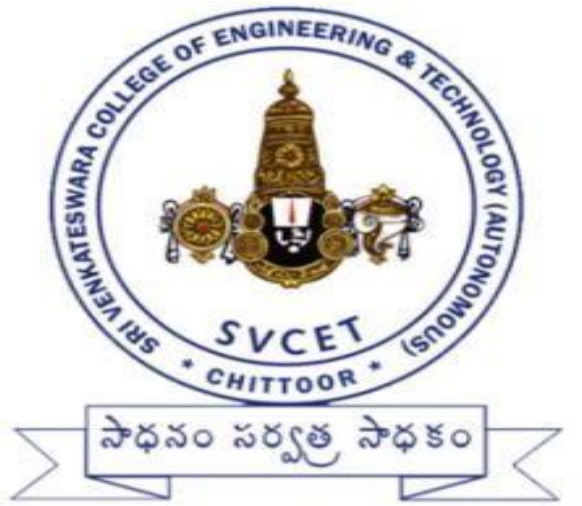

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

RVS NAGAR, CHITTOOR – 517127 (AP)

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BACHELOR OF ELECTRONICS &
COMMUNICATION ENGINEERING

PROJECT

A Fire Detection System using ESP8266 and Temperature and Smoke Sensors

Group Description:

Section: A

Batch No.: 8(3)

Members Details:

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INDEX

AIM: To design and develop a fire detection system using **ESP8266** using temperature and smoke sensors, ensuring rapid response and enhanced safety to detect flames or smoke promptly.

PROBLEM STATEMENT: Fire incidents pose a significant threat to life and property, necessitating the development of advanced fire detection systems to ensure rapid response and enhanced safety. The proposed project aims to design and develop a fire detection system utilizing the ESP8266 microcontroller, integrating temperature and smoke sensors to detect flames or smoke promptly. The primary objectives of this project are as follows:

1.Early Detection: Implement a robust and sensitive fire detection mechanism using temperature and smoke sensors to identify potential fire hazards at the earliest stage.

2.ESP8266 Integration: Integrate the ESP8266 microcontroller to facilitate wireless communication and real-time data transmission. This enables quick response and remote monitoring of the fire detection system.

3.Rapid Response: Develop algorithms and protocols within the system to ensure a rapid response when a fire hazard is detected. This includes triggering alarms, notifications, and initiating emergency protocols for timely evacuation or intervention.

4.Enhanced Safety Features: Implement additional safety features such as redundancy in sensor systems, self-check mechanisms, and fail-safes to minimize false alarms and improve the overall reliability of the fire detection system.

5.Remote Monitoring and Control: Enable remote monitoring and control of the fire detection system through a user-friendly interface, allowing users to check the status, receive alerts, and take necessary actions from a distance.

6.Integration with Emergency Services: Explore possibilities of integrating the system with local emergency services or alert mechanisms to ensure swift response in case of fire emergencies.

7.Power Efficiency: Design the system to be power-efficient to ensure continuous and reliable operation, with options for backup power sources in case of primary power failures.

8.User-Friendly Interface: Develop a user-friendly interface for system configuration, monitoring, and maintenance, ensuring ease of use for both residential and commercial applications.

By addressing these objectives, the project aims to contribute to the development of an intelligent and effective fire detection system that enhances safety, minimizes response time, and mitigates the impact of fire incidents on life and property.

SCOPE OF THE SOLUTION: Smart Fire Detection System with Automatic Water sprinkler has been developed to solve the slow response issue of fire accidents. The inputs provide readings for the system to analyse, such as sensors and Wi-Fi module that works as a transmitter for the sensor readings. Temperature, gas, and flame sensors are inputs. The readings from the inputs are displayed on the web page. Outputs like LED and Buzzer indicate a fire. The water system is lunched with a 12V water pump powered by Arduino and Controlled by a 5V relay. The sprinkler head is the outer of the water output. An ultrasonic sensor is used to measure the tank level and inform the need for refilling. Moreover, batteries are suppling the circuitry and the pump. The pump is 12V that cannot get powered by an Arduino. Relay is used as a switch to control the 12v motor that pumps water required from the tank. In addition to the microcontroller used, a Multiplexer is also used to deal with Analog and Digital lack of pins.

