

ABSTRAK

Bandara Soekarno-Hatta sebagai salah satu bandara teraktif di Asia berada dalam menghadapi tekanan pengelolaan konsumsi energi, khususnya di sistem penerangan yang beroperasi secara harian hampir 24 jam. Untuk meningkatkan efisiensi energi, penelitian ini merancang sistem kendali lampu cerdas berbasis *Internet of Things* (IoT) menggunakan mikrokontroler ESP32 dan aplikasi KME *Smart*. Sistem kendali lampu cerdas ini dirancang untuk mengatur lampu secara otomatis berdasarkan kondisi lingkungan, termasuk intensitas cahaya dan kehadiran orang, dan memungkinkan untuk pemantauan dan pengendalian dari jarak jauh melalui internet. Pengujian sistem mencakup evaluasi perangkat keras, perangkat lunak, serta performa aplikasi KME *Smart* dalam mengendalikan lampu secara *real-time*. Hasil pengujian menunjukkan bahwa sistem dapat mengontrol delapan lampu dengan respon rata-rata 0,2 detik, meskipun terdapat keterlambatan hingga 2 detik akibat gangguan konektivitas internet. Selain itu, pengukuran tegangan relai juga menunjukkan rentang variasi sebesar 1,383 V hingga 1,642 V. Dari hasil penelitian ini terungkap bahwa implementasi sistem kendali lampu cerdas berbasis IoT dapat memperbaiki efisiensi energi dan efektivitas operasional di Bandara Soekarno-Hatta, terutama pada ruang-ruang kritis seperti terminal penumpang dan ruang tunggu.

Kata kunci: IoT, ESP32, KME *Smart*, lampu cerdas, efisiensi energi, bandara

ABSTRACT

Soekarno-Hatta Airport, which is among the busiest airports in Asia, has a problem with energy consumption management, especially in its lighting system, which runs almost 24 hours a day. To improve energy efficiency, this research creates an intelligent lighting control system based on the Internet of Things (IoT) with the ESP32 microcontroller and the KME Smart application. This system seeks to automatically control lights based on environmental conditions, such as light intensity and the presence of people, and remote control and monitoring via the internet. Testing of the system involves hardware, software, and performance evaluation of the KME Smart app in actual lighting control. The test reveals that the system can handle up to eight lights with an average response time of 0.2 seconds, though a worst-case delay of 2 seconds was observed due to internet connectivity. Furthermore, voltage measurements on the relays varied between 1.383 V and 1.642 V. The findings show that the implementation of an IoT-based Smart lighting control system can improve operational performance and energy efficiency at Soekarno-Hatta Airport, particularly in critical areas such as passenger terminals and waiting lounges.

Keywords: IoT, ESP32, KME Smart, Smart lighting, energy efficiency, airport