A

REAL-TIME RESEARCH PROJECT REPORT

ON

GAS LEAKAGE ALERT SYSTEM

Submitted in partial fulfillment of the requirement for second year

of

BACHELOR OF TECHNOLOGY

IN

INFORMATION TECHNOLOGY

Submitted by

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Under the Supervision *of*

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VIGNANA BHARATHI INSTITUTE OF TECHNOLOGY

(Approved by AICTE, Accredited by NBA, NAAC, Permanently Affiliated to JNTUH)

Aushapur (v), Ghatkesar (m), Medchal.dist, TELANGANA-501 301

2024-2025

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Department of Information Technology

CERTIFICATE

This is to certify that the project entitled **"GAS LAEAKAGE ALERT NSYSTEM"** being submitted by **M.SUMANA SRI(23P61A1273),V.LOHITHA(23P61A12B9),V.SAI RAM(23P61A12C2)** in partial fulfillment of the requirement for second year of **Bachelor of Technology in Information Technology** is a record of bonafide work carried out by them under my guidance and supervision during the academic year 2024-2025.

The results embodied in this project report have not been submitted to any other University for the award of any degree or diploma.

Supervisor	Project coordinator	Head of the department
Mr. K. Venkat Reddy	**Ms. P. Sony**	**Dr. K. Kalaivani**
Asst. Professor	**Asst. Professor**	**Head of the**
Department of IT	**Department of IT**	**Department of IT**

AUSHAPUR(V), GHATKESAR(M), MEDCHAL. DIST-501301

Department of Information Technology

DECLARATION

We, **M.SUMANA SRI** bearing hall ticket number **23P61A1273, V.LOHITHA** bearing hall ticket number **23P61A12B9** and **V.SAI RAM** bearing hall ticket number **23P61A12C2**, hereby declare that the project report entitled **"GAS LEAKAGE ALERT SYSTEM"** under the guidance of **Mr. K. Venkat Reddy,** Department of Information Technology, **VBIT**, Hyderabad, is submitted in partial fulfillment of the requirement for second year of Bachelor of Technology in Information Technology.

This is a record of bonafide work carried out by us and the results embodied in this project have not been reproduced or copied from any source. The results embodied in this project report have not been submitted to any other university or institute for the award of any other degree or diploma.

M.SUMANA SRI(23P61A1273)

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ACKNOWLEDGEMENT

First and foremost, we wish to express our gratitude to our **Supervisor, Mr. K. Venkat Reddy,** Asst. Professor, Department of Information Technology for her valuable guidance and freedom she gave to us.

We also express our sincere thanks to **Mr. P. Shiva Kumar & Ms. P. Sony, Project Coordinator** for there encouragement and support throughout the project.

We also express our sincere thanks to **Dr K. Kalaivani, HOD of IT** for her encouragement and support throughout the project.

We take immense pleasure in thanking **Prof. Dr PVS Srinivas,Principal, Vignana Bharathi Institute of Technology**, **Ghatkesar** for having permitted us to carry out this project work.

Our outmost thanks also go to all the **FACULTY MEMBERS** and **NON-TEACHING STAFF** of the Department of Information Technology for their support throughout our project work.

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Abbreviations and Acronyms

SL.NO	ACRONYM	EXPANSION
1	IOT	Internet of Things
2	GPIO	General Purpose Input-Output
3	IDE	Integrated Development Environment
4	Wi-Fi	Wireless Fidelity.
5	MQ-5	Methane and LPG Gas Sensor
6	LCD	Liquid Crystal Display
7	I2C	Integrated Circuit

VIGNANA BHARATHI INSTITUTE OF TECHNOLOGY

Department of Information Technology

COURSE OUTCOMES

Course: Real Time or Field Based Research Project Course(22IT2281)

Class: II B Tech II Semester **AY:** 2024-2025

Course Outcomes

After completing the Projects, the student will be able to:

Code	Course Outcomes	Taxonomy
C229	Identify and state the problem precisely to prepare the abstract	Remember
C229	Analyze the existing system, and outlining the proposed methodology for effective solution	Analyze
C229	Use various modern tools for designing applications based on specified requirements	Apply
C229	Develop applications with adequate features and evaluate the application to ensure the quality	Create
C229	Prepare the document of the project as per the guidelines	Create

PROGRAM OUTCOMES (POs)

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUT COMES(PSO's)

PSO1 Simulate computer hardware and apply software engineering principles and techniques to develop various IT applications

PSO2 Analyze various networking concepts and also aware of how security policies, standards and practices are used for trouble-shooting.

PSO3 Design and maintain data base for providing back-end support to software projects.

PSO4 Apply algorithms and programming paradigms to produce IT based solutions for the real- world problems.

VIGNANA BHARATHI INSTITUTE OF TECHNOLOGY

Department of Information Technology

COs Mapping with PO/PSO

Project Title: GAS LEAKAGE ALERT SYSTEM

Name of the Supervisor: Mr. K. Venkat Reddy
Batch Details:

S. No	ROLLNO	STUDENT NAME	TECHNOLOGY
1	23P61A12B9	V.LOHITHA	IOT
2	23P61A1273	M. SUMANA SRI	IOT
3	23P61A123C2	V. SAI RAM	IOT

CO-PO Mapping for Major Project:

High-3 Medium-2 Low-1

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	P08	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PS04
C229.1	3	3	2	3	3	2	-	-	3	2	3	3	2	-	-	-
C229.2	2	2	3	2	3	2	-	-	3	2	3	3	2	-	-	-
C229.3	2	2	3	2	3	2	-	-	3	2	3	3	2	-	-	-
C229.4	2	2	3	2	3	2	-	-	3	2	3	3	2	-	-	-
C229.5	2	2	2	2	3	2	-	-	3	2	3	3	2	-	-	-
AVG	2.2	2.2	2.6	2.2	3	2	-	-	3	2	3	3	2	-	-	-