REQUIRED COMPONENTS TO DEVELOP SOLUTIONS:

Required Software:

Tinker CAD: TinkerCAD is a browser-based 3D design and modelling tool that allows users, particularly beginners and students, to create and prototype designs without the need for extensive technical skills. It is developed by Autodesk, a company known for its professional design and engineering software.

Fritzing: Fritzing is an open-source software tool designed to support designers, artists, researchers, and hobbyists in prototyping electronic projects. It provides a platform for creating clear and easily understandable visual representations of electronic circuits. Fritzing is particularly popular for its user-friendly interface and its emphasis on facilitating the design and documentation of electronics projects.

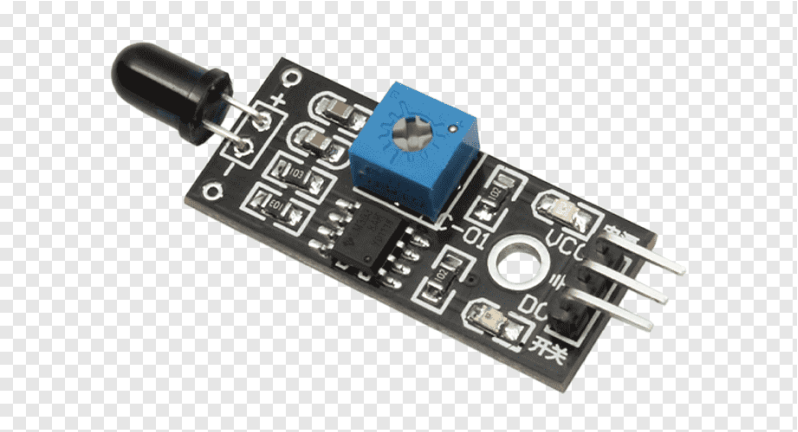
Arduino IDE: The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. The new major release of the Arduino IDE is faster and even more powerful! In addition to a more modern editor and a more responsive interface it features autocompletion, code navigation, and even a live debugger.

Required Hardware:

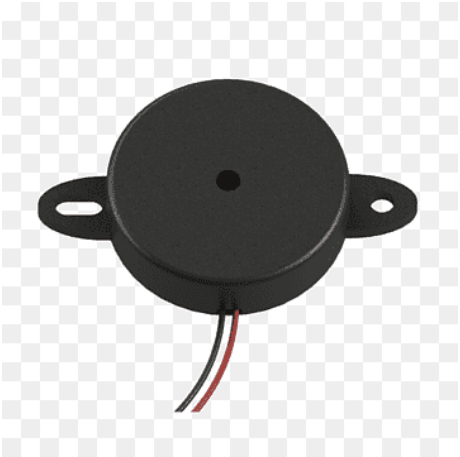
NodeMCU-V3 (ESP8266): The NodeMCU ESP8266 is an extensively employed development board in IoT applications, providing a versatile and cost-effective approach to connect devices to the internet. It features Wi-Fi and programming capabilities, facilitating speedy prototyping and deployment of IoT solutions.

MQ-4 (Smoke/Gas Sensor): MQ-4 gas sensor has high sensitivity to Methane, also to Propane and Butane. The sensor could be used to detect different combustible gas, especially Methane, it is with low cost and suitable for different application. Character. Configuration. * Good sensitivity to Combustible gas in wide range.

Flame Sensor: A flame detector is a type of sensor that can detect and respond to the presence of a flame. These detectors have the ability to identify smokeless liquid and smoke that can create open fire. For example, in boiler furnaces flame detectors are widely used, as a flame detector can detect heat, smoke, and fire.



Piezo Speaker: A piezoelectric speaker (also known as a piezo bender due to its mode of operation, and sometimes colloquially called a "piezo", buzzer, crystal loudspeaker or beep speaker) is a loudspeaker that uses the piezoelectric effect for generating sound.

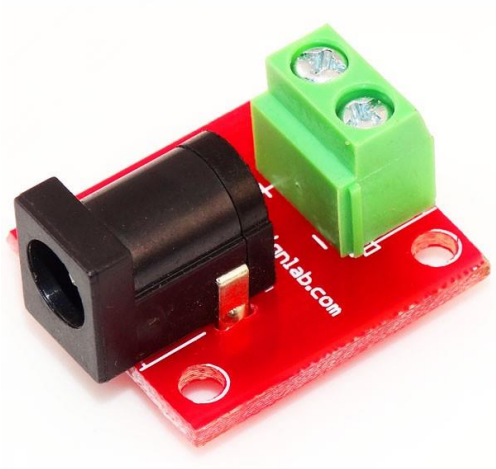


BC-547: BC547 is a bipolar junction transistor (BJT). It is kind of an NPN transistor. It has three terminals: Emitter, Collector and Base. The maximum current gain of BC547 is 800A.

