



GAS LEAKAGE DETECTING AND ALERTING SYSTEM USING IOT

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ABSTRACT

Hazardous gas leakage occurs in Oil and Gas Industry may leads to various environmental effects . Our project , “Gas explosion detecting and alerting system using IoT” aims to detect the hazardous gas leakage and alert the workers and company management. We have integrated IoT (Internet of Things) and GSM(Global System for Mobile Communication) to send SMS message to the corresponding workers and management. This project uses MQ135 gas leakage detection sensor to detect the hazardous gases like NH_3 (ammonia), sulfur, Benzene, CO_2 ,Smoke and other harmful gases. This sensor is connected with Arduino NANO . When the sensor detects leakage of gas , the arduino will activate the alarm buzzer to alert the workers their and the Arduino is interfaced with GSM module to send alert message to the management of the company.

INDRODUCTION

Gas explosions pose severe threats to life and property, especially in environments where combustible gases are present. To mitigate such risks, there's a need for a robust Gas Explosion Detecting and Alerting System that can promptly detect the presence of hazardous gases, communicate the danger to relevant authorities or individuals, and activate visible and audible alerts to evacuate the area or take necessary precautions. Our project , “Gas explosion detecting and alerting system using IoT” aims to detect the hazardous gas leakage and alert the workers and company management.

OBJECTIVES

- The primary goal of this project is to develop a cost-effective and reliable Internet of Things (IoT)-based system for detecting gas leaks and promptly alerting authorities by employing a high-sensitivity MQ-135 gas sensor module specifically designed to detect combustible gases like methane, the primary component of natural gas. Continuously monitor gas concentration levels within the designated area.
- Multi-Layered Alert System for Immediate Action by using a loud buzzer or alarm upon detecting a gas leak to provide an immediate auditory alert to occupants in the vicinity, activating a red LED to offer a clear visual confirmation of the gas leak's presence, also utilizing a GSM shield and SIM card to send SMS alerts to pre-programmed phone numbers, notifying designated individuals or emergency services, ensuring response.

LITERATURE SURVEY

S.No	Base Paper Title	Author	Proposed year	Journal
1.	Gas Leak Detection and Smart Alerting using IoT.	Raj Singh, Ankit Tiwari, Rishabh Singh, Saurabh Suman.	2021	i-Manager
2.	An Enhanced Smart Intelligent Detecting and Alerting System for Industrial Gas Leakage using IoT in Sensor Network.	GA Senthil, P Suganthi, R Prabha, M Madhumathi, S Prabhu, S Sridevi.	2023	IEEE (academia)
3.	Development of toxic gas monitoring and alarm system.	Muniyandy Elangovan, D Surya Prakash, C Hemadri.	2020	-

LITERATURE SURVEY

S.No	Base Paper Title	Author	Proposed year	Journal
4.	Design of an IoT Based Gas Wastage Monitoring, Leakage Detecting and Alerting System	Md Ibtida Fahim, Nowshin Tabassum, Abrar Ahamed Habibullah, Aritra Sarker, Sayeda Islam Nahid, Mohammad Monirujjaman Khan	2021	IEEE (Academia)
5.	Modeling and Simulation of a Gas Detecting Device for providing safety; and reducing the risk of accidents due to gas explosion or fire.	Rafsan Khan, Mashfiqul Islam Khan, Anika Bushra Soha, Abdullah Al Zayed	2021	Brac University

KEY CHALLENGES

- Sensor Accuracy and Reliability
- Data Transmission and Network Connectivity
- System Scalability and Integration
- Power Supply and Battery Life
- Cost Management
- Maintenance and Calibration

MOTIVATION

The motivation behind this project are

- Limitations of Traditional Methods as they often rely on human senses, which can be unreliable, especially for odourless gases
- The advent of the Internet of Things (IoT) presents a unique opportunity to create cost-effective and automated solutions for gas leak detection.

EXISTING SYSTEM

- Existing system provides only alerting system . in existing model the Arduino or other microcontroller is connected with any gas detecting sensor (like MQ135,MQ6) and when the sensor detects the gas leakage the buzzer buzzed and LED glows .
- The existing system only provides the alert to the workers who are nearby the Hazardous gas container .
- It didn't alert the management of the company .this is the major drawback of the most existing systems.

PROPOSED SYSTEM

Working of our project:

- The MQ135 sensor is connected with Arduino NANO and placed near the gas container(that is., where the hazardous gas is stored.
- Arduino NANO is connected with GSM shield using SIM card to send alert messages.
- Further the Arduino NANO is connected with LED and Buzzer to alarm the worker in that corresponding place.
- When the sensor detects the gas leakage, the LED glows and Buzzer (alarm) alerts the workers and alert message is send to the management quickly through the GSM shield.

