



KEMENTERIAN PENDIDIKAN TINGGI

JOJAPS

eISSN 2504-8457



Journal Online Jaringan Pengajian Seni Bina (JOJAPS)

DETECTION OF CIGARETTE SMOKE LEVELS IN THE ROOM USING THE FUZZY LOGIC MAMDANI METHOD

Muhammad Syahrizal, Fauzan Helmi* & Mesran

Department of Computer Science, Universitas Budi Darma, Medan, Indonesia

^aemail:helmifauzan809@gmail.com

**email:syahrizal83.budidarma@gmail.com*

Abstract

The number of sufferers of respiratory disorders both young and from adults caused by cigarette smoke has increased every year, from 192 countries mentioning about 40% of children in the world are exposed to cigarette smoke and more than 30% of adults become passive smokers. The use of cigarette smoke detector using Arduino which is equipped with a gas sensor makes it easy for early detection when someone wants to smoke in a room that should be clean from cigarette smoke and is equipped with a temperature sensor if too much smoke can make the temperature in the room changed. The design of smoke level detector in cigarettes with smoke sensor and temperature sensor uses fuzzy logic mandani algorithm, equipped with red and white led indicators, buzzer to provide information in the form of sound, LCD display that functions to display smoke and temperature information in the room. , and a fan as an output to remove cigarette smoke and cool the room temperature.

Keywords: Arduino, Gas sensor, Design of cigarette smoke detector, Fuzzy logic Mamdani

1. Introduction

In general, every person who smokes burns his cigarettes outside or inside the house, if someone smokes outside the house or the area that is allowed to smoke is an event that is not a problem. But it would be more dangerous if a smoker would burn their cigarettes in the house or room, especially if there are children or toddlers in the room who must be avoided from cigarette smoke. And the interference of cigarette smoke can also result in the emergence of several diseases for people who breathe it or are said to be passive smokers caused by uncontrolled cigarette smoke contained in the room.

In overcoming the problems that occur for a room that is used as a place for smokers, some of the solutions that have been offered are control systems for controlling tobacco smoke based on microcontrollers, MQ2 sensors, and LM35 sensors. Simulation of detection of cigarette smoke with MQ2 sensor and LM35 sensor as the main input to determine cigarette smoke levels and temperatures obtained from rooms filled with cigarette smoke. Microcontroller in the simulation of detection of cigarette smoke as a data processing unit, the input in the form of an MQ2 sensor is used as a reference to determine the amount of smoke detected, which is displayed on the LCD under various conditions to be determined. These provisions are in the form of clean air with a visual indicator in the form of white LED lights that will light up, the air starts to be polluted with a visual indicator in the form of a red LED light, and very dirty air with a visual indicator in the form of a flashing red LED. If the air condition is very dirty with a marked life of flashing red LEDs, then automatically the system with a microcontroller as the processing will automatically turn on the fan to suck and blow out the cigarette smoke that has filled the room.

Many of the fuzzy methods that can be used in life, one of which is the Mamdani method that can show great potential to effectively solve the problem of uncertainty, for example, is the implementation of Fuzzy Mamdani logic to detect cigarette smoke in the room by taking the amount of smoke and the temperature received. Then the method used is the Mamdani Fuzzy Logic Algorithm Method.

2. Theory

a. Cigarette smoke

Cigarette smoke is a pollutant against humans and the surrounding environment. Not only for health, smoking also becomes a problem in the economic field. In developed industrial countries, there is currently a tendency to stop smoking, whereas, in developing countries, such as Indonesia, the current tendency of smoking is increasing. Through a 1983 resolution, the World Health Organization (WHO) has set every May 31 as a World Tobacco-Free Day every year. The WHO WHO report in 1983 stated that the number of people who smoke increased 2.1 percent per year in developing countries, whereas in developed countries the opposite was true, the figure decreased by 1.1 percent per year.

b. Fuzzy Logic

Fuzzy logic is a control system methodology to solve problems, which can be implemented on systems, ranging from simple systems, small systems, embedded systems, PC networks, multi-channel or workstations based on data acquisition, and control systems. In fuzzy logic, the value of membership can be between 0 and 1. This means that a condition can have two values Yes and No, True and False, Good and Bad simultaneously, but the value depends on the weight of the membership it has.

c. Fuzzy Mamdani

The Mamdani method is also called the Max-Min method. This method was introduced by Ebrahim Mamdani in 1975. To get the output, there are several steps that must be done, namely:

1. The formation of a fuzzy set
2. Application function implications
3. The composition of the rules
4. Affirmation (defuzzification)

d. Arduino Uno

Arduino Uno is a component that is as small as a credit card. Although Arduino Uno is small, the board contains microcontroller components and a number of inputs and outputs that make it easy to create various electronic projects designed for specific purposes..