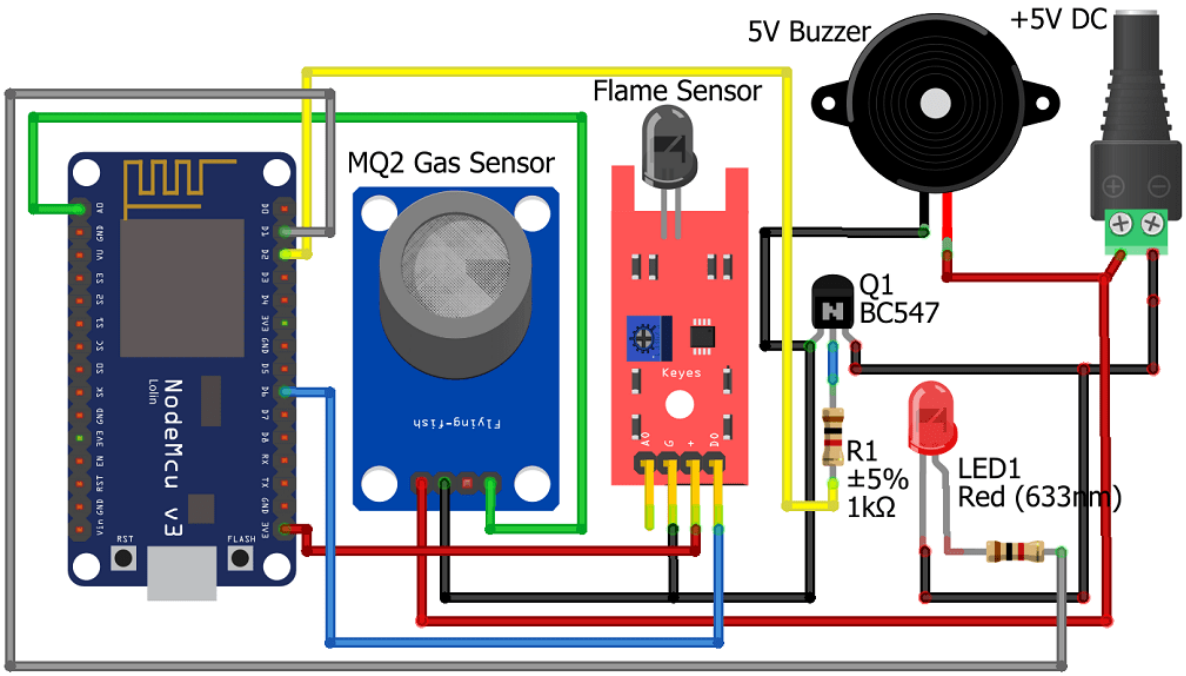
Resistor: A 220-ohm resistor is an electronic component that is used to resist the flow of electricity in a circuit. Resistors are used in a wide variety of electronic circuits to control the flow of current and protect other components from damage. 220-ohm resistors are a commonly used resistance value in electronic circuits.

LEDs: Current RGB LEDs are made by combining two kinds of materials: red-light LEDs are made of indium gallium phosphide (InGaP), while blue and green LEDs comprise indium gallium nitride (InGaN) semiconductors.

Jack-1: A metal pin at the end of a long wire joined to a piece of electrical equipment and used to connect it to another piece of electrical equipment.



