Gas leakage detector using Arduino
Program Book
For
Community Service Project

Name of the Student: Chilukuri Mallikharjun Reddy

Name of the College: Lakireddy Bali Reddy College of Engineering(A)

Registration Number: 20761A0476

Period of CSP: From: 28-11-2022 To: 07-01-2023

Name & Address of the Community/ Habitation: Mylavaram

Jawaharlal Nehru Technological University

Year: 2022-23

Community Service Project Report

Submitted in accordance with the requirement for the degree of B.Tech

Name of the College: Lakireddy Bali Reddy College Of Engineering

Department: Electronics and Communication Engineering

Name of the Faculty Guide: **Dr. Y.Amar Babu** ,HOD &Professor

Duration of the CSP:From: 28-11-2022 To: 07-01-2023

Name of the Student: Chilukuri Mallikharjun Reddy

Program of Study: B. Tech

Year of Study: 2022-23

Register Number: 20761A0476

Date of Submission:01-05-2023

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
(AUTONOMOUS)
L.B.Reddy Nagar, Mylavaram – 521 230.
Affiliated to JNTUK, Kakinada & Approved by AICTE, New Delhi
Accredited by NBA and NAAC, Certified by ISO 9001-2015

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Student'sDeclaration

I, Chilukuri Mallikharjun Reddy, a student of III B.Tech–VI Sem, Reg. No. 20761A0476 of the department of Electronics and Communication Engineering, Lakireddy Bali Reddy college of Engineering, do here by declare that I have completed the mandatory community service from 28-11-2022 to 07-01-2023 in Mylavaram under the faculty guide ship of Dr. Y.Amar Babu, HOD &Professor, department of Electronicsand Communication Engineering, Lakireddy Bali Reddy college of Engineering.

(SignatureandDate)

Endorsements

Faculty Guide
Dr. Y.Amar Babu
HOD &Professor

Head of the Department
Dr. Y.Amar Babu
HOD &Professor

Principal

Dr. K. Appa Rao
Principal & Professor

Certificate
(From Official of the Community)

This is to certify that Chilukuri Mallikharjun Reddy, Reg. No.20761A0476 of Lakireddy Bali Reddy college of Engineering underwent community service in Mylavaram from 28-11-2022 to 07-01-2023. The overall performance of the Community Service Volunteer during his/her community service is found to be _____(Satisfactory/Good).

Authorized Signatory with Date and Seal

Acknowledgements

The Satisfaction that accompanies that the successful completion of any task would be incomplete without the mention of people whose ceaseless co-operation made it possible, whose constant guidance and encouragement crown all efforts with success.

I express my deep sense of gratitude with reverence and humility to Government authorities for extending his support and for providing us with an environment to complete the project successfully.

I would like to express my sincerest gratitude to community people, for his support and for providing us with an environment to complete the project successfully.

I humbly express my thanks to our Principal **Dr**. **K. Appa Rao** for extending his support and for providing us with an environment to complete our project successfully.

I would also like to thank our Vice Principal, **Dr. K. Harinadha Reddy** for encouraging us which certainly helped to complete the project in time.

I would like to express our deep gratitude to Dean R & D, **Dr.E.V.Krishna Rao** sir for his valuable suggestions.

I deeply indebted to our Head of Department **Dr. Y.Amar Babu,** who modeled us both technically and morally for achieving greater success in life.

I extremely thankful to my guide **Dr. Y.Amar Babu**, HOD &Professor, Department of Electronics and Communication Engineering, for his excellence guidance, timely and valuable suggestions and encouragement that enabled the success of the project.

I would like to express my heart full thanks to our parents for their unflinching support and constant encouragement throughout the period of our project work for making it a successful one.

I would like to thank all the teaching and non-teaching staff members of Electronics and communication Engineering, who have extended their full co-operation during the course of my project.

I thank all my friends who helped me sharing knowledge and by providing material to complete the project in time.

CHILUKURI MALLIKHARJUN REDDY
(20761A0476)

Contents

CHAPTER1:

EXECUTIVE SUMMARY

This report highlights the community service activities performed by the student in the Community Service Program (CSP). The CSP involved working with the local community to provide assistance in various areas, including education, health, and environmental sustainability. The student participated in several activities such as organizing health camps, conducting awareness campaigns, and volunteering for community clean-up drives. The CSP provided an excellent opportunity for the student to develop various skills and gain valuable experience. The report also includes a summary of the key learning objectives and outcomes achieved by the student during the program.

Community Description:

The community where the CSP took place is a semi-rural area located in the outskirts of the city. The community comprises people from diverse socio-economic backgrounds, and the majority of them rely on agriculture for their livelihoods.

Summary of Activities:

During the CSP, the student participated in several activities, including organizing health camps, conducting awareness campaigns, and volunteering for community clean-up drives. Additionally, the student worked with local NGOs and government agencies to implement sustainable solutions to address environmental issues in the community.

Learning Objectives and Outcomes:

1. To develop leadership and teamwork skills: The student gained experience in working with a diverse team and leading various community service activities.

2. To enhance communication skills: The student improved their communication skills by interacting with community members and coordinating with team members.

3. To gain practical experience in project management: The student learned how to plan, organize and execute various community service projects.

4. To understand community needs and challenges: The student gained a deeper understanding of the challenges faced by the community and the impact of community service in addressing them.

5. To promote sustainable development: The student worked towards implementing sustainable solutions to address environmental issues in the community.

Overall, the Community Service Program provided the student with an excellent opportunity to contribute to the community, develop various skills, and gain valuable experienc

CHAPTER 2:
OVERVIEW OF THE COMMUNITY

(a) Demographic Details (give details of geographical area covered, climate, land use & cropping patterns, availability of natural resources & raw materials, availability of special skills/trades, etc.) Mylavaram is a Town in Krishna district of the Indian state of Andhra Pradesh. It is located in mylavaram mandal of Vijayawada revenue division. Mylavaram village has higher literacy rate compared to Andhra Pradesh. In 2011, literacy rate of Mylavaram village was 76.49% compared to 67.02% of Andhra Pradesh. The Mylavaram village has population of 21763 of which 10796 are males while 10967 are females as per Population Census 2011.In Mylavaram Male literacy stands at 82.18 % while female literacy rate was 70.95 %.

(b) Socio-economic Status (details of social conditions, current occupations of the target beneficiaries, present average annual income, availability of basic amenities and facilities etc.) Most of the villagers depend on agriculture as weather & land conditions are very much suitable for paddy and few commercial crops. Generally, all the villagers tend to work as agriculture labour whose annual wages in the range around Rs. 30, 000 - 75, 000/-. As literacy found to increasing tremendously where no matching job opportunities are seen. In view of this, focus is given to the creation of job openings by making jobless undergraduates with suitable skill set required for selective industries.

(c) Target Beneficiaries (type of target beneficiaries' total size of target group(s), % of SC/ST of total population in project area etc.) Schedule Caste (SC) constitutes 14.17 % while Schedule Tribe (ST) were 4.08 % of total population in Mylavaram village. It is also observed that around 65.04% of literacy among these groups was found, but most of the undergraduates need jobs.

Mylavaram village is located in Mylavaram Tehsil of Krishna district in Andhra Pradesh, India. It is situated 120km away from district headquarter Mylavaram. It is the sub-district head quarter of Mylavaram village. As per 2011 stats, Mylavaram village is also a gram panchayat. The total geographical area of village is 1457 hectares. Mylavaram has a total population of 30,000 peoples. There are about 5,669 houses in Mylavaram village. Vijayawada is nearest city to Mylavaram which is approximately 28km away.

Sunshine: Avg. 10 Hrs a day

Average Temperature Range: 22 – 42 Celsius.

Humidity Range: 40 – 55 %

Wind Speed Range: 1.64 to 2.12 m/sec towards East, West

No. of days above freezing: 255

Probability of Precipitation: 20 – 29%

The entire land area of Mylavaram is 14.57 km2. More than 60% of land being used for paddy and other commercial crops viz., cotton, chilly, tomato, rose flowers etc. along with plenty of mango gardens. Usually, the rains are very good in the concerned season and sufficient enough

to serve the residential needs and crops as well. The occurrence of natural calamities is very less in Mylavaram.

