PROTOTYPE SISTEM KONTROL DAN MONITORING SUHU DAN KELEMBABAN PADA MULTI RUANG KUBIKEL BERBASIS *INTERNET OF THINGS* (IOT)

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ABSTRAK

Multi ruang kubikel pada sistem distribusi tenaga listrik memerlukan pemantauan suhu dan kelembaban yang akurat untuk mencegah kerusakan peralatan akibat panas berlebih atau kelembaban tinggi. Penelitian ini merancang prototype sistem monitoring dan kontrol suhu-kelembaban berbasis Internet of Things (IoT) menggunakan ESP8266 sebagai mikrokontroler utama. Tiga jenis sensor digunakan, yaitu DHT11, DHT22, dan DHT20, masing-masing dipasang pada kubikel dengan kondisi lingkungan berbeda. Sistem dilengkapi dengan aktuator kipas dan lampu, serta notifikasi *real-time* melalui Telegram Bot saat suhu >40°C atau kelembaban >70% RH. Data juga ditampilkan melalui LCD I2C. Pengujian dilakukan dalam kondisi normal, panas, dan lembab. Hasil menunjukkan DHT20 memiliki akurasi tertinggi dengan MAPE 0,40% untuk suhu dan 0,32% untuk kelembaban. Sistem mampu mengirimkan notifikasi dengan tingkat keberhasilan 100% dan rata-rata delay 5,4–5,6 detik, serta mendeteksi kerusakan sensor secara otomatis. Sistem ini terbukti efektif dalam pemantauan dan pengendalian suhu-kelembaban ruang kubikel secara otomatis dan *real-time*. Penelitian ini berkontribusi dalam peningkatan keandalan sistem distribusi tenaga listrik dan dapat dikembangkan lebih lanjut dengan integrasi lokasi atau visualisasi data.

Kata kunci: *Internet of Things*, Multi Ruang Kubikel, Suhu, Kelembaban, ESP8266, Telegram Bot

PROTOTYPE OF TEMPERATURE AND HUMIDITY CONTROL AND MONITORING SYSTEM IN MULTI COMPARTMENT CUBICLE BASED ON INTERNET OF THINGS (IoT)

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ABSTRACT

Multi-cubicle electrical rooms in power distribution systems require accurate temperature and humidity monitoring to prevent equipment failure caused by overheating or excessive moisture. This study designs a prototype of a temperature and humidity monitoring and control system based on the Internet of Things (IoT), using the ESP8266 microcontroller as the core controller. Three types of sensors—DHT11, DHT22, and DHT20—are deployed in separate cubicles with varying environmental conditions. The system integrates actuators (fan and heater lamp) and sends real-time alerts via Telegram Bot when the temperature exceeds 40°C or humidity surpasses 70% RH. Sensor data is also displayed on an LCD I2C screen. Testing was conducted under normal, hot, and humid conditions. Results show that the DHT20 sensor delivers the highest accuracy, with a MAPE of 0.40% for temperature and 0.32% for humidity. The system achieved 100% notification success rate with an average delay of 5.4–5.6 seconds and is also capable of detecting sensor malfunctions automatically. The system proves to be effective in real-time monitoring and automatic control of cubicle environments. This research contributes to improving the reliability of power distribution systems and offers potential for future development, including integration with GPS-based location mapping, cloud-based data storage, and machine learning algorithms for early anomaly detection and predictive maintenance. The modular nature of the system also allows it to be adapted for use in other industries requiring precise environmental control, such as pharmaceutical storage, data centers, and electrical panel rooms in critical infrastructure.

Keywords: *Internet of Things, Multi-Cubicle Room, temperature, humidity, ESP8266, Telegram Bot*