MINOR PROJECT

AUTOMATIC FIRE DETECTOR ALARM SYSTEM

Diploma In Electronics Engineering

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CERTIFICATE

This is to certify that the Mini Project entitled "Automatic Fire Detector" being submitted by **Ritik Upadhyay, Harsh Raja, Azfaar Khan, Pushkar Varshney, Mohammad Saqib and Eshav saxena** from Diploma in Electronics Engineering, University Polytechnic, have successfully completed their project under our supervision and guidance during the session 2022-2023.

Mr. Tanveer Hasan

(Associate Professor, University Polytechnic AMU)

ACKNOWLEDGEMENT

We would like to express our special thanks of gratitude to our teacher **Mr Tanveer Hasan**,who gave us the golden opportunity to do this project on the topic "Automatic Fire Detector" and It helped us in doing a lot of Research and we came to know about a lot of things related to this topic.

INDEX

INTRODUCTION

- This minor project is a propotype of an automatic fire alarm and extinguishing system.
- It works on the principle of detection of infrared rays.
- Fire alarm systems provide a means to detect and identify a fire or a potential fire outbreak in a building, warn the occupants of the building about the fire via audible alarm .
- The main components of a fire alarm system are typically the flame detectors (and other detectors like heat, gas detectors).
- Some advantages of fire alarms include an early warning benefit and the potential to save life and property, low cost and the opportunity to place the device in chosen locations

- **List of Components Used In Project:**

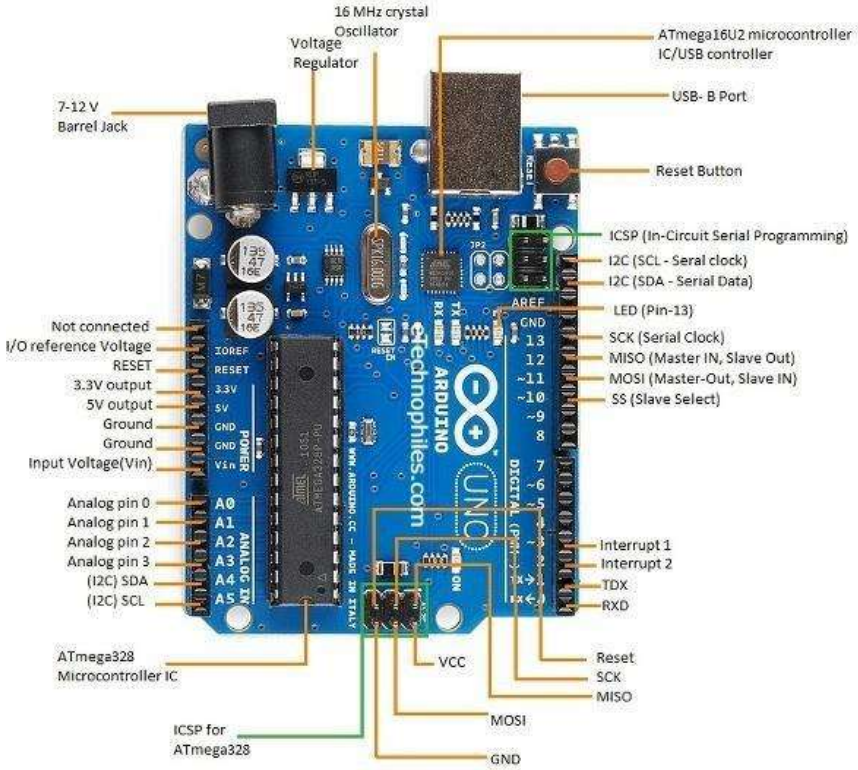
S.No.	Equipment Used	Range	Quantity
1.	ARDUINO UNO	+5V	1
2.	FLAME SENSOR MODULE	3V-5.5V	1
3.	5V RELAY MODULE	0-5V	1
4.	BUZZER	3V-24V	1
5.	BREADBOARD	–	1

- **COMPONETS USED:-**

- Arduino uno

Arduino UNO is a microcontroller board based on the **ATmega328P**. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

- **PIN CONFIGURARTION**



Vin: This is the input voltage pin of the Arduino board used to provide input supply from an external power source.

5V: This pin of the Arduino board is used as a regulated power supply voltage and it is used to give supply to the board as well as onboard components.

