

SMOKE DETECTION DESIGN USING MQ-2 SENSOR AND EXHAUST FAN BASED ON MICROCONTROLLER

Adi Winarno

Electrical Engineering
University of PGRI Adi Buana
Surabaya, Indonesia
adiwinarno@unipasby.ac.id

Widodo

Electrical Engineering
University of PGRI Adi Buana
Surabaya, Indonesia
widodo@unipasby.ac.id

Rahmat Hanif Darmawan

Electrical Engineering
University of PGRI Adi Buana
Surabaya, Indonesia
rahmathnf@gmail.com

Abstract- Clean air is a very important requirement for life on earth, especially for humans. Nowadays people are competing to maintain air quality in their environment by using Air Conditioners (AC). The use of air conditioning in the home environment without us knowing that the air we breathe is contaminated with smoke. The smoke in the air-conditioned room cannot escape because the room is always closed. As a result, the smoke content that cannot escape is very dangerous, so a prototype of an indoor smoke detector is made using the Arduino microcontroller and the MQ-2 sensor as a smoke sensor. If smoke is detected by the MQ-2 sensor, Arduino will turn on the bazzer and fan.

Keywords: Arduino UNO, MQ-2 sensor, buzzer, exhaust fan.

I. INTRODUCTION (HEADING 1)

A room that has a cooling system such as an Air Conditioner (AC) has the characteristics of a closed room. Smoke in an air-conditioned room such as cigarette smoke, combustion smoke, fire smoke, kitchen smoke will be very dangerous if you can't get out of the room. The condition of the air contaminated by smoke will have an effect on health including coughing, shortness of breath and lung disease.

To reduce the risks that occur due to smoke, a system is needed that can detect and reduce the concentration of gases from smoke pollution. The main objective of this design is to control toxic substances (CO) released by smoke by facilitating air circulation and being able to restore freshness in the room. air conditioned. The input of this system is the MQ-2 Sensor which functions to detect smoke to produce an output voltage which is then processed in the microcontroller. The microcontroller will activate the relay driver to turn on the exhaust fan which functions to expel smoke pollution in an air-conditioned room.

II. METHODS

Researchers designed a tool that can make it easier to detect smoke in an air-conditioned room. This tool works full 24 hours to monitor the condition of air quality in the room. This tool is designed to be as effective and fast as possible in conducting smoke detection and will automatically remove smoke using an exhaust fan.

With several considerations that must be met above, the overall design of the tool can be seen through the diagram below this.

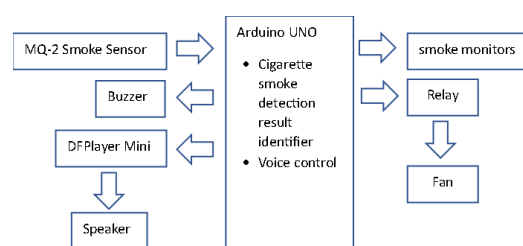


Fig.1 system block

The explanation of each system diagram is as follows:

- Arduino UNO is used to replace the task of the computer as a tool to receive input from the surrounding environmental conditions and is also used as a processing brain.
- MQ-2 sensor as a smoke detection system
- The relay is used as an automatic switch to run the fan
- The fan is used as a smoke extractor in a room that has been detected by the MQ-2 sensor

In figure 2. The smoke detector workflow works when it detects smoke, when smoke is detected in an air-conditioned room, the MQ2 sensor will send smoke data to Arduino UNO, Arduino will set work and send output data to the monitor to display in bad air conditions and then arduino will turn on the output in the form of a buzzer and exhaust fan as a smoke remover.

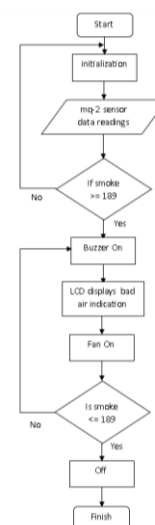


Fig.2 Flowchart of the designed system

This tool is designed to facilitate the detection of cigarette smoke in air-conditioned rooms. So that when someone smokes in the room, the device will automatically detect the

smoke produced from cigarettes, and turn on the fan and buzzer automatically to indicate bad air conditions.

