

ABSTRACT

Global electricity demand is expected to increase by 30% by 2040, requiring efficient automatic control systems to reduce energy waste in buildings. This study aims to design and implement an IoT-based electrical device control system using infrared sensors and a Real-Time Clock (RTC). The methods used include literature review, hardware design with ESP32, E18-D80NK sensors, and DS3231 RTC, as well as Flutter application development for automatic and manual control. Testing was conducted by comparing energy consumption between automatic and manual modes over a one-month period. The test results showed that the system was able to reduce energy consumption by 33.34%, from 146.322 kWh to 97.548 kWh per month, and save electricity costs of up to Rp 98,680.5. The system responds to device activation automatically within an average time of 594.86 ms and supports real-time remote monitoring and control through the Antares IoT platform. With a system uptime of 95% and an average communication latency of 3.033 ms (XL) and 3.733 ms (WiFi), the system has proven to be viable and reliable for implementation in smart building scenarios. The system also offers flexibility in use through two control modes: automatic and manual.

Keywords: infrared sensor, RTC, IoT, energy efficiency, electrical device control