GND: This pin of the board is used to ground the Arduino board

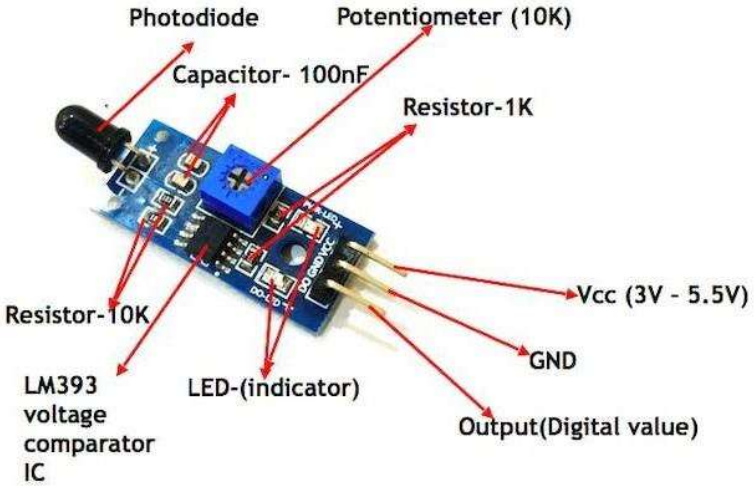
Analog Pins: The pins A0 to A5 are used as an analog input and it is in the range of 0-5V.

Digital Pins: The pins 0 to 13 are used as a digital input or output for the Arduino board.

Serial Pins: These pins are also known as a UART pin. It is used for communication between the Arduino board and a computer or other devices.

LED Pin: The board has an inbuilt LED using digital pin-13. The LED glows only when the digital pin becomes high.

- Flame sensor module



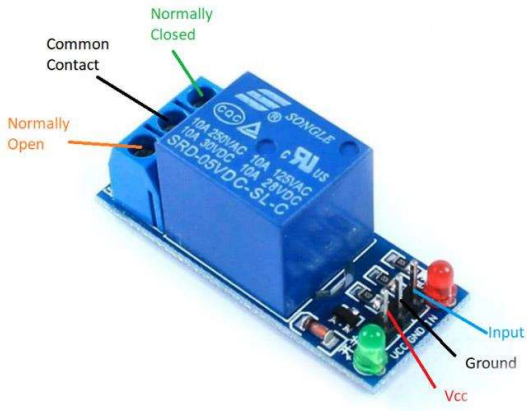
This sensor module is primarily used to detect an open flame. It does this by detecting light that is in the IR (infrared) spectrum which is emitted by a flame. That spectrum is typically in the range of 700-1100nm.

The module has both an analog output and a digital output with sensitivity adjustment on the module.

The Analog output on '**A0**' is normally a voltage of approximately 1/2 Vcc when no signal is detected. The actual voltage level will depend on the setting of the sensitivity pot. If a flame is detected, that output voltage will drop towards ground depending on the strength of the IR detected.

The Digital output on '**D0**' is normally LOW. When IR is detected by the sensor, the output goes HIGH. The sensitivity adjustment can be used to set the trip point. LED2 will light when the output goes HIGH.

- 5V Relay Module



Relay is one kind of electro-mechanical component that functions as a switch. The relay coil is energized by DC so that contact switches can be opened or closed. A single channel 5V relay module generally includes a coil, and two contacts like normally open (NO) and normally closed (NC).

What is a 5V Relay?

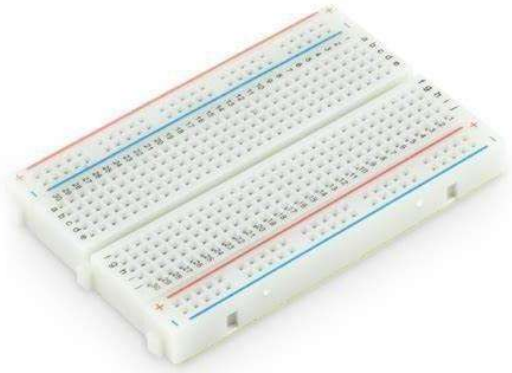
A 5v relay is an automatic switch that is commonly used in an automatic control circuit and to control a high-current using a low-current signal. The input voltage of the relay signal ranges from 0 to 5V.

- Buzzer

An audio signaling device like a beeper or buzzer may be electromechanical or piezoelectric or mechanical type. The main function of this is to convert the signal from audio to sound. Generally, it is powered through DC voltage and used in timers, alarm devices, printers, alarms, computers, etc. Based on the various designs, it can generate different sounds like alarm, music, bell & siren.It's output frequency is 0 to 3.5Khz.