(b) Demographic details and Socio-economic profile – as per 2011 census (type of target beneficiaries total size of target group(s), % of SC/ST of total population in project area, details of social conditions, current occupations of the target beneficiaries, present average annual income, availability of basic amenities and facilities etc.)

Schedule Caste (SC) constitutes 14.17 % while Schedule Tribe (ST) were 4.08 % of total population in Mylavaram village. Most of the villagers depend on agriculture as weather & land conditions are very much suitable for paddy and few commercial crops. Generally, all the villagers tend to work as agriculture labour whose annual wages in the range around Rs. 30, 000 - 75, 000/-. As literacy found to increasing tremendously where no matching job opportunities are seen. In view of this, focus is given to the creation of job openings by making jobless undergraduates with suitable skill set required for selective industries. It is also observed that around 65.04% of literacy among these groups was found, but most of the undergraduates need jobs.

(c) Brief Industrial Scenario of the target area (may refer to Industrial Profile of Districts by MSME)

The target area “Mylavaram” is 15 km away from nearby industrial zone Kondapalli. The major industries established are A.P.Heavy Machinery Engg. Ltd, Hindustan Petroleum Cor.Ltd., Bharat Petroleum Corporation Ltd., Indian Oil Corporation Ltd., Vijayawada Thermal Power Station etc. The soil in the Mylavaram is mainly black cotton (58%), clay loamy (23%) and red loam (19%).

CHAPTER3
COMMUNITY SERVICE PART

During the Community Service Project, several activities were undertaken to address the needs and challenges faced by the community. These activities included:

1. Health and Sanitation Awareness: The student conducted sessions on health and sanitation to raise awareness among the community members about the importance of maintaining proper hygiene practices. The sessions covered topics such as hand-washing, waste management, and safe drinking water.
2. Educational Programs: Educational programs were organized for children to improve their literacy and numeracy skills. The student conducted classes on basic reading, writing, and math skills.
3. Community Clean-up Drives: The student organized clean-up drives to maintain cleanliness and hygiene in the community. The drives focused on cleaning up the streets and public areas.
4. Skill Development Workshops: The student conducted skill development workshops to help community members learn new skills that could help them in their livelihoods. The workshops covered topics such as tailoring, carpentry, and basic computer skills.

Through these activities, the student gained valuable life skills, technical skills, and values. The student learned the importance of community engagement and the role that an individual can play in improving the lives of others. The student also learned to communicate effectively with people from different backgrounds and to work collaboratively towards a common goal. Technical skills such as organizing events, conducting workshops, and using technology for communication were also acquired during the project. Overall, the project provided an opportunity for the student to develop leadership skills, empathy, and a sense of responsibility towards our major community of Mylavaram in the Krishna District of A.P.

CHAPTER4: ACTIVITY LOG

4.1 ACTIVITY LOG FOR THE FIRST WEEK

Day&Date	Brief description of the daily activity	Learning Outcome	Person In-Charge Signature
Day–1	Introduction to the community and service project	A community survey is a method of collecting data from a filtered target audience to help you understand an issue particular to them. community service is a way for people to make a difference in the world.	
Day-2	Needs and importance of community service project	The world play an important role in the development of society, ranging from social enterprises in some of the poorest rural areas of the globe.	
Day–3	Created forms for community service	Making questionnaire to identify the problems in the community.	
Day–4	Conducted survey in the community	Interacting with people which improves the communication skills and knowing the problems in the community.	
Day–5	Conducted survey in the community	Interacting with people which improves the communication skills and knowing the problems in the community.	
Day–6	Conducted survey in the community	Interacting with people which improves the communication skills and knowing the problems in the community.	

4.2 WEEKLY REPORT

WEEK–1 (From Dt:28-11-2022 to Dt:03-12-2022)

Objective of the Activity Done: Research
Detailed Report: During the first week of the project, we focused on researching and evaluating different gas sensors and IoT modules that could be used in our gas leakage detector prototype. Our primary goal was to identify components that would be affordable, accurate, reliable, and compatible with our project's requirements and specifications. We considered several types of gas sensors, such as MQ2, MQ3, MQ4, MQ5, and MQ9, and compared heir sensitivity, response time, stability, and selectivity to LPG gas. After analyzing the data and feedback from various sources, we chose the MQ5 gas sensor as it had the highest sensitivity to LPG gas and was relatively inexpensive compared to other options. We also determined that the MQ5 gas sensor was suitable for our project's detection range and resolution, and could be easily integrated with an Arduino microcontroller. Next, we focused on selecting an IoT module with Wi-Fi connectivity that would enable remote monitoring and data transmission. We evaluated several options, such as ESP8266, ESP32, and NodeMCU, and compared their features, performance, and ease of use. After considering the pros and cons of each module, we selected the ESP8266 as it was cost-effective, widely used, and had a robust community and documentation support. We also determined that the ESP8266 was compatible with our Arduino microcontroller and could be easily programmed using the Arduino IDE. Overall, the first week of the project was crucial in laying the foundation for our gas leakage detector prototype. By conducting thorough research and analysis, we were able to identify the best components for our project and ensure that they met our requirements and expectations. This allowed us to move forward with confidence and focus on the next stages of the project.

4.3 ACTIVITY LOG FOR THE SECOND WEEK

Day & Date	Brief description of the daily activity	Learning Outcome	Person In-Charge Signature
Day–1	Survey Results and problem identification	Problem solving	
Day-2	Research and study the principles and technology used in the gas leakage detection	Understanding of the principles and operation of gas leakage detection	
Day–3	Read scientific papers on gas leakage testing and analysis	Familiarity with research on gas leakage detection	
Day–4	Read scientific papers on gas leakage testing and analysis	Familiarity with research on gas leakage detection	
Day–5	Read scientific papers on gas leakage testing and analysis	Familiarity with research on gas leakage detection	
Day–6	Identified the solution for the problem	Problem solving	

4.4 WEEKLY REPORT WEEK–

2(From Dt: 05-11-2022 to Dt:10-12-2022)

Objective of the Activity Done: Hardware and Software Design process
Detailed Report:
During the second week of the project, we focused on the hardware and software design process for
the gas leakage detector prototype. This involved designing the circuit diagram, creating the PCB
layout, and ordering the necessary components. First, we designed the circuit diagram for the gas
detector using the MQ5 gas sensor and an Arduino Uno as the microcontroller. The circuit diagram
included the MQ5 gas sensor, a voltage regulator, an LED indicator, and a resistor. We also included
a solenoid valve to shut off the gas supply in case of a gas leak, which would be controlled by the
Arduino Uno. We used the Fritzing software to create the circuit diagram, which helped us visualize
the connections between the components and ensure that the circuit was properly wired. Next, we
created the PCB layout for the circuit using the Eagle PCB design software. We designed the PCB
layout to fit our specific requirements and dimensions, and to ensure that the components were placed
and routed correctly. We also added labels and annotations to the PCB layout to make it easier to
assemble and troubleshoot. Finally, we ordered the necessary components for the gas leakage detector
prototype, such as the MQ5 gas sensor, the solenoid valve, the LED indicator, the resistor, and the
Arduino Uno.We sourced the components from reliable and reputable suppliers to ensure their quality
and compatibility. Overall, the second week of the project was crucial in translating our design
concept into a tangible prototype. By designing the circuit diagram and PCB layout and ordering the
components, we were able to move closer to assembling and testing the gas leakage detector
prototype.

