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Increasing Clean Air With The Design Of Siozon Equipment

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Keywords

Internet of things, air pollution, sound pollution, sensors, monitoring

Abstract. This paper discussed a level of pollution has increased with times by lot of factors like the increase in population, increased vehicle use, industrialization and urbanization which results in harmful effects on human wellbeing by directly affecting health of population exposed to it. In order to monitor In this project we are going to make an IOT Based Air Pollution Monitoring System in which we will monitor the Air Quality over a web server using internet and will trigger a alarm when the air quality goes down beyond a certain level, means when there are sufficient amount of harmful gases are present in the air like CO2, smoke, alcohol, benzene and NH3. It will show the air quality in PPM on the LCD and as well as on webpage so that we can monitor it very easily. In this IOT project, you can monitor the pollution level from anywhere using your computer or mobile.

1. INTRODUCTION

Air is a source of human life that can be obtained freely. Good and bad air quality can affect human health and activities. Clean air can make someone feel comfortable in a certain place, so they can carry out activities well and pleasantly. On the other hand, poor air quality due to pollution can actually disrupt life activities. Air pollution is caused by human factors and their activities. Activity - Human activities that cause air pollution are burning (trash burning, motorized vehicles, forest burning and cigarette smoke) which produces smoke, dust and grit pollutants. (fine sand), and gas (CO and NO) which produce dust, steam and gas pollutants; mining and excavation; and other activities (Joko, 2016).

Air pollution occurs everywhere, including indoors and outdoors, and What is dangerous is that indoor air pollution is in the third position of environmental factors that affect environmental health that affect human health, with indoor air quality 2-5 times worse than outdoors. It is impossible to avoid air in everyday life. Dirty air can cause harm, for example lung disease and can even cause death due to poisoning from unhealthy air pollution. With advances in technology, getting clean air indoors is no longer difficult. Based on the problems above, the author intends to write a thesis with the title "Designing a Dirty Air Filter Device to Automatically Turn Clean Air Using Arduino and Smoke Sensors". By designing this tool, we can purify the air in a room or a room into clean air so that no one experiences respiratory problems due to breathing dirty air. Minimize infection with viruses, bacteria or diseases in room.

Literature

Air Definition And Pollution.

Air is one of the abiotic factors that influences the life of biotic components (living creatures). Air contains compounds in gas form, including gas which is very important for life, namely oxygen. Earth's atmosphere contains around 20% of the oxygen needed by all living things in it. Oxygen plays a role in burning carbohydrate compounds in the body of organisms through respiration. Air pollution is a condition where the air quality becomes damaged and contaminated by substances both harmless and harmful to the health of the human body. Air pollution usually occurs in big cities and also densely industrialized areas that produce gases containing substances above normal limits. According to Chambers (1976) and Masters (1991), what is meant by air pollution is the addition of physical or chemical substances or subtracts into the normal air environment that reach a certain amount, so that they can be detected by humans (can be counted and measured) and can have an effect on humans, animals, vegetation, and materials (Mukono, 2000).

Causes of Air Pollution

According to Andrews (1972) in Udayana (2004, p. 7), the causes of air pollution can be grouped into three groups, namely:

a. Surface friction such as friction (rubbing) of several materials such as asphalt, soil, iron and wood which throws solid particles into the air in various sizes.
b. Evaporation comes from volatile liquids, for example gasoline, paint oil and steam produced by the metal, chemical and other industries.
c. Combustion, such as burning fossil fuels such as oil, diesel, gasoline, coal, burning forests and so on. This combustion is an oxidation process that produces CO2, CO, SOx, NOx gases or hydrocarbon compounds that do not burn completely. In Indonesia, approximately 70% of air pollution is caused by emissions

The causes of air pollution are divided into 2, namely natural activities caused by nature itself and human activities caused by humans themselves. The following are the differences between air pollution from natural activities and air pollution from human activities: Natural activities that occur in nature can cause air pollution in the atmosphere. The manure produced by livestock contains methane compounds which can increase the earth's temperature, causing global warming. A similar process occurs in the nitrogen cycle in the atmosphere. Apart from that, natural disasters such as the eruption of Mount Brapi produce volcanic ash which pollutes the surrounding air which is dangerous for health and plants. Forest fires that occur well will produce large amounts of carbon dioxide which can pollute the air and be dangerous for the health of animals and humans. Human activities are now increasingly uncontrolled, industrial and technological advances bring a negative side to the environment because they are not handled properly. The following is pollution caused by human activities: Burning trash, Industrial fumes, Vehicle emission, Cigarette smoke, Exhaust chemical compounds such as CFCs, etc.

