburg (HCU) has worked in the context of the study project 'Location Based Services' (LBS) on the opportunity of a positioning with wireless-LAN by a Fingerprinting-method. In this connection all questions related to the implementation, achievable accuracy as well as the type of position determination were identified. Based on these questions, different forward thinking approaches and algorithms needed to be tested - on the one hand to generate a more precise position specification, on the other hand to enable a fast calculation of the position. In this scientific work the approach to the project, its processing and the achieved results are described. The focus is on the development of a Fingerprinting-method, based on a probabilistic approach. This is the algorithms of the Occupancy-Grid Mappings which is used for detection with laser- and ultrasonic-sensors for robots and thus belongs to the SLAM-algorithm (Simultaneous Localization and Mapping). Based on this algorithm, accuracies of 0.3 - 3.0 meters could be achieved at the end of the project. These results show that the Occupancy-Grid-method is useful for a personal indoor localization.