VISVESVARAYA TECHNOLOGICAL UNIVERSITY

BELAGAVI, KARNATAKA

IOE PROJECT (21CSE754)

Report on

"FIRE ALARM SYSTEM"

Submitted by

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ABSTRACT

The development of an automated fire alarm system using Tinkercad is a key advancement in the field of safety and emergency response. This project aims to design a functional fire alarm prototype utilizing Tinkercad's easy-to-use simulation platform, which allows for the creation and testing of electronic circuits and components. The fire alarm system consists of key components, including a temperature sensor (such as the DHT11), a smoke sensor (MQ-2), and an alarm module. These sensors work together to detect environmental changes indicative of fire hazards. Upon detection of abnormal temperature or smoke levels, the system triggers an audible alarm, alerting individuals to the presence of a potential fire. The use of Tinkercad allows for virtual assembly and testing of the circuit before actual implementation, making it an ideal tool for prototyping and educational purposes. This fire alarm system offers an affordable and effective solution for enhancing safety measures in homes, schools, and small establishments, and serves as a valuable learning resource for those interested in electronics and IoT systems.

INTRODUCTION

Fire alarm systems are essential safety mechanisms designed to detect and respond to fire hazards, ensuring timely evacuation and minimizing damage. These systems are widely used in residential, commercial, and industrial settings to prevent loss of life and property.

The ability to quickly and effectively detect fires before they spread can make a life-saving difference. But how do these systems work, and how can we simulate their operation This is where Tinker cad, a user-friendly online tool for 3D design, electronics, and coding, comes into play. By utilizing Tinker cad's powerful simulation tools, we can build and test a fire alarm system without the need for physical components or complex setups. In this project, we use Tinker cad, an online simulation platform, to design a basic fire alarm system using an Arduino Uno, a temperature sensor (LM35/DHT11), a buzzer, and an LED indicator.

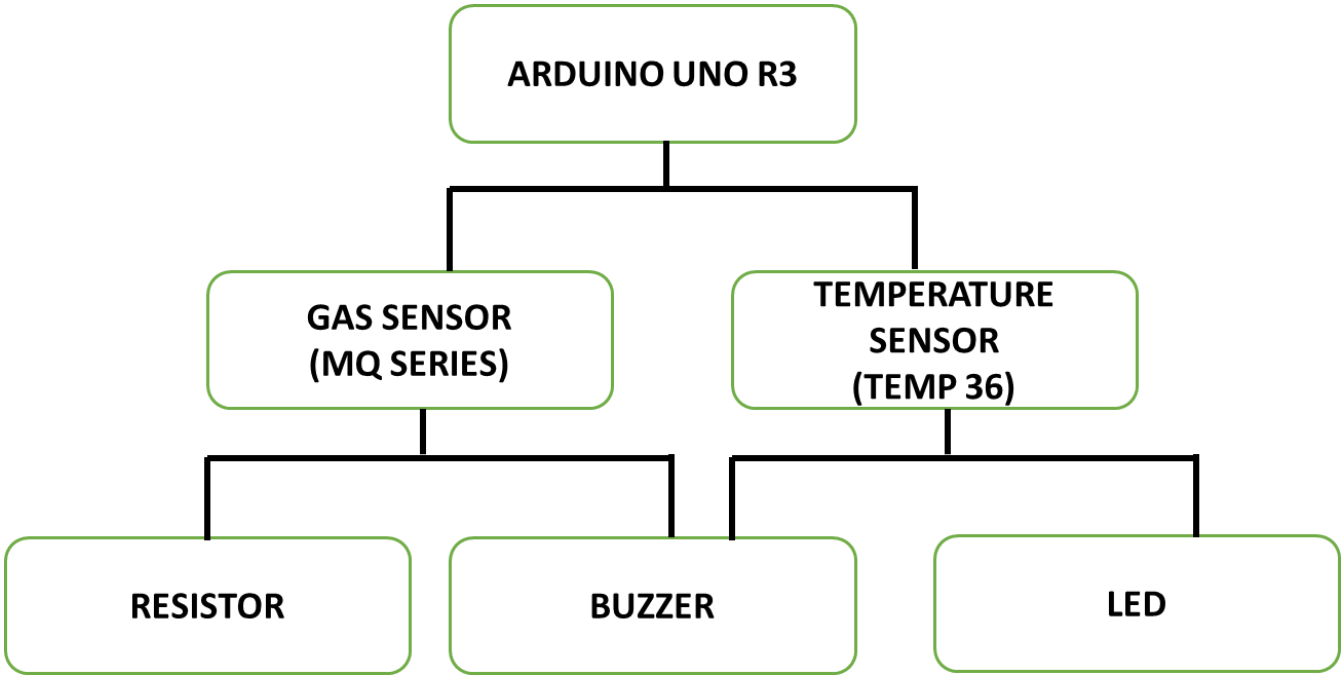
The core function of this system is to detect a temperature rise beyond a predefined threshold, which indicates a potential fire. When this occurs, the Arduino Uno processes the sensor data and triggers both the buzzer (to produce an alarm sound) and the LED (to provide a visual alert). This real-time response allows for quick action, reducing the risk of fire spreading.

