

## ABSTRAK

Penelitian ini bertujuan untuk merancang dan mengimplementasikan robot sterilisasi ruangan berbasis Internet of Things (IoT) menggunakan ESP32-S3 dan ESP32-CAM. Robot dirancang untuk membantu proses sterilisasi ruangan dengan sistem kendali jarak jauh melalui antarmuka website serta dilengkapi sistem monitoring visual secara real-time. ESP32-S3 digunakan sebagai pusat pengendali sistem, sedangkan ESP32-CAM digunakan sebagai perangkat monitoring, Access Point (AP), dan Web Server. Sistem robot dilengkapi dengan motor DC dan driver L298N untuk mengatur pergerakan maju, mundur, belok kiri, belok kanan, serta berhenti. Selain itu, servo motor SG90 digunakan untuk mengatur posisi kamera ke arah atas dan bawah. Pengendalian lampu dan waktu proses sterilisasi dilakukan melalui antarmuka website.

Metode penelitian meliputi perancangan perangkat keras dan perangkat lunak, perakitan sistem, pemrograman, implementasi, serta pengujian setiap komponen dan sistem secara keseluruhan. Pengujian dilakukan terhadap driver motor, relay, inverter, step-down, lampu simulasi, pergerakan robot, monitoring website, timer, komunikasi WiFi, dan servo motor. Hasil pengujian menunjukkan bahwa robot dapat menjalankan perintah pergerakan melalui website, sistem monitoring ESP32-CAM dapat menampilkan kondisi sekitar robot secara real-time, servo dapat mengatur posisi kamera ke atas dan bawah, serta sistem lampu dan timer dapat dikendalikan sesuai perintah. Pengujian intensitas cahaya lampu simulasi menggunakan lux meter menghasilkan intensitas 775 lux pada jarak 10 cm dan 16 lux pada jarak 3 m. Berdasarkan hasil pengujian, sistem robot dapat beroperasi sesuai dengan perancangan. Lampu neon yang digunakan dalam penelitian ini merupakan media simulasi sumber sinar UV-C.

**Kata kunci:** Robot Sterilisasi, ESP32-S3, ESP32-CAM, Internet of Things, UV-C, Monitoring.

## ABSTRACT

This research aims to design and implement an Internet of Things (IoT)-based room sterilization robot using ESP32-S3 and ESP32-CAM. The robot is designed to support the room sterilization process through a remote control system using a web-based interface and is equipped with a real-time visual monitoring system. The ESP32-S3 is used as the main system controller, while the ESP32-CAM is used as a monitoring device, Access Point (AP), and Web Server. The robot system is equipped with a DC motor and L298N driver to control forward, backward, left, right, and stop movements. In addition, an SG90 servo motor is used to adjust the camera position upward and downward. Lamp control and sterilization process timing are operated through the web interface.

The research method includes hardware and software design, system assembly, programming, implementation, and testing of each component and the overall system. Testing was conducted on the motor driver, relay, inverter, step-down module, simulation lamp, robot movement, website monitoring, timer, WiFi communication, and servo motor. The test results show that the robot can execute movement commands through the website, the ESP32-CAM monitoring system can display the surrounding conditions in real time, the servo motor can adjust the camera position upward and downward, and the lamp and timer systems can be controlled according to the given commands. The intensity test of the simulation lamp using a lux meter resulted in an intensity of 775 lux at a distance of 10 cm and 16 lux at a distance of 3 m. Based on the test results, the robot system can operate according to the designed specifications. The neon lamp used in this research serves as a simulation medium for a UV-C light source.

**Keywords:** Sterilization Robot, ESP32-S3, ESP32-CAM, Internet of Things, UV-C, Monitoring.