CO-PO mapping Justification

Course: Real Time or Field Based Research Project Course (22IT2281)

Class: II B Tech II Semester **AY**: 2024-2025

Mapped POs:

PO1	**Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
PSO1	Simulate computer hardware and apply software engineering principles and techniques to develop various IT applications

Supervisor Signature

ABSTRACT

Gas leakage alert system using gas sensor and Arduino uno. Gas leakage is a serious hazard that can lead to explosions, poisoning, and severe environmental damage. This project aims to design and implement a gas leakage detection and alert system using an MQ-series gas sensor, Arduino UNO, and a GSM module. When the sensor detects a gas concentration exceeding a predefined threshold, the Arduino processes the data and triggers an alert. The system then sends an SMS notification and makes an emergency call to predefined contacts, such as homeowners, safety officers, or emergency services. This real-time alert mechanism enhances safety by enabling quick responses to gas leaks in homes, industries, and laboratories. The system is cost-effective, easy to implement, and scalable for various applications.

Gas leakage is a critical safety concern in residential, commercial, and industrial environments, as it can lead to fires, explosions, and health hazards. This project proposes a real-time Gas Leakage Alert System using an **MQ-series gas sensor**, **Arduino UNO**, and a **GSM module** to detect and respond to the presence of combustible gases like LPG or methane. When the sensor detects a gas concentration above a predefined threshold, the Arduino processes the data and immediately triggers safety measures. These include activating a buzzer to alert nearby individuals and sending an SMS along with making a phone call to predefined emergency contacts. This ensures that even if no one is present at the location, appropriate actions can be taken quickly to prevent any damage.

The system is designed to be **low-cost, easy to implement, and scalable**, making it suitable for a wide range of applications from homes to industrial facilities. It provides a strong foundation for integrating advanced features such as cloud connectivity, mobile app alerts, and automation of safety equipment like exhaust fans or gas valves. By combining embedded systems and IoT technologies, the project highlights how engineering solutions can be used to enhance safety and prevent disasters, demonstrating its relevance for both academic learning and real-world implementation.

1. INTRODUCTION

1.1 INTRODUCTION

Internet of Things (IOT) is a concept where each device is assigned to an IP address and through that IP address anyone makes that device identifiable on internet. The mechanical and digital machines are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. Basically, it started as the "Internet of Computers." Research studies have forecast an explosive growth in the number of "things" or devices that will be connected to the Internet. The resulting network is called the "Internet of Things" (IoT). The recent developments in technology which permit the use of wireless controlling environments like, Bluetooth and Wi-Fi that have enabled different devices to have capabilities of connecting with each other. Using a WIFI shield to act as a Micro web server for the Arduino which eliminates the need for wired connections between the Arduino board and computer which reduces cost and enables it to work as a standalone device.

1.2 BACKGROUND

Existing gas detection systems often face several limitations, including inaccurate gas readings, reliance on manual monitoring, and difficulties with integration into broader safety protocols. Many of these systems require frequent calibration and maintenance, increasing both time and cost. Additionally, real-time alerts may not be provided, delaying response to potential gas hazards. Furthermore, scalability is often an issue, as many systems are not adaptable to both small and large-scale environments. In contrast, the GASGUARD project offers an advanced solution by ensuring accurate detection, real-time notifications, seamless integration, and scalability, addressing the shortcomings of current systems and providing enhanced safety and reliability.

1.3 PROJECT OBJECTIVES

- **Real-Time Gas Monitoring**: Provide continuous monitoring of hazardous gases in various environments.
- **Accurate Detection**: Ensure precise and reliable detection of gases like CO, CO2, methane, and oxygen.
- **Timely Alerts**: Deliver immediate notifications when gas levels reach unsafe thresholds.
- **Safety Compliance**: Help organizations meet safety regulations and standards related to gas monitoring.
- **Integration and Scalability**: Offer a scalable system that integrates easily into existing safety infrastructure.

1.4 SCOPE

The Gas Leakage Alert System has a broad scope in ensuring safety in homes, industries, and laboratories where combustible gases are used. It provides real-time detection and alerts, making it highly useful for preventing accidents. The system is cost-effective, easy to implement, and scalable for future enhancements like cloud integration, mobile app notifications, GPS tracking, and smart automation. It serves as a solid foundation for developing advanced IoT-based safety systems and offers great potential for real-world applications and further research.

1.5 PROJECT MANAGEMENT

Management of any project can be briefly disintegrated into several phases. Our project has been decomposed into the following phases:

Experimentation

This phase involved discussions regarding necessary equipment regarding the project. The study of related already existing projects, gathering required theoretical learning. It also included figuring out the coding part, by developing simple algorithms and flowcharts to design the whole process.

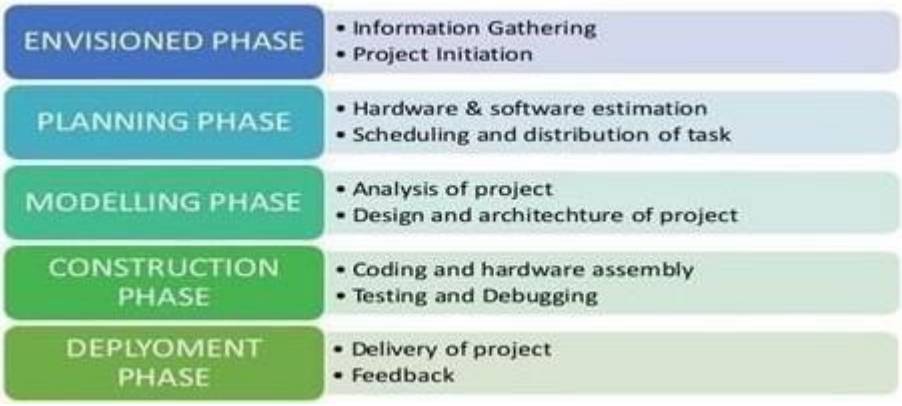

Fig .5.1.1: Model of Phases in Project Management

Design

This phase was, designing layout of the application, and the necessary features to be included. This involved the complete hardware assembly and installing the code to Arduino Uno. The power strip was designed to connect the home appliances that can be controlled via GPIO pins.

