

PERANCANGAN DAN IMPLEMENTASI *SMART SYSTEM IoT* UNTUK PEMANTAUAN SUHU DAN KELEMBAPAN RUANG OPERASI MATA BERBASIS ESP32

Sahruni Usman (105 82 11030 23)

Program Studi Teknik Elektro Fakultas Teknik Universitas Muhammadiyah
Makassar

Email: sahruniusman@gmail.com

ABSTRAK

Ruang operasi membutuhkan pengendalian suhu dan kelembapan yang stabil untuk menjaga sterilitas serta kenyamanan pasien dan kinerja instrumen medis. Pemantauan manual memiliki keterbatasan karena tidak bersifat real-time dan bergantung pada petugas. Tujuan skripsi ini adalah merancang dan mengimplementasikan *smart system Internet of Things (IoT)* untuk pemantauan suhu dan kelembapan ruang operasi mata berbasis ESP32. Metode yang digunakan meliputi studi literatur, perancangan perangkat keras (ESP32 dan sensor BME280), perancangan perangkat lunak menggunakan Arduino IDE, integrasi koneksi Wi-Fi rumah sakit, pembuatan dashboard pada platform *Blynk*, serta pengujian kinerja sistem. Ruang lingkup pengujian mencakup akurasi sensor terhadap alat referensi (termometer dan higrometer), jangkauan koneksi berdasarkan *Received Signal Strength Indicator (RSSI)*, waktu pemuatan dashboard, stabilitas koneksi, dan fungsi notifikasi email saat kondisi abnormal. Hasil menunjukkan sensor BME280 memiliki selisih suhu $\pm 0,5$ °C dan kelembapan $\pm 2\%$ *Relative Humidity (RH)*. Koneksi Wi-Fi tetap stabil cenderung kuat hingga jarak 9 meter dengan nilai RSSI berkisar antara -50 hingga -59 dBm. Waktu pemuatan dashboard berada pada rentang 0,8–2,1 detik, stabilitas koneksi selama 1 jam menunjukkan kehilangan koneksi 0%, dan notifikasi email terkirim dengan waktu penerimaan < 1 menit saat suhu > 27 °C atau kelembapan $> 60\%$. Sistem ini efektif untuk pemantauan real-time dan peringatan dini kondisi lingkungan ruang operasi.

Kata Kunci : *Internet of Things*, ESP32, BME280, *Blynk*, suhu dan kelembapan, notifikasi email.

DESIGN AND IMPLEMENTATION OF AN ESP32-BASED IOT SMART SYSTEM FOR MONITORING TEMPERATURE AND HUMIDITY IN AN EYE OPERATING ROOM

Sahruni Usman (105 82 11030 23)

Program Studi Teknik Elektro Fakultas Teknik Universitas Muhammadiyah
Makassar

Email: sahruniusman@gmail.com

ABSTRACT

Operating rooms require stable temperature and humidity control to maintain sterility, patient comfort, and reliable performance of medical instruments. Manual monitoring is limited because it is not real-time and depends on staff availability. The objective of this thesis is to design and implement an Internet of Things (IoT)-based smart system for monitoring temperature and humidity in an ophthalmic operating room using an ESP32 microcontroller. The method includes a literature review, hardware design (ESP32 and BME280 sensor), software development using Arduino IDE, integration with the hospital Wi-Fi network, dashboard development using the Blynk platform, and system performance testing. The evaluation scope covers sensor accuracy against reference instruments (thermometer and hygrometer), connection range based on the Received Signal Strength Indicator (RSSI), dashboard loading time, connection stability, and email notification functionality under abnormal conditions. Results indicate that the BME280 sensor achieves a temperature deviation of ± 0.5 °C and a humidity deviation of $\pm 2\%$ Relative Humidity (RH). The Wi-Fi connection remains stable up to a distance of 9 meters, with RSSI values ranging from -50 to -59 dBm,. Dashboard loading time ranges from 0.8 to 2.1 seconds, the 1-hour stability test shows 0% disconnections, and email alerts are delivered in under 1 minute when temperature exceeds 27 °C or humidity exceeds 60%. The system enables effective real-time monitoring and early warning for operating-room environmental conditions.

Keywords : *Internet of Things, ESP32, BME280, Blynk, temperature and humidity, email notification.*