

ABSTRAK

Penelitian ini bertujuan mengembangkan sistem otomatisasi pengendalian fasilitas ruang kuliah yang terintegrasi dengan sistem reservasi ruangan melalui pemanfaatan teknologi *Internet of Things (IoT)* dan algoritma deteksi gerakan berbasis *frame differencing*. Sistem dirancang untuk dapat mengakses data reservasi dari sistem informasi SIRARU melalui *Application Programming Interface (API)* dan mengendalikan perangkat secara otomatis berdasarkan jadwal reservasi serta keberadaan pengguna di dalam ruangan. Komponen utama yang digunakan dalam prototipe ini meliputi *NodeMCU ESP8266* sebagai pengakses data API, *Arduino Uno* sebagai pengendali perangkat, dan *ESP32-CAM* sebagai alat pendeteksi gerakan visual. Pengujian dilakukan dalam lima skenario, yaitu pengambilan data status ruangan, pengendalian berdasarkan jadwal, deteksi gerakan, pengendalian berdasarkan gerakan, serta kombinasi antara keduanya. Hasil pengujian menunjukkan bahwa sistem mampu mengakses data dari API dengan tingkat keberhasilan 100% dan waktu respons rata-rata 3 detik. Deteksi gerakan oleh *ESP32-CAM* juga menunjukkan akurasi 100% dengan rata-rata waktu respons 0,5 detik. Selain itu, sistem berhasil menerapkan logika pengendalian *AND* antara jadwal dan gerakan, sehingga perangkat hanya aktif jika kedua kondisi terpenuhi. Penelitian ini menunjukkan bahwa integrasi antara sistem reservasi dan deteksi visual dapat meningkatkan efisiensi energi serta akurasi pengelolaan fasilitas ruang kuliah secara adaptif dan otomatis.

Kata kunci: *Internet of Things*, sistem reservasi ruangan, *ESP32-CAM*, *frame differencing*, otomatisasi ruang, deteksi gerakan.

ABSTRACT

This study aims to develop an automated control system for classroom facilities integrated with a room reservation system by utilizing *Internet of Things (IoT)* technology and a motion detection algorithm based on *frame differencing*. The system is designed to access reservation data from the SIRARU information system through an *Application Programming Interface (API)* and automatically control devices based on the reservation schedule and user presence in the room. The main components used in this prototype include the *NodeMCU ESP8266* as the API data retriever, *Arduino Uno* as the device controller, and *ESP32-CAM* as the visual motion detector. The system was tested in five scenarios: API data retrieval, schedule-based control, motion detection, control based on detected motion, and a combination of both conditions. Test results show that the system successfully accessed API data with a 100% success rate and an average response time of 3 seconds. Motion detection by the *ESP32-CAM* also demonstrated 100% accuracy with an average response time of 0.5 seconds. Furthermore, the system successfully implemented an *AND* logic control, ensuring that devices are only activated when both a valid schedule and user movement are detected. This research demonstrates that integrating a room reservation system with visual motion detection can improve energy efficiency and facility management accuracy in classroom environments through adaptive and automated control.

Keywords: *Internet of Things*, room reservation system, *ESP32-CAM*, *frame differencing*, facility automation, motion detection.