Basic Concepts of Microcontrollers

A microcontroller is a chip that functions as an electronic circuit controller and can generally store programs, and consists of a CPU (Central Processing Unit), memory, certain I/O and supporting units such as an Analog-to-Digital Converter (ADC) which is integrated in it. .According to (Chamim 2012) a microcontroller is a computer system in which all or most of its elements are packaged in one IC chip, so it is often called a single chip microcomputer. A microcontroller is a computer system that has one or several very specific tasks. According to Fauzi (2011:1) A microcontroller is a chip that functions as an electronic circuit controller and can generally store programs in it.

There are so many functions of a microcontroller that you can't mention them all, but there are just a few important ones, namely:

1. As a Counter
2. As a Decoder and Encoder
3. As Flip – Flop
4. As an Oscillation Generator
5. As a Timer / Timer
6. As an ADC (Analog Digital Converter)
7. Lan Sak Pirutute

Alv and Vegard's Risc processor microcontroller or often abbreviated as AVR is an 8 bit RISC microcontroller. Because of RISC, most of the instruction code is packaged in one clock cycle. The AVR microcontroller is a type of microcontroller architecture that is Atmel's mainstay. This architecture is designed to have various advantages and is a refinement of existing microcontroller architectures.

Table 1. Atmel AVR Microcontroller Series

Seri	Flash (kbytes)	RAM (bytes)	EEPROM (kbytes)	Pin I/O	Timer 16-bit	Timer 8-bit	UART	PWM	ADC 10-bit	SPI	ISP
ATmega8	8	1024	0.5	23	1	1	1	3	6/8	1	Ya
ATmega8535	8	512	0.5	32	2	2	1	4	8	1	Ya
ATmega16	16	1024	0.5	32	1	2	1	4	8	1	Ya
ATmega162	16	1024	0.5	35	2	2	2	6	8	1	Ya
ATmega32	32	2048	1	32	1	2	1	4	8	1	Ya
ATmega128	128	4096	4	53	2	2	2	8	8	1	Ya
ATtiny12	1	-	0.0625	6	-	1	-	-	-	-	Ya
ATtiny2313	2	128	0.125	18	1	1	1	4	-	1	Ya
ATtiny44	4	256	0.25	12	1	1	-	4	8	1	Ya
ATtiny84	8	512	0.5	12	1	1	-	4	8	1	Ya

2. METHOD

The research location was carried out on the campus of the Medan Institute of Technology. From this final assignment report, the author obtained data using the following method:

1. Study of literature

   The author examines references obtained from several scientific works such as journals and several books used as references in this research regarding filtering dirty air to make it clean.

2. Analysis and Design

   This method is carried out by analyzing existing problems, existing limitations and required needs so that the design can be carried out well.

3. Implementation and Testing

   This method is carried out by implementing the system design using Arduino, then analyzing the results of the system.

Software Research Tools and Materials

a. Tool

The tools used in this research are:

- Acer laptop type Core(TM) i3-3217U CPU @1.80GHz 1.80GHz
- Windows 7 32-Bit Operating System
- Arduino IDE
- Microsoft Visual
- Proteus

b. Material

The materials used in this research are reference books from journals regarding filtering dirty air into clean air automatically using Arduino.

The process of realizing the design of a tool for welcoming guests in the informatics department using an Arduino Uno requires identifying needs. The purpose of identification is to determine whether the tool system is working properly, so it is necessary to identify the tools being made, including:

1) Arduino Uno microcontroller as the main system controller.
2) Infrared sensor as input for detecting human entry and exit
3) 16x2 LCD display to display the number of counters.
4) Arduino IDE application for programming microcontrollers.
5) 5V adapter as a voltage source.

