

GAS LEAKAGE DETECTION AND MESSAGE ALERT SYSTEM

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This Report Presented in Partial Fulfillment of the Requirements for the Degree of
Bachelor of Science in Computer Science and Engineering

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APPROVAL

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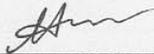
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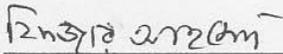
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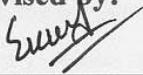
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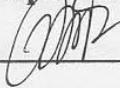
We hereby declare that, this project has been done by us under the supervision of **Md. Sazzadur Ahamed, Senior Lecturer, Department of CSE** at Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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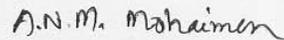
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ABSTRACT

With the development in the fields of embedded, human intrusion has become less and embedded field of project are being widely used for safety plan. LPG gas accident has become very common and very dangerous sometimes may lead to danger than damage our life make it to protect human life. But with the help of modern technology, we can protect ourselves from the incident. In such case, we have done some important system design and implement, which will be next future of embedded system. We have a system that will be the based on human computer interactions. This gas leakage detection and message alert system will be the next automation system. This system will be installed in kitchen, rooms or any Where in the house it detects the LPG gas and helps our world, as a solution to manual primary LPG gas, a cost effective gas leakage detection and message alert system is developed. We basically use MQ-6 Sensor Module which is a generic gas sensor used to detect LPG presence. The Module has Digital Out and Analog Out. It Detects LPG from 200ppm to 10000ppm. Once the MQ-6 Sensor Module detected any gas/smoke a message is sent to the owner by their number by the GSM Module. People also use the NodeMCU which will control Solenoid valve and fan. By continuing this process this device will help us from being damaged and keep us safe.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

By using Arduino Uno, MQ-6, GSM Module (SIM800L), Speaker etc. We can make an embedded system which control a situation. The concept of this project is mainly to overcome the deficit of this situation.

1.2 Inspiration

Our modern time is a time of technology. Human are becoming more dependent on embedded systems. Days past, this dependency is increasing exponentially. LPG gas accident has become more usable but sometimes some leakage occurrence may lead to danger for people [1]. So we decided to make a design that can reduce it. For this circumstances, we have done some important system design and implement, which will be next future of embedded system? We will have a system that will be based on human computer interactions. This gas leakage detection and message alert system will be the next automation system. This system will be installed in kitchen, rooms and it detects the LPG gas and helps us and our friends and family to be safe. We developed a cost effective gas leakage detection and message alert system. We call it in the gas leakage detection and message alert system.

1.3 Objectives

The main of this project is to design a LPG gas detection or smoke detection using MQ-6 gas/smoke sensor and GSM module send SMS to the owner. The gas leakage detection and message alert system is a fixed device and it will installed in kitchen, rooms. The Gas leakage detection or smoke detection using MQ-6 gas/smoke sensor, Arduino Uno GSM SIM800L module. This project is used for the gas/smoke detection, once the gas/smoke is detected a message is sent to the owner by their number. The GSM SIM800L and MQ-6 sensor interfacing with Arduino Uno or Mega are really simple. At last the sound alarm will produce alert on gas leak and by using NodeMCU one can control Solenoid valve and fan [11].

1.4 Estimated Outcome

LPG gas leakage is now a very serious issue. Our developed product's primary outcome will be make the user alert for this challenging situation. Mainly this product demands a large advance development and a big range of gas detection system. For this matter it might be worth nothing that how the outcome of the project is exactly verifying embedded system arrangement to refine the productions combination to make this involuntary factor.

1.5 Draft of the Report

Mainly discussing about motivation, objectives and goal briefly is the purpose of this chapter. Besides that, message is sent to the owner by their number and sound alarm will produce alert on gas leak. It has summarized the "This gas leakage detection and message alert system" [7].

CHAPTER 2

BACKGROUND

2.1 Introduction

In this chapter, we discuss on several research work done by designing and building machines, gas identification.

Embedded system makes or design a module or a machine that can perform a task by programming. The Embedded system is a programs update days by days. Qualification is one of most noticeable challenge. Making the embedded system visually attention-grabbing will always remain a core feature. Stipulation clenches the embedded system's topic, and a large scale of opportunities are available for the qualification of embedded system.

2.2 Interrelated Work

Implement of gas leakage detection is an unparalleled message based on GSM module [8]. There have some embedded system based on other objective. But, our system is only based on realistic automated many effective feature to facilitate the system. ”. This system is fixed device and it will installed in kitchen, rooms. From the beginning, we were very interested on embedded system and wanted to develop something [10]. So, we chosen this gas leakage detection system to developed, comparatives studies the use of robotics system in LPG gas search is more discussed due LPG gas search to frequently being unprotected to unsafe action to make a life safer. A gas leakage detection and message alert system is a mechanical device that performs a task using sensors to perceives its environment, computer programs to control the system based on its environment, functions that are involved in the embedded system may concern to show a discrepancy for sustaining tasks like identifying, monitoring, conditions, controlling. This portion offers a summary of embedded system which is developed to show LPG gas search along with certain strategy aspect for this embedded system. The embedded system that have been developed for LPG gas leakage detection, fixed system, etc.

2.3 Comparative Studies

Using this system, People can install the gas leakage detection and message alert system in the kitchen, rooms. If there is any kind of leakage of LPG gas then MQ-6 gas/smoke sensor will sense then LPG gas. When the gas/smoke is detected a message is sent to the owner by their number and it will perform a sound alarm. By hearing this alarm the people of that home can aware about the situations. Then the people can take necessary step against the situation. People also use the NodeMCU which will control Solenoid valve and fan.

2.4 Opportunity of the Problem

LPG gas and saving people and environment always measured as a perilous task. We can take some measures by this embedded system to make sure that LPG do not cause any jeopardy. Certain related departments have already trying to develop and deploy LPG gas and rescue system in a less complex way. Still, the performance of the product is not an adequate amount of satisfaction. Mainly this project is examined from two points of opinion: “price and performance” and “weight and size”. To conclude, the system should make possible to save people and detect the LPG gas leakage.

