Shri Shamrao Patil (Yadravkar) Educational & Charitable Trust's

Sharad Institute of Technology College of Engineering

(AUTONOMOUS INSTITUTE) YADRAV (ICHALKARNJI)-416121

(Approved by AICTE, New Delhi, Recognized by Government of Maharashtra & Affiliated to DBATU)

DEPARTMENT OF ARTIFICIAL INTELLIGIENCE AND DATA SCIENCE

A

Project Report

on

"Smart LPG Gas System Using IOT"

Submitted in partial fulfilment of the requirement for the degree of

Bachelor of Technology

in

ARTIFICIAL INTELLIGIENCE AND DATA SCIENCE

by

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under the guidance of

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Department of ARTIFICIAL INTELLIGIENCE AND DATA SCIENCE,

Sharad Institute of Technology College of Engineering, Yadrav-Ichalkaranji

2024-25

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This is to certify that,

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Studying in B-Tech. Artificial Intelligience And Data Science have successfully completed theproject entitled

"Smart LPG Gas System Using IOT"

under the guidance and supervision of Prof **Ms.V.S.Mali** during the academic year 2024-2025 towards the partial fulfilment of the curriculum prescribed by Dr. Babasaheb Ambedkar Technological University, Lonere for the award of the degree of Bachelor of Technology in Artificial Intelligience And Data Science.

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Last but not least we are thankful to our parents for their moral as well as financial support.

ABSTRACT

Gas leakages are a severe problem in residences and other areas where residential gas is utilized. The consumer has no idea of how much gas is being used and how much time left when he or she needs to book a new LPG cylinder. As a result, in this project, we offer an Internet of Things (IOT)-based system that analyses several characteristics of an LPG cylinder and, as a result, keeps the consumer informed via a mobile application. When the gas level is falls below the threshold, an alert message will receive to the user via the buzzer and via the mobile app, and when the LPG level is extremely low, the amount of gas in the cylinder is found using a sensor called a load cell and the rate of gas remaining in the cylinder is updated to the app that is being used by the user (below 20 percent). We prevent pre booking and late booking by automating the booking of new LPG. When a gas leak is detected, the user is notified via a mobile application and a buzzer. Using GPS, the precise location of the fire accidents will be communicated and also automatically turn off regulator.

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LIST OF FIGURES

CHAPTER 1

INTRODUCTION

1.1 Background

Liquefied Petroleum Gas (LPG) is widely used for domestic, commercial, and industrial purposes. Its applications range from cooking and heating in households to fueling vehicles and powering industrial equipment. LPG's popularity stems from its efficiency, relatively clean combustion, and portability compared to other fuel sources like coal and kerosene. However, traditional LPG systems have several limitations, such as safety risks, inefficient usage, and supply chain issues.

Smart technologies have the potential to revolutionize the way LPG systems operate by integrating Internet of Things (IoT) devices, sensors, and data analytics. These technologies can address the aforementioned challenges by providing real-time monitoring, automated controls, and enhanced safety features.

1.2 Motivation

Improving Safety and Efficiency

Developing a smart LPG gas system using IoT can enhance safety by detecting leaks and automating shut-off valves, while also improving efficiency through real-time monitoring and optimization of gas consumption.

Enhancing Customer Experience

The smart system can provide users with real-time updates on gas levels, delivery schedules, and maintenance needs, improving the overall customer experience and convenience.

Reducing Environmental Impact

By optimizing gas usage and minimizing waste, the smart LPG system can help reduce the environmental impact of LPG consumption and contribute to sustainability efforts.

1.3 Objective

- To design and develop a gas leak detection system that can detect the presence of LPG gas and trigger an alarm or shut off the gas supply in case of a gas leak.

- To integrate the gas leak detection system with wireless and GSM technology to send an SMS alert to a designated phone number in case of gas leakage.

1.4 Scope of Work

The scope of work outlines the tasks, deliverables, and boundaries of the Smart LPG Gas System project. The goal is to design, develop, and implement an intelligent system that enhances the safety, efficiency, and user convenience of LPG usage through real-time monitoring, automated controls, and advanced analytics.

