Improving the Positioning Accuracy Method using Virtual Access Points in the Border Area

MyungIn Ji, Youngsu Cho, Yangkoo Lee, Jooyoung Kim, Sangjoon Park
Electronics and Telecommunications Research Institute
Positioning Information Technology Research Team
Daejeon, Republic of Korea
{myungin, choys, yk_lee, kimjy, sangjoon}@etri.re.kr

ABSTRACT

Weighted Centroid Localization (WCL) is a one of simple approach for indoor positioning algorithms, which calculate the weighted sum between access points' position and device's received signal strength. In general, WCL is more suitable for terminal-based (e.g., smartphone) positioning rather than fingerprint method, because it only records the position of access points to the DB and also needs low amount of computational process.

However, by its own computational characteristics, WCL has disadvantage of inaccurate positioning accuracy in the border area (such as in the region near the edge of access points installed, boundary of building). Generally it is called *Border Area Effect Problem.*

In this paper, we take a closer look at the causes of the problem, and to mitigate this phenomena, we use virtual access point concept. Firstly, we create virtual access points (*vAP*) around user's initial position. Initial position can be calculated by basic WCL based on existing (real) access points (*rAP*). *vAPs* are generated using geometrically symmetrical displacement manner by this initial position. If the *vAPs* are placed within the *rAPs* area, bias error can be increased. So, we adjust any *vAPs* are not existing in the convex hull that *rAPs* formed with their edges. Then we calculate the final position based on the combination of *rAPs* and *vAPs*. Because the result can affect to the initial position, above procedures are repeated until the final position is stabilized.

We evaluated our algorithms using simulation and also real test on ETRI 12th building with Android smartphones. As a result, our algorithms mitigates effectively the inaccurateness, especially in the border area.

KEYWORDS: WCL, WPS, Border Area Effect, Indoor Positioning