# Fire Alarm System Using Temperature and Gas Sensor

Introduction

- The project is a **Fire Alarm System** using a **temperature sensor, gas sensor, LED, and piezo buzzer** in **TinkerCAD** simulation.

- The circuit is built using an **Arduino** and a **breadboard** for component connections.

Working Principle

- **Temperature Sensor**: Detects temperature changes and produces a corresponding voltage output (10mV per °C change). LM-35 Temperature Sensor gives an analog output based on the instantaneous temperature value. This analog output is proportional to the instantaneous input.
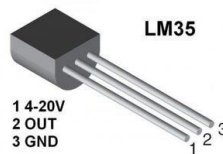

- **Gas Sensor**: Detects gas concentration in parts per million (ppm) and produces an analog output that is converted to digital using Arduino.

  The gas sensor is used to measure the concentration or presence of gas in the atmosphere. It is also used to detect smoke in the air. Based on the gas, a potential difference is generated by changing the resistance of the material present inside the sensor. The output is measure in terms of Voltage.

- **Alert Mechanism**: If temperature or gas concentration exceeds threshold values, the **LED and piezo buzzer** are activated.

Circuit Setup:
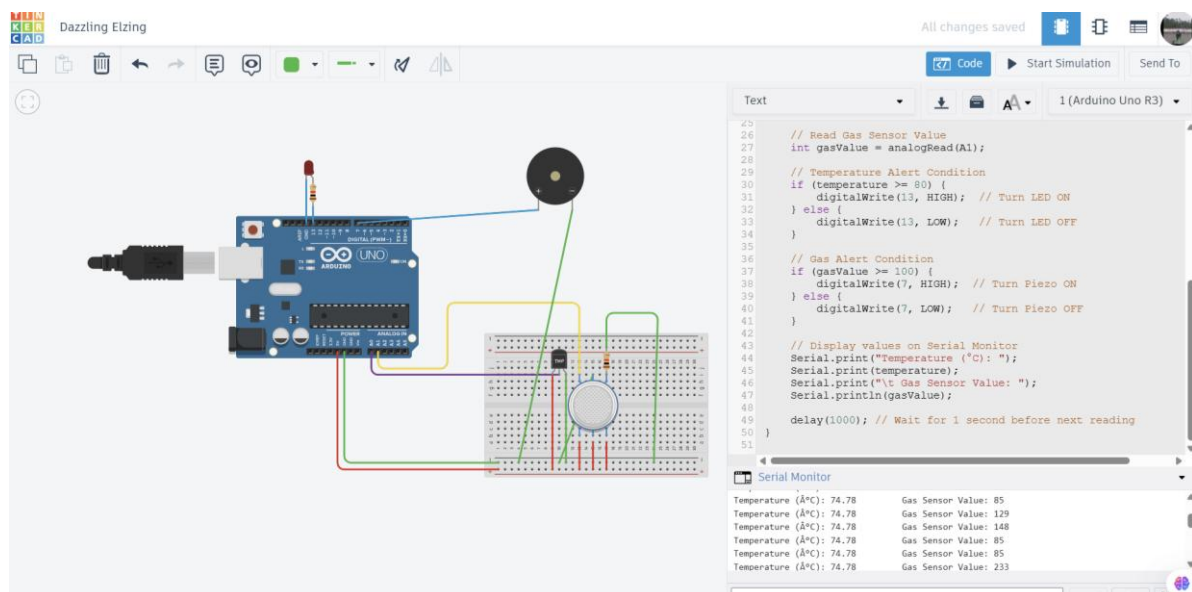
1. **Components Used**:
   - **Arduino, breadboard, temperature sensor, gas sensor, LED, piezo buzzer, resistors(1kohm)**, and **wires**.

2. **Connections**:
   - **Temperature sensor**:
     - VCC to **5V** (red wire),
     - GND to **GND** (green wire),
     - Vout to **A1** (analog input).
   - **Gas sensor**:
     - 3 power pins to **5V** (red wire),
     - GND to **GND**,
     - Output to **A0** (analog input).
   - **Piezo buzzer**:
     - Positive to **pin 7**,
     - Negative to **GND**.
   - **LED**:
     - Anode to **pin 13**,
     - Cathode to **GND** with a **resistor** to prevent excessive current.

Code:

// Pin Definitions

#define TEMP_SENSOR A0 // Temperature Sensor connected to A1

#define GAS_SENSOR A1   // Gas Sensor connected to A0

#define LED_PIN 13   // LED connected to digital pin 13

#define PIEZO_PIN 7   // Piezo Buzzer connected to digital pin 7

// Threshold Values

#define TEMP_THRESHOLD 80 // Temperature threshold (°C)

#define GAS_THRESHOLD 100 // Gas concentration threshold

void setup() {

  pinMode(A0, INPUT); // Temperature sensor as input

  pinMode(A1, INPUT);   // Gas sensor as input

  pinMode(13, OUTPUT);   // LED as output

  pinMode(7, OUTPUT);   // Piezo buzzer as output

```
  Serial.begin(9600);  // Start serial communication
}
void loop() {
  // Read Temperature Sensor Value
  int tempValue = analogRead(A0);
  float voltage = (tempValue / 1023.0) * 5.0; // Convert to voltage
  float temperature = voltage * 100; // Convert voltage to temperature
  // Read Gas Sensor Value
  int gasValue = analogRead(A1);
  // Temperature Alert Condition
  if (temperature >= 80) {
    digitalWrite(13, HIGH);  // Turn LED ON
  } else {
    digitalWrite(13, LOW);   // Turn LED OFF }
  // Gas Alert Condition
  if (gasValue >= 100) {
    digitalWrite(7, HIGH);  // Turn Piezo ON
  } else {
    digitalWrite(7, LOW);   // Turn Piezo OFF  }
  // Display values on Serial Monitor
  Serial.print("Temperature (°C): ");
  Serial.print(temperature);
  Serial.print("\t Gas Sensor Value: ");
  Serial.println(gasValue);
  delay(1000); // Wait for 1 second before next reading}
```

Code Explanation

- **Variable Declarations**:
  - float temp, Vout, gas sensor reading, and pin assignments.
- **Setup Function**:
  - pinMode() is used to define input/output pins.
  - Serial.begin(9600) initializes serial communication.

- **Loop Function**:
  - Reads sensor values using analogRead().
  - **Threshold Conditions**:
    - If temperature ≥ **80°C**, **LED turns ON**, else OFF.
    - If gas concentration ≥ **100 ppm**, **Piezo buzzer turns ON**, else OFF.
  - Displays values using Serial.print().
  - **Delay of 1 second** to update values.

Simulation & Output Observation

- **Gas Sensor Testing**:
  - Moving smoke closer **activates piezo buzzer**, removing smoke **stops it**.
- **Temperature Sensor Testing**:
  - Increasing temperature **activates LED**, reducing it **turns it OFF**.

Conclusion

- The **Fire Alarm System** successfully detects **temperature rise and gas concentration** and triggers alerts accordingly.