4.5 ACTIVITY LOG FOR THE THIRD WEEK

Day & Date	Brief description of the daily activity	Learning Outcome	Person In-Charge Signature
Day–1	Collected the components required for the project	Learned about new components	
Day-2	Learned about the working and functionality of the hardware components	Learned about new components	
Day–3	Learned about the working and functionality of the hardware components	Learned about new components	
Day–4	Learned about the software required for the project	Software requirement	
Day–5	Learned about the software required for the project	Software requirement	
Day–6	Learned connections and interfacing	Learned new connections	

4.6 WEEKLY REPORT WEEK–

3(From Dt:12-12-2022 to Dt:19-12-2022)

Objective of the Activity Done: Assembling the hardware and programming Arduino
Detailed Report:
During the third week of the project, we assembled the hardware and programmed the Arduino Uno
for the gas leakage detector prototype. We also wrote the code to read data from the gas sensor and
transmit it over Wi-Fi to a local server, as well as configured the Wi-Fi connectivity of the IoT
module.First, we assembled the hardware components of the gas leakage detector prototype. We
connected the MQ5 gas sensor, solenoid valve, LED indicator, resistor, and Arduino Uno according to
circuit diagram and PCB layout that we designed in the previous week. We also added a power supply
and other necessary components. Next, we wrote the code for the Arduino Uno to read data from the
MQ5 gas sensor and send it over Wi-Fi to a local server. We used the Arduino IDE and the
appropriate libraries to read analog data from the gas sensor and convert it to digital data that could be
transmitted over Wi-Fi. We also programmed the Arduino Uno to control the solenoid valve and LED
indicator based on the gas readings. We then configured the Wi-Fi connectivity of the IoT module,
ensuring that it was properly connected to the local network and could communicate with the local
server. We used the appropriate firmware and settings to establish a secure and reliable Wi-Fi
connection. Overall, the third week of the project was crucial in bringing together the hardware and
software components of the gas leakage detector prototype. By assembling the hardware and
programming the Arduino Uno, we were able to read data from the MQ5 gas sensor and transmit it
over Wi-Fi to a local server for remote monitoring and control.

4.7 ACTIVITY LOG FOR THE FORTH WEEK

Day & Date	Brief description of the daily activity	Learning Outcome	Person In-Charge Signature
Day–1	Assemble the device components and test the hardware	Hands on experience with device assemble.	
Day-2	Learned the skills to write a code	Hands on experience with programming skill.	
Day–3	Write code for the device.	Hands on experience with programming skill.	
Day–4	Debug the code for the project.	Hands on experience with programming skill.	
Day–5	Troubleshoot any issue that arise during the testing phase.	Learned Troubleshoot.	
Day–6	Develop a user manual for the device.	Developed technical writing.	

4.8 WEEKLY REPORT

WEEK – 4 (From Dt: 19-12-2022 to Dt:24-12-2022)

Objective of the Activity Done: Prototype and test
Detailed Report:
During the fourth week of our project, we conducted controlled testing of the gas detector system
that we developed. The testing was conducted to evaluate the system's sensitivity and accuracy in
detecting LPG gas levels, as well as to verify the Wi-Fi connectivity and data transmission to the
server. To test the system's sensitivity, we exposed the gas sensor to various levels of LPG gas and
recorded the response of the sensor. We used a gas chamber to control the concentration of LPG gas
in the air and exposed the sensor to concentrations ranging from 100 ppm to 10,000 ppm. We found
that the sensor was able to detect even low concentrations of LPG gas, and its response was linear and
consistent with the gas concentration. To evaluate the system's accuracy, we compared the sensor's
readings with a calibrated LPG gas detector. We found that the readings from our gas detector system
were within a reasonable margin of error compared to the calibrated detector.We also tested the Wi-Fi
connectivity and data transmission to the server by connecting the gas detector system to a Wi-Fi
network and sending the data to a server. We verified that the data was transmitted correctly and
consistently and that the system was able to detect and report gas leaks in real-time. In summary,
during the fourth week of our project, we conducted controlled testing of the gas detector system and
found that it was sensitive and accurate in detecting LPG gas levels. We also verified that the Wi-Fi
connectivity and data transmission to the server were working correctly, demonstrating the system's
real-time gas leak detection capability.

4.9 ACTIVITY LOG FOR THE FIFTH WEEK

Day & Date	Brief description of the daily activity	Learning Outcome	Person In-Charge Signature
Day–1	Conducted initial testing of the device	Practical experience with device testing	
Day-2	Continued testing	Practical experience with device testing	
Day–3	Record the results and compare them with the known values.	Practical experience with Data analysis skills	
Day–4	Identify any discrepancies and make necessary adjustments to the device	Practical experience with Data analysis skills	
Day–5	Record the results and compare them with the known values.	Practical experience with Data analysis skills	
Day–6	Prepare a presentation on the device and its capabilities.	Practical experience with Presentation skills.	

4.10 WEEKLY REPORT
WEEK – 5 (From Dt: 26-12-2022 to Dt: 31-12-2022)

Objective of the Activity Done: Field testing
Detailed Report:
During the fifth week of our project, we conducted field testing of the gas detector system in homes,
hotels, and LPG gas storage areas. We installed the device in these locations and monitored the
readings remotely to evaluate its effectiveness in detecting gas leaks. During the field testing, we
received feedback from the users, which we used to make improvements to the device. For instance,
received feedback from a hotel owner that the alarm sound was too loud and disturbing for the guests.
modified the device's sound output to make it less loud while still being audible enough to alert the
staff of the gas leak. Similarly, we received feedback from a homeowner that the RGB LED indicating
the gas levels was not visible from a distance. We improved the LED's brightness and added a feature
to blink the LED when the gas levels exceeded the safe limit, making it more visible from a distance.
Overall, the field testing helped us to identify the strengths and weaknesses of the gas detector system,
and we were able to make improvements based on the feedback received from the users. These
improvements increased the system's usability, effectiveness, and reliability in detecting gas leaks,
making it a more useful and valuable device for homes, hotels, and LPG gas storage areas.

4.11 ACTIVITY LOG FOR THE SIXTH WEEK

Day & Date	Brief description of the daily activity	Learning Outcome	Person In-Charge Signature
Day–1	Conduct further testing on the device to improve accuracy.	Further practical experience with device testing.	
Day-2	Analyze the results and compare them to known values.	Further practical experience With data analysis skills	
Day–3	Develop guidelines for using the device to ensure gas leakage prevention.	Further practical experience With technical writing skills	
Day–4	Create marketing materials to promote the device.	Further practical experience with marketing skills.	
Day–5	Conduct a pilot study to test the device in a real-world setting.	Practical experience with real-world testing	
Day–6	Collect feedback from users and make necessary improvements.	User feedback collection and analysis.	

4.12 WEEKLY REPORT
WEEK – 6 (From Dt:02-01-2023 to Dt:07-01-2023)

Objective of the Activity Done: Compile all the data and analyze the results
Detailed Report:
During the final week of the gas detector project, our team gathered all the data collected from the
design, implementation, and testing phases. We carefully analyzed the data to draw conclusions
about the performance of the device and the effectiveness of our approach. We then compiled our
findings into a comprehensive report that included detailed descriptions of the gas detector's design,
how it was implemented, the testing procedures we used, and the results we obtained. We also
included graphs and charts to illustrate our data and make it more accessible to readers. To ensure
that users could properly operate and maintain the gas detector, we created a user manual that
included step-by-step instructions for installation, configuration, and maintenance. The manual was
designed to be easy to understand and follow, with clear explanations of each step and visual aids to
assist users. Overall, we are proud of the work we have accomplished in this project, and we believe
that our gas detector can provide a valuable tool for individuals and organizations to detect potentially
harmful gas leaks and improve safety in various environments.