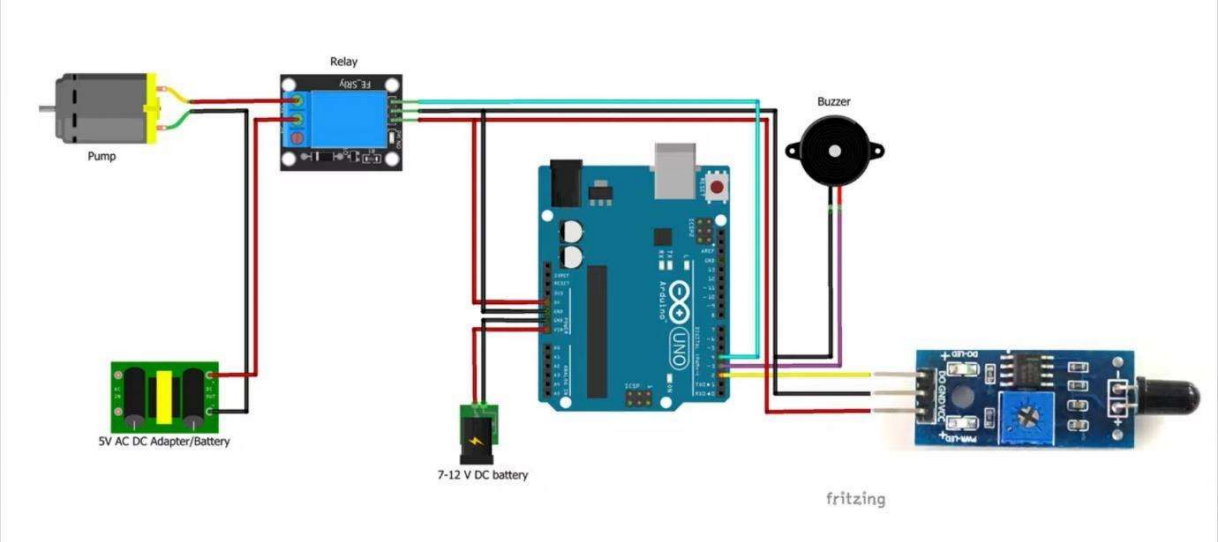
The **pin configuration of the buzzer** is shown above. It includes two pins namely positive and negative. The positive terminal of this is represented with the '+' symbol or a longer terminal. This terminal is powered through 6Volts whereas the negative terminal is represented with the '-'symbol or short terminal and it is connected to the GND terminal.

- Breadboard



A Breadboard is simply a board for prototyping or building circuits on. It allows you to place components and connections on the board to make circuits without soldering. The holes in the breadboard take care of your connections by physically holding onto parts or wires where you put them and electrically connecting them inside the board. The ease of use and speed are great for learning and quick prototyping of simple circuits. More complex circuits and high frequency circuits are less suited to breadboarding. Breadboard circuits are also not ideal for long term use like circuits built on perfboard (protoboard) or PCB (printed circuit board), but they also don't have the soldering (protoboard), or design and manufacturing costs (PCBs).

- **CIRCUIT DIAGRAM OF AUTOMATICFIRE DETECTOR:-**



THE WORKING CONCEPT OF THE FIRE DETECTION SYSTEM:-

- The flame sensor is a photosensor. So as soon as the flame is lit and within the range of the sensor, the sensor will send the signal back to the Arduino board.
- Upon receiving the signal from the flame sensor, the Arduino board will send the signal back to the buzzer commanding it to ring.
- As soon as the buzzer receives the signal, it will start ringing completing the fire detection and alarm cycle.
- After a delay of 5 second the DC pump comes into play for sprinkling purpose

• CIRCUIT PHOTO:

