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IOT BASED FIRE DETECTION AND ALERT WITH E-MAIL NOTIFICATION SYSTEM

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ABSTRACT

Fire accidents can lead to significant loss of life and property if not detected and addressed promptly. The Automatic Fire Detection and Alert with email Notification System is designed to provide an early warning mechanism by detecting fire incidents in real time and alerting stakeholders via email notifications.

The system utilizes flame sensors, temperature sensors, and smoke detectors to monitor environmental conditions continuously. When a fire is detected, the system triggers an alert by activating a buzzer indicator for local notification. Simultaneously, it sends an email notification to predefined contacts, such as building administrators, emergency services, or the fire department.

INTRODUCTION

Fire accidents are one of the most hazardous emergencies that can result in severe damage to life and property. Early detection and timely response are critical in preventing such incidents from escalating. A Fire Detection Alarm and Email Notification System is an innovative solution that combines traditional fire alarm technology with modern communication methods to enhance safety and response efficiency.

This system is designed to detect fire hazards using sensors such as smoke detectors, heat sensors, and flame detectors. Upon detecting any fire-related anomaly, the system triggers an alarm to alert occupants immediately. Simultaneously, it sends an automated email notification to concerned authorities, such as building managers, security personnel, or fire departments. This ensures that even if no one is present at the location, necessary action can be taken remotely.

The integration of email notifications enhances the effectiveness of traditional fire alarm systems by providing real-time alerts, allowing for faster emergency response and minimizing potential losses. This system is particularly beneficial for large commercial buildings, industrial sites, and remote locations where immediate human intervention may not always be possible.

With advancements in technology, modern fire detection systems incorporate IoT (Internet of Things) and cloud-based platforms to enhance accuracy and reliability. These systems can store incident data, analyze patterns, and improve preventive measures. Additionally, they can be integrated with mobile applications for instant notifications, ensuring a more comprehensive approach to fire safety.

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In conclusion, a Fire Detection Alarm and Email Notification System is a crucial enhancement to fire safety protocols. By combining real-time fire detection with instant digital alerts, it significantly improves emergency preparedness and response, helping to safeguard lives and assets.

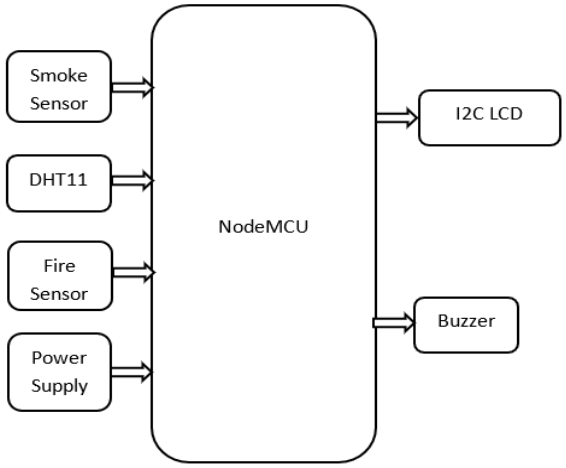

Figure.1 Block Diagram

LITERATURE SURVEY

A study by J. Smith et al. (2018) explored the effectiveness of IoT-based fire detection systems using wireless sensor networks (WSNs). The research demonstrated that integrating IoT with fire alarms significantly reduced emergency response time and improved fire detection accuracy compared to conventional alarm systems. The study also highlighted the importance of cloud-based data storage, which allows authorities to access historical fire incident data for analysis and preventive measures.

In another study conducted by R. Kumar et al. (2020), a fire detection system utilizing NodeMCU and GSM technology was proposed. The system was capable of sending SMS alerts to emergency responders upon detecting fire hazards. While this system proved effective in delivering alerts, it had limitations in terms of scalability and real-time monitoring, as SMS-based alerts often experience delays in message delivery. This limitation can be overcome by adopting email-based notifications, which provide instant and reliable communication to multiple recipients simultaneously.

