

# Differential Wi-Fi – A Novel Approach for Wi-Fi Positioning Using Lateration

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## SUMMARY

For positioning using Wi-Fi either location fingerprinting or lateration is commonly employed. Fingerprinting is very labour consuming as a database with RSS (Received Signal Strength) scans from all visible access points (APs) measured on a large number of known reference points has to be established. Lateration requires the use of theoretical path loss models to convert the RSS measurements into ranges to all visible APs. To improve the applicability of RSS-based lateration methods in indoor environments and further provide feasible mathematical analysis for indoor localization, in this work we propose an improved lateration method based on the well-known DGNS principle, which can outperform the original lateration methods in terms of performance significantly. The idea of the novel approach termed Differential Wi-Fi (DWi-Fi) is that positioning corrections can be deduced if reference stations are deployed at certain AP locations or in a network in the area of interest. They measure the RSS to all other visible APs similar as it is done on the mobile user's side. The RSS and the deduced range or coordinate corrections are obtained from a comparison with the known ranges between the AP reference stations. In addition, in a reference AP network area correction parameters (i.e., Flächenkorrekturparameter FKP) can be calculated similar as it is done in RTK-GNSS positioning in a CORS network. These corrections are then applied to the current RSS scans from the mobile user. The major advantage of DWi-Fi is that the RSS to range conversion is based on correction parameters and not only on standard theoretical path loss models. In this contribution the concept is discussed in detail and first promising results are presented.