The block diagram of the Design of a Dirty Air Filter Device to Automatically Turn Clean Air Using Arduino and a Smoke Sensor is as follows:

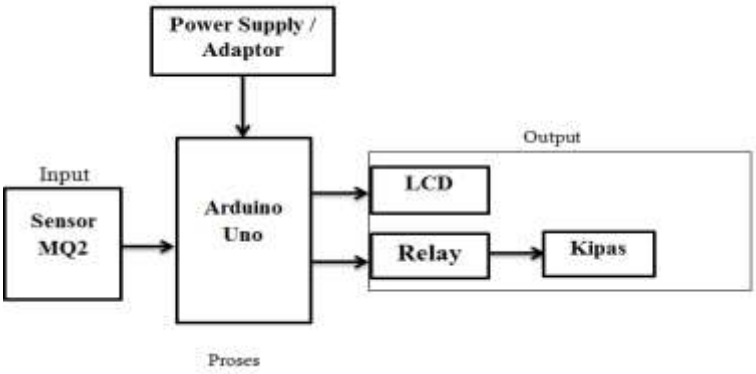

Figure 2. Block Diagram

In Figure 2 the block diagram of the work process for designing a device to filter dirty air into clean air automatically using Arduino and a smoke sensor can be explained. The system starts from the power supply as a power/voltage supply. If the power supply is active, then it detects the existing smoke via the MQ sensor. 2 and will be received by the Arduino, if the smoke has been detected it will appear on the LCD then the fan will be active to filter the smoke through a relay which functions to control or utilize the active electric power from the power supply. In designing this system, it uses Arduino Uno, MQ Smoke Sensor, 16x2 LCD, Fan as the main system to filter dirty air that will appear on the LCD display. The schematic design for "filtering dirty air into clean air automatically using Arduino and a smoke sensor" can be seen below

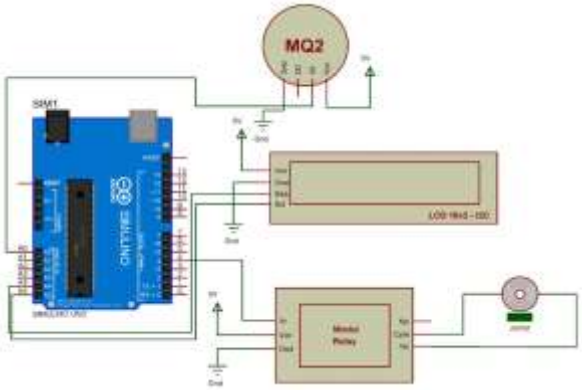

Figure 3. Schematic of a circuit for filtering dirty air into clean air automatically

The schematic device circuit above uses an Arduino Uno as a board to connect the MQ2 sensor, 16x2 LCD as well as the relay and fan modules. The mq2 sensor is useful for detecting existing smoke sensors, and will appear on the LCD which is connected to the Arduino board and will be filtered through the relay and fan modules. The following is an overview of the design and manufacture of equipment carried out and developed in the design system used in making equipment to filter dirty air into clean air. In the design and manufacture of power supply equipment that is useful as a source of incoming voltage. An image of the power supply circuit can be seen in the image below:

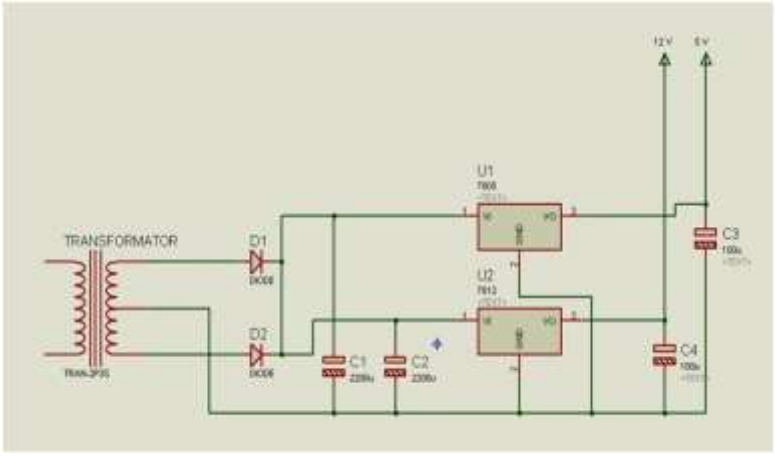

Figure 4. SchematicPower Supply Circuit

In the power supply circuit there is a transformer which is useful for reducing and changing the voltage from 220 VAC to 12 VDC. Diodes are useful as current rectifiers before they are given to the load. Meanwhile, the capacitor acts as a filter and stores the voltage from the input. The 7805 regulator IC functions to reduce the voltage from +7.5 VDC to +5VDC. And the 7812 regulator IC functions to filter so that the output voltage remains 12VDC.