CHAPTER 2

LITERATURE REVIEW

1	Gas Leakage Detection and Smart Alerting and Prediction Using IoT	Asmita Varma, Prabhakar S, Kayalvizhi Jayavel (2020)	The IoT is used to alert the concerned user via call, SMS, and e-mail, and also predict hazardous situations by performing data analytics.
2	LPG leakage detection using IoT	Prof. Dr Chetana Tukkoji Prof. Sanjeev Kumar A N	LPG leakage is classified into three categories, LOW, MEDIUM & HIGH based on the square measure. This paper conjointly shows the ratio and temperature.
3	Gas Leakage and Fire detection using Raspberry Pi	Sourabh Jamadagni, Nikita Chougule, Priyanka Sankpal, Shwetali Patil, Nikita Chougule, Shailesh Gurav (2019)	This paper presents industrial monitoring system using IOT, the sensor used here is MQ2 for leakage detection. Raspberry Pi ensures all components are interfaced
4	GSM-based Low-cost gas leakage explosion and fire alert system with advanced security	Pritam Ghosh, Palash Kanti (2019)	It is equipped with a GSM modem as wireless media to send information to the owner through SMS and preventive measure is taken in absence of people.
5	Augmented Approach for Gas Leakage Detection using Swarm Robotics	Niladri Sarma, Arpit Mittal, Deeksha Choudhary, Aishwarya Chowdhury, T.Ramya (2019)	This paper aims at developing a swarm robot structure that is capable of interacting with one another through communication and the alert message is shared with the user through GSM.
6	Microcontroller-based gas leakage detection and evacuation system	Aderibigbe, Adekitan, Victor, Matthews (2018)	The microcontroller-based system activates a buzzer when gas leakage is detected and shuts the gas supply, hence sending the text via SMS to the stored mobile number.
7	Embedded Based LPG Das Monitoring & Automatic Cylinder Booking with Alert System	Prof. Mangesh Kakden, Kalyani janbande, Pradnya Gothe, Payal Ninave, Sancheti Dhoke (2018)	The proposed model notifies alert people before any leakage from the gas cylinder and the gas level reaches below the threshold limit of gas around 2kg so that the user can replace the old cylinder with the new one in time and automatically book the cylinder using a GSM module.
8	Android Application-based Gas Leakage Notifier	Aishwarya R, Akshath R Hegde, Ashwini N, Mohammed Thavaf A R, Anitha C (2017)	This paper introduces such a method, wherein the client is kept mindful of the leakage status through an Android application and cellular network-based SMS. The proposed solution is highly flexible and cost-effective.

9	Gas Level Detection And Automatic Booking Notification Using Iot	K.Muthamil Sudar, D.Lakshmi Lokesh, V. Samara simhareddy, Y. Chanikya Chowdary, C H. Harish Kumar, Nagaraj. P, P. Chinnasamy (2017)	As this project monitor's the gas level in the cylinder and if the gas level is lesser than a certain level then it automatically sends a notification to both user and the gas agency using a mobile network (GSM).

CHAPTER 3

PROBLEM STATEMENT

LPG (Liquid Petroleum Gas) is a highly flammable gas made up of a mixture of propane and butane. LPG is used for cooking at home, in restaurants, and in some industrial applications. They have flaws that allow gas to flow out. The gas is an impenetrable substance that can only be recognized through physical study of its odor. Gas leaking can only be recognized if there is a human nearby, and it cannot be identified if there is no human nearby. However, a human with a poor sense of smell may not be able to notice it. As a result, this system will aid in the detection of gas leaks. Furthermore, a gas leak might trigger a fire, which can result in significant injury or death, as well as the destruction of human property. This system was created using the Internet of Things.

To identify the level , leakage of LPG (Liquid Petroleum Gas) gas and it alert the user for booking the LPG cylinder also turn off the regulator when leakage is detected using IOT.

CHAPTER 4

OBJECTIVES

1.Enhance Safety:

- Provide instant alerts to users and emergency services in case of a detected leak.
- Integrate automated shut-off mechanisms to prevent accidents.

2.Improve Efficiency:

- Utilize predictive analytics to monitor and optimize gas consumption.
- Automate the process of gas refill orders based on usage patterns and predicted needs.
- Minimize wastage by providing users with insights into their gas usage habits.

3.Increase User Convenience:

a. Develop a mobile notification for control of the LPG system.
b. Allow users to receive real-time notifications regarding gas levels and system status.

4.Enhance User Experience:

c. Collect user feedback to continuously improve system features and performance.
d. Offer customizable alerts and notifications to meet individual user preferences.

5.Promote Environmental Sustainability:

e. Reduce carbon footprint by optimizing gas usage and reducing wastage.
f. Encourage users to adopt more energy-efficient practices through data-driven insights.