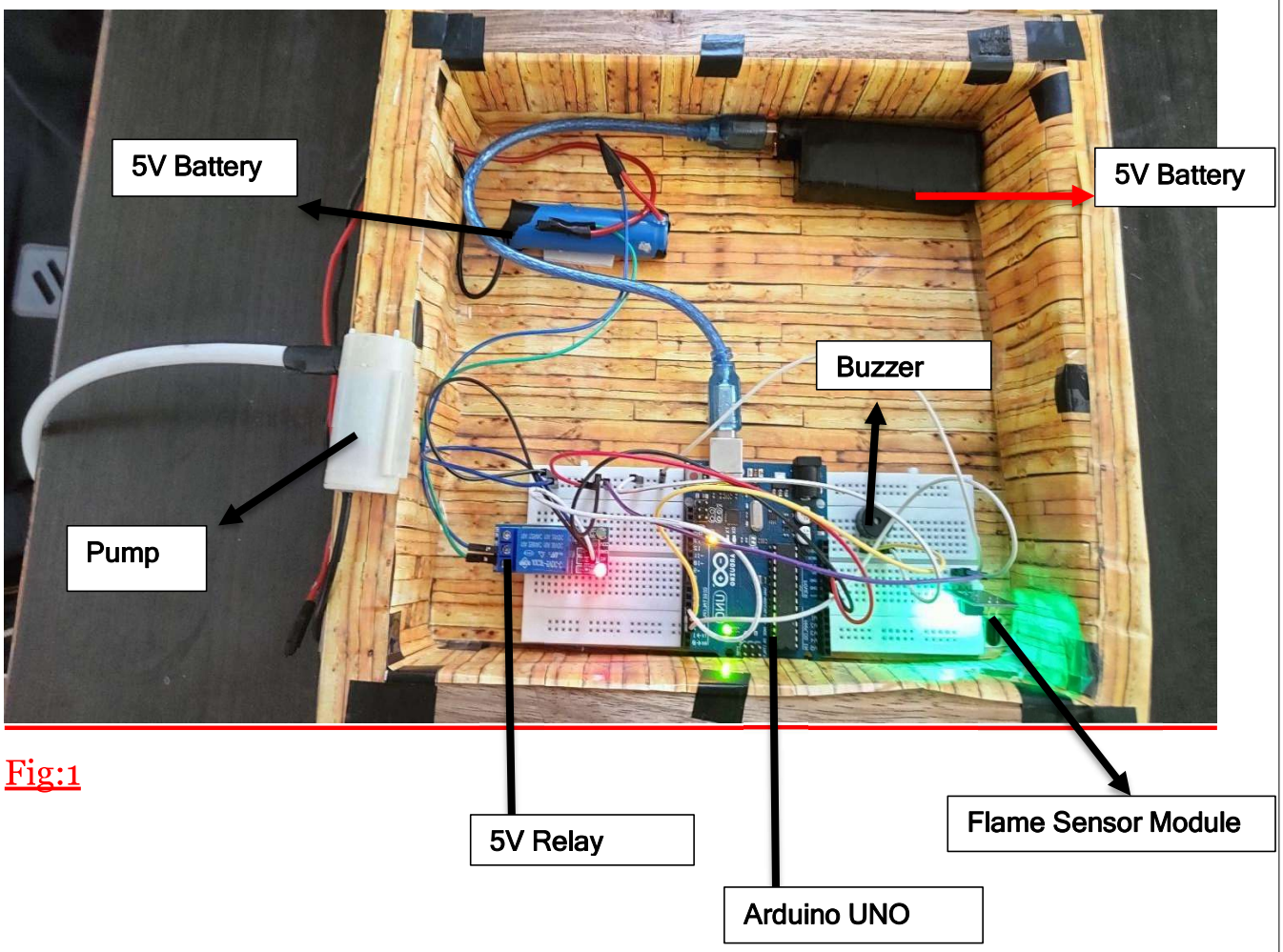


Fig:1

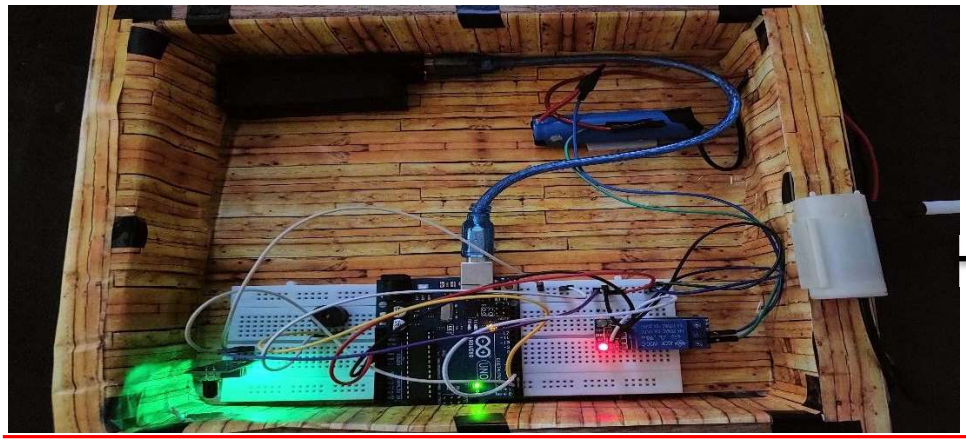


Fig: 2

- # ARDUINO PROGRAMMING CONCEPT:-

The Arduino programs are written in the Arduino Integrated Development Environment (IDE).

The structure of Arduino program is pretty simple. Arduino programs have a minimum of 2 blocks,

- **Preparation & Execution:-**

Each block has a set of statements enclosed in curly braces:

```
void setup( )
{
statements-1;
.
.
statement-n;
}
void loop ( )
{
statement-1;
.
.
```

statement-n;

}

Here ‘void’ is a command used to declare function.

- Here, setup ( ) is the preparation block function and loop ( ) isan execution block function.

NOTE: always open and closed brackets come after a function.

- The setup function is the first to execute when the program is executed, and this function is called only once. The setup function is used to initialize the pin modes and start serial communication. This function has to be included even if there are no statements to execute.

```
void setup ( )
{
pinMode (pin-number, OUTPUT); // set the ‘pin-number’ as output
pinMode (pin-number, INPUT); // set the ‘pin-number’ as output
}
```

After the setup ( ) function is executed, the execution block runs next. The execution block hosts

statements like reading inputs, triggering outputs, checking conditions etc..

In the above example loop ( ) function is a part of execution block. As the name suggests, the loop( )

function executes the set of statements (enclosed in curly braces) repeatedly.Program always follow "Linear Fashion" means execute the program line wise[First execute setup() function and then loop() function].

- Now, curly brackets after function shows that where the program start and finish.
- Arduino UNO program is a case sensitive
- "//" is used to write comment in program
- Every statement is finished with semi colon(;)
- "#define" is like a placeholder.Used to provide input output information,delay time,etc to Arduino UNO and attach equipment.

- Void loop ( )

  {