2.4.1 Time Scheduling

Table 2.1 Time scheduling

Planning	4 weeks
Design & Analysis	11 weeks
Coding	3 weeks
Testing & Implementation	5 weeks
Total	23 weeks (5 month and 2 weeks)

2.5 Contests

No matter what we are saying, the demand for advanced technology is swelling day by day. There is no stopping to it. Individuals are improving the overall product rates with a high amount of productivity. This might be a better solution to a difficult problem, but it is not enough without its efficiency to meet the challenges. We have done some important system design and implement which will be next future of embedded system? This gas leakage detection and message alert system will be the next automation system in industry and home. In this project we detect gas leakage using MQ-6 sensor and send message to specified number by GSM module. We have done some important system design and implement. Which will be next future of embedded system? We will have a system that will be the based on human.

2.6 Skill Sets and Experience

We have done some important system design and implementation. Which will be next future of embedded system? We will have a system that will be based on human computer interactions. This gas leakage detection and message alert system will be the next automation system in industry. In this project here the system interacts with MQ-6 sensor and send message to specified number by GSM module which attach with Arduino.

2.7 Free of Technology

Pay for an embedded system consummate can be a lavish endeavor for big industrial companies. Sometimes small things can't withstand the cost. For the warfare of this, various corporations are proposing embedded system as a provision. In this way, companies can quickly and effectively implement embedded system. We have done some important system design and implementation. Which will be next future of embedded system? We will have a system that will be the based on human computer interactions. This gas leakage detection and message alert system will be the next automation system in the industry and home.

CHAPTER 3

REQUIREMENT ANALYSIS

3.1 Flowchart Model

This is graphical flowchart representations of our project work.

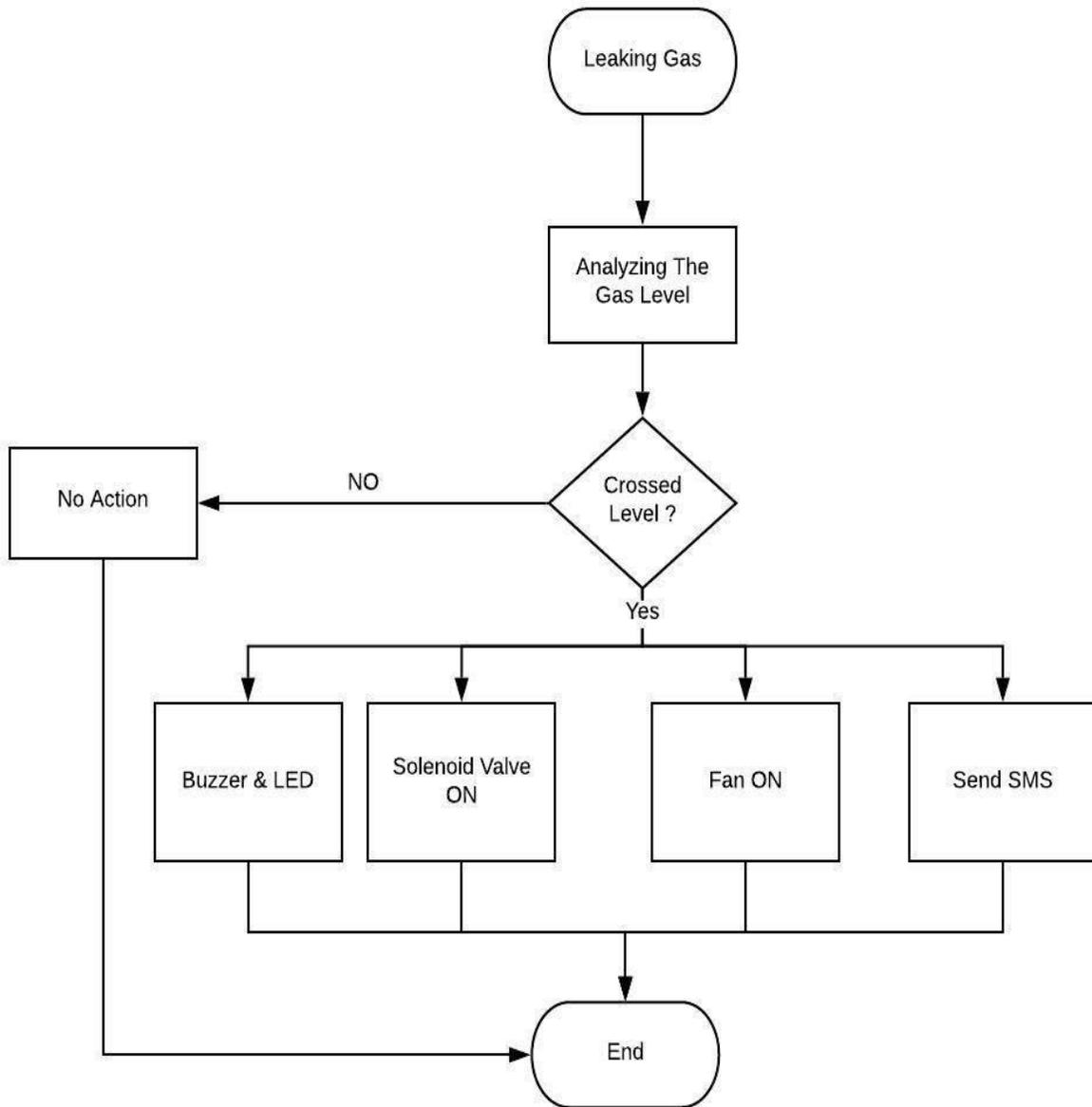


Figure 3.1 Flowchart Model

3.2 Requirement Collection: Requirement Collection basically define as that kinds of equipment we implement to fulfill our project. Here are the list of project devices which we use to complete our project.