3. RESULTS AND DISCUSSION

Minimum Hardware and Software Specification Requirements

To run the system, it is necessary to know what devices will support the performance process of designing a tool to automatically filter dirty air into clean air using Arduino and a smoke sensor. There are several required specifications for hardware and software. The minimum hardware requirements used for the process of making a device to filter dirty air into clean air are:

1. Processor: With a minimum speed of 2.0 GHZ
2. Memory: Minimum 2 GB
3. Hard disk: Minimum capacity 80 GB
4. Vga: With a minimum speed of 32 GB

The software requirements used for the process of making a device to filter dirty air into clean air are: Arduino IDE, Microsoft Office 201, Google Chrome

Testing on Components

Testing is carried out on components to determine whether the performance of each component is in accordance with the desired and intended objectives of this design. Testing of this tool was carried out by observing the performance of using the Arduino Uno Microcontroller, 16x2 LCD Display, MQ-2 Sensor, Relay, Fan and the entire circuit when running. The results of the overall system design can be seen in the image below.

Figure 5. Overall System Design Results

Arduino UNO Testing

This test is carried out by filling a simple program into the microcontroller. Then it is observed whether the circuit can work according to the program commands entered into the microcontroller. The simple program to fill in is as follows:

```
Blink §

// the setup function runs once when you press reset or power the board
void setup() {
  // initialize digital pin LED_BUILTIN as an output.
  pinMode(LED_BUILTIN, OUTPUT);
}

// the loop function runs over and over again forever
void loop() {
  digitalWrite(LED_BUILTIN, HIGH);   // turn the LED on (HIGH is the voltage level)
  delay(1000);                       // wait for a second
  digitalWrite(LED_BUILTIN, LOW);    // turn the LED off by making the voltage LOW
  delay(1000);                       // wait for a second
}
```

Figure 6. Arduino Testing Program Code

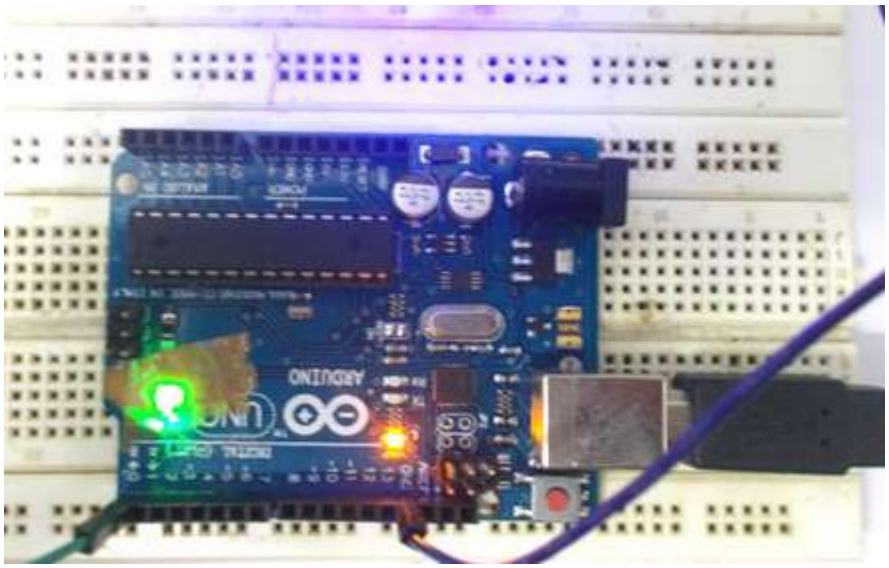

Figure 7. Arduino Uno Test Results

From the picture above you can see that the LED on the Arduino board is lit, this proves that the Arduino Uno is functioning properly according to the program that has been designed.

MQ-2 Sensor Testing

Testing on the MQ-2 sensor was carried out to find out whether the sensor was functioning properly or not. To find out whether this sensor is working well or not, you can easily see it by using the LED indicator behind the sensor. If the MQ-2 sensor detects an object, the LED on the back of the sensor will light up and if it is not detected, the LED will turn off. The following is an image of the MQ-2 sensor test results

Figure 8. MQ-2 Sensor Testing

From the picture above it can be concluded that the MQ-2 sensor is functioning well. The MQ-2 sensor can also be adjusted for detection distance by rotating the sensor setting behind the sensor near the indicator LED. The distance of the MQ-2 sensor has limitations, namely that it can only detect a maximum distance of 80 cm.