  digitalWrite (pin-number,HIGH); // turns OFF the component connected to 'pin-number'

```
delay (1000); // wait for 1 sec

digitalWrite (pin-number, LOW); // turns ON the
component connected to ‘pin-number’

delay (1000); //wait for 1sec
}
```

- **ARDUINO UNO CODE USED:-**

```
#define SENSOR_PIN 2
#define BUZZER_PIN 3
#define RELAY_PIN 4
#define SPRINKLER_START_DELAY 5000  //5 seconds
#define SPRINKLER_ON_TIME 3000      //3 Sec Sprinkler on time


unsigned long previousTime = millis();


void setup()
{
  pinMode(RELAY_PIN, OUTPUT);
  pinMode(SENSOR_PIN, INPUT);
}


void loop()
{
  //If there is fire then the sensor value will be LOW else the value will be HIGH
  int sensorValue = digitalRead(SENSOR_PIN);
//There is fire
  if (sensorValue == LOW)

    {
```

```
     analogWrite(BUZZER_PIN, 50);
//Turn on buzzer


    if (millis() - previousTime > SPRINKLER_START_DELAY) //We
will wait for few seconds before sprinkler can be
started once fire is detected.
    {
      digitalWrite(RELAY_PIN, LOW);
//Relay is low level triggered relay so we need to
write LOW to switch on the light
      delay(SPRINKLER_ON_TIME);
//Keep sprinkler on for sometime.
    }
  }
  else
  {
    analogWrite(BUZZER_PIN, 0);
    digitalWrite(RELAY_PIN, HIGH);
    previousTime = millis();
  }
   }
```

• CONCLUSION:-

Fire alarm systems can seem straightforward when you consider the ease of installation, but it can present some complex moral, operational and legal responsibility. There have also been some recent updates to the technology over the last few years worth noting. The underlying principles remain the same. Alarm sounders will give off an audible sound when flame is picked up by a flame detector and the ultimate goal is to warn other people in the building that there may be a fire and to evacuate immediately.

Every building needs a fire alarm system. Lives and valuable assets have been saved because of the early warning benefits of fire alarm systems. They are affordable and, when used properly and maintained regularly, are very reliable.

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