Development and testing

This phase had the development of the application. The android device was connected to the Arduino Uno via wireless network (Wi Fi) and the whole prototype was tested for identification and removal of bugs.

Real world testing

The prototype was ready to be tested into the real world and integrated with various real time electrical appliances.

1.6 OVERVIEW AND BENEFITS

Real-Time Detection: Instantly detects gas leaks and alerts users, minimizing the risk of accidents.
Remote Alerts: Sends SMS and makes calls to emergency contacts, even if no one is present at the site.
Cost-Effective: Uses affordable components like Arduino and MQ sensors, making it accessible for all.
User-Friendly: Easy to build, operate, and maintain with minimal technical expertise.
H**ighly Scalable:** Can be expanded with additional sensors, mobile apps, or cloud-based monitoring.
Increases Safety: Helps protect lives, property, and the environment from gas-related hazards.
Educational Value: Offers hands-on experience with IoT, embedded systems, and real-world problem-solving.

1.7 ORGANIZATION OF THESIS

Chapter 1 The thesis is organized into seven chapters including the introduction. Each chapter is unique on its own and is described with necessary theory to comprehend it.

Chapter 2 deals with *Literature Review*, this chapter reflects a comprehended form of the existing projects related to the topic. It credits the projects along with a brief paragraph of summery about the project.

Chapter 3 describes the *Hardware Modelling and setup* of the project. The chapter points the main features of the prototype, gives a layout of the project, lists the components requires. It briefly describes the various setup processes involved with the project, including hardware interfacing and software installation and setup according to our requirement.

Chapter 4 is the *Logic and operation* of the project. A flow chart presents the actions describe the working process of the prototype.

Chapter 5 is the *Result*. It describes the results of the proposed system.

Chapter 6 is the *conclusion and Future scope*. This chapter includes the result of the project work carried, the limitations it possesses.

Chapter 7 is the *Future enhancements.* It describes the Future Enhancements of the prosed system.

Chapter 8 lists the *References* that have been used for the commencement of the project work

2. LITERATURE REVIEW

2.1 Title: GSM Based LPG Gas Leakage Alert System
Journal: Journal of Artificial Intelligence, Machine Learning, and Neural Network, 2023
Authors: Pawar et al.
The project uses an MQ-2 gas sensor with Arduino Uno and GSM to detect LPG leakage. It sends SMS alerts to users and sounds a buzzer to ensure early warning in homes

2.2 Title: Design and Implementation of an Automatic Gas Leakage Monitoring System
Journal: International Journal of Sustainable Energy and Environmental Research, 2021
Author(s): Baballe et al.
The system employs an MQ-5 gas sensor with GSM and an LCD display. It provides real-time alerts and visual feedback for enhanced safety in households.

2.3 Title: PG Gas Leak Detection Tool with Foam Spray
Journal: Information Technology and Electrical Journal, 2024
Author(s): Pamungkas et al.
This project uses an MQ-6 sensor, Arduino Uno, and servo motors. It not only detects gas leaks but also activates a blower and foam spray as safety measures.

2.4 Title: IoT-Based LPG Gas Leak Detection System Using NodeMCU
Journal: Journal of Artificial Intelligence, Electronics, and Automation, 2021
Author(s): Prananda et al.
The system uses an MQ-2 sensor with NodeMCU and a gas regulator controller. It sends data to the cloud and enables remote control via IoT.

3. HARDWARE MODELLING AND SETUP

3.1 MAIN FEATURES OF THE PROTOTYPE

Real-Time Gas Detection: Continuously monitors gas concentration using an MQ-series gas sensor to detect leakage instantly.
Threshold-Based Alert: Automatically triggers an alarm (buzzer) when the gas level exceeds a predefined safety limit.
SMS Notification: Sends an automatic SMS alert to predefined emergency contacts to inform them about
the gas leak.
Emergency Call: Initiates a phone call to notify homeowners or safety officers for immediate action.
Arduino UNO Based Control: Uses Arduino UNO as the central microcontroller for processing sensor data and controlling alerts.
GSM Module Integration: Enables wireless communication for remote alerting via SMS and calls without internet dependency.

3.2 PROJECT LAYOUT

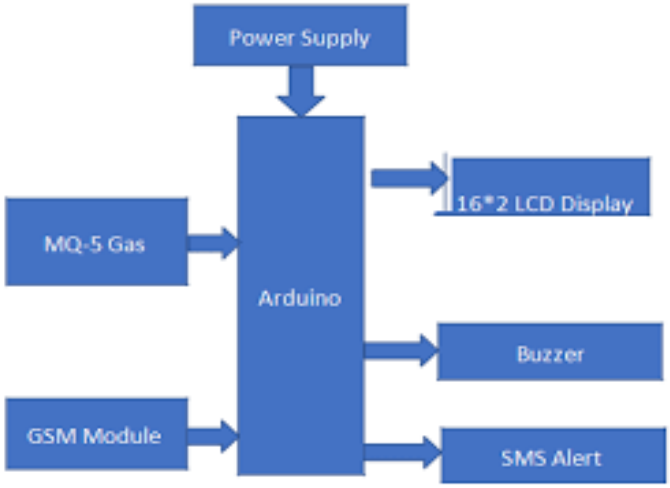

Fig 3.2.1: Layout of Project Module

Arduino Uno: Arduino UNO is a low-cost, flexible, and easy-to-use programmable open-source microcontroller board that can be integrated into various electronic circuits.
LCD Display: An LCD consists of a layer of liquid crystals sandwiched between two transparent electrodes. When an electric current is applied, the crystals align to control the amount of light passing through them, creating the image you see on the screen.

