

RANCANG BANGUN MANAJEMEN ENERGI DAN SISTEM KEAMANAN KOST BERBASIS INTERNET OF THINGS

ABSTRAK

Penerapan teknologi Internet of Things (IoT) dalam manajemen energi dan sistem keamanan kost menghadirkan solusi inovatif yang efisien dan terintegrasi. Penelitian ini bertujuan untuk merancang sistem berbasis mikrokontroler ESP32 yang mampu memantau dan mengendalikan konsumsi energi serta meningkatkan keamanan penghuni kost. Sistem ini menggunakan sensor PZEM-004T untuk memantau penggunaan listrik, sensor DHT11 untuk mengukur suhu dan kelembapan, serta electric door lock yang dikendalikan melalui RFID dan sensor sidik jari. Telegram digunakan sebagai media notifikasi ancaman secara real-time. Hasil pengujian menunjukkan sistem mampu mengontrol perangkat elektronik seperti lampu dan kipas secara otomatis berdasarkan cahaya dan suhu lingkungan. Sensor LDR berhasil mendeteksi intensitas cahaya untuk pengaturan lampu otomatis, sedangkan DHT11 mencatat suhu dan kelembapan dengan akurasi cukup baik pada kisaran suhu 28–32°C dan kelembapan 60–75% RH. PZEM-004T mencatat daya konsumsi perangkat kipas sebesar 20–22Watt dan lampu sebesar 9–10Watt dengan nilai tegangan yang stabil di sekitar 220 Volt. Sistem keamanan melalui electric door lock dapat membuka pintu secara akurat menggunakan RFID dan fingerprint. Notifikasi ancaman berhasil dikirim melalui Telegram dengan waktu respons sekitar 1–2 detik. Dengan hasil tersebut, sistem ini dinilai efektif dalam mengelola konsumsi energi dan meningkatkan keamanan, serta berpotensi menjadi model implementasi kost pintar yang mendukung pengembangan konsep kota cerdas (smart city).

Kata kunci: Internet of Things, sistem keamanan kost, efisiensi energi, Mikrokontroler, Kost pintar.

DESIGN AND DEVELOPMENT OF ENERGY MANAGEMENT AND BOARDING HOUSE SECURITY SYSTEM BASED ON INTERNET OF THINGS

ABSTRACT

The application of Internet of Things (IoT) technology in energy management and dormitory security systems offers an integrated and efficient solution for modern boarding environments. This study aims to design a system based on the ESP32 microcontroller capable of monitoring and controlling energy usage while enhancing occupant safety. The system incorporates the PZEM-004T sensor to measure electricity consumption, the DHT11 sensor for temperature and humidity detection, and an electric door lock system operated via RFID and fingerprint authentication. Telegram is used as a real-time notification platform for potential security threats. Experimental results show that the system can automatically control electronic devices such as lamps and fans based on environmental conditions. The LDR sensor successfully detects ambient light intensity for automated lighting control, while the DHT11 sensor accurately records temperature in the range of 28–32°C and humidity between 60–75% RH. The PZEM-004T sensor monitors fan power usage at around 20–22 Watts and lighting at 9–10 Watts, with voltage readings remaining stable near 220 Volts. The electric door lock system performs reliably in access authentication using RFID cards and fingerprints. Security alerts are successfully sent via Telegram with an average response time of 1–2 seconds. This IoT-based system demonstrates its effectiveness in reducing unnecessary energy use and enhancing dormitory security. It has the potential to serve as a scalable model for smart boarding houses and supports the broader development of smart city infrastructure.

Keywords: Internet of Things, boarding house security system, energy efficiency, microcontroller, smart boarding house.