3.2.1 User Requirement:

Table 3.1 User Requirement

Arduino Uno	Chases	Hard Board	Register
Base Board	Smart Phone	LED	Buzzer
A2B Cables	Jumper Wire	Battery charger	MQ-6 sensor Module
SIM800L GSM		Pin	NodeMCU
Relay Module		Fan	
OLED		Solenoid Valve	

3.2.2 Arduino Uno

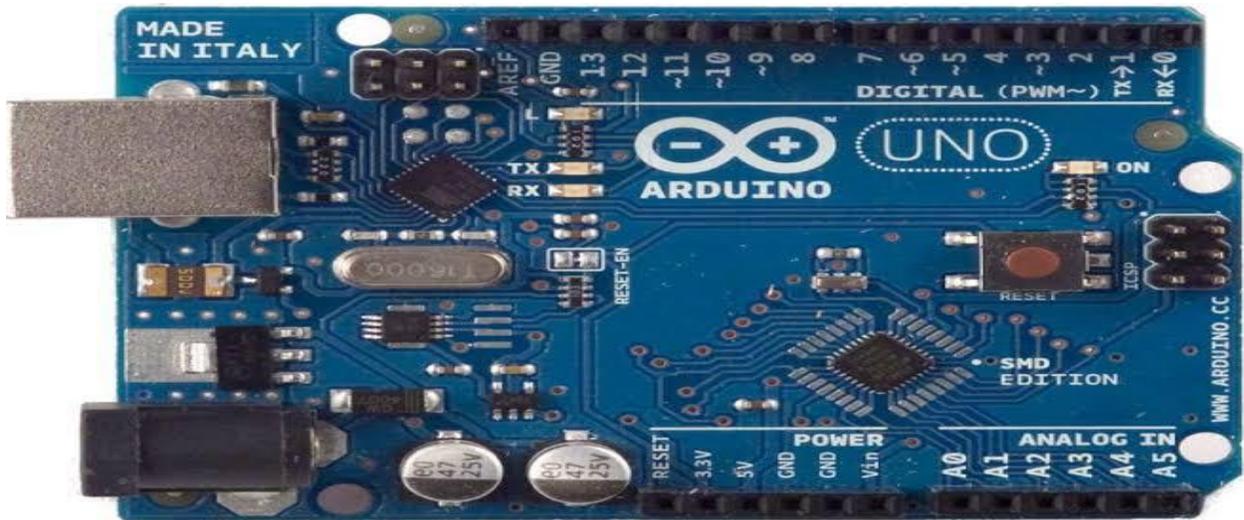


Figure 3.2 Arduino Uno

This gas leakage detection and message alert system will be the next future of automation system on industry and home. In this project here the system interacts with MQ-6 sensor and send message to specified number by GSM module which attach with Arduino [6]. The Arduino has an electronic prototyping platform based on Atmega AVR Microcontroller [9]. It Operates on +5 Volts. It has 14 Digital input output pins. It also have 6 Analog Input Pins. It has Flash Memory of 32KB and 1KB EEPROM. This is Serial Communication enabled.

3.2.3 LED Light



Figure 3.3 LED Light

LED is a kind of semiconductor. When electrons pass through the semiconductor then the LED will light up. LED lights are more efficient compared to incandescent and CFL bulbs.

3.2.4MQ-6 Sensor Module



Figure 3.4 MQ-6 Sensor Module

We have done some important system design and implementation, which will be next future of embedded system. We will have a system that will use a MQ-6 gas sensor [2]. This is a generic gas sensor used to detect LPG presence [3]. The Module has Digital Out and Analog Out. It Detects LPG from 200ppm to 10000ppm. It Operated on +5 Volts. This is Can be used detect other gases like Methane and Alcohol as well.

3.2.5 SIM800L GSM Module

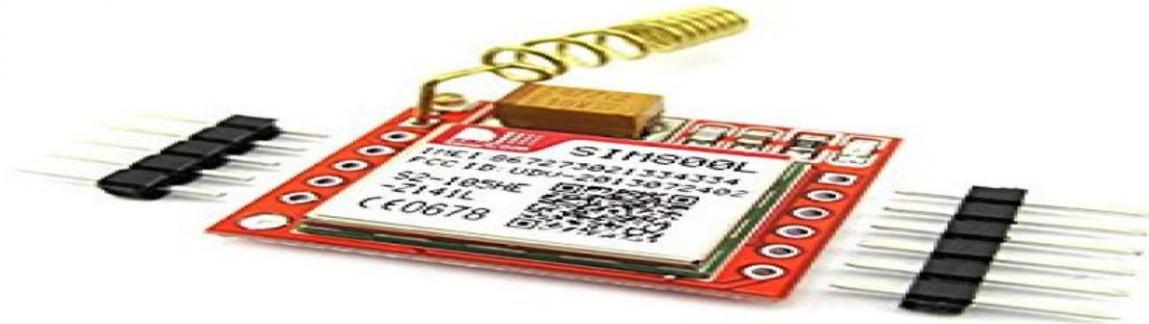


Figure 3.5 SIM800L GSM Module

We have done some important system design and implementation, which will be next future of embedded system. We will have a system that will be based on human computer interactions. This is used to send SMS alerts upon gas leak. In this device Serial Communication is employed. AT COMMANDS - are used to communicate with GSM Module [4].