PROPOSED SYSTEM

The IoT-Based Fire Detection and Alert with Email Notification System is designed using a combination of hardware components, software tools, and IoT-based communication technologies to ensure real-time fire detection and emergency alerting. The system consists of essential hardware components, including smoke sensors, flame sensors, and temperature sensors (DHT11), which continuously monitor environmental conditions for potential fire hazards. These sensors are interfaced with the NodeMCU (ESP8266) microcontroller, which acts as the central processing unit for data collection, processing, and transmission. An I2C LCD display is used to provide real-time fire status updates, and a buzzer is included to generate an immediate local alarm when fire

conditions are detected. The system is powered through a regulated power supply unit, ensuring reliable operation in different environments.

The methodology of the project involves several key steps. First, the sensors continuously monitor temperature, smoke levels, and flame intensity, transmitting the collected data to the NodeMCU microcontroller. Once the detected values exceed predefined threshold levels, the system triggers an immediate alert by activating the buzzer for local notification. Simultaneously, an automated email notification is sent to predefined contacts, including building administrators, emergency responders, and fire departments. This ensures that authorities are notified even if no one is present at the fire site, allowing for a quicker response and minimizing damage.

To enable remote monitoring, the system utilizes IoT-based cloud storage and dashboards for real-time data visualization. Sensor readings are uploaded to a cloud platform using Wi-Fi communication, allowing users to access fire detection data from anywhere through a web or mobile application. The Arduino IDE is used to program the NodeMCU, and the entire system is tested using Proteus simulation

The system's low-cost implementation, scalability, and ease of deployment make it a viable solution for homes, offices, and industries. Future improvements could include AI-based fire risk prediction, automatic sprinkler activation, and mobile app integration. Overall, the project demonstrates that IoT-enabled fire detection systems can significantly improve fire safety by reducing response times and enabling real-time monitoring, making them an essential tool for modern fire prevention strategies.

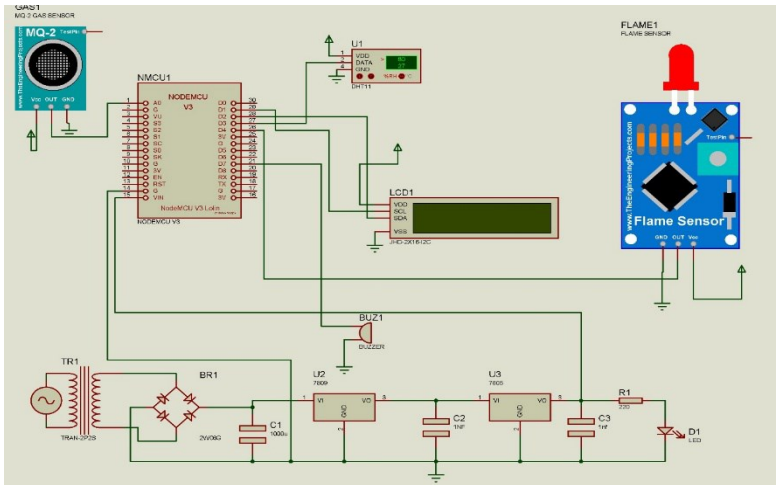

Figure.2 Schematic Diagram

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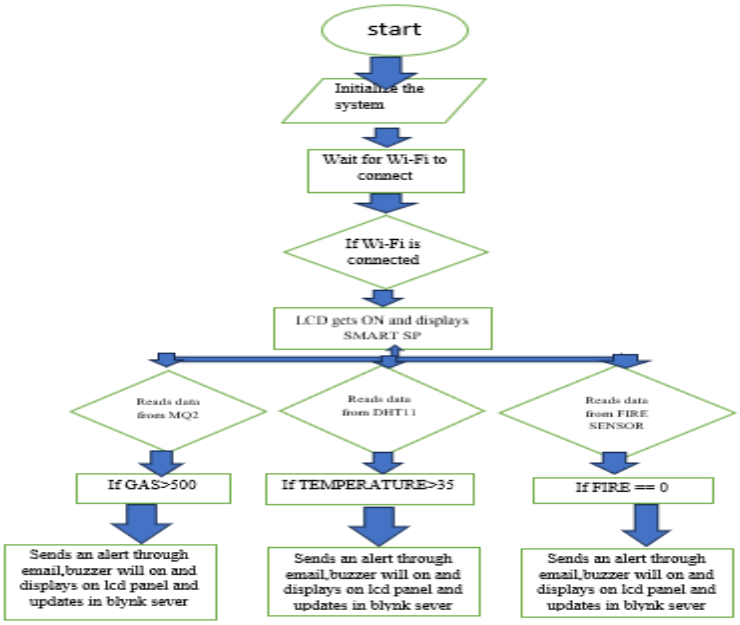

