

ABSTRAK

Penumpukan sampah pada saluran air dapat menghambat aliran dan meningkatkan risiko terjadinya genangan. Penelitian ini bertujuan merancang prototipe alat pembersih sampah otomatis sekaligus memonitor kapasitas bak penampungan menggunakan ESP32 dan metode Fuzzy Sugeno. Sistem menggunakan tiga sensor ultrasonik HC-SR04 untuk mendeteksi ketinggian air, mendeteksi sampah di depan conveyor, dan memantau kapasitas bak. Data sensor diolah pada ESP32, kemudian keputusan pengoperasian conveyor ditentukan berdasarkan aturan Fuzzy Sugeno dengan keluaran tegas untuk kondisi ON atau OFF. Conveyor digerakkan motor DC gearbox melalui driver L298N, sedangkan kondisi bak ditampilkan melalui LCD I2C, buzzer, dan notifikasi Telegram. Hasil pengujian menunjukkan enam skenario pembacaan sensor ultrasonik berhasil dijalankan, lima skenario pengujian Fuzzy Sugeno menghasilkan keputusan sesuai aturan, pengendalian conveyor berhasil pada lima skenario, dan seluruh skenario notifikasi serta pengujian keseluruhan sistem dinyatakan berhasil. Conveyor beroperasi ketika air tersedia dan sampah terdeteksi, serta berhenti ketika salah satu kondisi tidak terpenuhi atau bak penampungan penuh. Dengan demikian, prototipe mampu mengintegrasikan fungsi deteksi, pengangkatan sampah, monitoring kapasitas, dan pemberian notifikasi dalam satu sistem otomatis.

Kata kunci: ESP32, conveyor, Fuzzy Sugeno, sensor ultrasonik, Telegram

ABSTRACT

The accumulation of waste in drainage channels can obstruct water flow and increase the risk of waterlogging. This study aims to design a prototype of an automatic waste-cleaning device while monitoring the capacity of a waste collection bin using an ESP32 microcontroller and the Fuzzy Sugeno method. The system uses three HC-SR04 ultrasonic sensors to detect water level, detect waste in front of the conveyor, and monitor the capacity of the collection bin. The sensor data are processed by the ESP32, and the conveyor operation is determined using Fuzzy Sugeno rules with crisp outputs representing ON or OFF conditions. The conveyor is driven by a DC gearbox motor through an L298N motor driver, while the condition of the collection bin is displayed through an I2C LCD, buzzer, and Telegram notifications. The test results showed that six ultrasonic sensor reading scenarios were successfully performed, five Fuzzy Sugeno test scenarios produced decisions in accordance with the defined rules, conveyor control was successfully achieved in five scenarios, and all notification and overall system test scenarios were successfully completed. The conveyor operates when water is present and waste is detected, and stops when one of these conditions is not met or when the collection bin is full. Therefore, the prototype successfully integrates waste detection, waste lifting, capacity monitoring, and notification functions into a single automated system.

Keywords: ESP32, conveyor, Fuzzy Sugeno, sensor ultrasonik, Telegram