CHAPTER5: OUTCOMES DESCRIPTION

5.1 Socio-Economic Survey questionnaire:

1. Do you use gas appliances in your home (e.g. stove, water heater, furnace)?

a. Yes

b. No

2. Have you ever experienced a gas leak in your home?

a. Yes

b. No

3. Do you have a gas detector in your home?

a. Yes

b. No

4. If yes, how often do you check the batteries and test the detector?

a. Monthly

b. Every 6 months

c. Once a year

d. Rarely

e. Never

5. Have you ever had your gas appliances inspected by a professional?

a. Yes

b. No

6. If yes, how often do you have them inspected?

a. Every year

b. Every 2 years

c. Every 3 years

d. Rarely

e. Never

7. Are you aware of the signs of a gas leak?

a. Yes

b. No

8. If yes, what are they? (Select all that apply)

a. Smell of gas

b. Hissing or whistling sound

c. Dead or dying plants

d. Physical symptoms such as headaches, nausea, or dizziness

e. None of the above

9. Do you know what to do if you suspect a gas leak in your home?

a. Yes

b. No

10. If yes, what are the steps you would take? (Select all that apply)

a. Open windows and doors to ventilate the area

b. Turn off the gas supply at the meter or tank

c. Evacuate the area immediately and call 911 or your gas company

d. Try to locate the source of the leak and repair it yourself

e. None of the above

11. How concerned are you about gas safety in your home?

a. Very concerned

b. Somewhat concerned

c. Not very concerned

d. Not at all concerned

12. Would you be interested in learning more about gas safety and how to prevent gas leaks in your home?

a. Yes

b. No

5.2 Problems Identified

1. Lack of awareness: People in the community may not be aware of the potential risks associated with gas leakage or may not know how to detect gas leaks. This can lead to a delay in identifying and addressing the issue.

2. Limited access to technology: Not everyone in the community may have access to gas leakage detectors due to financial constraints or lack of availability in the market. This can increase the risk of gas-related accidents.

3. Technical issues: Gas leakage detectors may have technical issues or may not function properly, leading to false alarms or failure to detect gas leaks.

4. Maintenance issues: Gas leakage detectors require regular maintenance, such as battery replacement and sensor calibration. Lack of maintenance can lead to the device malfunctioning and failing to detect gas leaks.

5. Language barriers: Some members of the community may not speak the language in which the instructions for gas leakage detectors are provided, which can make it difficult for them to use the devices effectively.

5.3 Solution

Here are some short-term and long-term action plans for the gas leakage detector prototype:

Short-term action plan:

1. Perform thorough testing and validation of the gas leakage detector prototype to ensure its accuracy, reliability, and safety.

2. Conduct user testing and feedback sessions to assess the usability and effectiveness of the device and identify any issues or areas for improvement.

3. Develop a user manual and training materials to guide users on how to install, operate, and maintain the device properly.

4. Conduct market research and feasibility analysis to identify potential customers, partners, and stakeholders and assess the demand, competition, and regulatory requirements of the gas leakage detector prototype.

5. Identify and address any legal, ethical, or social implications of the device, such as privacy, liability, or accessibility concerns.

Long-term action plan:

1. Enhance the functionality and features of the gas leakage detector prototype, such as adding remote control, voice recognition, or data analytics capabilities.

2. Expand the scope and reach of the gas leakage detector prototype to cover other types of gases and environments, such as natural gas, industrial facilities, or outdoor spaces.

3. Develop partnerships and collaborations with other companies, organizations, or government agencies to scale up the production and distribution of the device and increase its accessibility and affordability.

4. Incorporate feedback and insights from users, experts, and stakeholders to improve the design, performance, and impact of the device and align it with the evolving needs and preferences of the market.

5. Conduct ongoing research and development to advance the state-of-the-art in gas leak detection and safety and leverage emerging technologies and trends, such as AI, blockchain, or renewable energy, to create innovative solutions that enhance the quality of life for individuals and communities.

5.4 Description of the Community awareness programme/s conducted w.r.t the problems and their outcomes:

The community awareness program was conducted in the local community center to raise awareness about the dangers of gas leakage and the importance of having a gas leakage detector installed. The program was attended by approximately 50 community members, including adults and children. The program was conducted over two days, with a duration of two hours per day.

The first day of the program focused on creating awareness about the risks associated with gas leakage, how gas leakage detectors work, and the benefits of having a detector installed. The session was conducted by a subject matter expert who provided detailed information on the topic, including how to recognize the symptoms of gas leakage and what to do in the event of a gas leak.

The second day of the program involved a hands-on demonstration of the gas leakage detector, with the students from the local school being invited to participate in the demonstration. The students were shown how to install the detector and how to test it. They were also given a brief overview of the components of the detector and how they work.

The outcomes of the community awareness program were significant. The program helped to increase awareness about the dangers of gas leakage, and the importance of having a detector installed in the home. It also helped to dispel some of the myths associated with gas detectors and to promote their use as a safety tool. As a result of the program, several community members expressed an interest in purchasing a gas leakage detector for their homes, and the local school expressed an interest in partnering with the project team to conduct similar awareness programs in the future.

5.5 Report of the mini-project work done in the related subject w.r.t the village:

INTRODUCTION:

Gas leakage is a serious problem and nowadays it is observed in many places like residences, industries, and vehicles like Compressed Natural Gas (CNG), buses, cars, etc. It is noticed that due to gas leakage, dangerous accidents occur. The Liquefied petroleum gas(LPG), or propane, is a flammable mixture of hydrocarbon gases used as fuel in many applications like homes, hostels, industries, automobiles, and vehicles because of its desirable properties which include high calorific value, less smoke, less soot, and meager harm to the environment. Liquid petroleum gas (LPG) is highly inflammable and can burn even at some distance from the source of leakage. This energy source is primarily composed of propane and butane which are highly flammable chemical compounds. These gases can catch fire easily. In homes, LPG is used mainly for cooking purposes. When a leak occurs, the leaked gases may lead to an explosion. Gas leakage leads to various accidents resulting in both material loss and human injuries. Homefires have been occurring frequently and the threat to human lives and properties has been growing in recent years. The risks of explosion, fire, suffocation are based on their physical properties such toxicity, flammability, etc. The number of deaths due to the explosion of gas cylinders has been increasing in recent years. The Bhopal gas tragedy is an example of accidents due to gas leakage. The reason for such explosions is due to substandard cylinders, old valves, no regular checking of gas cylinders, worn out regulators and a lack of awareness of handling gas cylinders. Therefore, the gas leakage should be detected and controlled to protect people from danger. Anodorant such as ethanethiol is added to LPG, so that leaks can be detected easily by most people. However, some people who have a reduced sense of smell may not be able to rely upon this inherent safety mechanism. A gas leakage detector becomes vital and helps to protect people from the dangers of gas leakage. A number of research papers have been published on gas leakage detection techniques. In this system, the gas leakage is detected and controlled by means of an exhaustfan. The level of LPG in cylinder is also continuously monitored . In this paper a low-cost advanced sensor-based gas leakage detector, alert and control system is proposed and discussed. The system is very efficient, user friendly, portable, not only small in size but also the device very cost effective to buy for our needs.

Methodology:

In this paper, semiconductor sensors are used to detect LPG gas. An MQ6 semiconductor sensor is used. Sensitive material of the MQ-6 gas sensor is SnO2, which has lower conductivity in clean air. When the target combustible gas exists, the sensor conductivity increases along with the rising gas concentration. The MQ6 gas sensor has a high sensitivity to Propane, Butane and LPG, and response to Natural gas. The sensor could be used to detect different combustible gasses, especially Methane; it has a lowcost and is suitable for different applications. The MQ-6 can detect gas concentrations anywhere from 200 to10,000ppm. The sensor's output is an analog resistance.

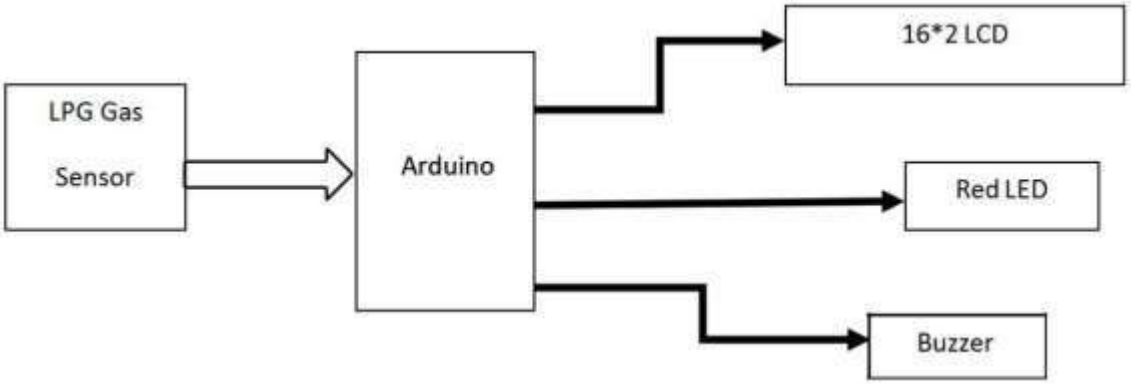

Figure5.1.Blockdiagram of gas leakage detection and alert system.