HARDWARE AND SOFTWARE REQUIREMENTS (MODULES)

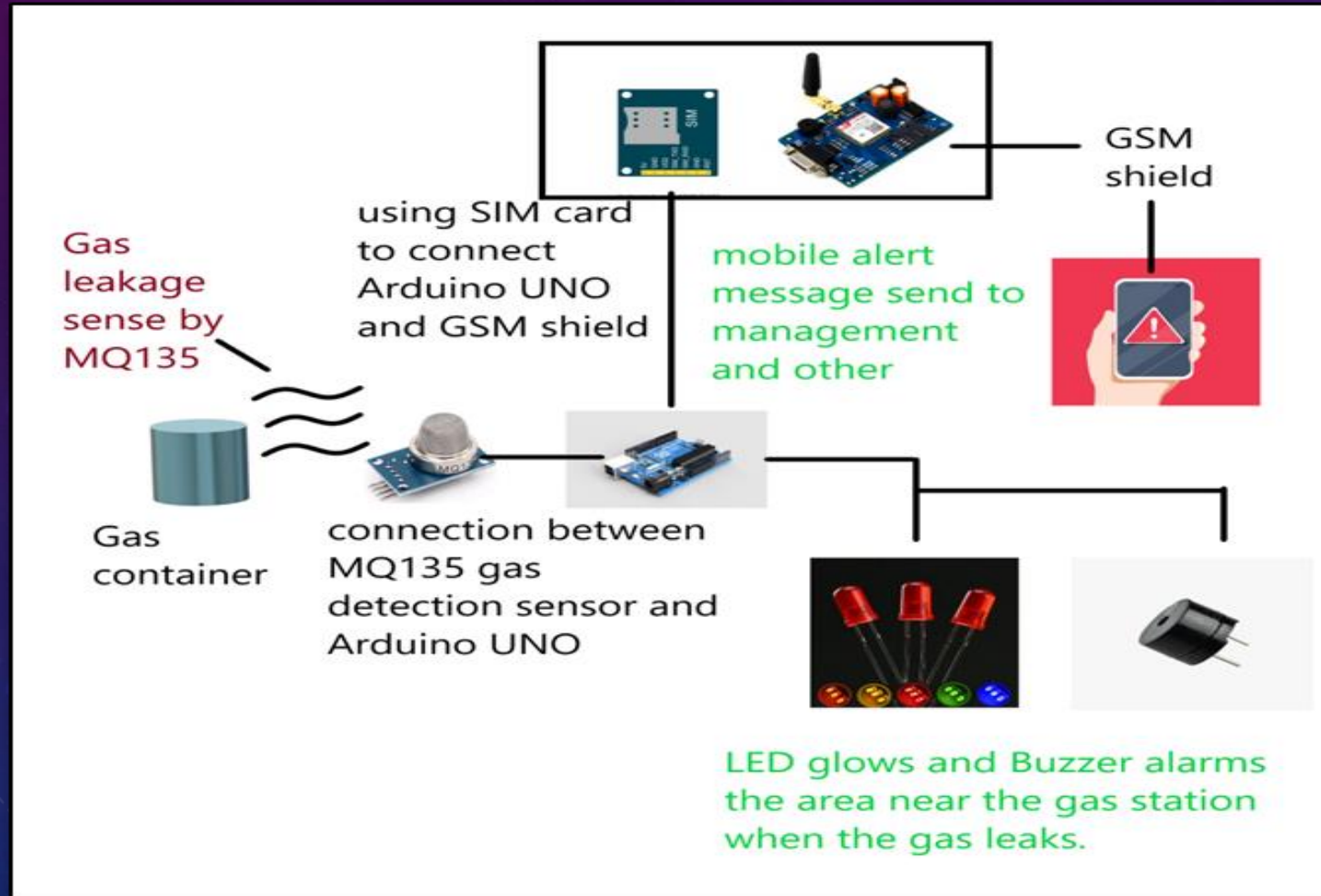
Hardware Requirements :

- MQ135 gas sensor module
- Arduino NANO
- GSM Shield
- SIM card
- LED light
- Buzzer or alarm

