

ABSTRAK

SISTEM KENDALI MOTOR ADAPTIF BERBASIS *FUZZY LOGIC* PADA *SMART POULTRY*

(2026 : 81 Halaman + 39 Gambar + 10 Tabel + Daftar Pustaka + Lampiran)

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Pentingnya menjaga kondisi lingkungan kandang ayam pada sistem *smart poultry* agar tetap optimal, terutama pada parameter suhu, kelembaban, dan konsentrasi gas *ammonia*. Ketidakseimbangan parameter tersebut dapat menyebabkan *heat stress*, menurunkan produktivitas, hingga meningkatkan angka kematian ayam. Didasarkan pada kebutuhan akan metode pengendalian yang fleksibel dan mampu menangani ketidakpastian data lingkungan. Metode *fuzzy logic* dipilih karena mampu mengolah data dalam bentuk linguistik seperti “panas”, “lembab”, dan “gas tinggi” menjadi keputusan pengendalian yang lebih halus tanpa memerlukan model matematis yang kompleks. Data yang digunakan dalam sistem diperoleh dari sensor suhu dan kelembaban (DHT22) serta sensor gas *ammonia* (MQ-137), yang kemudian diproses oleh mikrokontroler ESP32. Hasil pengolahan data menggunakan metode *fuzzy* Mamdani menghasilkan *output* berupa pengaturan kecepatan motor BLDC melalui sinyal PWM. Analisa menunjukkan bahwa sistem mampu mengatur kecepatan kipas secara bertahap sesuai perubahan kondisi lingkungan, sehingga sirkulasi udara menjadi lebih stabil. Berdasarkan hasil perancangan dan pengujian, dapat disimpulkan bahwa sistem kendali motor adaptif berbasis *fuzzy logic* mampu meningkatkan efisiensi ventilasi kandang ayam secara otomatis.

Kata kunci: *Smart Poultry, Fuzzy Logic, Motor Adaptif, ESP32, Sensor DHT22, Sensor MQ-137, Exhaust Fan, Sistem Ventilasi*

ABSTRACT

ADAPTIVE MOTOR CONTROL SYSTEM BASED ON FUZZY LOGIC IN SMART POULTRY

(2026: 81 Pages + 39 Figures + 10 Tables + References + Appendices)

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ELECTRICAL ENGINEERING

STUDY PROGRAM OF ELECTRONICS ENGINEERING

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The importance of maintaining optimal environmental conditions in poultry housing within a smart poultry system, especially in parameters such as temperature, humidity, and ammonia gas concentration. Imbalance in these parameters can cause heat stress, reduce productivity, and increase poultry mortality rates. This is based on the need for a control method that is flexible and capable of handling uncertainty in environmental data. Fuzzy logic is chosen because it is able to process data in linguistic forms such as “hot”, “humid”, and “high gas” into smoother control decisions without requiring complex mathematical models. The data used in the system are obtained from temperature and humidity sensors (DHT22) as well as ammonia gas sensors (MQ-137), which are then processed by the ESP32 microcontroller. The results of data processing using the Mamdani fuzzy method produce an output in the form of BLDC motor speed regulation through PWM signals. The analysis shows that the system is able to regulate fan speed gradually according to changes in environmental conditions, so that air circulation becomes more stable. Based on the results of design and testing, it can be concluded that the adaptive motor control system based on fuzzy logic is able to improve the efficiency of poultry house ventilation automatically.

Keywords: Smart Poultry, Fuzzy Logic, Adaptive Motor, ESP32, DHT22 Sensor, MQ-137 Sensor, Exhaust Fan, Ventilation System