

ABSTRAK

RANCANG BANGUN SISTEM LAMPU OTOMATIS BERBASIS ESP32 DENGAN MONITORING DAN KONTROL JARAK JAUH MENGUNAKAN *BLYNK* IoT

(Jean Widiani, 2026: 68 halaman)

Penerangan rumah yang masih dioperasikan secara manual menyebabkan penggunaan energi listrik menjadi kurang efisien, terutama ketika lampu dibiarkan menyala tanpa diperlukan. Penelitian ini bertujuan merancang dan membangun prototype Smart Lamp berbasis Internet of Things (IoT) menggunakan mikrokontroler ESP32 yang mampu melakukan pengendalian dan monitoring lampu secara otomatis maupun manual melalui aplikasi Blynk. Sistem memanfaatkan sensor Light Dependent Resistor (LDR) untuk mendeteksi intensitas cahaya, sensor Passive Infrared (PIR) untuk mendeteksi keberadaan manusia, serta modul PZEM-004T sebagai sensor pemantauan parameter kelistrikan yang meliputi tegangan, arus, daya, dan energi listrik. Metode yang digunakan meliputi perancangan perangkat keras, perangkat lunak, dashboard monitoring, serta pengujian fungsi setiap komponen dan sistem secara keseluruhan. Hasil implementasi menunjukkan bahwa sistem mampu mengendalikan dua lampu secara otomatis berdasarkan kondisi cahaya dan keberadaan manusia, serta menyediakan mode manual melalui aplikasi Blynk. Dashboard berhasil menampilkan informasi status lampu, intensitas cahaya, tegangan, arus, daya, energi listrik, durasi penggunaan lampu, dan estimasi biaya listrik secara real-time. Berdasarkan hasil pengujian, seluruh fitur sistem berfungsi sesuai dengan rancangan sehingga prototype Smart Lamp mampu meningkatkan kemudahan pengendalian dan monitoring penggunaan energi listrik pada sistem penerangan rumah.

Kata kunci : Smart Lamp, Internet of Things (IoT), ESP32, Blynk, PZEM-004T, Monitoring Energi

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Manual operation of household lighting can lead to inefficient electricity consumption, particularly when lights are left on unnecessarily. This study aims to design and develop an Internet of Things (IoT)-based Smart Lamp prototype using an ESP32 microcontroller, which enables automatic and manual control and monitoring of household lighting through the Blynk application. The system utilizes a Light Dependent Resistor (LDR) sensor to detect light intensity, a Passive Infrared (PIR) sensor to detect human presence, and a PZEM-004T module to monitor electrical parameters, including voltage, current, power, and electrical energy consumption. The methods employed in this study include hardware design, software development, monitoring dashboard design, and functional testing of each component and the overall system. The implementation results show that the system is capable of automatically controlling two lamps based on lighting conditions and human presence, while also providing a manual control mode through the Blynk application. The dashboard successfully displays lamp status, light intensity, voltage, current, power, electrical energy consumption, lamp usage duration, and estimated electricity costs in real time. Based on the testing results, all system features function as designed. Therefore, the Smart Lamp prototype can improve the convenience of controlling and monitoring electrical energy consumption in household lighting systems.

Keywords: *Smart Lamp, Internet of Things (IoT), ESP32, Blynk, PZEM-004T, Energy Monitoring*