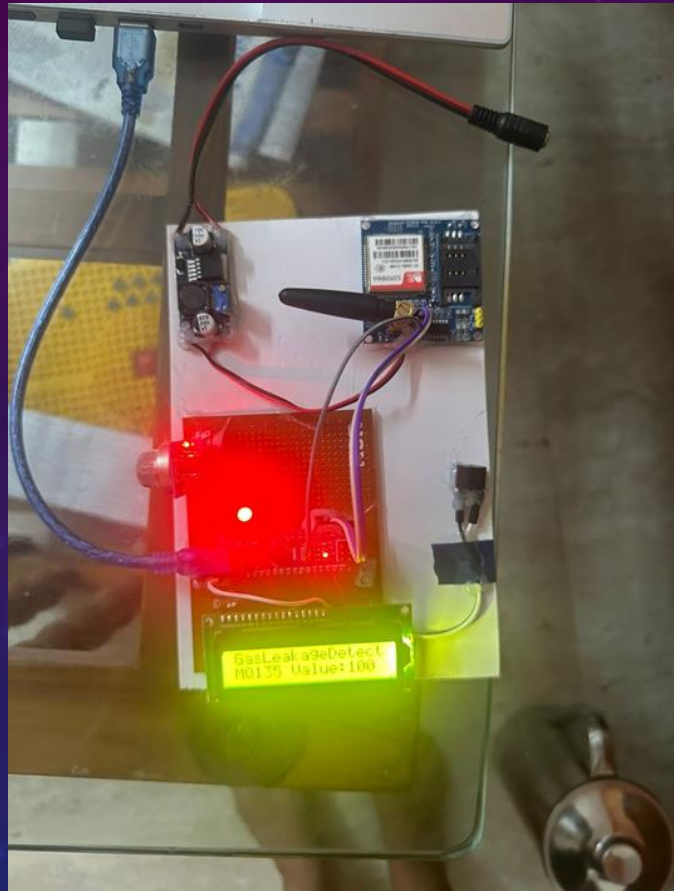
Software Requirements:

- Processor 1GHz
- RAM 64 bit
- Arduino IDE (version 2.3.2 - windows 64 bits)