This system is based on the Arduino UNO R3 and MQ-6 gas sensor. When the sensor detects gas in the atmosphere, it will give digital output1 and if gas in not detected the sensor will give digital output 0. Arduino will receive the sensor output as digital input. If the sensor output is high, then the buzzer will start tuning along with the LCD that will show that "Gas detected: Yes". If the sensor output is low then buzzer will not be tuning, and the LCD will show that "Gas detected: No". The buzzer most commonly consists of a number of switches or sensors connected to control unit that determines which button was pushed or whether a preset time has lapsed, and usually illuminates a light on the appreciate button or control panel, and sounds awarning in the form of a continuous or intermittent buzzing or beeping sound. For the design of a sensor-based gas leakage detector and alarm system the following hardware components are required. Table 1 lists the list of required hardware opponents, quantity and price in Bangladeshi Taka. The gas detector system is very cheap and it will cost only 917 BD Taka.

The device is portable, light weight, user friendly and efficient with multi-functional features. In Figure 2, some important components that are needed to design the gas leakage detection and alert system are presented.

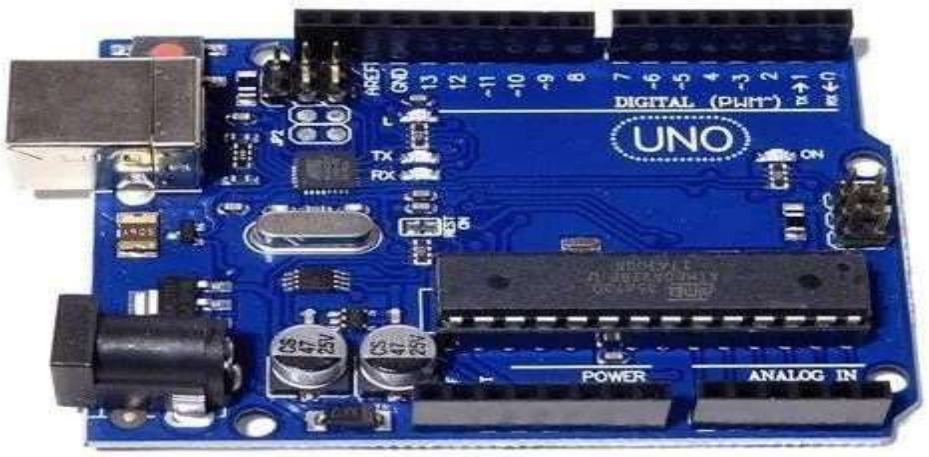

FIG5.2.ArduinoUno

The Arduino Uno is an open-source microcontroller board in light of the CPU ATmega 328P microcontroller and created by Arduino.cc and at first delivered in 2010. The board is furnished with sets of computerized and simple information/yield (I/O) sticks that might be communicated to different extension sheets (safeguards) and other circuits. The board has 14 advanced I/O pins (six fit for PWM yield), 6 simple I/O sticks, and is programmable with the Arduino IDE (Coordinated Advancement Climate), through a sort B USB cable. It very well may be fueled by the USB link or by an outer9-voltbattery, how ever it acknowledges voltages somewhere in the range of 7 and 20 volts. It is like the Arduino Nano and Leonardo. The equipment reference configuration is circulated under an Innovative House Attribution Offer. The same 2.5 permit and is accessible on the Arduino site. Design and creation documents for certain adaptations of the equipment are additionally accessible.

"Uno" signifies "one" in Italian and was decided to stamp the underlying arrival of Arduino Software. The Uno board is the principal in a progression of USB-based Arduinoboards ; it and form 1.0 of the Arduino IDE were the reference variants of Arduino, which have now developed to fresh errel eases. The ATmega 328 on the board comes prearranged with a bootloader that permits transferring new code to it without the utilization of an outside equipment programmer.

While the Uno conveys utilizing the first STK500 protocol, it contrasts from all former sheets in that it doesn't utilize the FTDIUSB-to-chronic driver chip. All things being equal, it utilizes the Atmega16U2(Atmeg a8U2up toformR2)customized as a USB-to-sequential converter.

As we discussed we know that Arduino Uno is the most standard board available and probably the best choice for a beginner. We can directly connect the board to the computer via a USB Cable which performs the function of supplying the power as well as acting as a serial port.

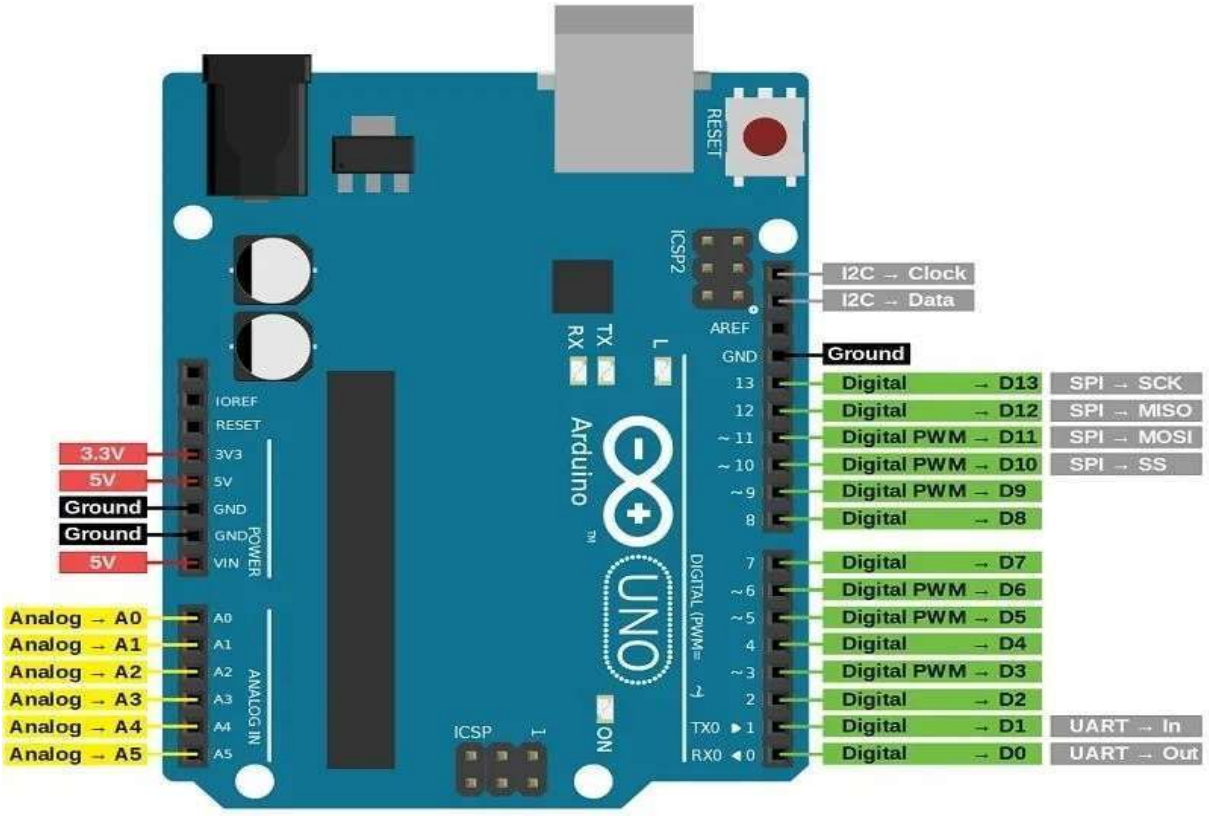

FIG5.3. ArduinoUNOpindiagram

Vin: This is the input voltage pin of the Arduino board used to provide input supply from an external power source.