III. RESULTS AND DISCUSSION

The design of a smoke detector using the mq-2 sensor and a microcontroller-based exhaust fan can be described as follows:

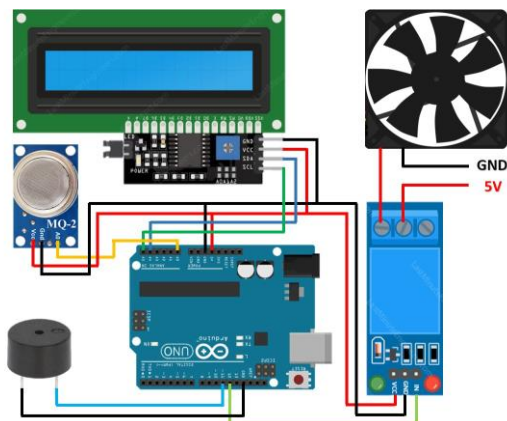


Fig. 4 Wiring diagram

The installation of the electronic module consists of input, process and output sections. In the input section as input data, namely the smoke sensor module, in the process section as a data processor using Arduino Uno, and in the output section as a result of the input data processing results there is a 16x2 LCD, exhaust fan and buzzer

All components that have been assembled in accordance with the overall design will know the performance and function of the tool. From the measurement of the research tools that have been designed and made, it can be concluded that the product results are:

- Using the MQ-2 sensor as a smoke detector in an air-conditioned room operated using an Arduino UNO microcontroller.
- The warning system if there is smoke in the bazer will turn on and notify the LCD that there is smoke, which is a sign that the air is not good.
- If the air in the room is air-conditioned, if smoke is detected, the exhaust fan will turn on to remove smoke.

Testing of the tool is carried out according to each section starting from testing the power, namely the current. The electric current needed for the tool is an electric current of 12 volts DC (Direct Current), namely electricity whose value does not change. The direction of flow of electric current is only positive or negative. The tool used for this test is a digital multimeter. From the test results, it was found that the output is 12 V which is enough to power the Arduino UNO and other components.

Testing to find out whether the Arduino port can function displaying characters on the LCD. By uploading the sketch program, the LCD will display the characters as written in the Arduino UNO program.

Testing the relay to determine whether the relay can work if the input voltage is given. From the results of the test, the relay contact which was initially NO after being given a voltage of 5v then the contact will change to NC to connect the current to the Fxhaust Fan.

Testing the buzzer to ensure that the buzzer is in good condition and can be used using a 5 volt power supply from pin 4 Arduino UNO. From the test results, after the buzzer is connected to the power supply and the voltage is applied, the buzzer sounds, which means the buzzer is in good condition and ready to be used as an alarm or warning.

The test is carried out by burning paper in the room to signal that there is smoke on the smoke sensor, if there is smoke the LCD will light up indicating that the surrounding air is unhealthy, the bazzer will light up, the relay will function to move the exhaust fan to remove smoke.

The results of the MQ-2 sensor test were carried out to measure the sensor's output voltage when the sensor detects smoke in smokeless air, and when the sensor detects air containing smoke. The characteristic of this sensor output is that when it detects the presence of CO, the output voltage increases according to the level of ppm. Measurement of ppm levels is obtained from a comparison between the sensor resistance when there is gas and the sensor resistance in clean air or does not contain smoke. the more smoke, the greater the value of V_{out} .

Table I. Testing of MQ-2 sensor

Minute-To	Results detection	Condition	Vout
1	66 ppm	No smoke	0.65
2	74 ppm	No smoke	0.99
3	99 ppm	No smoke	1.57
4	190 ppm	There is smoke	2.01
5	210 ppm	There is smoke	2.59
6	350 ppm	There is smoke	4.05
7	470 ppm	There is smoke	5.09

From the table above it can be seen that the greater the smoke detected by the MQ-2 sensor, the sensor output voltage and the results of the sensor detection value will also increase.

Based on the test results above, it can be seen that the system that has been designed can run successfully. The speed of the sensor in detecting smoke is very dependent on the size of the room because the value obtained by the sensor affects or triggers the operation of other circuits such as turning on the buzzer. The graph of the relationship between the results of smoke detection and the voltage during the test time, the longer the test, the value of the detection results will increase . and will activate the buzzer, and fan.

The MQ-2 sensor acts as a smoke and gas detector which can output in the form of a PPM level unit. The higher the PPM, the air around is contaminated with smoke.

From the results of data analysis that has been carried out as shown in the Table of Testing Results for the mq-2 Sensor, researchers can discuss the results of the automation system research that has been made. The results with testing the MQ-2 sensor device in detecting smoke using PPM levels, testing the data is obtained when the ppm level is small, the power used will be the same as the PPM, if the PPM level is large, the power required for the MQ-2 sensor will also experience a significant increase. can touch up to 5.09 volts

IV. CONCLUSION

From testing the component series and software testing that has been carried out above, a prototype is formed. Testing this series of tools can be summed up as follows:

1. When the MQ2 sensor does not detect smoke, the voltage coming out of the sensor is in a high position (the led light turns green). When the MQ2 sensor detects cigarette smoke, the output voltage of the sensor is high (the LED lights up red).
2. The Arduino Uno microcontroller circuit works according to the program design that was made.
3. When the MQ2 sensor detects smoke, the buzzer and exhaust fan will light up, and the LCD will display "Bad Air".

From the test results it was concluded that the Arduino Uno functioned properly

The test results show that MQ-2 is as expected, that is, if there is gas around the room, the sensor will respond quickly.

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