3.2.6 Jumper wire

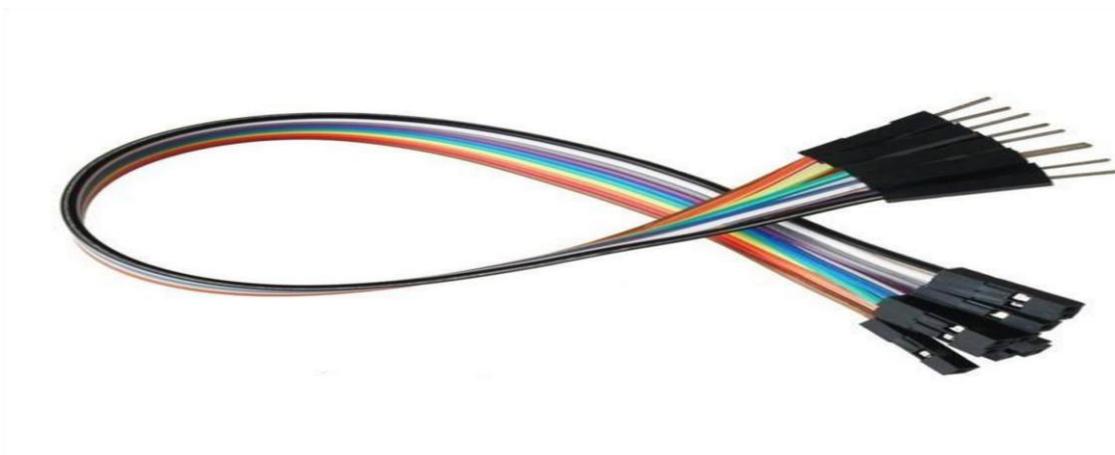


Figure 3.6 Jumper Wire

A jump wire is a type of electrical wire, which also can be joint with group of cables. A jumper wire have connector or pin at each end, which is normally used to inconnect the components of a breadboard or baseboard or other prototype. Where the other equipment or components will be attach with jumper wire.

3.2.7 NodeMCU

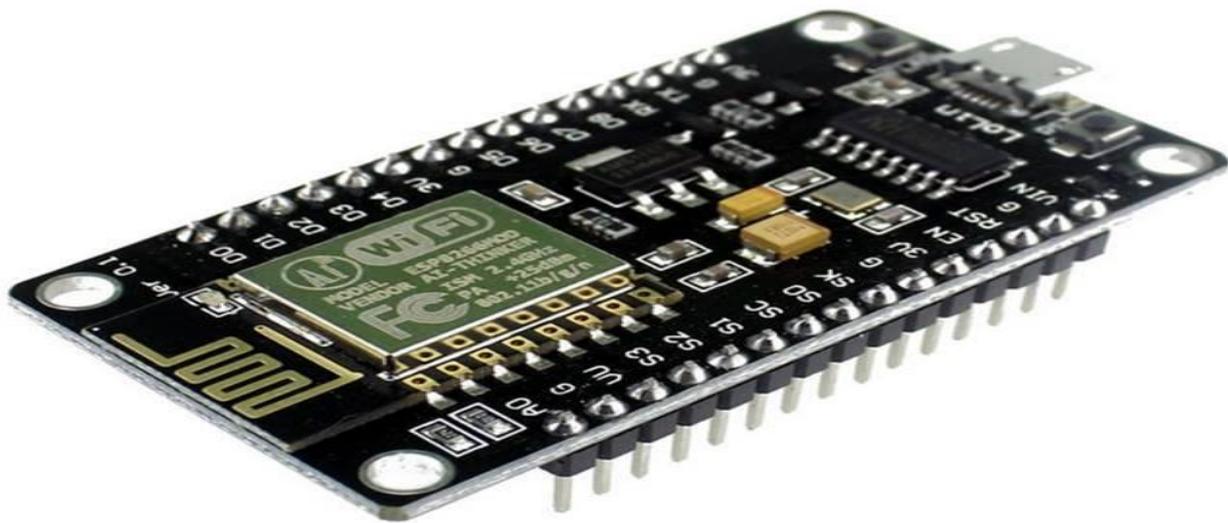


Figure 3.7 NodeMCU

NodeMCU is an open source Internet of things (IoT) platform. In our gas leakage detection system project we are using this NodeMCU. It has firmware which runs on the ESP8266 Wi-Fi chip. Here in our project for internet control over Fan and Gas Valve and Also it send an email message to user if gas detected .So we can say that this is an automation process by which when gas detected then it send email to user then user check out this mail. Then if user want to control the gas valve or off the gas connection then user can do it by android apps .Also user run the fan by this apps. Here for controlling and connection of fan and gas valve we use 4 channel 5v relay module which is connected to the NodeMCU then we control whole actuators by apps.

3.2.8 A2B Cables



Figure 3.8 A2B Cables

A2B Cables are used to connect the Arduino uno and to the computer port or battery port. This is used to correlation to the hardware to software. By using A2B cables we can set command through software and it work through hardware.

3.2.9 Buzzer



Figure 3.9 Buzzer

Buzzer are used for alarm. It work like an alarm by making sound. It have two pins, one of them are positive and other is negative. By implementing the buzzer pins we produce sound alarm. In our project this buzzer will be used to identify the gas, if there leakage happens then the buzzer will turn on by making sound.

3.2.10 Solenoid Valve



Figure 3.10 Solenoid Valve

Solenoid valve will be set up on the gas cylinder. This solenoid valve have two valves, which one of them will be set up to gas cylinder and other will set to the main line. We can control this Solenoid valve to control over the flow of gas. If there any gas leakage happens then by using the apps which will be installed to the user can turn off the valve, by doing this activity we can prevent gas accident.

3.2.11 Cooling Fan



Figure 3.11 Cooling Fan

Usually Cooling Fan will be used to flow away the smoke or gas. If there have some gas leakage happens then one user can turn off the fan by using of the installed apps. By doing this activity one can partially prevent this kinds of situations.

3.2.12 OLED



Figure 3.12 OLED

Usually we use OLED to represent the level of gas and smoke level. In our device the OLED will view to the user. By using the OLED one can monitoring the gas or smoke level. If the level is low then nothing to worry but when the level high then one can use NodeMCU to control over danger.