5V: This pin of the Arduino board is used as a regulated power supply voltage and it is used to give supply to the board as well as on board components.

3.3V: This pin of the board is used to provide a supply of 3.3V which is generated from a voltage regulator on the board.

GND: This pin of the board is used to ground the Arduino board.
Reset: This pin of the board is used to reset the microcontroller. It is used to Resets the microcontroller.

Analog Pins: The pins A0 to A5 are used as an analog input and it is in the range of 0-5V.

DigitalPins: The pins 0 to13 are used as a digital input or output for theArduino board.

Serial Pins: These pins are also known as a UART pin. It is used for communication between the Arduino board and a computer or other devices. The transmitter pin number1 and receiver pin number0 is used to transmit and receive the data resp.

ExternalInterruptPins: This pin of the Arduino board is used to produce the External interrupt and it is done by pin numbers 2 and 3.

PWMPins: This pins of the board is used to convert the digital signal into an analog by varying the width of the Pulse. The pin numbers 3,5,6,9,10 and 11 are used as a PWM pin.

SPIPins: This is the Serial Peripheral Interface pin, it is used to maintain SPI communication with the help of the SPI library. SPI pins include:

1. SS:Pin number 10 is used as a Slave Select
2. MOSI:Pin number 11 is used as a Master Out Slave In
3. MISO:Pin number 12 is used as a Master In Slave Out
4. SCK:Pin number 13 is used as a Serial Clock

LED Pin: The board has an inbuilt LED using digital pin-13. The LED glows only when the digital pin becomes high.

AREFPin: This is an analog reference pin of the Arduino board. It is used to provide are a reference voltage from an external power supply.

Fig5.4.16x2LCD

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. The 16 x 2 intelligent alpha numeric dot matrix display is capable of displaying 224 different characters and symbols.

- Pin1 (Ground/Source Pin): This is a GND pin of display, used to connect the GND terminal of the microcontroller unit or power source.
- Pin2 (VCC/SourcePin): This is the voltage supply pin of the display, used to connect the supply pin of the power source.
- Pin3(V0/VEE/ControlPin): This pin regulates the difference of the display, used to connect a changeable POT that can supply 0 to 5V.
- Pin4(Register Select/Control Pin):This pin toggles among command or data register, used to connect a microcontroller unit pin and obtains either 0 or 1(0=datamode ,and 1= commandmode).
- Pin5(Read/Write/ControlPin):This pin toggles the display among the read or writes operation, and it is connected to a microcontroller unit pin to get either 0 or 1 (0 =Write Operation, and 1= ReadOperation).
- Pin 6 (Enable/Control Pin): This pin should be held high to execute Read/ Write process, and it is connected to themicrocontroller unit &constantly held high.
- Pins 7-14 (Data Pins): These pins are used to send data to the display. These pins are connected in two-wire modes like 4-wiremode and 8-wiremode. In 4-wiremode,only four pins are connected to the microcontroller unit like 0 to 3,whereas in 8-wiremode, 8-pins are connected to microcontroller unit like 0 to 7.

- Pin15 (+ve pin of the LED):This pin is connected to +5V
- Pin 16(-ve pin of the LED):This pin is connected to GND.

Fig5.5.Buzzer

Also known as a sounder, audio alarm or audio indicator, a buzzer is a basic audio device that **generates a sound from an incoming electrical signal**. Buzzers come in two primary forms — piezo buzzers and magnetic buzzers.

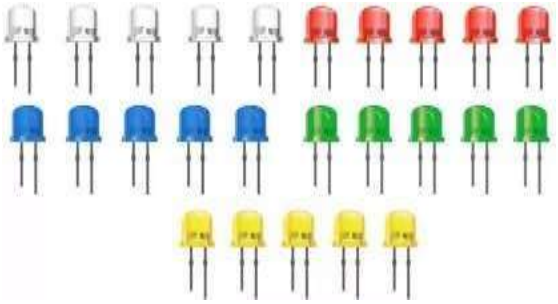

Fig5.6.LEDs

A light-emitting diode (LED) is a semiconductor device that emits light when an electric current flows through it. When current passes through an LED, the electrons recombine with holes emitting the light in the resulting process to make it glow bright

Fig5.7.MQ6(LPGGasSensor)

The MQ6 (LPG Gas Sensor) is a simple-to-use liquefied petroleum gas (LPG) sensor. It can be used in gas leakage detecting equipment in consumer and industry applications, this sensor is suitable for detecting LPG, iso-butane, propane, LNG. Avoid the noise of alcohol, cooking fumes and cigarette smoke.

The MQ-6 can detect **gas** concentrations anywhere from 200 to 10000 ppm. This sensor has a high sensitivity and fast response time. The sensor's output is an analog resistance. The drive circuit is very simple; all you need to do is power the heater coil with 5V, add a load resistance, and connect the output to an ADC.

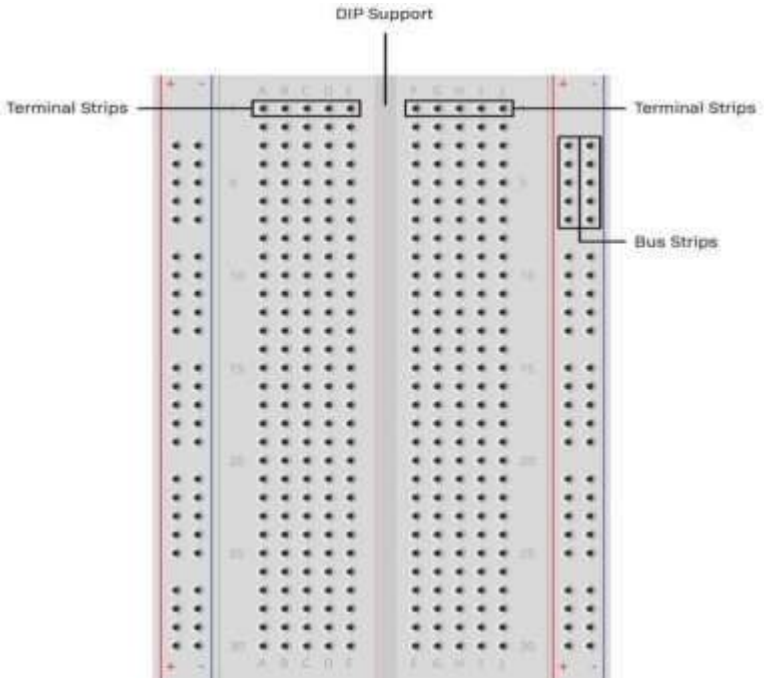

Fig5.8.breadboard

Bus Strips

A bus strip lets you connect the breadboard to a power supply so that the other electronic components on the breadboard can be powered. To give your breadboard power, you'll use the bus strips to connect to a power supply.

Bus strips are usually found at the outer edges of a breadboard or in between the terminal strips, and are almost always narrower than the terminal strips.

A typical breadboard will have two bus strips: a column for ground, which is marked in blue or black coloring, and a column for power, also called voltage, which is marked in red.

Bus strips are also sometimes called rails, power rails, power buses, or just buses.

Terminal Strips

Most of the area in a breadboard is taken up by terminal strips. Terminal strips are made up of small holes, or perforations, where you can plug in your electronic components.

Terminal strips are connected in specific ways based on their rows and columns. It's important to understand the layout of the terminal strip on the breadboard you're working with. Make sure you check the labeling of your breadboard before plugging things in!

Center groove(DIP Support)

Most breadboards have a notch or a groove that runs down the center, through the middle of the terminal strips. This line down the middle serves a number of functions.

The center groove on a breadboard allows certain types of integrated circuits called dual in-line packages to be connected in a way that straddles that line. It also shows where the terminal strips have been divided and which columns are connected, and it also allows breadboards to be easily tacked on top of each other for storage or larger projects.

A breadboard (sometimes called a plug block) is used for building temporary circuits. It is useful to designers because it allows components to be removed and replaced easily. It is useful to the person who wants to build a circuit to demonstrate its action, then to reuse the components in another circuit.

