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Home And Industrial Safety Using Fire And Gas Detection Sensor

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Abstract: Fire hazards in industrial environments can lead to catastrophic losses. An early detection system can significantly mitigate risks. This paper presents an IoT-based industrial fire detection system using Arduino Nano, OLED display (128×64), MQ-2 gas sensor (for LPG detection), Flame Sensor (for fire detection), DHT11 (for temperature and humidity monitoring), and a Buzzer. The system provides real-time monitoring and alerts users with distinct buzzer sounds for different alerts. The OLED display operates in a slideshow format to accommodate all sensor readings within the limited display space. The proposed system ensures early fire detection with improved accuracy and efficiency.

Keywords: IoT, Fire Detection, Industrial Safety, Arduino, Sensors, Embedded System.

I. INTRODUCTION

Industrial fire accidents pose a significant threat to human lives and infrastructure. Traditional fire detection methods rely on smoke detectors or heat sensors, which may not be efficient for detecting early-stage fire hazards. The integration of IoT and sensor-based automation can enhance fire detection efficiency by providing real-time alerts and remote monitoring. This paper presents a low-cost, IoT-enabled industrial fire detection system capable of monitoring temperature, gas leaks, and flames. With instant alerts and intelligent monitoring, the proposed system improves industrial safety and minimizes potential losses.

II. PROJECT OBJECTIVE

The primary objectives of this project are:

- To develop a real-time fire detection system using multiple sensors.
- To integrate an OLED display for sensor data visualization.
- To use a buzzer system for distinguishing different hazards through custom sound patterns.
- To provide early warnings to prevent fire-related accidents.
- To enable remote monitoring for industrial safety applications.
- To explore future enhancements such as automated fire suppression mechanisms.

III. LITERATURE REVIEW

Several studies have been conducted on fire detection and prevention using IoT. A study by [Author et al., 2021] proposed an IoT-based fire detection system using GSM modules for alerts. Another research by [Author et al., 2020] used AI-based image processing techniques for flame detection. However, such methods may be computationally expensive. Our system improves upon these approaches by offering sensor-based, real-time monitoring that can be deployed in industrial environments with minimal power consumption.

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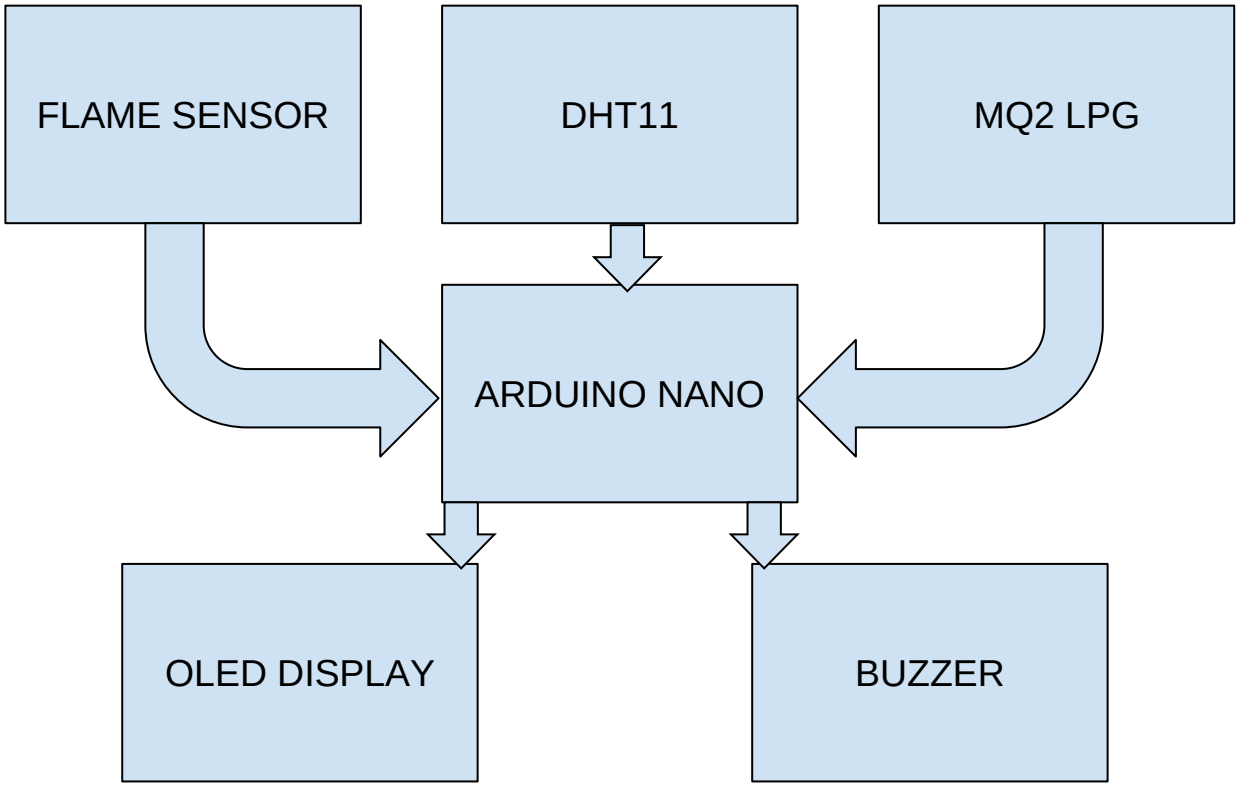
Fig. 1 BLOCK DIAGRAM



- Arduino Nano: Central processing unit to handle sensor data.
- Flame Sensor: Detects fire flames.
- MQ-2 Gas Sensor: Detects LPG gas leaks.
- DHT11 Sensor: Monitors temperature and humidity.
- OLED Display: Displays sensor data in a slideshow format.
- Buzzer: Produces distinct alarm sounds for different hazard alerts.
- Power Supply: Provides necessary operating voltage.