3.3 COMPONENTS REQUIRED

S.NO	COMPONENT	QUANTITY
1.	Arduino Uno	1
2.	Bread Board	1
3.	LCD Display	1
4.	Jumper Wires	15
5.	Servo Motor	1
6.	IR Sensors	2
7.	I2C Interface	1
9.	USB Cable	1

Table 3.3.1: Component List

3.4 SETTING UP THE SYSTEM

3.4.1 INSTALLATION OF ARDUINO IDE

Get the latest version from the download page. You can choose between the Installer (.exe) and the Zip packages. We suggest you use the first one that installs directly everything you need to use the Arduino Software (IDE), including the drivers.

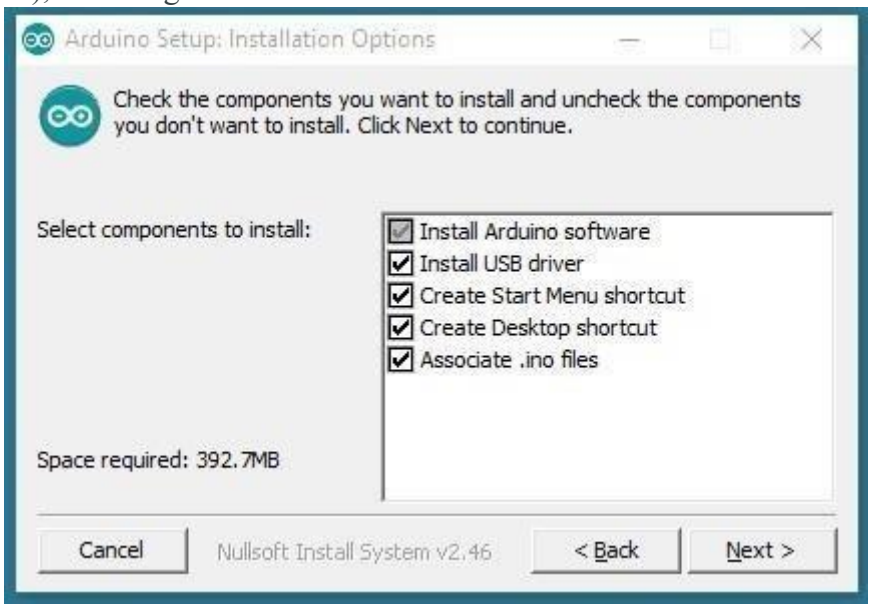

Fig 3.4.2: Choose Components to download Arduino IDE

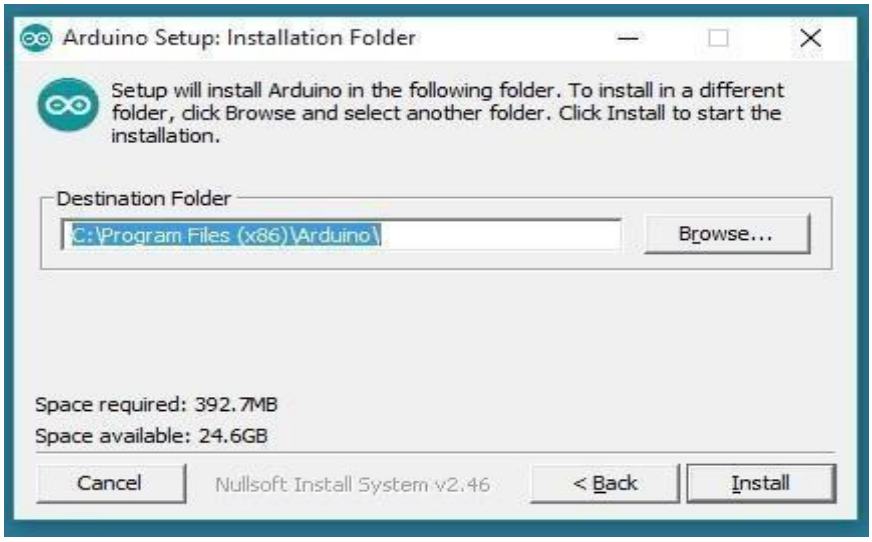

Fig3.4.3: Choose Arduino Installation directory

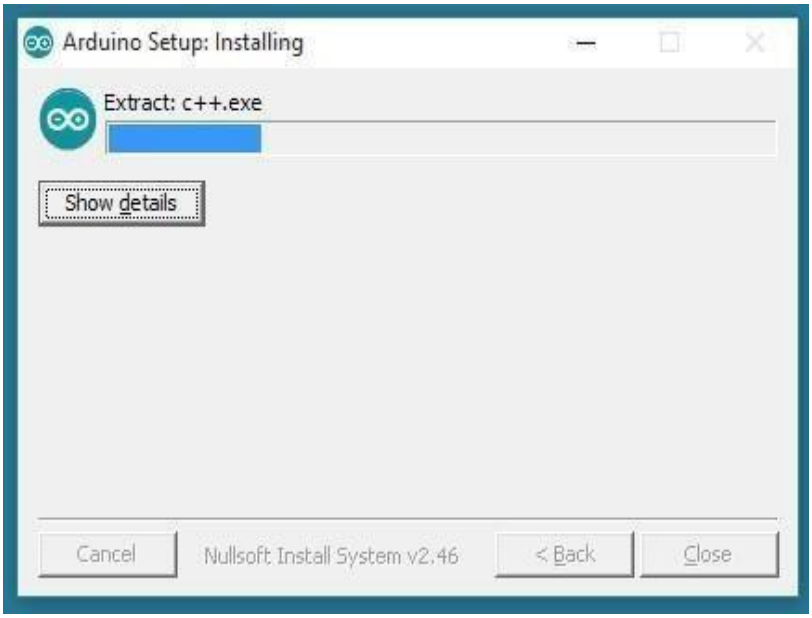

Fig 3.4.4: Installation of Arduino IDE

33.5 HARDWARE ASSEMBLY

The Arduino UNO is a standard board of Arduino. Here UNO means 'one' in Italian. It was named as UNO to label the first release of Arduino Software. It was also the first USB board released by Arduino. It is considered as the powerful board used in various projects. Arduino.cc developed the Arduino UNO board.

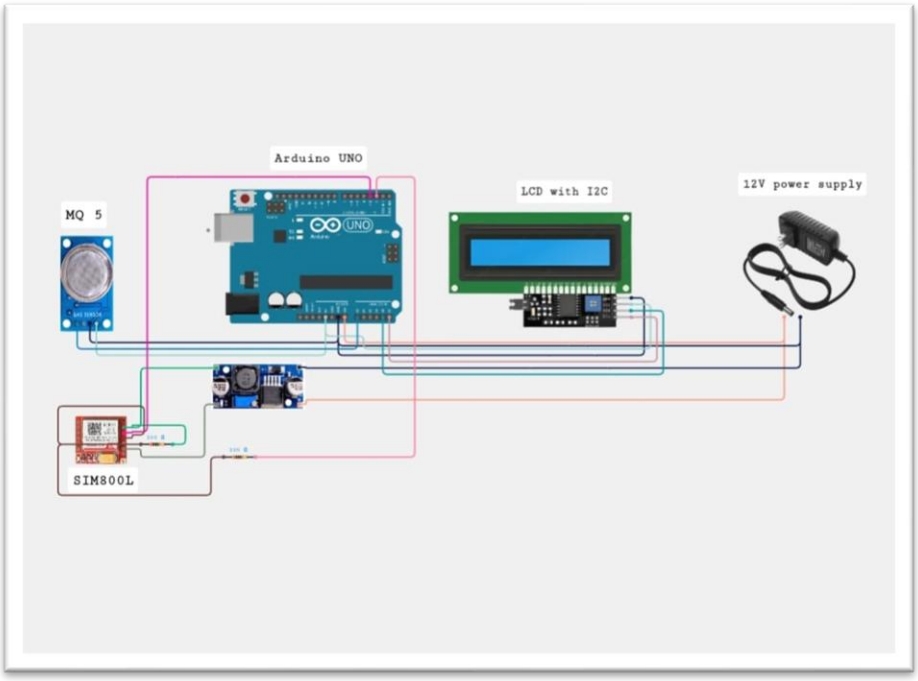

Fig 3.5.1: Architecture of Gas Leakage Alert System

Arduino UNO is based on an ATmega Microcontroller. It is easy to use compared to other boards, such as the Arduino Mega board, etc. The board consists of digital and analog Input/Output pins (I/ O), shields, and other circuits. The Arduino UNO includes 6 analog pin inputs, 14 digital pins, a USB connector, a power jack, and an ICSP (In-Circuit Serial Programming) header. It is programmed based on IDE, which stands for Integrated Development Environment. It can run on both online and offline platforms. The IDE is common to all available boards of Arduino.

MQ-5 Gas Sensor: A sensitive sensor designed to detect gases like LPG and natural gas with high accuracy.

SIM800L Module: A GSM module that enables sending SMS and making calls for remote communication in IoT projects.

LCD Display: A screen used to visually display real-time data and system status to users.

I2C Interface: A communication protocol that allows easy connection of multiple peripherals using just two wires.

12V Adapter: Provides stable power supply to the entire circuit, ensuring reliable operation of all components.

