

# Abstract

**Moustafa Hussein Aly**

## **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 ( $\pm 20.43$  cm) than a distinct lighting system ( $\pm 45.9$  cm). The uniform lighting system is well adapted to low-Rx field of view (FOV) and narrow radiation angle (error  $\pm 1$  mm when semiradiation angle  $\pm 5$  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  $\pm 3.08$  cm when semiradiation angle  $\pm 20$  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 ( $\pm 8.6$  deg), while a distinct lighting system is limited to Rx with a wide FOV ( $\pm 53.96$  deg).