

RANCANG BANGUN SISTEM PENDETEKSI DAN KONTROL KADAR ASAP ROKOK MENGGUNAKAN METODE *FUZZY LOGIC*

Nama Mahasiswa : Shylvester Simanjuntak
NIM : 3103221319
Dosen Pembimbing : Hikmatul Amri, S.ST., M.T.

ABSTRAK

Paparan asap rokok di ruang tertutup berpotensi menimbulkan dampak kesehatan serius, terutama bagi perokok pasif. Penelitian ini merancang sistem pendeteksi dan pengendali kadar asap rokok berbasis *Fuzzy Logic* Tsukamoto dengan menggunakan sensor MQ-7 untuk mendeteksi karbon monoksida (CO) dan sensor DHT22 untuk mengukur suhu ruangan. Data yang diperoleh diproses melalui tahapan fuzzifikasi, inferensi aturan *fuzzy*, dan defuzzifikasi. Hasil keluaran berupa sinyal PWM digunakan untuk mengatur kecepatan kipas DC sebagai aktuator sirkulasi udara, sedangkan *buzzer* berfungsi sebagai alarm peringatan. Hasil pengujian menunjukkan sistem mampu beroperasi secara *real-time* dan menyesuaikan kondisi lingkungan. ketika suhu berada pada 30,5 °C dan kadar asap 491 PPM, kipas berputar pada kecepatan maksimum dengan nilai PWM 220 serta *buzzer* aktif. Sebaliknya, pada suhu 24,0 °C dan kadar asap 173 PPM, kipas berputar sedang dengan nilai PWM 113 dan *buzzer* tidak aktif. Perbandingan antara hasil pengukuran dan perhitungan pada kecepatan kipas menghasilkan nilai rata-rata selisih sebesar 3,627 PWM dan nilai *error* sebesar 2,666 %, yang menunjukkan kinerja sistem dalam mengendalikan kecepatan kipas sesuai kondisi ruangan. Rancangan ini digunakan pada sistem pengendali kadar asap di ruang tertutup serta mendukung implementasi kawasan tanpa rokok (KTR).

Kata kunci: *Fuzzy Logic*, Arduino Uno, MQ-7, DHT22, Asap Rokok, Pengendali Kipas.

DESIGN OF A CIGARETTE SMOKE DETECTION AND CONTROL SYSTEM USING THE FUZZY LOGIC METHOD

Name : Shylvester Simanjuntak
Study Number : 3103221319
Supervisor : Hikmatul Amri, S.ST., M.T.

ABSTRACT

Exposure to cigarette smoke in enclosed spaces has the potential to cause serious health impacts, especially for passive smokers. This study designs a cigarette smoke detection and control system based on Tsukamoto Fuzzy Logic by employing the MQ-7 sensor to detect carbon monoxide (CO) and the DHT22 sensor to measure room temperature. The acquired data are processed through the stages of fuzzification, rule inference, and defuzzification. The output in the form of a PWM signal is used to control the speed of a DC fan as an air circulation actuator, while a buzzer functions as a warning alarm. The test results show that the system is capable of operating in real time and adapting to environmental conditions. When the temperature is 30.5 °C and the smoke concentration reaches 491 PPM, the fan rotates at maximum speed with a PWM value of 220 and the buzzer is activated. Conversely, at a temperature of 24.0 °C and a smoke concentration of 173 PPM, the fan rotates at medium speed with a PWM value of 113 and the buzzer remains inactive. A comparison between measured and calculated fan speed values yields an average difference of 3.627 PWM and an error of 2.666%, indicating the system's performance in controlling fan speed according to room conditions. This design can be applied to smoke control systems in enclosed spaces and supports the implementation of smoke-free areas.

Keywords: Fuzzy Logic, Arduino Uno, MQ-7, DHT22, Cigarette Smoke, Fan Controller.