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FIRE ALARM SYSTEM USING ARDUINO

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Abstract:- This paper presents the design and implementation of a fire alarm system utilizing Arduino technology. The system is engineered to provide early detection of fire hazards through the integration of smoke and temperature sensors. Upon detecting elevated smoke levels or temperatures, the system activates an alarm and notifies users through an SMS alert via a GSM module. Additionally, the design incorporates a simple user interface for manual activation and deactivation, enhancing usability. The prototype demonstrates the effectiveness of microcontroller-based systems in improving safety measures in residential and commercial environments. The results indicate high sensitivity and reliability, showcasing the potential for widespread application in fire safety management.

Keywords:Sensor,Detector,Controller,Alert,Buzzer.

INTRODUCTION

Fire safety is a critical aspect of both residential and commercial buildings. Traditional fire alarm systems can be expensive and complex, but advancements in technology, particularly with microcontrollers like Arduino, offer an accessible and cost-effective solution.
This project aims to design a fire alarm system that utilizes Arduino to detect smoke and heat, providing timely alerts to prevent fire-related incidents. By integrating sensors such as smoke detectors and temperature sensors with the Arduino platform, we can create a system that not only detects potential fire hazards but also alerts occupants through alarms or notifications.
The flexibility of Arduino allows for easy modifications and enhancements, making it ideal for educational purposes and DIY enthusiasts. This introduction outlines the key components and functionality of the system,

Advantages
Cost-effective and easy to assemble.
Quick fire detection and alerting mechanism.
Can be expanded with IoT for remote monitoring.
Suitable for small-scale safety applications.

Applications
Homes: Early fire detection in kitchens or living rooms.
Offices: Alerts in case of electrical fires.
Warehouses: Monitors for fire hazards in storage areas.

NEED OF THE STUDY.

The need for a study on a fire alarm system using Arduino can be framed in the context of several factors that emphasize the importance of developing cost-effective, customizable, and reliable fire detection systems. Here's an overview of the need for this study::

Cost-effectiveness

Reliability and Accuracy

Environmental Considerations

Innovation and Technological Advancement

Reducing False Alarms

3.1 LITERATURE SURVEY

Current State of Fire Detection Technology: Review of commercial fire alarm systems and the use of sensors like smoke detectors, gas sensors, and heat sensors in modern fire alarm systems. Arduino and Its Applications in Safety Systems: How Arduino is used in similar safety systems (e.g., home automation, security systems). Comparison of Arduino-Based Fire Alarm Systems with Other Technologies: Evaluate the effectiveness of an Arduino-based system against traditional systems and discuss their advantages and limitations.

1. Importance of fire detection and alarm systems in safety applications.
2. Traditional fire alarm systems vs. modern automated systems.
3. Role of microcontrollers in fire detection systems.
4. Overview of Arduino as a microcontroller for fire detection.

3.2 RESEARCH METHODOLOGY

A research methodology outlines the approach, techniques, and procedures used to design and analyse a fire alarm system based on Arduino. Below is a structured methodology for such a project.

3.3 BLOCK DIAGRAM

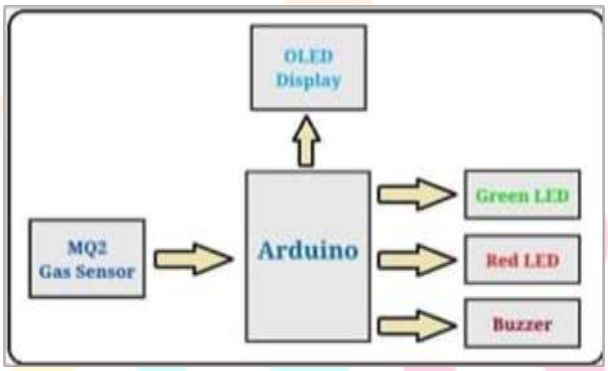

Fig. - fire alarm system using Arduino

Fig. Arduino uno

Arduino Uno Information

The **Arduino Uno** is one of the most popular microcontroller boards in the Arduino family. It is widely used for prototyping, automation, IoT projects, and embedded systems development.

