Adaptive Virtual and Dropping AP Algorithm to Mitigate the Border Area Effect

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ABSTRACT

The location finding methods based on RSSI (Received Signal Strength Indicator) measurements encounters several problems affecting the performance. Especially for centroid method, the positioning accuracy is severely degraded by the distribution of the reference nodes, which are equivalent to APs (Access Points) for RSSI case. In the centroid algorithm, the position of the target node, or user, is calculated based on the APs' position which is assumed to be known in advance, and RSSI measurement indicating that the target node is located within the coverage of the APs. Then, the centroid algorithm estimates the position of the target node to the "center" of those APs with considering the RSSI measurement as weighting factor. Since the position is estimated the center of APs the APs should encircle the area that target node may exists. Otherwise, the position estimate shows biased results, and this problem is called as "border effect area". To mitigate the border area effect by compensating the geometrically poor distribution of APs, virtual AP and drop AP method was proposed in the literatures. However, the methods needs initial guess of the target node's position, and didn't thoroughly take the number of virtual and dropped AP into account. Since the number of virtual and dropped AP decides the "degree of compensation" so it should be considered adaptively depending on the position of the target node. The proposed method counts the number of "hearable APs", and decides the number of virtual and dropped APs, adaptively. Therefore, the proposed method does not require initial position estimation, and enhances the positioning estimation performance. Simulation results validate that the positioning accuracy is improved with the proposed algorithm, especially when the real position of the target node is near border. Also, results using different virtual or dropped AP choosing method are compared.

KEYWORDS: RSSI, centroid algorithm, border area effect, virtual AP method, drop AP method