ABSTRACT

The increasing rate of motor vehicle theft in Indonesia has driven the development of modern and responsive security systems. This research aims to design an Internet of Things (IoT)-based vehicle security system utilizing the ESP32 microcontroller and a fingerprint sensor for biometric authentication, as well as a proximity sensor to detect vehicle movement. The system is also equipped with Telegram notifications and a buzzer as a physical alarm. The methodology includes literature review, hardware and software design, and system testing under various conditions. The results show that the system consistently recognizes both registered and unregistered fingerprints, with an error rate of 6.67% from 90 test iterations. The average response time for registered fingerprints is 1 second, while unregistered fingerprints are rejected within approximately 1 second, with the alarm activated for about 15 seconds. Additionally, the data transmission delay testing produced an average delay of 30.21 milliseconds, which falls under the "Excellent" category based on TIPHON standards and is considered ideal according to ITU-T G.114. These results indicate that the proposed system has strong potential as a fast, effective, and real-time IoT-based vehicle security solution.

Keywords: *Internet of Things (IoT), fingerprint, proximity,* ESP32*,* Telegram*, vehicle security system.*