ABSTRACT

Current smart door lock systems generally still rely on conventional authentication methods such as PIN, RFID, and fingerprint, which, although practical, have limitations in terms of flexibility and security. To address this, this project designs and implements an additional authentication system based on local facial recognition using an ESP32-CAM connected to a Tuya Cloud-based smart door lock. The system has two operating modes, namely administrator (face enrollment) and automatic facial verification, which is controlled via a mini switch. The facial detection process is carried out using the MTMN model, while the recognition uses FRMN, both are processed directly on the ESP32-CAM without the help of an external server. The verification results are sent to the ESP32, which then sends an API request to Tuya Cloud to unlock the door. Based on tests under four different lighting conditions, the system recorded a facial detection accuracy of 80% at 240 lux, 76% at 95 lux, 70% at 50 lux, and 68% at 20 lux. The average system response time from detection to unlocking is 2799 ms. These results show that the system can work efficiently and reliably in real environments, especially under sufficient lighting.

Keywords: (*smart door lock, ESP32-CAM, Tuya Cloud)*