Abstract

Management of crowded places in Hajj using Radio Frequency Identification (RFID)

Hajj is the fifth pillar of Islamic pillars. Muslims perform it annually at the same time in certain specified places. This regularly causes problems of human congestion, which has caused deaths and injuries from crushing and suffocation among pilgrims.

This work aimed to offer a practical solution for the overcrowding problem by monitoring, managing, and organizing pilgrims using radio frequency identification (RFID) technology. The proposed RFID system consists of tools like RFID reader, RFID tag, RFID antenna, controller, computer and auxiliary equipment equipment such as automatic gate openers and visual-audible alarms.

The constructed prototype suggests the reconstruction of the pilgrims' pathways into the main paths that are surrounded by emergency side pathways to the left and right that allow the dispersion of crowds of pilgrims through open gates.

According to the project plan, the RFID system will identify crowd locations and initiate a pre-alarm system to enable authorities toperform certain actions to prevent overcrowding. Then, if those actions failed to prevent overcrowding, the system would open the gates and start audible and visual alarms at the congested locations to direct people away from these dangerous areas. The result of prototype testing was successful.

Additionally, the report included measurement of the received signal strength indicator (RSSI) for the RFID reader used with one of the packages supplied tags. This measurement indicates the strength of the signal received by the reader from the tag. The RSSI graph was successfully plotted; accordingly, it paves the way for the inclusion of such input in future work to serve as a filter that prevents signal interfaces among readers and tags and to localize actions to only the affected zones.

We recommend considering the application of the idea of this model and the undertaking of future studies based on this study to reduce the number of deaths and injuries that occur during Hajj seasons due to problems with pilgrim congestion.

Keywords: Radio frequency identification, Crowd management, hajj, agent, pilgrim RFID readers, RFID tags Received Signal Strength Indicator (RSSI)

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