CHAPTER 5

Methodology

5.1 Main Methodology

1. Sensor Integration: Connect LPG gas sensors to a microcontroller.

2. IoT Connectivity: Connect the microcontroller to an IoT module (Wi-Fi, GSM,).

3. Database: Set up data ingestion, storage, and analytics on database

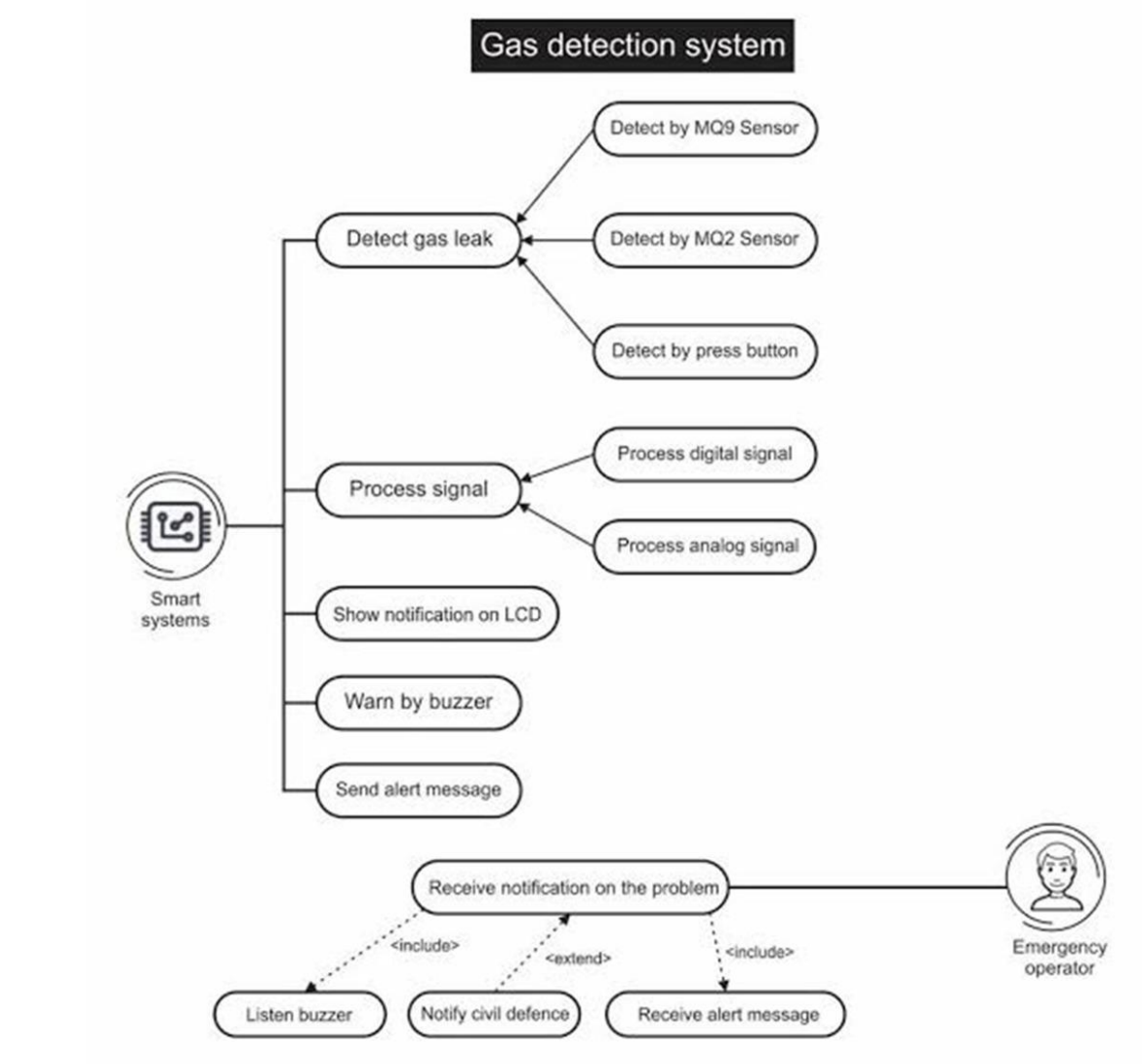
4. Data Analytics: Develop algorithms for gas consumption analysis, leak detection, and predictive maintenance.

5. Automation: Integrate a loadcell valeu for automated gas control based on sensor data and analytics insights.

6. User Interface: Develop a web portal for remote monitoring and control.

7. Security: Implement robust security measures for data encryption, authentication, and authorization.

USE CASE DIAGRAM



Use case diagrams show what a system does, Actors and use cases, all in one place. They help us visualize how a system behaves, And identify its functional requirements.

Figure 5.2

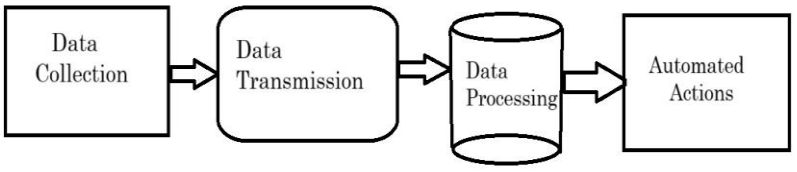
This use case diagram shows the flow of gas detection, signal processing, and emergency response actions in a smart gas detection system. The system can both automatically detect gas and alert responsible parties for further action .

DATA FLOW DIAGRAM

A flowchart is a diagram that visually represents a process, workflow, or algorithm. It uses symbols to represent different steps in the process, and arrows to show the flow of the process. Flowcharts are a useful way to communicate and document complex processes in a clear and concise way.

Figure 5.3

DFD



This flowchart shows how a cool web app called "Online Monitoring and Evaluation of Project and Internship" helps manage student projects and internships.

1. Sign In: First, students and faculty log in using their usernames and passwords. The app checks if this information is correct.
2. Information Time: If the login is successful, students enter their details. Faculty might also mention their area of expertise. An admin can even send out links or forms to collect information from students.
3. Matching and Grouping: All this info is stored in a big database. The app then uses this info to find the perfect guide for each student to help with their project. Based on these matches, project groups are formed with students working together.
4.Project Central: Students can now see a special dashboard to track their project's progress, like important deadlines they need to meet. They can also add details about their project or internship, such as the title and the guide assigned to them. They can even upload important files like presentations, reports, or internship photos.
5. Friendly Reminders & Safe and Sound: If a student forgets to upload something important, the app gives them a friendly reminder on their phone. But don't worry, the app keeps all thisinformation confidential and secure!
6. Access Anywhere: The best part? This helpful app can be accessed from any device, like a phone or laptop, making managing projects on the go a breeze!