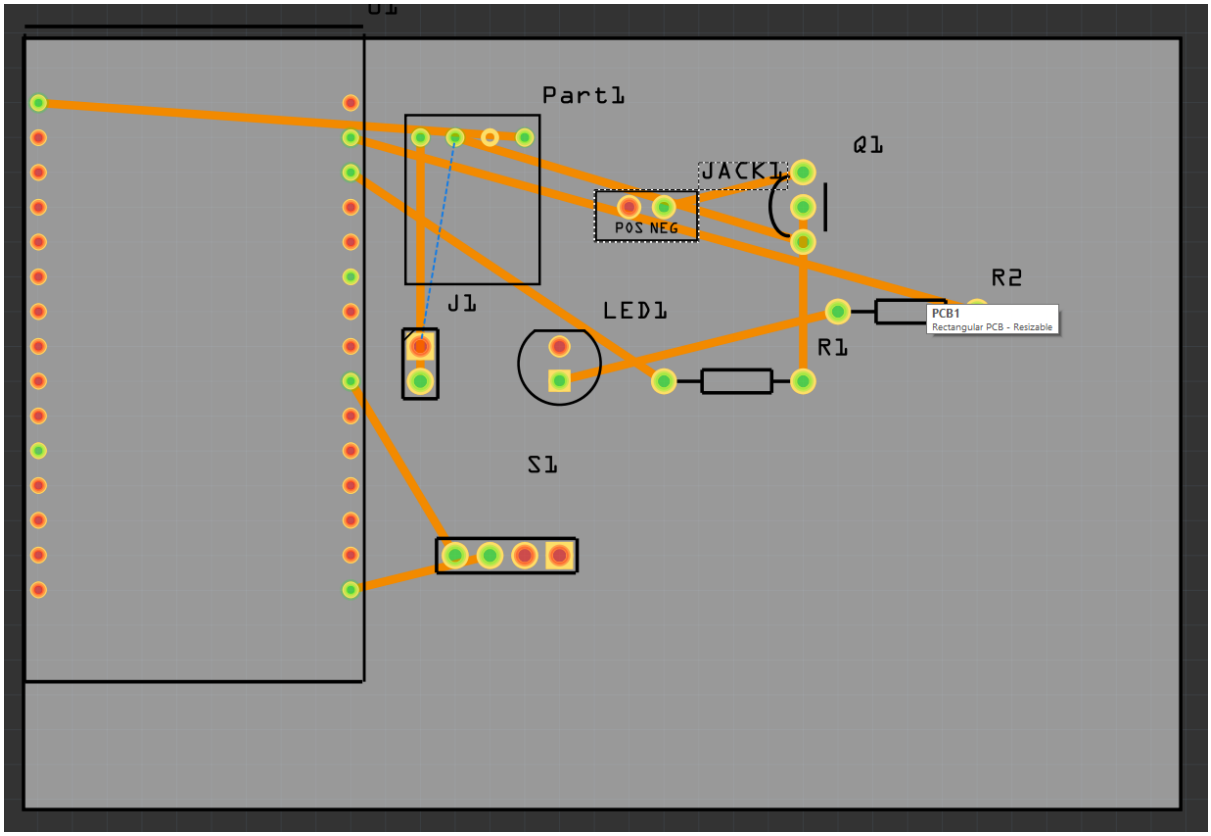
SIMULATED CIRCUIT:



VIDEO OF THE DEMO:

[Fire Detection System.mp4]

GERBER FILE:



CODE FOR THE SOLUTION:

```
#include <ESP8266WiFi.h>
#include <Grandeur.h>

// Grandeur credentials
const char* apiKey = "grandeurl7rt9rrt01hf0ljl71ed9aco";
const char* deviceID = "devicel7rtbn5b01hi0ljl6nrk2kig";
const char* token =
"4e79b47b67adbd6fffa8c38b97ed90e64cad9d452f4b080b31586b1070feaa45";

Grandeur::Project project;
Grandeur::Project::Device device;

int mq2 = A0; // smoke sensor is connected to analog pin A0
int data = 0;
int buzzer = D1;

void getSMK(const char* code, int smk)
{
Serial.print("SMOKE: ");
Serial.println(smk);
}

void connectWiFi(const char* ssid, const char* password) {
Serial.print("Connecting to WiFi");
WiFi.begin(ssid, password);

while (WiFi.status() != WL_CONNECTED) {
delay(1000);
Serial.print(".");
}

Serial.println("\nConnected to WiFi");
}

void setup()
{
Serial.begin(9600);
connectWiFi("Ptcl Gpon Al quim", "pakistan123");
project.begin(apiKey, deviceID, token);
device = project.device(deviceID);
pinMode(buzzer, OUTPUT);
}

void loop()
{
if (project.isConnected())
{
```

```
data = analogRead(mq2);
device.data().set("smk", data, getSMK);
if (data > 400)
{
tone(buzzer, 6000, 500);
delay(400);
}
else
{
noTone(buzzer);
}
}

delay(1000);
project.loop();
}
```