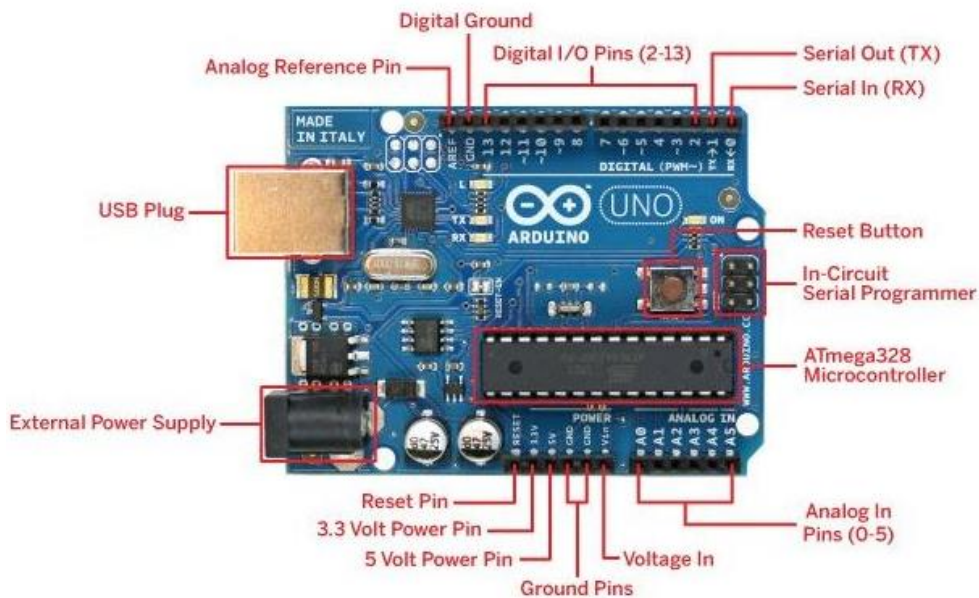


Figure 1. Arduino Uno Board

3. System Design

The design is a stage to determine the needs of a new system that will be made so that the tools made can function in accordance with what is desired and structured so that they can provide accurate information and information. As a form of modeling the tool design will be described in the form of system flowcharts and system block diagrams.

a. Flowchart System

This flowchart will show the work process of a series that has been made, where the first input data obtained from the mq-2 sensor that detects the presence or absence of cigarette smoke and the lm35 sensor detects the presence or absence of changes in temperature in the room. With the detection of gas and temperature, several actions will be carried out in accordance with the regulations that have been made.