3.2.13 Relay Module



Figure 3.13 Relay Module

In our project we use 4 channel 5v relay module which is connected to the NodeMCU which we can control whole actuators by apps. Relay Module use to control the power to the actuators by doing switching on and off.

3.3 Modelling and Description:

We have done some important system design and implementation. Which will be next future of embedded system. We basically use MQ-6 Sensor Module which is a generic gas sensor used to detect LPG presence. The Module has Digital Out and Analog Out. It Detects LPG from 200ppm to 10000ppm. Once the MQ-6 Sensor Module detected any gas/smoke a message is sent about the danger to the owner by their phone number by the GSM Module.

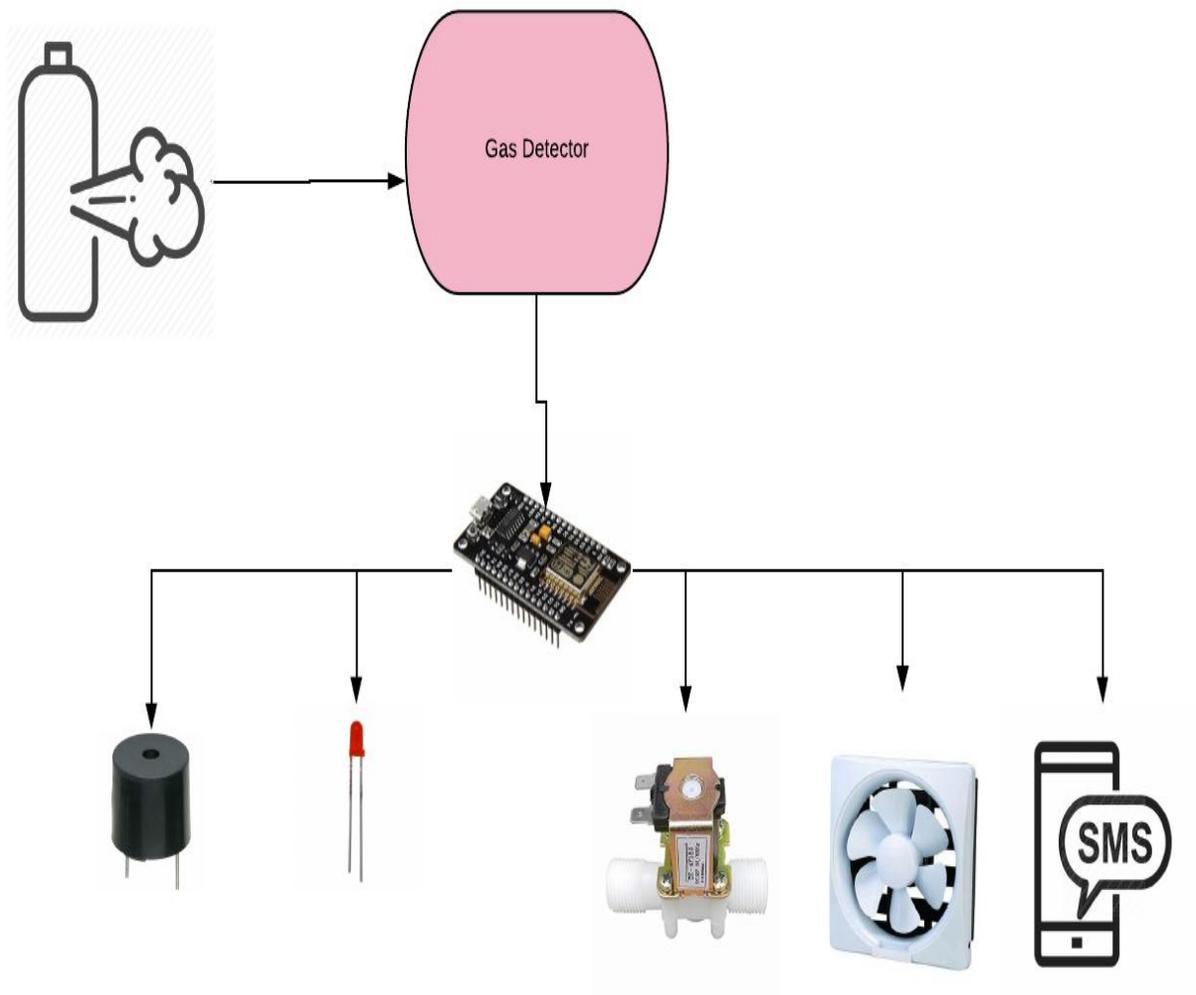


Figure 3.14 Modeling and Description

CHAPTER 4

Design Specification

4.1 Front-end Design

In Front-end Design we use virtual Arduino Uno and many other hardware devices which help us to build up the hardware design specification. Here we use virtual Arduino uno, GSM SIM800L, and LED light, Jumper wires, MQ6 Sensor Module, wire and Buzzer.