ARCHITECTURAL DIAGRAM

In LPG gas, detection of leakage is done by the gas sensor which is interfaced with Arduino. When gas is detected, we inform the user about the gas leakage by sending the message, turning on the buzzer, and also the message displayed on the LCD. In auto gas booking we continuously measure the amount of gas which is present in the cylinder. When the gas level goes below the set level then the message will be sent to the gas agency through NodeMCU Module and a confirmation message received by the user from the gas agency. So, the user gets the cylinder within time. Whenever gas leakage is detected by the LPG sensor automatically relay connected to the mains will be disconnected in turn there will be no supply to the home. In turn, avoiding any fire hazards. Simultaneously windows will open to make sure gas intensity reduces.The below diagram represents the architecture of the system.

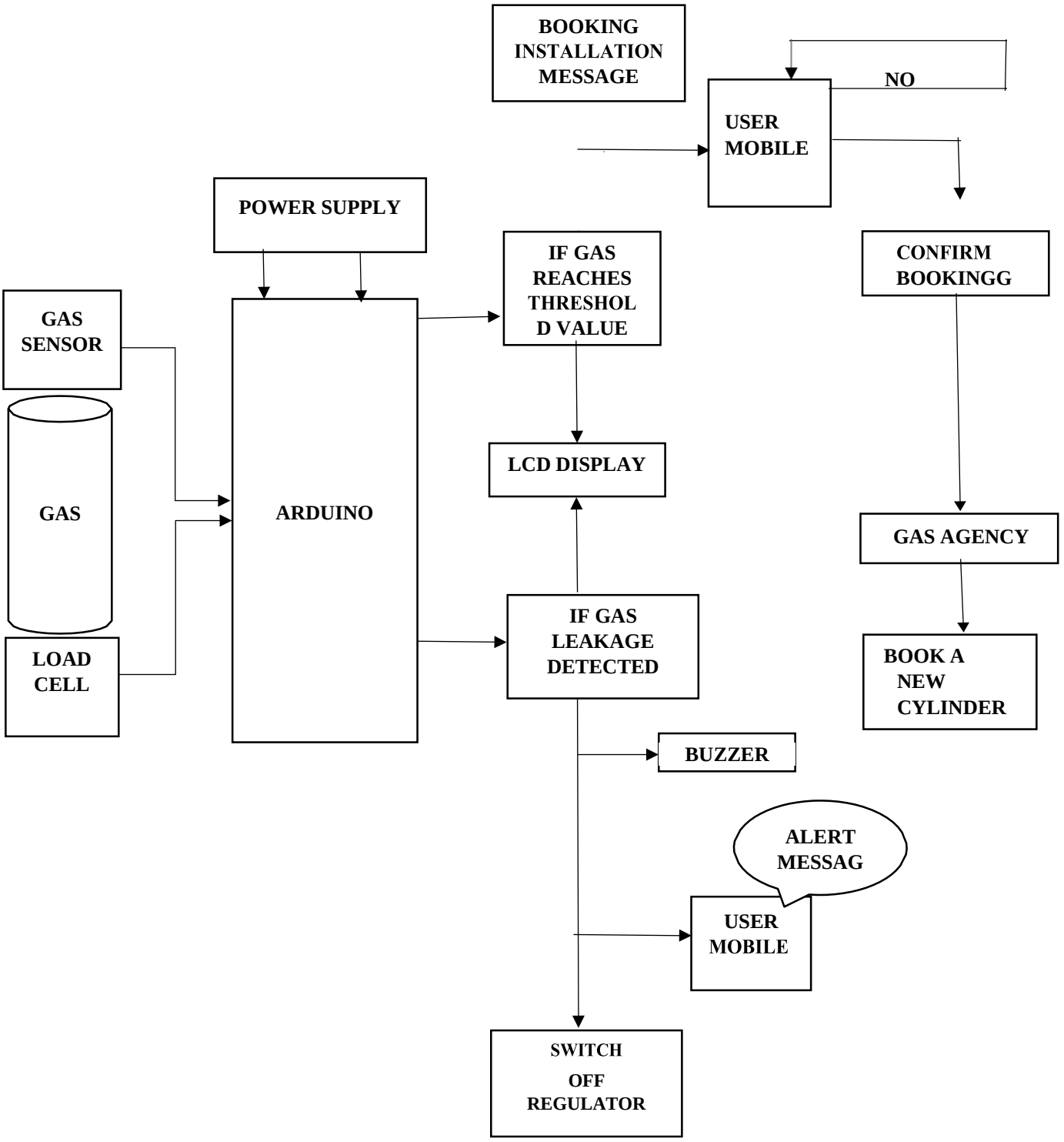
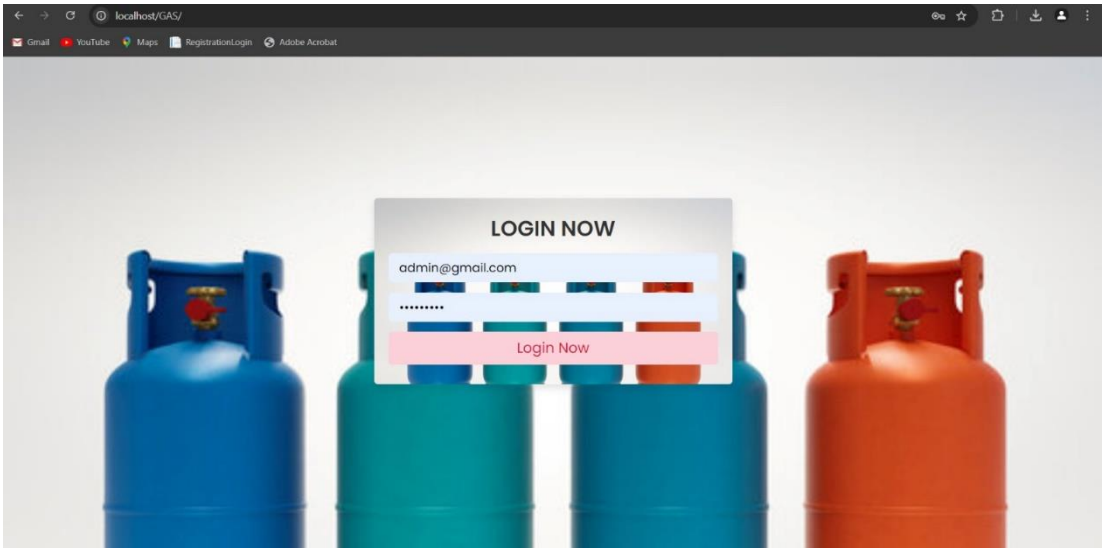