IV. COMPONENT USED

- Arduino Nano (Microcontroller)
- OLED Display (128×64)
- MQ-2 Gas Sensor (LPG detection)
- Flame Sensor (Fire detection)
- DHT11 Sensor (Temperature & Humidity)
- Buzzer (Audible Alerts)
- Power Supply (5V Adapter)
- Resistors, Connecting Wires, and PCB

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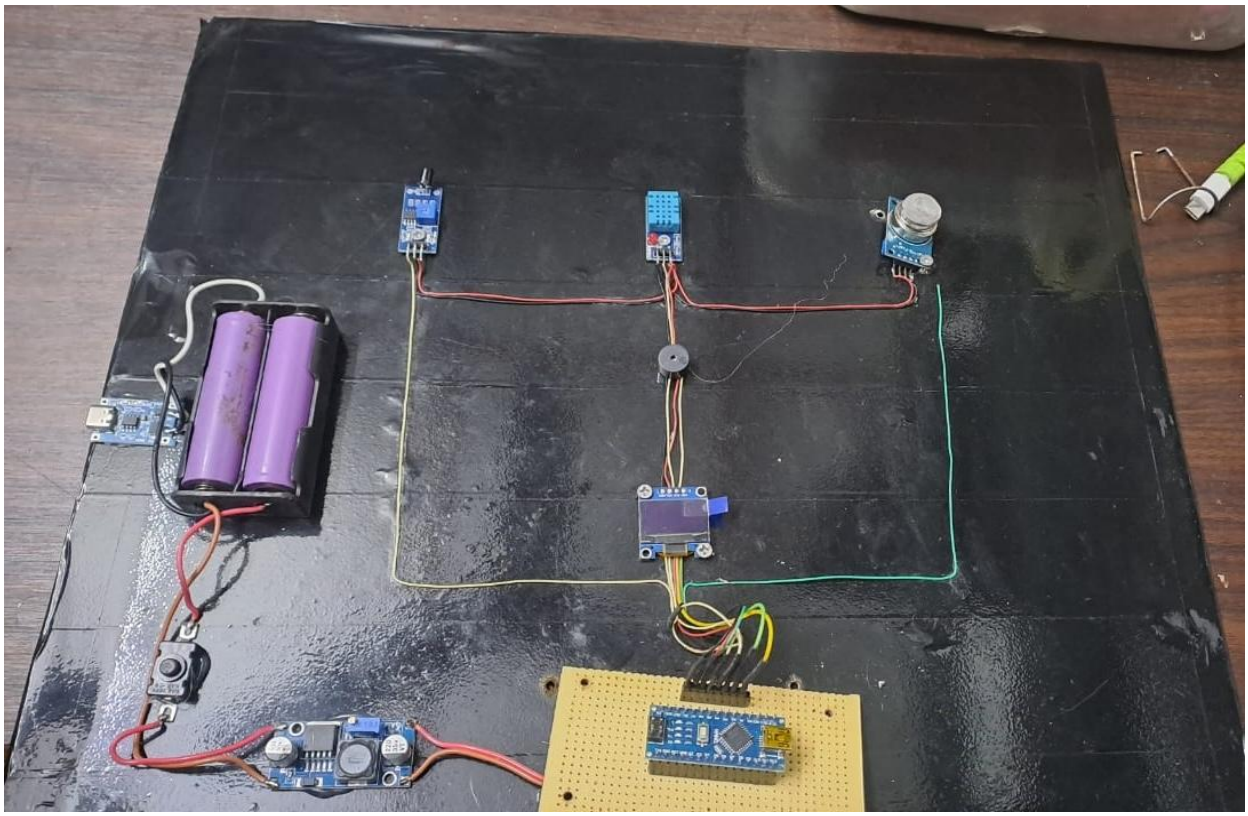
V. CIRCUITS



VI. APPLICATIONS

1.

- Industrial Safety Monitoring: Early fire and gas leak detection in factories.
- Smart Buildings: Automated fire detection for offices and commercial spaces.
- Warehouses & Storage Units: Monitoring fire hazards in storage areas.
- Residential Use: Home safety against fire and gas leaks.

VII. RESULT

The implemented system successfully detects fire, gas leaks, and temperature rise and provides real-time alertsthrough visual (OLED) and audible (Buzzer) notifications. Each hazard triggers a unique buzzer sound, allowing users to distinguish between different emergencies. The OLED display cycles through sensor readings in a slideshow format, ensuring that all data is displayed within the limited screen size.

VIII. CONCLUSION

This paper presented an IoT-based fire detection system that enhances industrial safety. By integrating multiple sensors, real-time alerts, and a buzzer notification system, the project ensures an efficient and cost-effective solution for fire and gas leak detection. The low power consumption and ease of deployment make it ideal for industrial and residential applications.

IX. FUTURE SCOPE

1. Integration with IoT Cloud for remote monitoring and SMS alerts.
2. Wireless Notifications via Wi-Fi or GSM module for instant alerts.
3. AI-based Image Processing for flame detection using ESP32-CAM.
4. Automatic Fire Suppression System using Relay-Controlled Sprinklers.

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