4.1.1 Building Hardware Design

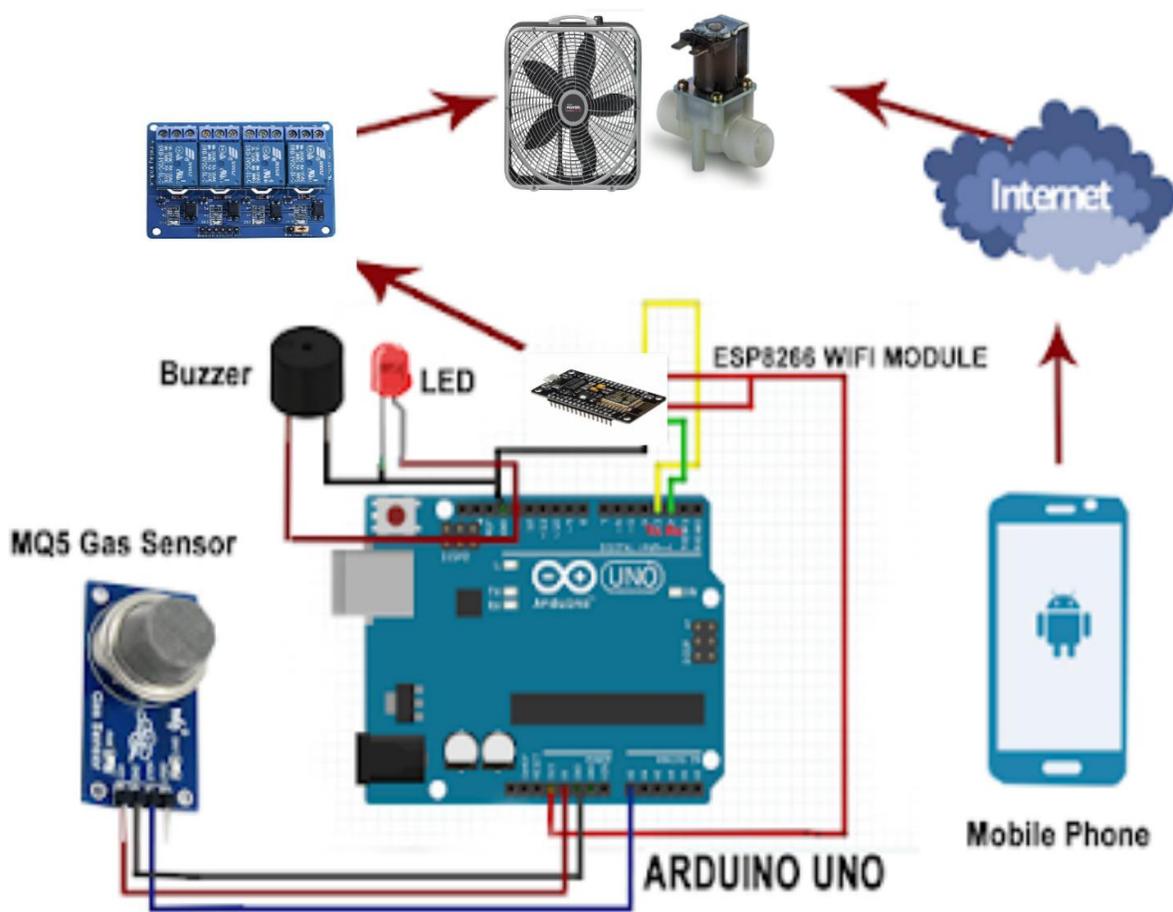


Figure 4.1 Front-end Design

4.2 Creating App for Controlling

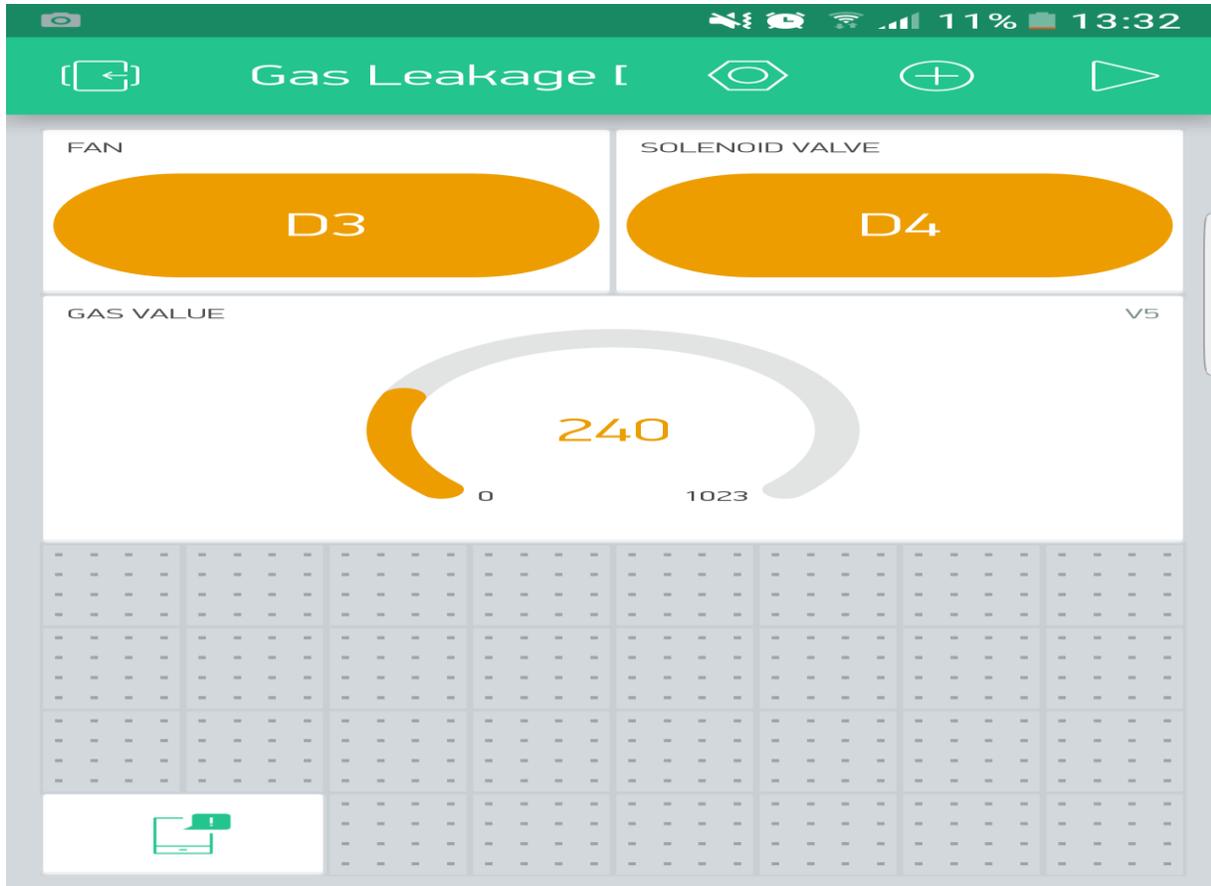


Figure 4.2 User Interface

Here in the app there are two buttons for controlling. D3 is for turn ON/OFF. This mainly control the adjust fan from the device. D4 is for solenoid valve. The solenoid valve can control the flow of gas coming from the cylinder. When there is a leakage, we press the D4 button and stops the flow of gas.