BOOKING INSTALLATION MESSAGE
NO
USER MOBILE
POWER SUPPLY
IF GAS REACHES THRESHOL D VALUE
CONFIRM BOOKINGG
GAS SENSOR
GAS
ARDUINO
LCD DISPLAY
GAS AGENCY
IF GAS LEAKAGE DETECTED
LOAD CELL
BOOK A NEW CYLINDER
BUZZER
ALERT MESSAG
USER MOBILE
SWITCH OFF REGULATOR

Figure 5.4

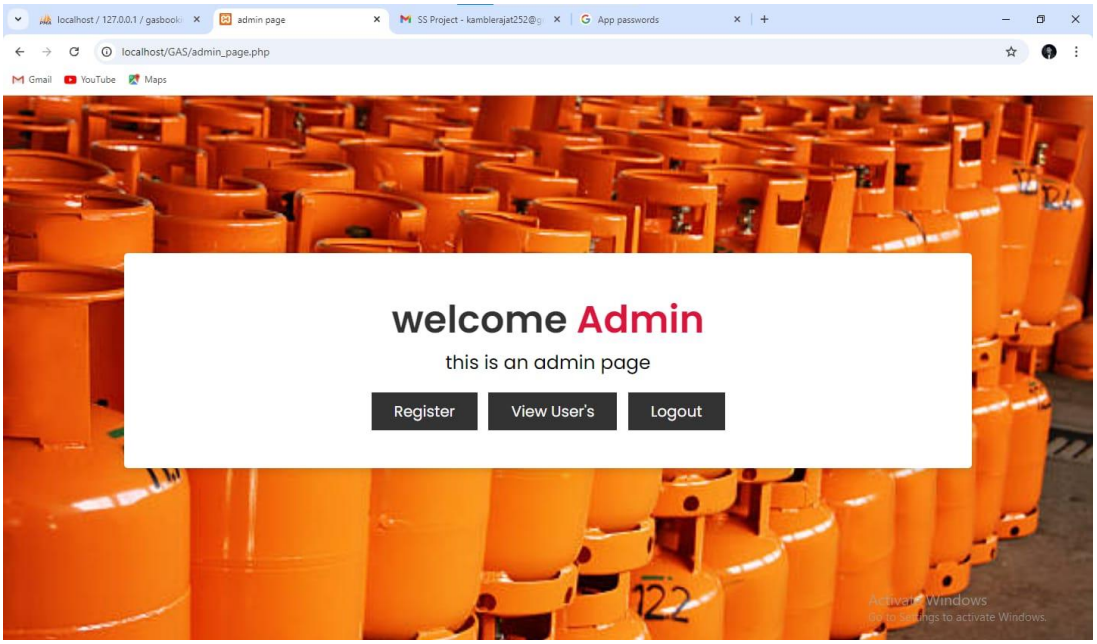
CHAPTER 6

RESULTS AND DISCUSSION

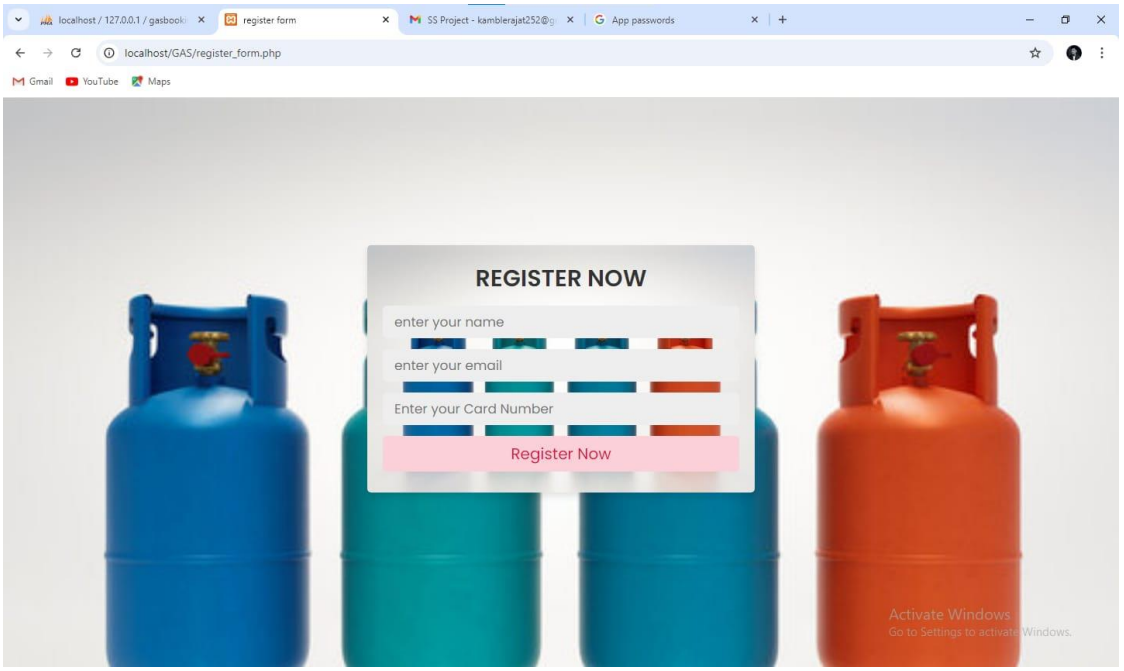
1. Figure 6.1 Admin Login form



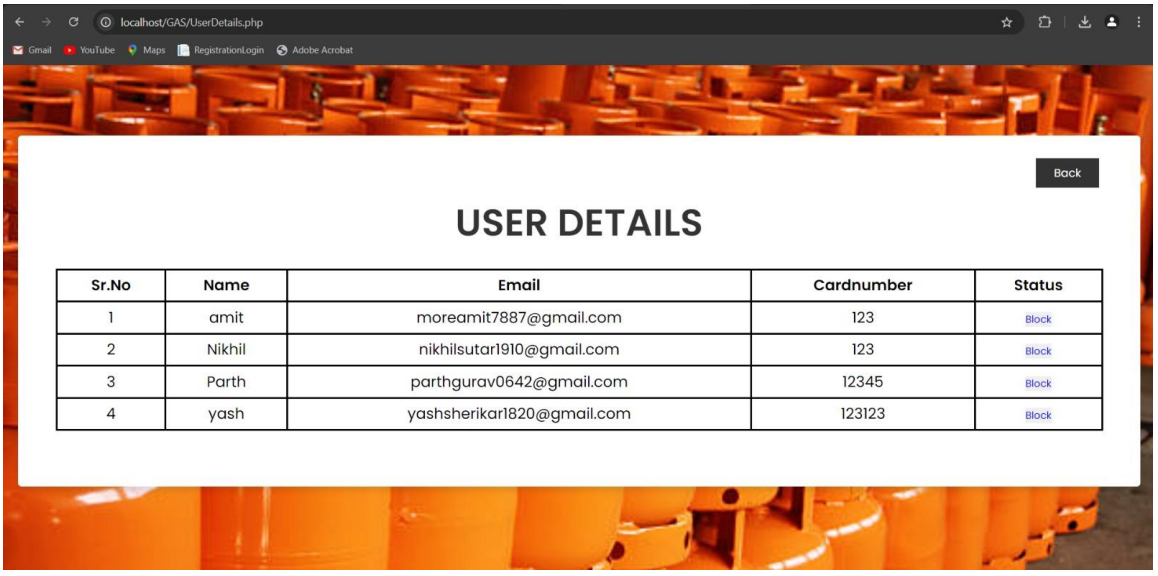
2. Figure 6.2 Admin Page



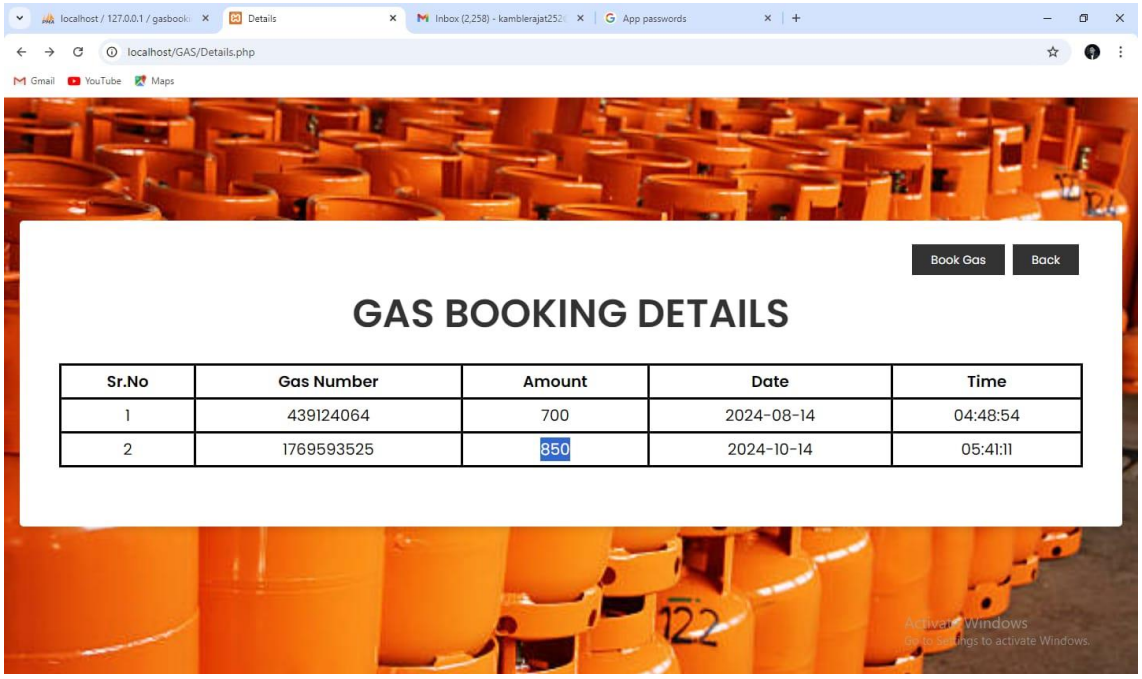
3. Figure 6.3 Register Page



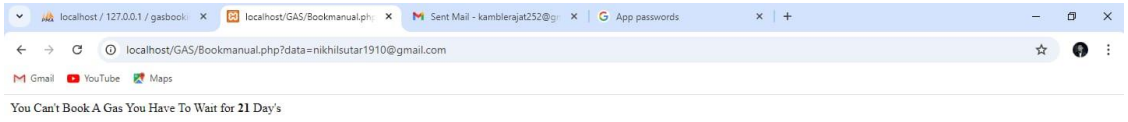
4. Figure 6.4 User Details



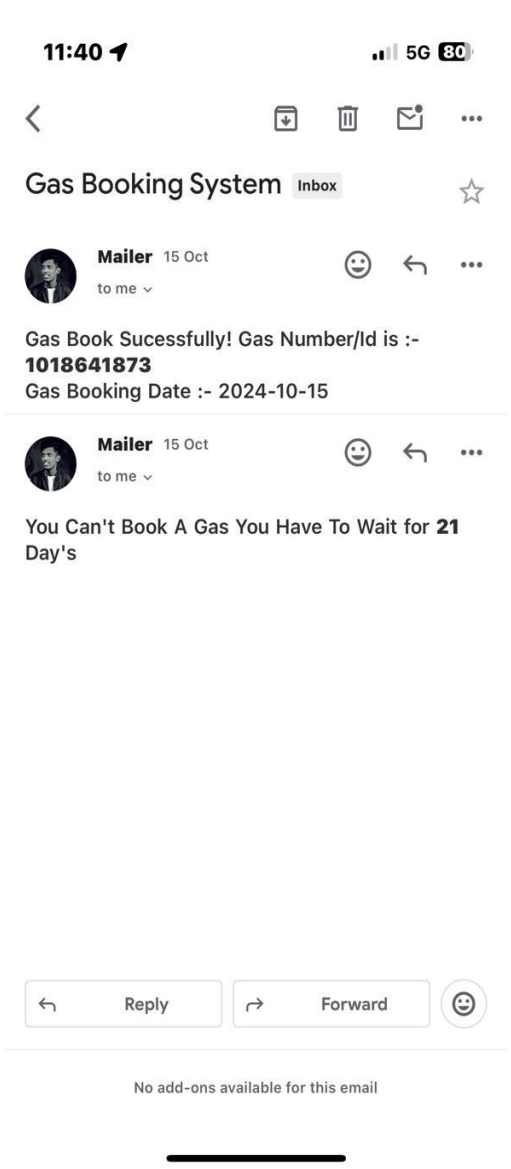
5. Figure 6.5 Gas Booking Details

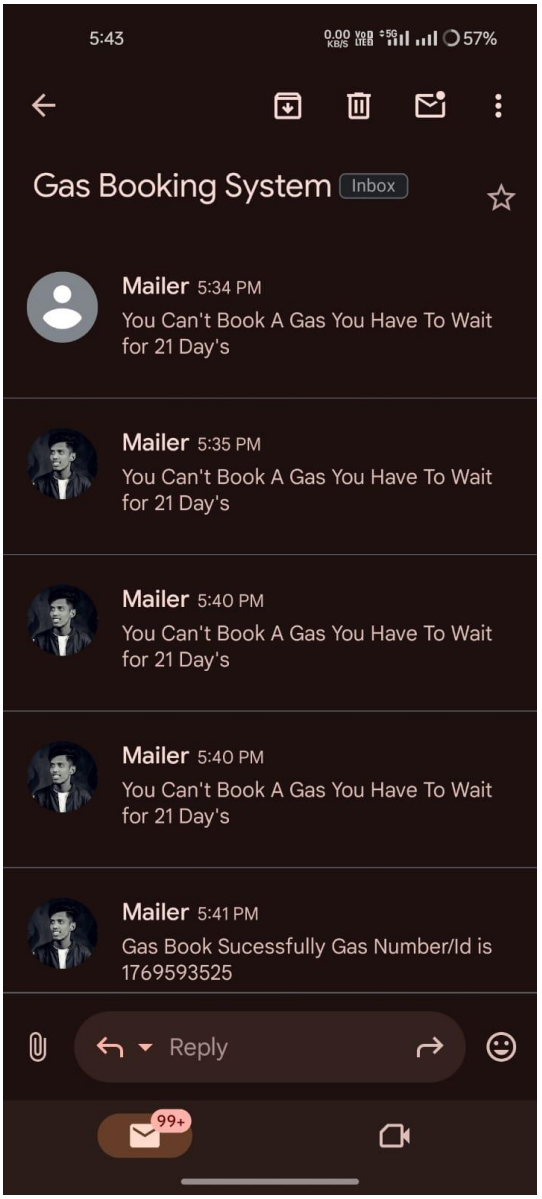


6. Figure 6.6 Bookimg gas Message



7. Figure 6.7 Booking Succesful Message





CHAPTER 7

FUTURE WORK

1. **Hardware and Software Optimization:**

Refine the hardware components and software algorithms to enhance system performance, reliability, and energy efficiency. This could involve optimizing sensor accuracy, reducing power consumption, and improving data processing algorithms to achieve real-time monitoring and control.

2. **User Interface Enhancement:**

Focus on improving the user interface of the system, including mobile applications, web dashboards, and voice-activated assistants, to provide a seamless and intuitive user experience. Incorporate user feedback to add new features, streamline workflows, and enhance usability.

