

ABSTRACT

ENVIRONMENT AWARE LOCATION ESTIMATION IN CELLULAR NETWORKS

Location Based Services enable personalized services to the mobile subscribers based on their current position and consequently mobile positioning has received significant attention in both research and industry over the past few years. It plays a key role in providing location based services such as wireless emergency services, intelligent transportation systems, location tracking, and location-based billing.

Using received signal strength (RSS) measurements from the control channels of several base stations, the location of a mobile unit can be estimated. Although the RSS method is not as precise as other localization methods in literature such as angle of arrival, time of arrival, and assisted global positioning system, it is easy to implement on any cellular network as it does not require any changes to existing phones and network structure. Since radio propagation characteristics vary in different environments, knowing the environment of the mobile user is essential for accurate RSS based location estimation. In this study, a novel mobile positioning algorithm for cellular networks based on the estimation of the radio propagation environment is presented. The key feature of the proposed method is its capability to estimate the environment of the mobile user as either urban, suburban or rural using pattern recognition and to utilize this information for enhancing RSS based distance calculations. The proposed algorithm has been evaluated using field measurements collected from a GSM network in diverse geographic locations. Our approach turns out to be significantly beneficial, enhancing estimation accuracy, and thereby enabling high-performance mobile positioning in a practical and cost effective manner. Additionally, it is computationally light-weight and can be integrated onto any received signal strength based algorithm as an enhancement add-on.