4.3 Back-end Design

In the Back-end Design describe how the project will works in exception way, how the change will happen, how new function and logic will work. The programmer can create logical code and modify the program, andthey can doing this whole things with the help programming languages like: C, Python, C++, etc.

4.4 Implementation Requirement:

All the Implementation requirements are given below.

Table 4.1 Implementation Requirement

Arduino Uno	Chases	Hard Board	Register
Base Board	Smart Phone	LED	Buzzer
A2B Cables	Jumper Wire	Battery charger	MQ-6 sensor Module
SIM800L GSM		Pin	NodeMCU
Relay Module		Fan	
OLED		Solenoid Valve	

CHAPTER 5

Implementation and Testing

5.1 Implementation of Apex-end Design

We used Arduino uno, MQ-6 gas sensor , GSM sim 800L module,LED, jumper wire, male to male connector, male to female connector, bread board, buzzer. For the Implementation of Apex-end Design we use ARDUINO Mega, GSM module, Led etc. There is the Implementation of Apex-end Design, such as:

5.1.1 Arduino Uno to Gas Sensor Connection

There are some significant and important implementation. We will have a system & design that will interact with the Environment detect the gas and send message to the user. It might be used at home or industry. At first I connect Arduino mega A0 pin to gas sensor's analog input. Then there will be a need for a battery. So in bread board, we connect the gas sensor's vcc pin with battery's positive point and sensor's GND will connect with negative point.

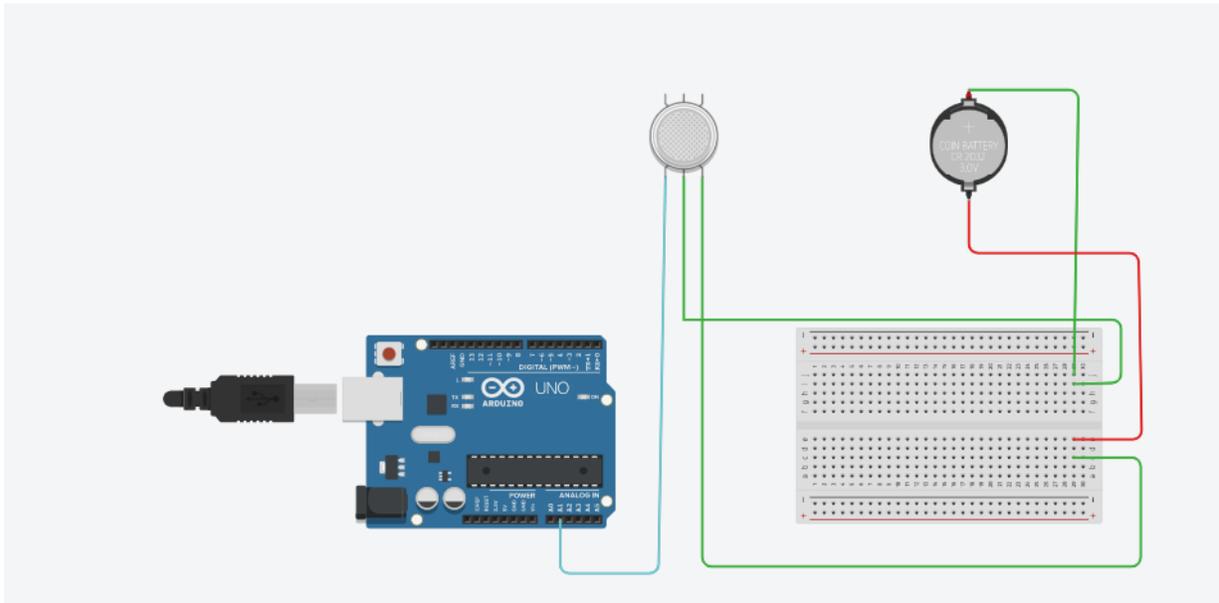


Figure 5.1 Arduino Uno to MQ-6 gas sensor connection with a battery

5.1.2 Arduino Uno to Buzzer connection

We use a buzzer in product to make sure that it gives a signal with its sound whenever it detects any increase in gas level. We connect our buzzer's digital output pin with arduino's digital pin 8 and connecting buzzer's GND with Arduino's GND pin.

