ABSTRAK

SISTEM KENDALI PENCAHAYAAN OTOMATIS UNTUK DISPLAY BOARD BERBASIS MIKROKONTROLER

(Ema Zaskia 2025 : 62 halaman)

Sistem pencahayaan display board pada pameran umumnya masih bekerja secara statis, yakni menyala terus-menerus tanpa mempertimbangkan keberadaan pengunjung. Kondisi ini menyebabkan pemborosan energi listrik yang signifikan. Penelitian ini bertujuan untuk merancang sistem kendali pencahayaan otomatis berbasis mikrokontroler ESP32 dan sensor ultrasonik HY-SRF05, yang mampu mendeteksi keberadaan pengunjung dalam jarak ≤100 cm. Lampu akan menyala secara otomatis ketika ada objek dalam jangkauan dan mati ketika area tidak terdeteksi aktivitas. Sistem juga dilengkapi buzzer peringatan jika objek terlalu dekat. Perancangan dilakukan melalui tahapan pembuatan hardware dan software, integrasi sistem, serta pengujian. Validasi akurasi sensor dilakukan dengan metode TOST (Two One-Sided Test) terhadap target jarak 100 cm dengan margin ±1 cm. Hasil pengujian menunjukkan nilai p-value < 0,05, yang berarti hipotesis nol ditolak dan rata-rata pengukuran sensor dinyatakan ekuivalen secara statistik terhadap nilai target. Uji fungsional dilakukan melalui tujuh skenario pengujian berdasarkan variasi jarak dan kondisi dinamis. Sistem mampu memberikan respons cepat terhadap keberadaan objek dan mengatur status lampu secara akurat. Berdasarkan pencatatan durasi nyala lampu, sistem menunjukkan efisiensi penggunaan energi dengan penghematan lebih dari 70% dibanding sistem manual. Kesimpulannya, sistem ini terbukti efektif, responsif, dan valid secara statistik. Implementasi alat ini mendukung efisiensi energi dan meningkatkan interaktivitas visual pada pameran secara signifikan.

Kata Kunci : Buzzer**,** Display Board, Mikrokontroler, Sesnsor Ultrasonik

ABSTRACT

AUTOMATIC LIGHTING CONTROL SYSTEM FOR DISPLAY BOARD BASED ON MICROCONTROLLER

(Ema Zaskia 2025: 62 *pages*)

The lighting system of display boards at exhibitions generally operates statically, with lights remaining on continuously without considering the presence of visitors. This condition leads to significant energy waste. This study aims to design an automatic lighting control system based on the ESP32 microcontroller and HY-SRF05 ultrasonic sensor, which can detect the presence of visitors within a distance of ≤100 cm. The lights turn on automatically when an object is within range and turn off when no activity is detected in the area. The system is also equipped with a warning buzzer when the object is too close.The design process includes the development of hardware and software, system integration, and testing. Sensor accuracy validation was carried out using the TOST (Two One-Sided Test) method, with a target distance of 100 cm and a margin of ±1 cm. The test results showed a p-value < 0.05, indicating that the null hypothesis was rejected and the average sensor measurement is statistically equivalent to the target value. Functional tests were conducted through seven test scenarios based on distance variations and dynamic conditions. The system responded quickly to object presence and accurately controlled the light status. Based on recorded light duration, the system demonstrated energy usage efficiency with more than 70% savings compared to a manual system.In conclusion, the system is proven to be effective, responsive, and statistically valid. The implementation of this tool supports energy efficiency and significantly enhances visual interactivity in exhibitions.

***Keywords**: Buzzer, Display Board, Microcontroller, Ultrasonic Sensor,*