The holes in a breadboard are connected **by** metal clips that span five holes, **horizontally**. These metal clips allow each row of five holes to be connected. There are no vertical connections on a terminal strip. Horizontal rows on either side of the center groove are also not connected to each other.

2.9Jumperwires

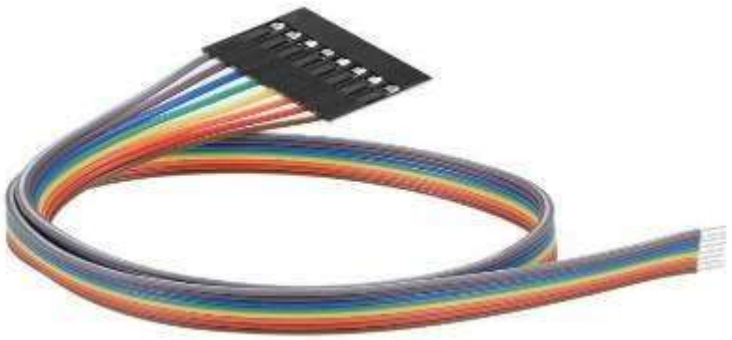

Fig5.9. Jumper wires

Jumper wires are not technically part of the breadboard itself, but they’re an important part of any circuit or other electronics project that uses a breadboard.

A jumper wire is a short piece of wire with hard metal points on the end which plug into the holes on a breadboard. These allow you to make connections on the breadboard and start building a circuit. Jumper wires come in different colors and lengths, and you can buy them pre-made.

Result and Analysis

The Tinkercad is aproprietary software tool suite used primarily or electronic design automation. The software is used mainly by electronic design engineers and technicians to create schematics and electronic prints for manufacturing printed circuit boards. Figure 3 and figure 4 shows the circuit diagram that was designed. This system I s based on Arduino UNOR3 and MQ-6 gas sensor. When the sensor detects gas in atmosphere, it will give a digital output of 1 and if gas is not detected the sensor will give a digital output of 0. Arduino will take the sensor output as the digital input. If sensor output is high, then the buzzer will start tuning and the LCD will show that"Gas detected". If sensor output is low then the buzzer will not be tuning, LCD will show that "Gas not detected". The detector incorporates a MQ-6sensor (with gas detection range of 300–10,000ppm) as the LPG gas sensor, PIC 16F690 microcontroller as the control unit, LCD for displaying gas concentration, a buzzer as an alarm and a number of LEDs to indicate the gas leakage status. The microcontroller senses the presence of a gas when the voltages signal from the MQ-6 sensor goes beyond a certain level and gives an audio visual alarm.

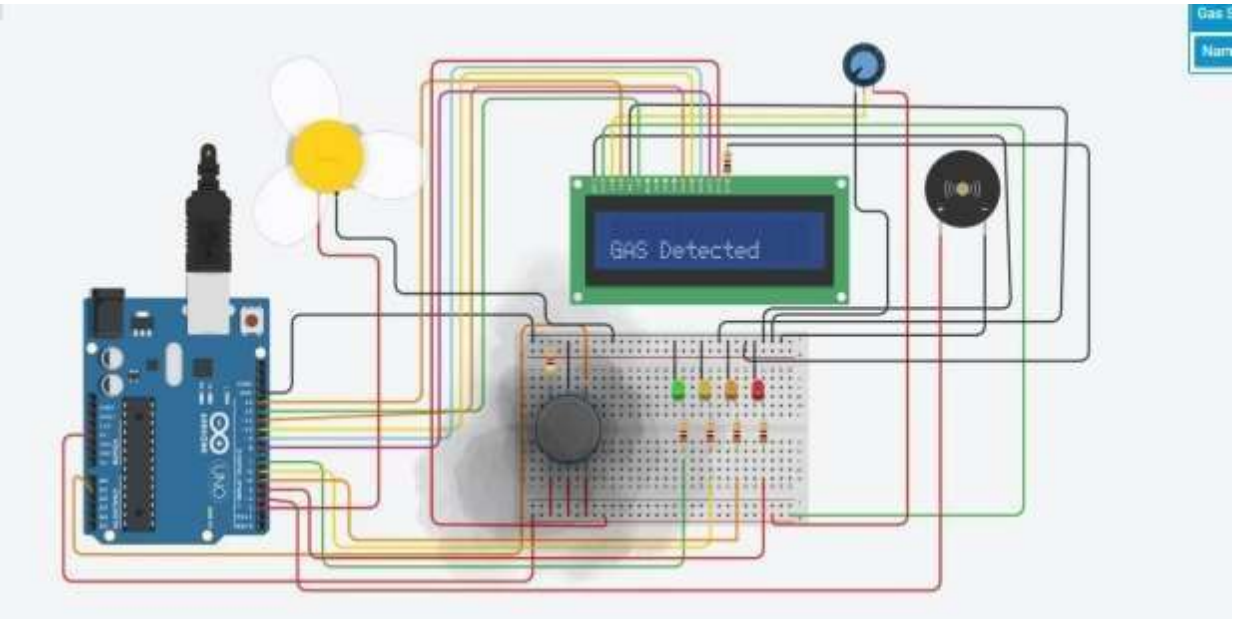

Fig5.10.gasdetected

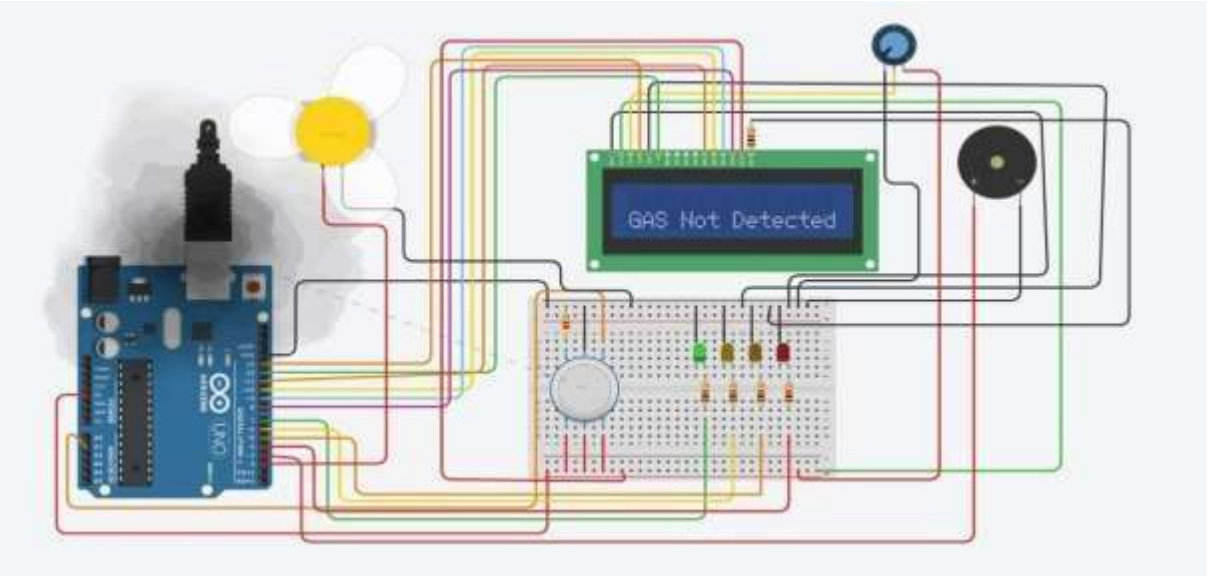

Fig5.11.gasnotdetected

If the system detects the level of gas in the air that exceeds the safety level it will activate the alarm which includes the buzzer to alert the users at home of the abnormal condition and to take any necessary action. The most tell-tale sign of a leak is the smell of gas in the home. However, in the case of a carbon monoxide leak, there are also particular physical symptoms you may suffer from if there is a leak. The output result of this paper is that the leakage will be detected and stopped within 2 s after the leakage starts. This system can even detect the level of gas leakage. This is an efficient method for automatically detecting and controlling the gas leakage. Moreover, the fire accidents are also prevented by switching off the power supply. The idea for gas detection and control can be implemented at a large scale for various industries. This system can be installed in a kitchen, at a hostel cafeteria, and any other areas. This can be helpful in reducing accidents caused by gas leakage in household as well as in any similar commercial set up. In our country there are 180 million people, and due to its low cost his product is affordable and will prevent many accidents and save many properties and human lives.