3. **Integration with Smart Home Ecosystems:**

Explore integration with existing smart home ecosystems and platforms such as Google Home, Amazon Alexa, or Apple HomeKit to enable seamless interoperability with other smart devices and services. This could include voice commands, automation routines, and cross-device synchronization for enhanced convenience and automation.

4. **Advanced Analytics and Machine Learning:**

Develop advanced analytics and machine learning models to extract actionable insights from the data collected by the smart LPG gas system. This could involve predictive maintenance algorithms to anticipate equipment failures, anomaly detection techniques to identify unusual usage patterns, and optimization algorithms to improve resource allocation and energy efficiency.

5. **Scalability and Deployment:**

Design the system architecture with scalability in mind to support deployment in a variety of environments, including residential, commercial, and industrial settings. Develop deployment strategies and scalability plans to accommodate a growing base and

increasing data volumes while maintaining system performance and reliability.

6. Security and Privacy:

Strengthen security measures to protect the smart LPG gas system against cyber threats, data breaches, and unauthorized access. Implement encryption, authentication, and access control mechanisms to safeguard sensitive information and ensure user privacy compliance with data protection regulations.

7. Field Testing and Validation :

Conduct extensive field testing and validation of the smart LPG gas system in real- world environments to assess its performance, reliability, and user satisfaction. Gather feedback from users, gas suppliers, and maintenance personnel to identify areas for improvement and validate the system's effectiveness in addressing user needs and requirements.

8. Partnerships and Collaborations:

Establish partnerships and collaborations with industry stakeholders, research institutions, and government agencies to leverage expertise, resources, and funding opportunities for further development and commercialization of the smart LPG gas system. This could involve joint research projects, pilot deployments, and technology transfer initiatives to accelerate innovation and adoption.

By focusing on these future work areas, you can drive the completion of the smart LPG gas system project and unlock its full potential to revolutionize LPG management, improve user safety, and promote sustainability in energy usage.

CHAPTER 8

CONCLUSION

Implementing a smart gas LPG system offers a multitude of benefits, enhancing both safety and convenience for consumers and providers alike. Through advanced monitoring and automation technologies, such a system ensures efficient gas usage, reduces wastage, and minimizes the risk of accidents. Additionally, the integration of smart features facilitates seamless user interaction, empowering consumers with greater control and insight into their gas consumption patterns. Ultimately, the adoption of a smart gas LPG system represents a significant step towards modernizing infrastructure, promoting sustainability, and impro Implementing a smart gas LPG system offers a multitude of benefits, enhancing both safety and convenience for consumers and providers alike. Through advanced monitoring and automation technologies, such a system ensures efficient gas usage, reduces wastage, and minimizes the risk of accidents. Additionally, the integration of smart features facilitates seamless user interaction, empowering consumers with greater control and insight into their gas consumption patterns. Ultimately, the adoption of a smart gas LPG system represents a significant step towards modernizing infrastructure, promoting sustainability, and improving overall quality of life. Comparison of simulated and experimental results.

CHAPTER 9

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