

ABSTRAK

RANCANG BANGUN SISTEM MONITORING KUALITAS AIR DAN PEMBERIAN PAKAN IKAN OTOMATIS MENGGUNAKAN METODE *FUZZY LOGIC* BERBASIS IOT

(2026: xiv + 99 Halaman + 26 Gambar + 27 Tabel + 12 Lampiran)

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Pemantauan kualitas air dan pemberian pakan yang hanya berbasis jadwal dapat menyebabkan proses pemberian pakan tetap berlangsung meskipun kondisi air belum sesuai. Penelitian ini merancang dan mengevaluasi sistem monitoring kualitas air dan pemberian pakan ikan otomatis pada kolam ikan lele berbasis *Internet of Things* menggunakan metode *fuzzy logic*. Sistem menggunakan ESP32 sebagai pusat kendali, sensor suhu, sensor pH, sensor ultrasonik untuk memantau ketersediaan pakan, *motor servo* sebagai aktuator, Blynk sebagai media monitoring dan kontrol, serta Telegram sebagai media notifikasi. Nilai suhu dan pH diklasifikasikan ke dalam lima kategori, yaitu Sangat Buruk, Buruk, Cukup, Baik, dan Optimal, kemudian diproses melalui *fuzzy rule base* untuk menghasilkan keputusan *Feed ON* atau *Feed OFF*. Hasil pengujian menunjukkan rata-rata error sensor suhu sebesar 3,62% dengan akurasi 96,38%, error sensor pH sebesar 11,24% dengan akurasi 88,76%, dan error sensor ultrasonik sebesar 2,64% dengan akurasi 97,36%. Validasi *fuzzy rule base* pada 30 data uji menghasilkan kesesuaian 100% antara keputusan rancangan dan keputusan sistem. Pengujian *quality of service* menunjukkan seluruh skenario memperoleh *packet loss* 0,00%, dengan *delay* rata-rata 165,70 ms pada pengiriman data suhu ke Blynk, 187,30 ms pada pengiriman status sistem, 102,10 ms pada perintah pakan manual, 126,90 ms pada perubahan mode, dan 1557,00 ms pada pengiriman notifikasi Telegram. Hasil tersebut menunjukkan bahwa sistem mampu menjalankan pemantauan, pengambilan keputusan, pengendalian aktuator, komunikasi data, dan penyampaian notifikasi secara terintegrasi. Namun, penelitian ini masih terbatas pada pengujian fungsi teknis alat dan belum mencakup pengaruh sistem terhadap pertumbuhan ikan maupun efisiensi penggunaan pakan.

Kata Kunci: Monitoring Kualitas Air, Pemberian Pakan Otomatis, *Fuzzy Logic*, *Internet of Things*, Real-Time Monitoring

ABSTRACT

DESIGN AND DEVELOPMENT OF AN IOT-BASED WATER QUALITY MONITORING AND AUTOMATIC FISH FEEDING SYSTEM USING FUZZY LOGIC METHOD

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Water quality monitoring and scheduled feeding without considering pond conditions may cause feeding to continue even when the water condition is not suitable. This study designs and evaluates an Internet of Things-based water quality monitoring and automatic fish feeding system for catfish ponds using the fuzzy logic method. The system uses an ESP32 as the main controller, a temperature sensor, a pH sensor, an ultrasonic sensor to monitor feed availability, a servo motor as the actuator, Blynk as the monitoring and control platform, and Telegram as the notification medium. Temperature and pH values are classified into five categories, namely Very Poor, Poor, Fair, Good, and Optimal, and are then processed through a fuzzy rule base to produce Feed ON or Feed OFF decisions. The test results show an average temperature sensor error of 3.62% with an accuracy of 96.38%, a pH sensor error of 11.24% with an accuracy of 88.76%, and an ultrasonic sensor error of 2.64% with an accuracy of 97.36%. The fuzzy rule base validation using 30 test data produced 100% agreement between the designed decisions and the system decisions. The Quality of Service test showed that all scenarios obtained 0.00% packet loss, with an average delay of 165.70 ms for temperature data transmission to Blynk, 187.30 ms for system status transmission, 102.10 ms for manual feeding commands, 126.90 ms for automatic and manual mode switching, and 1557.00 ms for Telegram notification delivery. These results indicate that the system is able to perform monitoring, decision-making, actuator control, data communication, and notification delivery in an integrated manner. However, this study is limited to testing the technical functions of the system and does not yet evaluate its effect on fish growth or feed utilization efficiency.

Keywords: Water Quality Monitoring, Automatic Fish Feeding, Fuzzy Logic, Internet of Things, Real-Time Monitoring