The temperature sensor (such as LM35 or DHT11) continuously monitors the surrounding temperature. If the recorded temperature surpasses a critical level (e.g., 50°C), the Arduino activates the alert system. This simple yet effective mechanism demonstrates the fundamental working of a fire detection system.

Using Tinker cad, we can simulate and test the functionality of the fire alarm system without requiring physical components. This not only helps in understanding circuit design and programming but also allows for modifications and improvements before actual implementation. The project can be further enhanced by integrating a GSM module to send emergency SMS alerts or connecting a relay module to trigger water sprinklers automatically.

In conclusion, this project provides an excellent introduction to embedded systems and IoT-based safety solutions. By simulating real-world fire detection mechanisms, it lays the foundation for advanced smart alarm systems, which can be used in homes, offices, and industries to ensure fire safety.

BLOCK DIAGRAM



COMPONENTS REQUIRED:

Arduino UNO: The Arduino UNO is a microcontroller board that serves as the central unit for controlling and processing signals from various sensors and components in electronic projects.

Gas Sensor: A gas sensor detects the presence of gases such as smoke or carbon monoxide, triggering an alert when hazardous levels are detected.

Resistors: Resistors limit or control the flow of electrical current in a circuit, protecting sensitive components and adjusting signal levels as needed.

Buzzer: A buzzer is an electronic component that emits sound to provide audio feedback or alerts in response to certain conditions in a circuit.

Temperature Sensor TMP36: The TMP36 is a low-power, high-precision digital temperature sensor that communicates temperature readings to a microcontroller through the I2C interface.

Breadboard: A breadboard is a tool used for prototyping electronic circuits without soldering, allowing easy connections and modifications for testing and development.

LED: An LED (Light Emitting Diode) is a semiconductor that emits light when current passes through it, often used in circuits for indicators or displays.

PIN DIAGRAM:

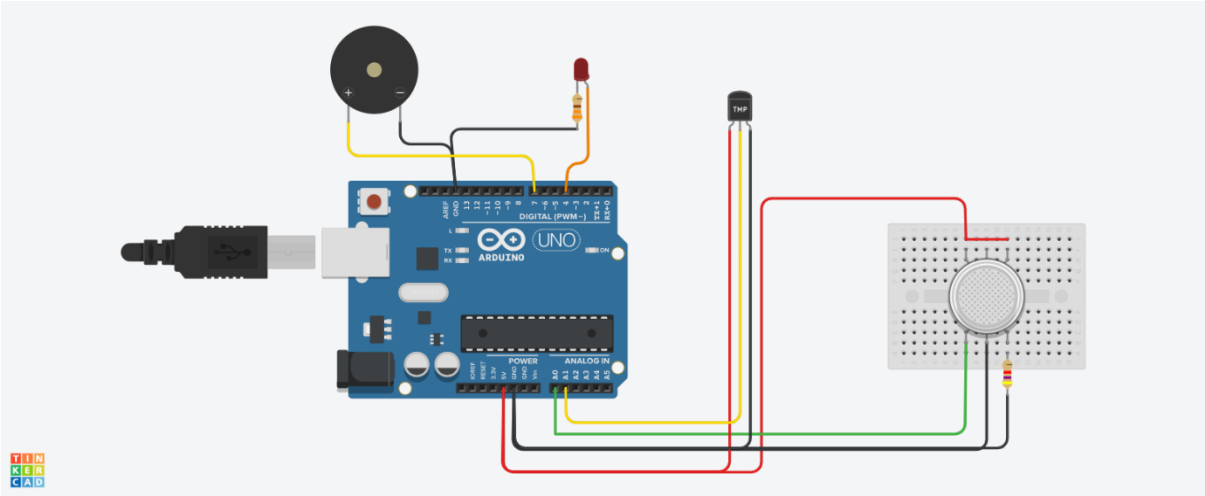


Fig: TINKER CAD CIRCUIT

WORKING:

In a fire alarm system built with Arduino and components like a gas sensor, temperature sensor, buzzer, and LED, the system works as follows:

- **Gas Sensor:** It detects harmful gases like smoke or carbon monoxide in the air. If the gas concentration exceeds a set threshold, it sends a signal to the Arduino.
- **Temperature Sensor:** The temperature sensor (e.g., TMP36) monitors the surrounding temperature. If it detects a temperature above a certain threshold (indicating a fire), it sends a signal to the Arduino.
- **Arduino UNO:** The Arduino processes data from both the gas and temperature sensors. If either sensor detects a dangerous condition (high gas levels or high temperature), it activates the alarm system.
- **Buzzer and LED:** The Arduino triggers the **buzzer** to emit a loud sound, alerting people to the fire hazard. Simultaneously, an **LED** lights up as a visual indicator of the alarm being triggered.

CODE FOR THE SIMULATION:

```
// C++ code
 //
 int gas_sensor = 0;

 int tempsensor = 0;

 void setup()
 {
  pinMode(A0, INPUT);
  pinMode(A1, INPUT);
  Serial.begin(9600);
  pinMode(7, OUTPUT);
  pinMode(7, OUTPUT);
  pinMode(4, OUTPUT);
 }

 void loop()
 {
  gas_sensor = analogRead(A0);
  tempsensor = map(((analogRead(A1) - 20) * 3.04), 0, 1023, -20, 120);
  Serial.println(tempsensor);
  Serial.println(gas_sensor);
  delay(1000); // Wait for 1000 millisecond(s)
  if (gas_sensor >= 300) {
   tone(7, 5274, 100); // play tone 100 (E8 = 5274 Hz)
  } else {
   digitalWrite(7, LOW);
  }
  if (tempsensor <= 30) {
   digitalWrite(4, HIGH);
  } else {
   digitalWrite(4, LOW);

 }
 }
```

RESULT

The fire alarm system project using Tinker cad was a successful demonstration of how basic electronic components and sensors can be integrated to create an efficient and responsive safety mechanism. Through the simulation, the system effectively detected fire hazards by using temperature and smoke sensors. As the temperature or smoke levels reached a certain threshold, the system was programmed to activate the alarm, replicating how real-world fire alarms function. The microcontroller, programmed via Tinker cad's coding platform, was able to read sensor inputs and trigger the alarm based on predefined conditions, showcasing the critical role of programming in ensuring a reliable response. The real-time feedback provided during the simulation allowed for immediate testing and adjustments to the sensor thresholds, further validating the system's responsiveness to varying levels of danger. The project not only mimicked real-life fire detection scenarios but also highlighted the potential for expanding the system, such as integrating wireless alerts or adding more sophisticated sensors. In conclusion, the project successfully demonstrated the potential of using Tinkercad to create a virtual yet functional fire alarm system, which could easily be adapted for real-world applications to ensure safety and protect lives.