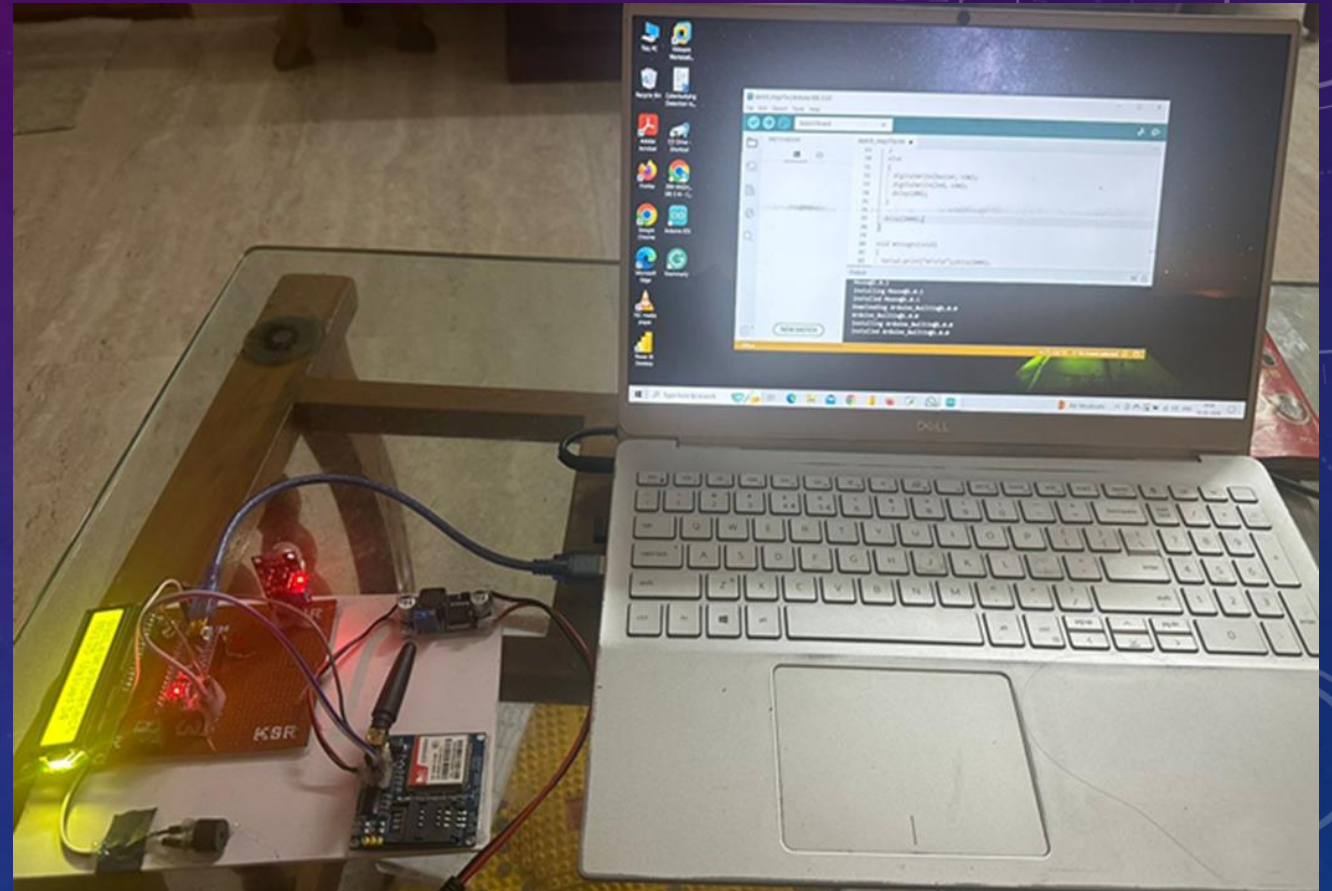
SYSTEM ARCHITECTURE



OUTPUT



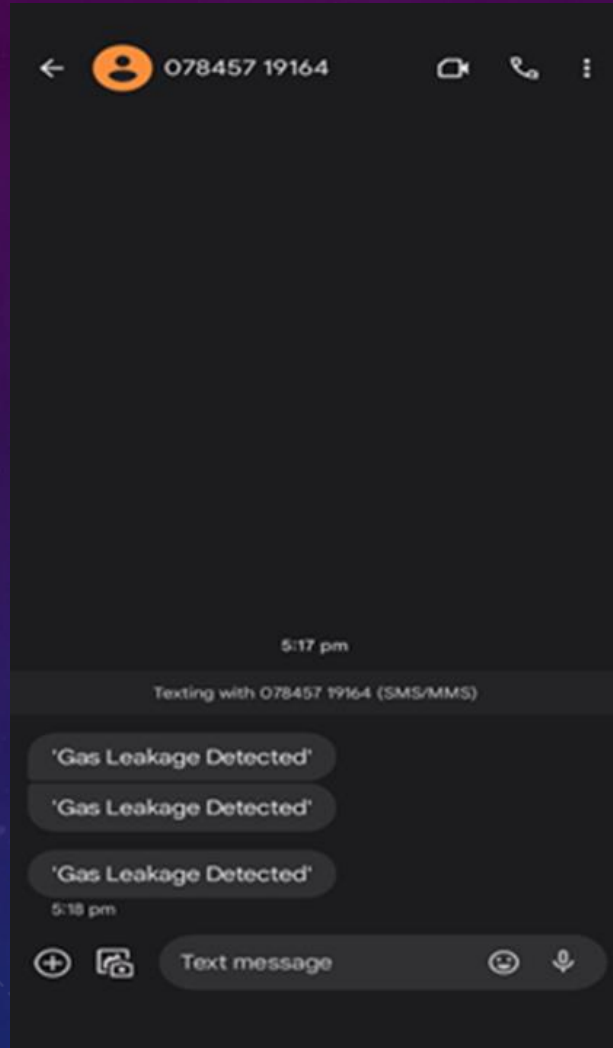
Connections in the board



Working Model connected with Arduino IDE

OUTPUT

Alert Message



CONCLUSION AND FUTURE ENHANCEMENT

CONCLUSION:

- This project has presented a cost-effective gas explosion detection and alerting system leveraging the power of the Internet of Things (IoT).
- The continuous monitoring capabilities of the MQ-135 sensor, coupled with the Arduino's processing power and the GSM shield's communication features, create a robust system for early detection and timely notification.
- It is also a multi-faceted alerting system, encompassing a loud buzzer or alarm, a bright LED, and SMS notifications.

FUTURE ENHANCEMENT

- Sensor Integration:

Sensors for detecting smoke, carbon monoxide (CO), or temperature fluctuations could provide a more holistic picture of potential hazards.

- Cloud Connectivity :

This would enable remote monitoring of gas concentration levels, allowing for real-time data analysis and potentially triggering automated responses, such as shutting off gas valves remotely.

- Machine Learning and AI:

This could help the system distinguish between normal gas fluctuations and actual leaks, further reducing false alarms.

- Mobile App Integration:

Develop a mobile application that allows users to monitor gas concentration levels remotely, receive alerts, and potentially control the system settings.

REFERENCES

- [1] “Energy-Efficient routing protocol for reliable low-latency internet of Things in oil and gas pipeline monitoring” proposed by karam S N, Bila K, Year:2024
- [2] “Evaluating a novel gas sensor for ambient monitoring in automated life science laboratories” by MFR, Roddelkopf T, Year:2022.
- [3] “Modelling and implementation of a low-cost IoT-smart weather monitoring station and air quality assessment based on fuzzy inference model and MQTT protocol” by Fahim M,El Mhouti, Year:2023
- [4] “Enhancing data transmission in duct air quality monitoring using mesh network strategy for LoRa” by Mulick A, Abd Rahman AH, Year:2023
- [5] “Quantifying non-steady state natural gas leakage from the pipelines using an innovative sensor network and model for subsurface emissions – InSENSE” by Lo JH, Smits KM, Year: 2024