Non Cooperative Mobile Localization using a 3D Data base correlation technique

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Abstract:

In urban and suburban areas, non cooperative accurate location of mobile station (MS) in the GSM bandwidth is still a challenge. Moreover, for some applications, the mobile is situated in Non Line of Sight (NLOS) conditions, leading to a worst accuracy of the location. Usually the localization technique, at one or few base stations (BS), is based on the knowledge of either the signal strength, or of the relative delays of the successive rays associated to the channel impulse response, or lastly of the angle of departure (AoD) at the BSs of the dominant ray. In this paper, we propose an estimation of the MS location by introducing a hybrid metric combining spectral correlation and multipath component distance (MCD). This MCD uses information both on AOD and relative time of arrival (TOA) of the strongest rays. The environment where both the BS and the MS are situated, is assumed to be known and this environment is divided into a large number of cells. A ray launching technique is thus able to predict the channel characteristics of a reverse link between the BS and each cell. A comparison can be made between the measured channel characteristics at the BS and those calculated in each cell. By introducing a hybrid metric based on both MCD and the spectral correlation, one can try to find the minimum value of this metric and thus the expected location of the MS. To improve the location accuracy, it has been supposed that the MS successively transmits on 110 subcarriers among the 124 possible subcarriers of a GSM link. This leads to a total bandwidth of 22 MHz. After a description of the proposed localization method, examples are pr esented based on experimental results.