Futurework

Overall, software and hardware parts of the systems have been developed and tested by introducing a small amount of LPG near gas sensor module. The authors of this paper working to include multi functions with this device. One of the notable future functions of this system is to add a subsystem where wastage of gas and the uses of gas can be monitored using this system. The system is flexible as a greater number of sensors and relays can be added to it according to the whole LPG supply setup in those premises. The author is adding more software based intelligent functions with this system. This is an automatic gas detection, control and alert system. In future this system will have a feature where it can notify the emergency services if any accidents happen. A mobile app and web-based app for real time monitoring also will be added. In the user app for this system many smart features will be added. The overall features will make the system more safe for the users. The system will be optimized for use in many places like the car, the home, industries and many other places. After designing the final prototype with smart multifunctional features, the system will be implemented in real life scenarios as a pilot project. A survey will be done soon before using the system and another one will be done after implementing the system to discover the KPI. Summarizing all the results, finding and analyzing a research article will be done and has plans to submit it to the MDPI sensors journal for review. In the future paper the features of this final product will be compared with the available gas detector systems presented in other articles.

Conclusions

The design of a sensor-based automatic gas leakage detector with an alert and control system has been proposed and discussed in this paper. This is a low-cost, low power, light weight, portable, safe, user friendly, efficient, multi featured and simple system device for detecting gas. Gas leakage detection will not only provide us with significance in the health department but it will also lead to raise our economy, because when gas leaks it not only contaminates the atmosphere but also wastage of gases will hurt our economy. The proposed system will cost only USD10 which is easily affordable even for poor people. In the open literatures it is noticed that much work has not been done for a smart gas detection system. In future, more advanced features will be integrated with this system which will provide users with more safety and relaxation. The proliferation of handheld devices has led to developments in the field of smart gas sensors, which has considerably widened their scope of application. The need for ensuring safety in workplaces is expected to be the key driving force for the market over the coming years.

CHAPTER 6: RECOMMENDATIONS AND CONCLUSIONS OF THE MINIPROJECT

Recommendations:

Based on the gas leakage detector prototype that you have described in the project, here are some recommendations that are to be considered:

1. Calibration: Calibrate the MQ5 gas sensor periodically to ensure that it provide accurate readings of the LPG gas level in the air. You can use a calibration gas or a reference gas with a known concentration of LPG to verify the sensor's response.

2. Sensitivity: Test the sensitivity of the MQ5 gas sensor to other gases, such as carbon monoxide or methane, that may be present in the air and could interfere with the detection of LPG. You may need to adjust the sensor's threshold or filtering parameters to minimize false alarms.

3. Power source: Ensure that the gas leakage detector prototype is powered by a reliable and safe power source. Consider using a battery backup or a power surge protector to prevent damage to the circuit in case of power fluctuations or outages.

4. Integration: Explore ways to integrate the gas leakage detector prototype with other smart home or IoT devices, such as smoke detectors, security cameras, or mobile apps. This will enable users to receive real-time alerts and take appropriate actions in case of gas leakage or other emergencies.

5. User interface: Design a user-friendly interface for the gas leakage detector prototype, such as an LCD display or a voice prompt, that provides clear and concise instructions and feedback to users. Consider adding a manual override or a test mode to allow users to check the sensor's functionality and ensure that the device is working properly.

6. Maintenance: Provide instructions and guidelines for maintaining and servicing the gas leakage detector prototype, such as cleaning the sensor, replacing the battery or the solenoid valve, or updating the firmware. Include a troubleshooting section in the user manual to help users resolve common issues and errors.

Conclusions:

In conclusion, the gas leakage detector prototype described in your project abstract is a promising solution for detecting LPG gas leaks and preventing potential hazards. By using an MQ5 gas sensor and an Arduino microcontroller, the device can continuously monitor the level of LPG gas in the air and trigger an alarm or a shut-off valve when the gas level exceeds a predefined limit. By integrating the device with IoT and WiFi technologies, the device can also send real-time updates and notifications to users, allowing them to take immediate actions to mitigate the risks.

Student Self- Evaluation for the Community Service Project

Student Name	:Chilukuri Mallikharjun Reddy
Registration Number	:20761A0476
Period of CSP	:28-11-2022 to 07-01-2023
Date of Evaluation	**:**

Please rate your performance in the following areas:

Rating Scale: **Letter grade of CGPA calculation to be provided**

1	Oral communication	1	2	3	4	5
2	Written communication	1	2	3	4	5
3	Pro activeness	1	2	3	4	5
4	Interaction ability with community	1	2	3	4	5
5	Positive Attitude	1	2	3	4	5
6	Self-confidence	1	2	3	4	5
7	Ability to learn	1	2	3	4	5
8	Work Plan and organization	1	2	3	4	5
9	Professionalism	1	2	3	4	5
10	Creativity	1	2	3	4	5
11	Quality of work done	1	2	3	4	5
12	Time Management	1	2	3	4	5
13	Understanding the Community	1	2	3	4	5
14	Achievement of Desired Outcomes	1	2	3	4	5
15	**OVERALL PERFORMANCE**	**1**	**2**	**3**	**4**	**5**

Date: **Signature of the Student**

Evaluation by the Person in-charge in the Community/Habitation

Student Name	:Chilukuri Mallikharjun Reddy
Registration Number	:20761A0476
Period of CSP	**:** 28-11-2022 to 07-01-2023
Date of Evaluation	**:**
Name Of the person In-charge	**:**
Address with Mobile Number	:

Please rate the student's performance in the following areas:

Please note that your evaluation shall be done independent of the Student's self-evaluation
Rating Scale:1 is lowest and 5 is highest rank

1	Oral communication	1	2	3	4	5
2	Written communication	1	2	3	4	5
3	Pro activeness	1	2	3	4	5
4	Interaction ability with community	1	2	3	4	5
5	Positive Attitude	1	2	3	4	5
6	Self-confidence	1	2	3	4	5
7	Ability to learn	1	2	3	4	5
8	Work Plan and organization	1	2	3	4	5
9	Professionalism	1	2	3	4	5
10	Creativity	1	2	3	4	5
11	Quality of work done	1	2	3	4	5
12	Time Management	1	2	3	4	5
13	Understanding the Community	1	2	3	4	5
14	Achievement of Desired Outcomes	1	2	3	4	5
15	**OVERALL PERFORMANCE**	**1**	**2**	**3**	**4**	**5**

Date: **Signature of the Supervisor**

PHOTOS & VIDEO LINKS

FIG:1 INTERACTING WITH SHOP OWNER ABOUT GAS LEAKAGE

FIG:2 OUR GROUP EXLAINING ABOUT GAS LEAKAGE DETECTOR

FIG:3 EXPLAINING ABOUT THE WORKING OF THE DETECTOR

FIG:4 EDUCATING PEOPLE ABOUT PREVENTION OF FIRE ACCIDENTS

MARKS STATEMENT
(To be used by the Examiners)

INTERNAL ASSESSMENT STATEMENT

Name of the student	**:**Chilukuri Mallikharjun Reddy
Programe of study	**:**B.Tech.
Year of Study	**:**2022-2023
Group	**:**ECE
Register no/H.T No	**:**20761A0476
Name of the college	**:**Lakireddy Bali Reddy College of Engineering
University	**:**Jawaharlal Nehru Technological University Kakinada

Sl. No	***Evaluation Criterion***	***Maximum Marks***	***Marks Awarded***
1.	Activity Log	20	
2.	Community Service Project Implementation	30	
3.	Mini Project Work	25	
4.	Oral Presentation	25	
	GRAND TOTAL	100	

Date: **Signature of the Faculty**
Guide

Certified by

Date: **Signature of the Head of the**
Department/Principal

Seal: