D2D Distance Measurement using Kalman Filter Algorithm for Distance-based Service in an Office Environment

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Abstract— The device-to-device (D2D) distance-based service is affected by distance between the D2D devices. Thus, the wireless distance measurement between devices is an indispensable technology in D2D applications. When mobile devices use the distance between D2D devices in the D2D application, the distance should be measured easily and accurately. Several methods can be used to measure the distance between D2D devices. The RSSI system can be used to estimate the D2D distance easily and inexpensively because most D2D devices can estimate the received signal strength. However, estimating the distance using a RSSI is difficult due to inaccuracies. We tested the relationship between distance and a Bluetooth RSSI to look into the inaccuracy of the RSSI in an office environment. Through the results of this test, we realize that the D2D distance is hard to be classified due to the inaccuracy of Bluetooth RSSI. Therefore, filtering algorithm should be applied to reduce the inaccuracy of the Bluetooth RSSI. Nowadays, Kalman filter is widely used in many research fields and shows good performance. Thus, we use the Kalman filter to increase the accuracy of Bluetooth RSSI. To evaluate the effectiveness of the Kalman filter algorithm, we tested the D2D distance measurement in an office environment. The result of this test indicates that the Kalman filter reduces the inaccuracy of Bluetooth RSSI significantly. In addition, we describe wireless body area network (WBAN) region classification using Bluetooth RSSI and Kalman filter in an office environment.

Keyword— Device to Device (D2D), Distance, Kalman filter, Wireless signal, Wireless personal area network

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