

RSS-based Indoor Positioning Accuracy Improvement using Antenna Array in WLAN Environments

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ABSTRACT

The interest in utilizing Wi-Fi signals for indoor location estimation purposes has been increased recently due to wide deployment of WLANs. RSS based approach has become an attractive candidate for positioning owing to its simplicity and low-complexity, which can be easily implemented in modern mobile devices such as laptops and PDAs. However, the challenging nature of indoor wireless propagation environment has caused unstable estimations from RSS based localization techniques. The instability of position estimations with a single antenna at receiver, due to short-term fading, is addressed in this paper.

In our proposed approach, the variation of the signal power with respect to time is averaged using a uniform linear antenna array (ULA) at the receiving station, thereby, position estimations are stabilized. The estimations are calculated using triangulation and their accuracy in respect of number of array elements is analysed and simulated. The implication of the correlation of the channels at each antenna element is considered for location accuracy, assuming a 2D omni-directional diffuse field. The proposed positioning technique can be integrated into IEEE 802.11 compatible receivers with single-input multiple-output (SIMO) capability, thus be able to use for robust indoor localization purposes.

KEYWORDS: Indoor Positioning, RSS, Antenna Array, WLAN.