Specifications:

- **Microcontroller**: ATmega328P
- **Operating Voltage**: 5V
- **Input Voltage (recommended)**: 7-12V
- **Input Voltage (limits)**: 6-20V
- **Digital I/O Pins**: 14 (6 provide PWM output)
- **Analog Input Pins**: 6

3.4 Working principal of system

The Arduino-based fire alarm system operates by continuously monitoring environmental conditions using **fire detection sensors** (such as flame, smoke, and temperature sensors). When a fire hazard is detected, the system triggers an **alarm mechanism** (buzzer, LED, or SMS alert) to notify users.

- Home Safety Systems
- Fire Industrial Monitoring
- Offices and Commercial Buildings
- Hospitals & Healthcare Facilities
- Agricultural & Livestock Farms
- Smart Cities & IoT Fire Monitoring

3.5Components Required

1. LM35

2. MQ2 Sensor

3.Bread board

4.M.M Wire

5. LED 5M

6. Piezo Buzzer

7.Aurduino board

3.6 Arduino

```
// Define pin numbers
int smokeSensorPin = A0; // Smoke sensor connected to analog pin A0
int buzzerPin = 9;       // Buzzer connected to pin 9
int ledPin = 13;         // LED connected to pin 13

// Threshold value to trigger the alarm (this can be adjusted based on the sensor)
int smokeThreshold = 400;

void setup() {
  pinMode(smokeSensorPin, INPUT);  // Set smoke sensor as input
  pinMode(buzzerPin, OUTPUT);      // Set buzzer as output
  pinMode(ledPin, OUTPUT);         // Set LED as output

  Serial.begin(9600); // Begin serial communication for debugging
}
```

```
void loop() {
  int smokeLevel = analogRead(smokeSensorPin); // Read the smoke sensor value

Serial.print("Smoke Level: ");
  Serial.println(smokeLevel); // Print smoke level for debugging

  // Check if smoke level exceeds threshold
  if (smokeLevel > smokeThreshold) {
    digitalWrite(buzzerPin, HIGH); // Turn on the buzzer
    d
```

4. Flow chart

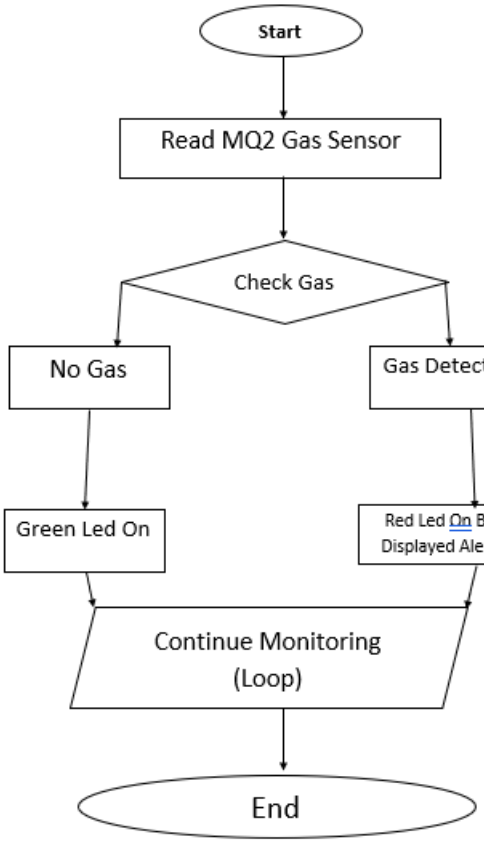

Fig. Flow chart of fire alarm system

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6. Conclusion

In conclusion, the gas detection system based on an Arduino and an MQ2 sensor provides an efficient and cost-effective solution for detecting harmful gases in various environments. With its ability to offer real-time monitoring and both visual (LEDs, OLED display) and audible (buzzer) alerts, it enhances safety by providing early warnings of potential hazards. While the system is

limited by factors such as detection range and potential accuracy issues, it remains highly useful for home, industrial, and public applications. Customization and expandability through the Arduino platform make it adaptable for more advanced or specialized uses, further increasing its value in safety and environmental monitoring.

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