

Abstract

Exploring the performance of indoor localization systems based on VLC-RSSI including the effect of NLOS components using two LED lighting systems

We analyze the effect of diffuse reflection on indoor localization systems based on visible light communication. The target position is estimated using a received signal strength indication technique. Two lighting systems are considered: distinct and uniform lighting systems. Each utilizes commercially available light-emitting diodes and photodiodes with an illumination level conforming to standards. We introduce a comparative study between the two lighting systems through different transmitter (Tx) and receiver (Rx) essential parameters. The results show that the uniform lighting system achieves less localization error (± 20.43 cm) than a distinct lighting system (± 45.9 cm). The uniform lighting system is well adapted to low-Rx field of view (FOV) and narrow radiation angle (error ± 1 mm when semiradiation angle ± 5 deg). In the case of a distinct lighting system, low-Rx FOV is also required, while the Tx semiradiation angle needs to be determined carefully (error ± 3.08 cm when semiradiation angle ± 20 deg). Finally, the uniform lighting system shows flexibility in the process of Tx and Rx designs. A uniform lighting system can utilize Rx with narrow FOVs (± 8.6 deg), while a distinct lighting system is limited to Rx with a wide FOV (± 53.96 deg).