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CELLULAR POSITIONING IN WCDMA NETWORKS USING PATTERN MATCHING

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ABSTRACT

Cellular positioning has opened the doors for various creative technological expansions in the field of Location Based Services, in addition to the safety function that it allows for. Despite the significant advances in cellular positioning, the developing and third world countries are being left behind. Better levels of accuracies are required in these nations where the majority of the population cannot afford GPS-enabled phones.

The pattern matching technique is focused on in this research. It involves studying signal patterns from the Base Stations to a mobile phone, to obtain fingerprints at each reference location to form a database. During the location estimation process, the observed fingerprint is compared with the database, and a subsequent match is made. The primary advantage of this technique is that high accuracies can be achieved with minimal costs.

This research focuses on studying the efficiency and accuracy of various pattern matching techniques which are investigated in both WCDMA and GSM networks in suburban areas in South Africa. Since certain areas have predominantly GSM coverage, it is necessary to include GSM network in this research. In addition, the inclusion of both GSM and WCDMA network data can be beneficial as it provides further criteria for correlation.

Field measurements are carried out to obtain the Radio Frequency measurements that are needed to construct the database. Various methods are analyzed and enhanced to obtain better levels of accuracies during the correlation process of the pattern matching procedure. This includes investigating the effects of penalty terms, weights, map matching, Exponential and Least Means Square approaches, as well as the use of measurements from GSM, WCDMA, and the combined networks.

High levels of accuracies were obtained and it can be concluded that these techniques do work in a suburban area, irrespective of its geographical location. The literature study shows that some of these pattern matching techniques would also yield good results in urban areas, while other techniques are more suitable for rural areas.