Figure.3 Flow Chart

RESULTS

Figure.4 Displaying Gas leakage On LCD

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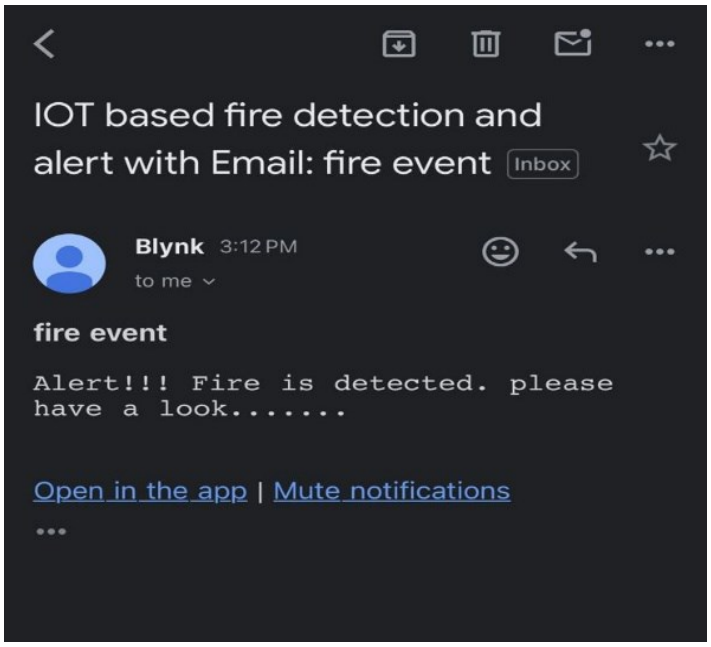

Figure.5 E-mail Alert of Fire detection

Figure.6 Fire detection On LCD

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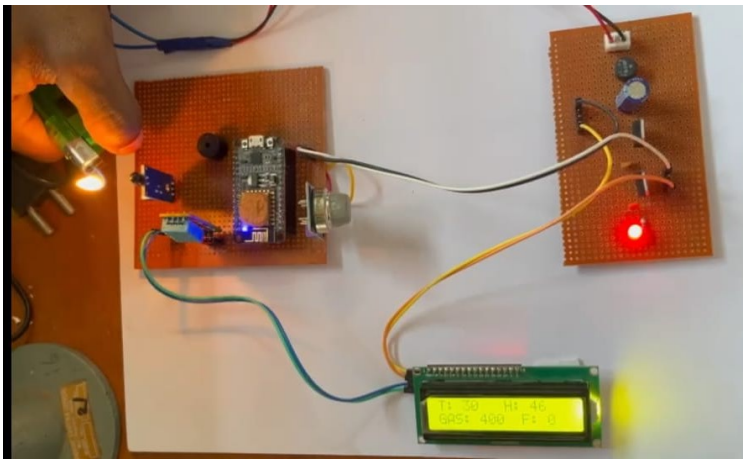

