Benchmark Measurements for
Wi-Fi Signal Strength-based Positioning System

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ABSTRACT

One of the difficulties in the indoor positioning research topic based on signal strength is to establish a metrology method accepted by the whole scientific community. The advantage of a formalized measurement method is to allow the comparison of every new algorithm to the existing solutions in order to measure the contribution objectively.

In buildings, the signal strength varies greatly from one frame to another because the distance travelled is not always identical. In this paper, we propose a methodology for recording the signal strength of Wi-Fi signals to provide a benchmark for offline use. The parameters which are studied are the input data of the recording system; they are classified into three categories: the type of the transmitted packets (broadcast, unicast, OFDM or not, size), the context (orientation of antennas, device model, number of access point, mobility pattern) and the environment (temperature, air humidity, human presence, building type).

For fingerprinting-based systems, the functions of similarity between the reference map and measurements will be compared based on the same observed values, leading to reliable and reproducible analysis.

The tool used to develop the record is called OwLPS (Open Wireless Positioning System). This platform is infrastructure-oriented, and integrates an embedded software code in the open operating system OpenWrt. Thus, any device, regardless of the operating system, can be used to send packets at the transport layer (TCP or UDP) whose signal strength is captured by the programmed access points in coverage. Signal measuring is always done with the same hardware, which allows the comparison of the measured values.

The case study compares two fingerprinting solutions, one from a manual mapping performed during the initialization phase, and another one using a self-calibration mechanism which re-qualifies periodically the radio environment in order to observe and to adapt to variations in measurements.

KEYWORDS: indoor positioning, signal strength, RSS, Wi-Fi, IEEE 802.11, metrology, benchmarking.