

Positioning with Multilevel Coverage Area Models

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ABSTRACT

Fingerprinting techniques provide good indoor and urban user location but a large scale service requires an enormous radio map (RM) database. To reduce the database size, we build a statistical model of the coverage area (CA) of each wireless base station (BS) using "fingerprints" (FP), i.e. reception samples. In previous work each CA is modeled as a single ellipse, so only 5 parameters need be stored in the RM for each BS. In this paper, we investigate the use of multiple CAs for every BS. CA ellipses are fitted to FPs corresponding to different RSS level ranges. Different choices of RSS boundaries based on the statistics of FPs RSS are examined with real data. We present a method for positioning using the proposed "multilevel coverage area radio map". The method is tested using real positioning data. Positioning results are compared with conventional one-level CA positioning and basic location fingerprint methods. The results show improvement of positioning accuracy compared with positioning with a single level CA. The improvement is due to better use of RSS level information in both the offline phase (constructing the CA radio map) and in the online phase (user positioning). The proposed multilevel CA positioning works with a much smaller RM database than the basic location fingerprint method, without severely degrading the position accuracy.

KEYWORDS: Positioning, fingerprint, signal strength, coverage area.