Figure.7 Detecting the Fire and temperature

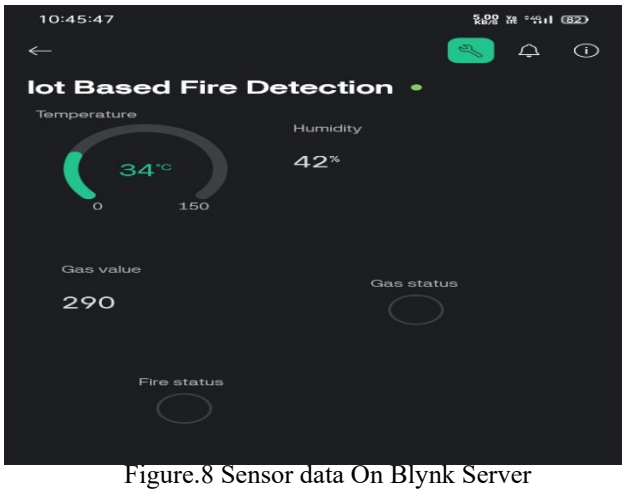

Figure.8 Sensor data On Blynk Server

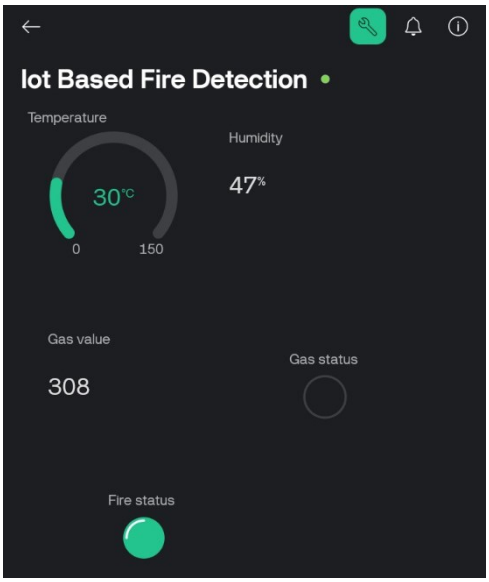

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Figure.9 Fire detection updating On Server

ADVANTAGES

1. **Early Fire Detection –** Detects fire at an early stage using sensors, reducing potential damage.
2. **Real-Time Alerts –** Sends immediate email notifications to authorities and users for quick response.
3. **Remote Monitoring –** Enables users to monitor fire hazards from anywhere using IoT connectivity.
4. **Automated Response –** Can be integrated with sprinklers or fire suppression systems for automatic action.
5. **Reduced Human Intervention –** Eliminates the need for manual monitoring, ensuring faster detection.

APPLICATIONS

1. **Residential Safety –** Protects homes by detecting fire and sending alerts to homeowners.
2. **Commercial Buildings –** Monitors offices, shopping malls, and hotels to ensure fire safety.
3. **Factories & Industries** – Prevents fire hazards in manufacturing plants and warehouses.
4. **Hospitals & Healthcare Centers** – Ensures patient and staff safety by detecting fires early.
5. **Schools & Universities –** Provides fire safety in educational institutions to protect students and faculty.
6. **Data Centers –** Prevents fire-related damage to sensitive servers and IT equipment.
7. **Smart Cities –** Enhances urban fire safety by integrating with IoT-based city monitoring systems.
8. **Parking Lots & Fuel Stations –** Detects fire hazards in areas with flammable materials.

CONCLUSION

The IoT-Based Fire Detection and Alert with Email Notification System provides an efficient and reliable solution for real-time fire detection and emergency response. Unlike traditional fire alarm systems, which are limited to local alerts, this system integrates smoke, flame, and temperature sensors with IoT technology to ensure automated and remote notifications. By utilizing the NodeMCU microcontroller, the system not only triggers an immediate buzzer alarm but also sends real-time email alerts to emergency responders, ensuring a faster and more effective response to fire hazards.

Overall, this project successfully demonstrates the importance of integrating IoT with fire safety mechanisms. By combining real-time monitoring, automated email notifications, and cloud-based data storage, the system significantly improves fire detection accuracy, emergency response times, and overall safety measures. With

further advancements, this system can be expanded to include mobile app notifications, AI-based fire prediction, and smart sprinkler integration, making fire prevention even more efficient and intelligent.

FUTURE SCOPE

1. Integration with Mobile Applications: The system can be enhanced by developing a mobile app that provides real-time fire alerts and sensor data, allowing users to monitor fire hazards remotely.
2. AI-Based Fire Prediction: Machine learning algorithms can be integrated to analyze sensor data and predict potential fire risks based on historical patterns, enabling preventive measures.
3. Smart Sprinkler System Integration: The system can be upgraded to automatically trigger a smart sprinkler system upon fire detection, helping to control the fire before emergency responders arrive.

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