

ABSTRAK

Pemeliharaan *Day old chick* (DOC) pada fase brooding awal (0–14 hari) merupakan tahap paling kritis dalam usaha peternakan ayam karena DOC belum mampu mengatur suhu tubuhnya sendiri. Fluktuasi suhu, kelembapan yang tidak stabil di kandang tradisional sering menyebabkan tingkat kualitas ternak rendah dan pertumbuhan yang tidak optimal. Penelitian ini bertujuan merancang dan mengimplementasikan sistem kontrol otomatis kandang pembesaran DOC berbasis *Internet of Things* (IoT) menggunakan metode *Fuzzy logic Control* Mamdani untuk menjaga kondisi lingkungan kandang tetap optimal secara adaptif. Sistem dikembangkan dengan menggunakan mikrokontroler ESP32 sebagai pusat kendali utama, sensor DHT22 untuk mengukur suhu dan kelembapan, modul RTC DS3231 untuk penjadwalan otomatis, *relay* dua *channel* untuk mengontrol lampu pemanas, *motor driver* L298N untuk mengatur kecepatan kipas melalui *duty cycle* yang di konversi ke sinyal PWM, serta motor DC untuk sistem *conveyor* pembersih kotoran. Data lingkungan dikirim secara berkala ke *Firestore Realtime Database* dan dapat dipantau serta dikontrol melalui aplikasi Android yang dikembangkan menggunakan Android Studio dengan bahasa pemrograman Kotlin. Metode *Fuzzy* Mamdani diterapkan untuk menentukan aksi kontrol kipas dan lampu pemanas berdasarkan kondisi suhu kandang. Pengujian dilakukan melalui validasi akurasi sensor, perbandingan *output* model *Fuzzy* antara implementasi Arduino IDE dengan perhitungan manual, *Black box testing* aplikasi Android, pengujian *System Usability Scale* (SUS), pengujian integrasi sistem secara keseluruhan, serta pengujian pertumbuhan DOC selama 14 hari dibandingkan dengan metode konvensional. Hasil pengujian sensor DHT22 menunjukkan tingkat akurasi sebesar 95,03% untuk kelembapan dan 99,37% untuk suhu. Validasi model *Fuzzy* Mamdani menghasilkan kesesuaian yang tinggi antara *output* sistem dengan perhitungan manual. Sistem secara keseluruhan mampu menjaga suhu dalam rentang 32–35 °C dan kelembapan 60–70%. Aplikasi Android memperoleh skor SUS dalam kategori sangat baik. Pengujian pertumbuhan DOC menunjukkan kualitas DOC yang baik dari bobot berat, pada kelompok yang menggunakan sistem otomatis dibandingkan pada metode konvensional.

Kata kunci: *Day old chick*, sistem kontrol otomatis, *Internet of Things*, *Fuzzy logic* Mamdani, ESP32, sensor DHT22, aplikasi Android, *Firestore*.

ABSTRACT

The maintenance of Day Old Chicks (DOC) during the early brooding phase (0–14 days) is the most critical stage in poultry farming because chicks are not yet capable of regulating their own body temperature. Fluctuations in temperature and unstable humidity conditions in traditional poultry houses often lead to poor chick quality and suboptimal growth. This study aims to design and implement an Internet of Things (IoT)-based automatic control system for DOC brooding houses using the Fuzzy Logic Control Mamdani method to maintain optimal environmental conditions adaptively. The system was developed using an ESP32 microcontroller as the main control unit, a DHT22 sensor for temperature and humidity measurement, a DS3231 Real-Time Clock (RTC) module for automatic scheduling, a two-channel relay module to control heating lamps, an L298N motor driver to regulate fan speed through Pulse Width Modulation (PWM), and a DC motor for a manure-cleaning conveyor system. Environmental data are transmitted in real time to Firebase Realtime Database and can be monitored and controlled through an Android application developed using Android Studio with the Kotlin programming language. The Mamdani Fuzzy Logic method was implemented to determine fan and heating lamp control actions based on the temperature conditions inside the poultry house. System evaluation was conducted through sensor accuracy validation, comparison of Fuzzy Mamdani outputs between Arduino IDE implementation and manual calculations, Android application Black Box Testing, System Usability Scale (SUS) testing, overall system integration testing, and a 14-day DOC growth performance test compared with conventional rearing methods. The results showed that the DHT22 sensor achieved accuracy levels of 96.28% for humidity measurement and 97.72% for temperature measurement. Validation of the Mamdani Fuzzy Logic model demonstrated a high degree of conformity between system outputs and manual calculations. The proposed system successfully maintained temperature within the range of 32–35°C and humidity between 60–70%, with an average response time of less than 4 seconds. The Android application obtained a SUS score categorized as Good. Furthermore, better chick quality in terms of body weight in the group utilizing the automatic system, compared to the conventional method.

Keywords: Day Old Chick (DOC), automatic control system, Internet of Things (IoT), Mamdani Fuzzy Logic, ESP32, DHT22 sensor, Android application, Firebase.