4. LOGIC AND OPERATION

4.1 BLOCK DIAGRAM

4.1 Block Diagram of Proposed System

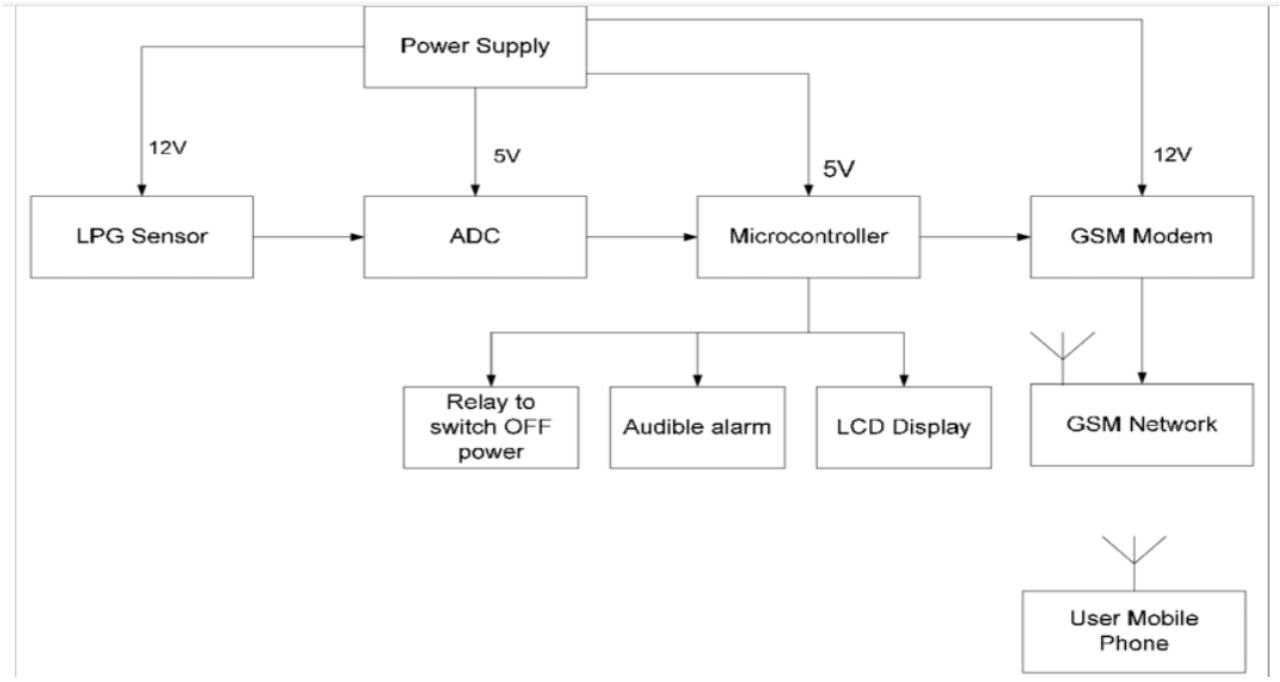

Fig 4.1.1: Block Diagram of Proposed System

This block diagram provides a high-level overview of the components and their interactions in a Smart car parking system using Arduino. Depending on specific requirements, additional components or refinements may be necessary, such as feedback mechanisms for precise control or safety features.

4.2 FLOW CHART

This flowchart gives the working of proposed project. The Car (Object) read by IR sensor and is then read by Arduino Uno. The Arduino Uno process the Object read by sensor and displayed on the LCD display. Then the gate attached to Servo controlled by micro controller of the Arduino Uno will open.

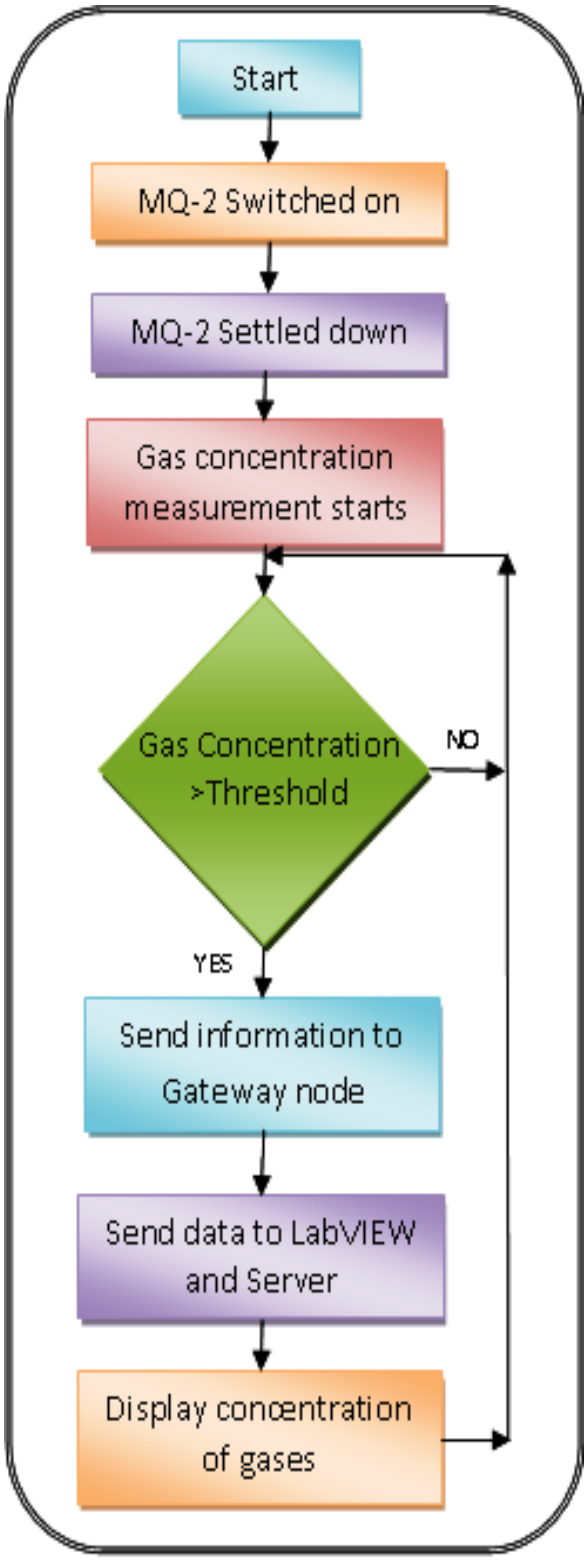

Fig 4.2.1: Flow chart of the proposed project

4.3 PRINCIPLE AND OPERATION

The Gas Leakage Alert System works on the principle of gas concentration detection using a **semiconductor gas sensor** (like the MQ-2 or MQ-5). These sensors detect the presence and concentration of combustible gases such as **LPG (Liquefied Petroleum Gas), methane (CH_4), or propane** in the air. When the gas concentration in the environment exceeds a **predefined threshold**, the resistance of the sensor changes, which is converted into an analog voltage. This voltage signal is read by the **Arduino UNO**, which then processes the data and triggers appropriate actions like sounding a buzzer and sending alerts via a **GSM module**. The core idea is to detect the gas early and warn the user to prevent accidents.

4.3.1 ADVANTAGES OF ARDUINO UNO

Arduino Uno uses a beginner-friendly programming environment (Arduino IDE), making it easy to write, upload, and modify code for parking system logic. **Cost-Effective**

It is an affordable microcontroller, which makes it ideal for low-cost smart parking solutions especially for small-scale or prototype projects.

1) **Ease of Use**

Arduino UNO is beginner-friendly with a simple programming environment, making it ideal for students and prototyping.

2) **Open-Source and Widely Supported**

A large community, extensive documentation, and libraries make troubleshooting and development easier.

3) **Digital and Analog Pin Support**

It supports both digital and analog inputs, allowing easy integration with the MQ-series gas sensor and GSM module.

4) **Low Cost**

It's a budget-friendly microcontroller, making the entire gas leakage system affordable.

5) **Quick Prototyping**

Its plug-and-play nature helps in rapid development and testing of IoT projects like yours.

6) **Expandable**

Easily expandable with shields and modules (e.g., GSM, LCD, Wi-Fi), which makes it flexible for future enhancements.

7) **Reliable for Basic IoT Applications**

Works well for small-scale projects like gas detection, where complex processing is not required.

4.3.2 DISADVANTAGES OF ARDUINO UNO

The Arduino Uno has a relatively low processing power and limited memory compared to more advanced microcontrollers.

1. **Limited Processing Power**

Arduino UNO has an 8-bit microcontroller with limited memory and speed, which may struggle with multiple sensor inputs or advanced features like cloud connectivity or data logging.

2. **No Built-in Connectivity**

It lacks built-in Wi-Fi or Bluetooth, so extra modules (like GSM or ESP8266) are needed for remote alerts or cloud communication.

3. **No Real-Time Operating System (RTOS)**

Arduino doesn't support multitasking well, which can be a limitation if you want to run several operations simultaneously (e.g., sensing, sending SMS, displaying data).

4.Limited Storage

The onboard memory (32 KB Flash, 2 KB SRAM) restricts the size of your code and data logs.

4. **Not Ideal for Long-Term Deployment**
   It's excellent for prototyping but may not be as robust or power-efficient for commercial or industrial use over long periods.
5. **Manual Power Backup Required**
   It doesn't have built-in battery backup, so an external power solution is necessary for use during power outages.

4.4 APPLICATION

4.4.1 INTERFACING ARDUINO UNO WITH ARDUINO IDE

1. Click on Start -> Control Panel -> System and Security.
2. Click on System -> Device Manager -> Ports (COM &LPT) -> Arduino UNO (COMxx). If the COM &LPT is absent, look Other Devices -> Unknown Device.
3. Right-click to Arduino UNO (COmxx) -> Update Driver Software -> Browse my computer for driver software.
4. Select the file "inf" to navigate else, select "ArduinoUNO.inf" .
5. Installation Finished.

Open the code or sketch written in the Arduino software. Select the type of board. Click on 'Tools and select Board.

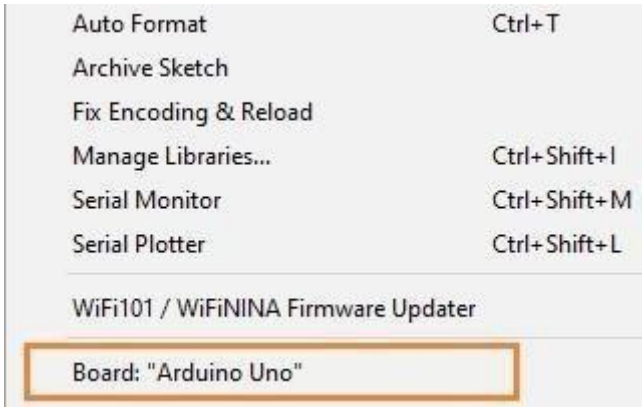

Fig 4.4.1.1: Selection of Arduino uno in Arduino IDE

- Select the port. Click on the Tools -> Port (select the port). The port likely will be COM3 or higher. For example, COM6, etc. The COM1 and COM2 ports will not appear, because these two ports are reserved for the hardware serial ports.
- Now, upload and run the written code or sketch.

Upload and run, click on the button present on the top panel of the Arduino display:

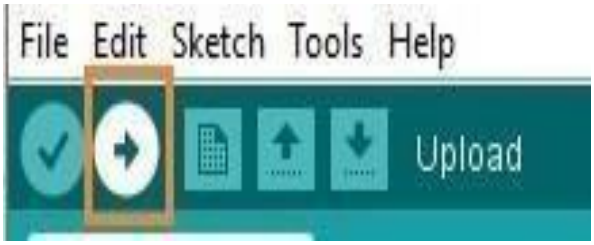

Fig 4.4.1.2: Uploading the Code

Within the few seconds after the compile and run of code or sketch, the RX and TX light present on the Arduino board will flash. The 'Done Uploading' message will appear after the code is successfully.

4.5 COST ESTIMATION

S.NO	COMPONENTS	QUANTITY	PRICE
1.	Arduino Uno	1	450
2.	MQ-5	1	116
3.	LCD Display	1	100
4.	Jumper Wires	`15	30
5.	SIM 800L	1	300
6.	GAS Sensor	1	80
7.	I2C Interface	1	100
8.	12V Adapter	1	200
Total			1376

Table 4.5.1: Cost Estimation

5. RESULT

After implementing the Gas Leakage Alert System using the MQ-series gas sensor, Arduino UNO, and GSM module:

- The system successfully **detects gas leaks** (such as LPG or methane) when the gas concentration crosses a **predefined threshold**.
- It **triggers a buzzer** to alert people nearby.
- An **SMS is sent** to predefined contacts (like homeowners or safety personnel) via the **GSM module**.
- The system is capable of making a **call** to emergency contacts when leakage is detected.
- It provides a **real-time, low-cost, and scalable safety solution**.
- The system was tested in a controlled environment and **responded accurately and quickly** to gas presence.

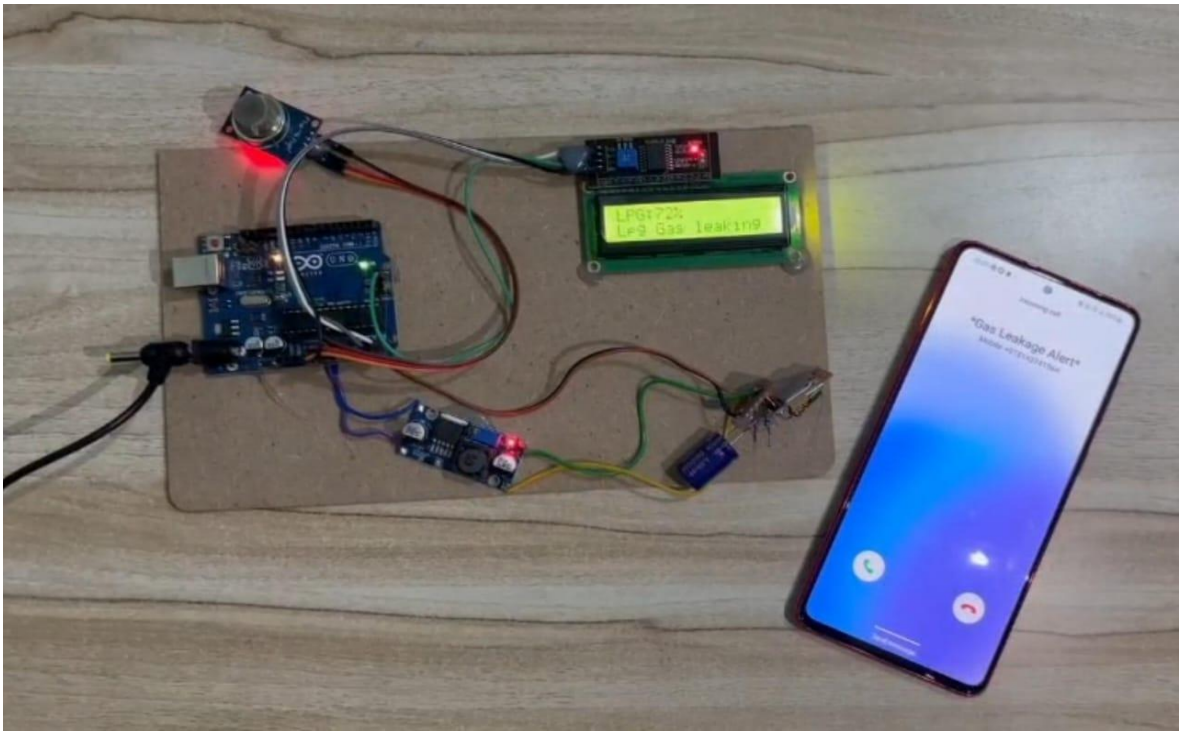

Fig 5.1.1: Result

6.CONCLUSION

In conclusion, the GAS LEAKAGE ALERT SYSTEM project offers an innovative and reliable solution for real-time monitoring of hazardous gases, enhancing safety in industrial, commercial, and residential environments. By utilizing Arduino-based technology, advanced gas sensors, and cloud integration, GAS LEAKAGE ALERT SYSTEM provides accurate detection, timely alerts, and seamless integration with existing safety systems. This project ensures that potential gas hazards are quickly identified and addressed, reducing risks, improving safety compliance, and offering scalable protection across diverse environments.

The **Gas Leakage Alert System** successfully demonstrates a practical and cost-effective solution for detecting hazardous gas leaks in real-time. By integrating the **MQ-series gas sensor**, **Arduino UNO**, and a **GSM module**, the system can efficiently monitor gas concentrations and respond immediately when dangerous levels are detected.

The system not only activates a **local buzzer alarm** to alert nearby individuals but also sends an **SMS notification and makes a call** to predefined emergency contacts, ensuring a timely response even in the absence of occupants. This real-time alert mechanism significantly enhances safety in **homes, industries, and laboratories**, reducing the risk of **explosions, poisoning, and property damage**.

Overall, this project highlights the potential of **IoT-based embedded systems** in improving public safety and demonstrates how students can apply engineering concepts to develop innovative solutions for real-world problems.

7.FURTHER ENHANCEMENT

To make your project more advanced and industry-ready, you can implement the following enhancements:

1. **Wi-Fi or IoT Cloud Integration**
   Use ESP8266/NodeMCU to connect with cloud services like **Blynk**, **ThingSpeak**, or **Firebase** for live monitoring and logging data.
2. **Mobile App Notifications**
   Instead of only SMS, use an app-based notification system with push alerts.
3. **Automatic Ventilation System**
   Trigger exhaust fans automatically when gas leakage is detected.
4. **Voice Assistant Integration**
   Use Google Assistant or Alexa to get gas levels using voice commands.
5. **Battery Backup System**
   Add a rechargeable battery module to make the system functional even during power cuts.
6. **Multi-Gas Detection**
   Integrate multiple gas sensors (like CO, CO_2) for detecting various hazardous gases.
7. **Display Panel**
   Add an LCD or OLED screen to show live gas levels.
8. **Location-based Alerts**
   Use GPS modules to send the location in SMS alerts, useful for mobile or outdoor setups.

8. REFERENCES

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