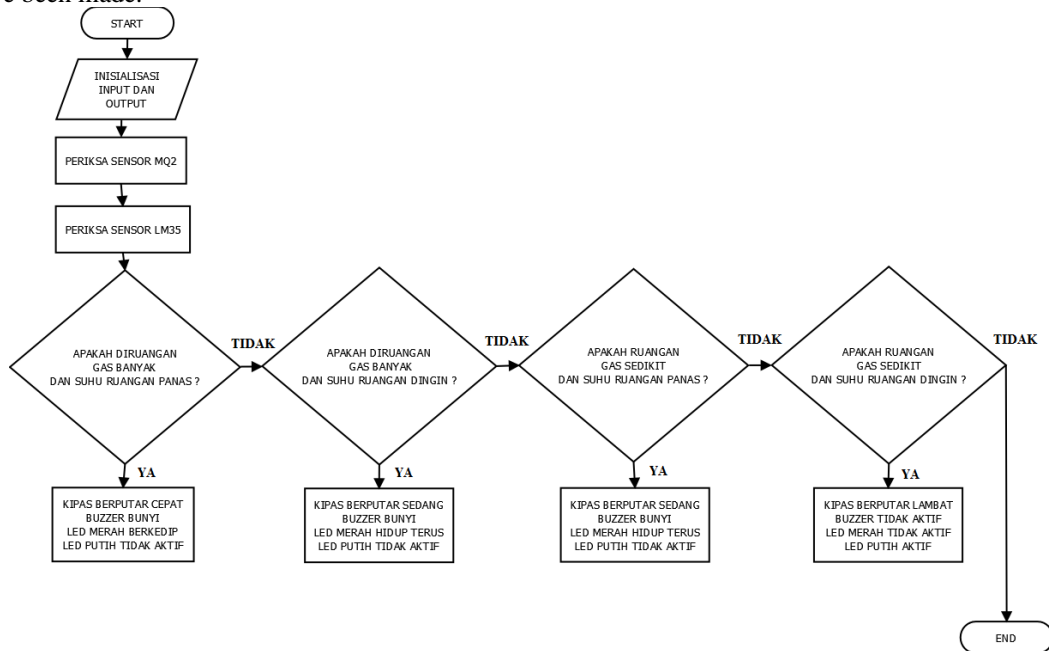


Figure 2. Flowchart

b. System Diagram Blocks

Block Diagram is one of the basic descriptions of a series of systems that will be designed and illustrate in general how the circuit works as a whole, each block diagram has a function of each. In the block diagram below, it will be able to analyze the workings of the circuit and can design the hardware to be made.

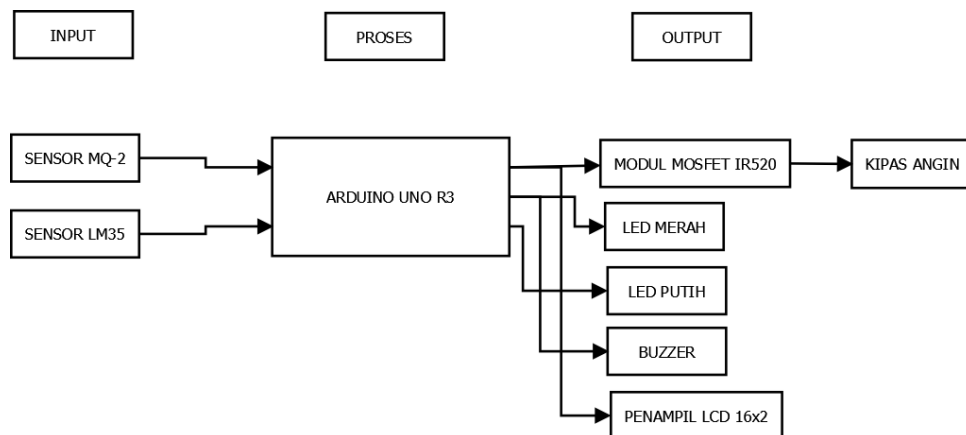


Figure 3. System Diagram Blocks

c. Hardware Design

The system is designed on a smoke detector level in the room with the Mamdani fuzzy logic method using Arduino Uno, gas sensor (mq-2) and temperature sensor (lm35), where later the fan will be driven by the MOSFET module with the command in from

Arduino Uno. This hardware series is broadly divided into several parts, namely Arduino Uno as the main component, MQ-2 Sensor, LM35 Sensor, Buzzer, Led, and IR520 Mosfet Module. General description of the hardware parts is shown in the picture that explains the schematic of the overall circuit and its constituent components, component values and ports used in each circuit.