Table 2. MQ-2 Sensor

No	Distance	Data	Voltage	Information
1	2 cm	LOW	0 volts	Detected
2	5 cm	LOW	0 volts	Detected
3	10 cm	LOW	0 volts	Detected
4	20 cm	LOW	0 volts	Detected
5	50 cm	LOW	0 volts	Detected
6	80 cm	LOW	0 volts	Detected
7	90 cm	HIGH	4.9 volts	Not detected
8	100 cm	HIGH	4.9 volts	Not detected
9	150 cm	HIGH	4.9 volts	Not detected

Relay Module Testing

Testing on the relay circuit is carried out to find out whether this module is functioning properly or not. This design is carried out to move the switch contacts with a small current so that it can conduct electricity to the fan that has been assembled. Below is the appearance or shape of the relay that has been assembled.

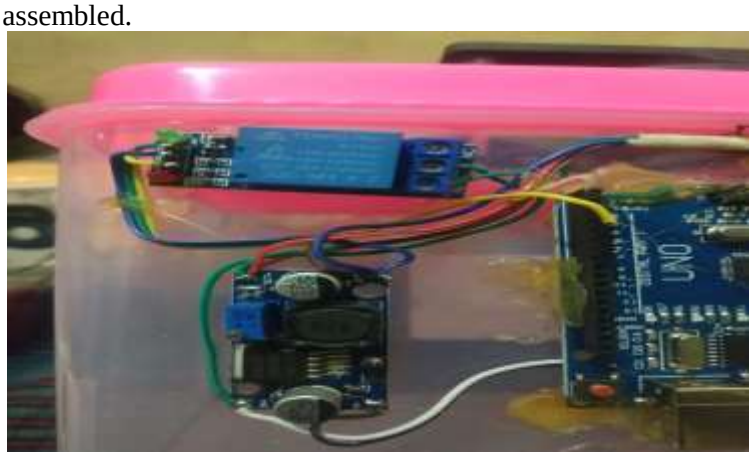

Figure 9 Relay Circuit Schematic

In Figure 9 it is concluded that the schematic circuit in the relay can run or be used properly according to the program design

Overall System Testing

Testing on the entire circuit is carried out to see whether the system as a whole functions as designed or not. Below is an overall schematic view.

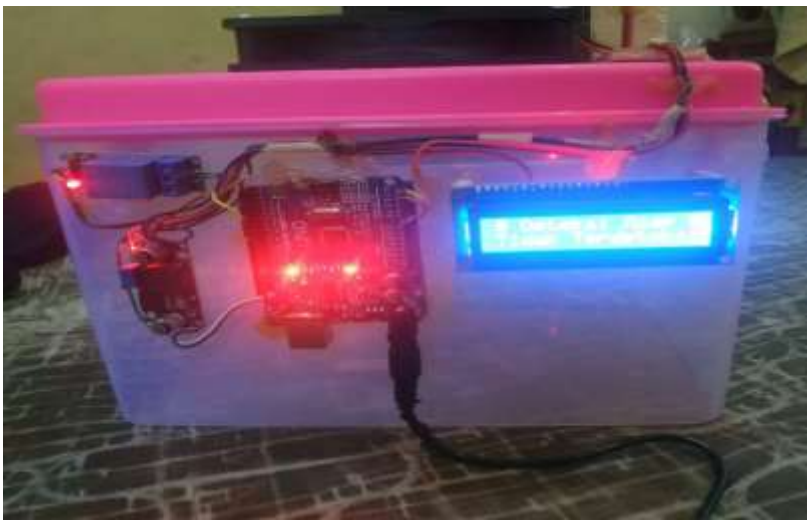

Figure 10. Overall circuit schematic

Figure 11. Display of Undetected Smoke

Figure 10 and Figure 11 above prove that the tool that has been designed can work well and can detect that there is no smoke in the room or that the tool does not detect smoke in the room.

4. CONCLUSION

After the cigarette smoke detector is realized, several conclusions can be drawn as follows: The way to design a system that is able to detect the presence of air in a room is to use an MQ-2 sensor which has an output that reads analog voltage. The way to filter dirty air into clean air is to use lime water and an air filter, namely a fan or what is usually called a fan. The way the MQ-2 sensor works is by issuing a signal in the form of changes in smoke levels. So when there is a change in the smoke level value, it results in the presence of smoke gas content around the MQ-2 sensor. When the smoke

level is more than 10, the fan will turn on as a neutralizer or air cleaner from cigarette smoke and when the smoke level is below 10, the fan will turn off. The way to implement an air filter system using Arduino is that the MQ-2 sensor will detect that there is a change in the air in the room, after that it will appear on the LCD display that smoke has been detected and the fan will automatically turn on to filter the dirty air.

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