

ABSTRACT

AIR QUALITY MONITORING AND PREDICTION SYSTEM BASED ON INTERNET OF THINGS (IOT) USING LINEAR REGRESSION METHOD IN SSFARM

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This study produced an Internet of Things (IoT)-based air quality monitoring system using ESP32 integrated with MQ-2, MH-Z19B, and temperature and humidity sensors, and tested in the SSFarm dairy goat farm environment in Sleman. The device successfully displayed real-time air data via the Serial Monitor and OLED, and showed consistent readings with low standard deviation (0.151 ppm) and a response pattern consistent with the MQ-2 datasheet curve. The applied linear regression model was able to predict CO₂ and CO concentration trends up to 12 hours in advance with high accuracy, as evidenced by an MAE value of 0.833 ppm and an RMSE of 0.912 ppm. The research results confirm that this system is suitable for use as a low-cost, stable, and adaptive air quality monitoring solution, despite limitations in absolute accuracy due to the characteristics of low-cost sensors.

Keywords: Internet of Things, Linear Regression, Sensor Calibration, Air Quality, Smart Farming

INTISARI

SISTEM PEMANTAUAN DAN PREDIKSI KUALITAS UDARA BERBASIS INTERNET OF THINGS (IOT) MENGGUNAKAN METODE REGRESI LINIER DI: SSFARM

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Penelitian ini menghasilkan sistem pemantauan kualitas udara berbasis Internet of Things (IoT) menggunakan ESP32 yang terintegrasi dengan sensor MQ-2, MH-Z19B, serta sensor suhu dan kelembaban, dan diuji di lingkungan peternakan kambing perah SSFarm, Sleman. Perangkat berhasil menampilkan data udara secara real-time melalui Serial Monitor dan OLED, serta menunjukkan konsistensi pembacaan dengan standar deviasi rendah (0,151 ppm) dan pola respons yang sesuai dengan kurva datasheet MQ-2. Model regresi linier yang diterapkan mampu memprediksi tren konsentrasi CO₂ dan CO hingga 12 jam ke depan dengan akurasi tinggi, dibuktikan melalui nilai MAE sebesar 0,833 ppm dan RMSE sebesar 0,912 ppm. Hasil penelitian menegaskan bahwa sistem ini layak digunakan sebagai solusi monitoring kualitas udara murah, stabil, dan adaptif, meskipun terdapat keterbatasan pada akurasi absolut akibat karakteristik sensor low-cost.

Kata kunci: *Internet of Things, Regresi Linier, Kalibrasi Sensor, Kualitas Udara, Pertanian Cerdas*