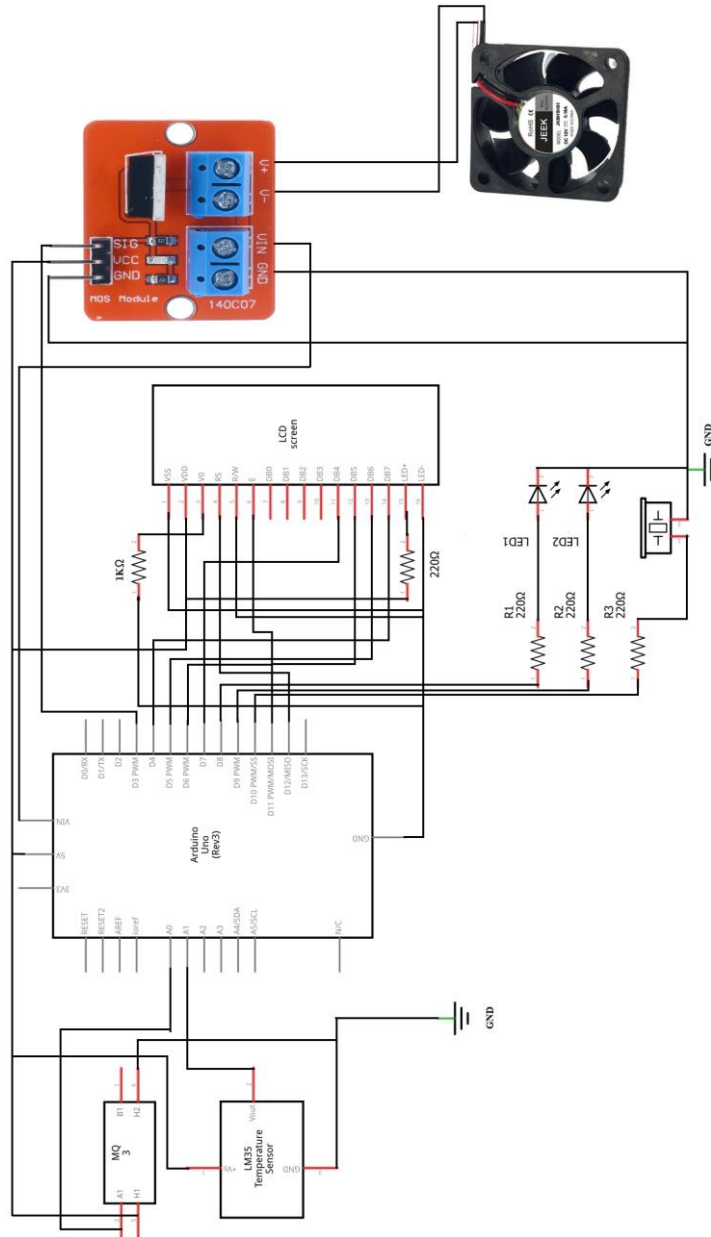


Figure 4. Overall Range of Cigarette Smoke Detection System

4. Conclusion

In this paper, artificial intelligence with robotics and sensor systems can identify fan speeds based on cigarette smoke and room temperature, so as to make it easier for people to anticipate the dangers that will be felt when smoking in a room.

Reference

- [1] E. Mulyanto S.Si., M.Kom, *Kecerdasan Buatan*. Yogyakarta: ANDI Yogyakarta, 2010.
- [2] S. Rawuh, “Sejarah Robot dan Pengertian tentang Robotika,” *Agustus*, 3, 2012. [Online]. Available: <https://www.eyuana.com/2012/08/sejarah-robot-dan-pengertian-tentang.html>. [Accessed: 01-Jun-2019].
- [3] Sivaranjith, “Temperature sensor IC LM35,” *September*, 18, 2018. [Online]. Available: <https://automationforum.co/temperature-sensor-ic-lm35/>. [Accessed: 01-Jun-2019].
- [4] Wikipedia, “Rokok,” *April*, 23, 2019. [Online]. Available: <https://id.wikipedia.org/wiki/Rokok>. [Accessed: 01-Jun-2019].
- [5] L. M. Yulyantari and I. P. Wijaya ADH, “Manajemen Model Pada Sistem Pendukung Keputusan,” E. Risanto, Ed. Yogyakarta: Penerbit ANDI, 2018, pp. 189–208.
- [6] A. Kadir, *Arduino & Sensor*. Yogyakarta: ANDI Yogyakarta, 2018.
- [7] S. Arduino, “Mengenal Arduino Software (IDE),” *Maret*, 16, 2016. [Online]. Available: <https://www.sinuarduino.com/artikel/mengenal-arduino-software-ide/>. [Accessed: 01-Jun-2019].
- [8] A. Kadir, *From Zero to a PRO*. Yogyakarta: ANDI Yogyakarta, 2014.