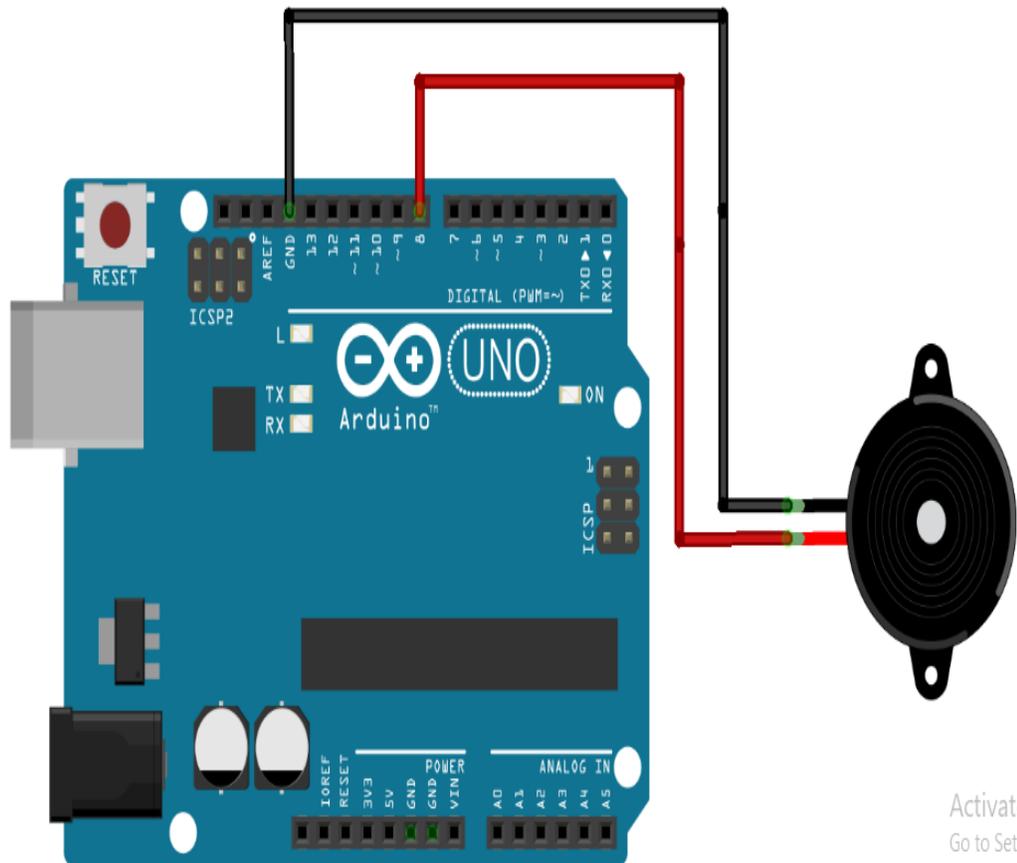


Figure 5.2 Arduino Uno to Buzzer connection

5.1.3 Arduino Uno to LED connection:Here we are using a LED for giving instant signal. LED's digital pin is connected with 13 and other pin goes to GND. When it connect to the pin number 13 and the GND pin then the LED will light up.

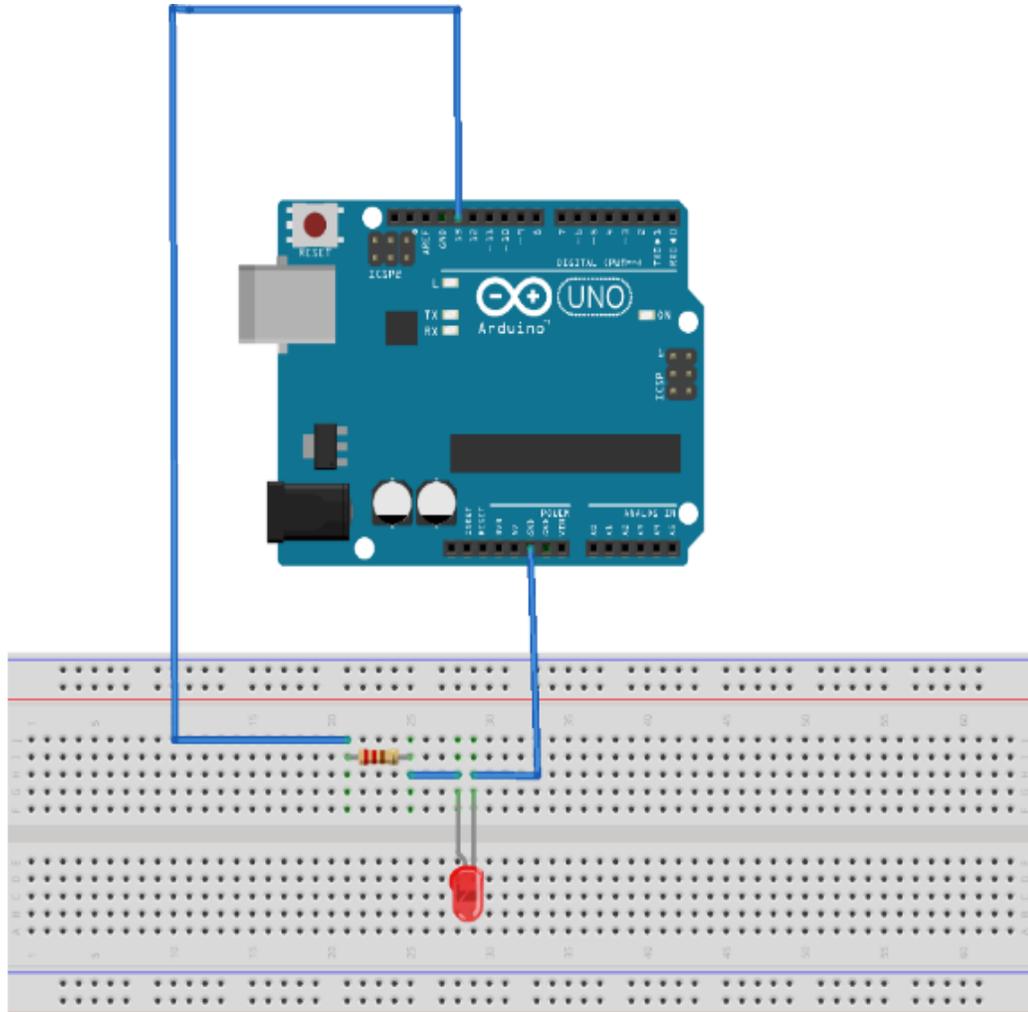


Figure 5.3 Arduino Uno to LED connection

5.1.4 Arduino Uno to GSM module connection:Here, GSM module is mainly sending the message via its SIM [5]. A SIM is already planted in the module. Whenever the gas sensor detects leakage then it sends message to user.

The first point (from left) of GSM is NET pin which is connected with a power source's negative site and second pin is VCC which is connected to the positive site. Fourth pin is RXD which is we connected with arduino digital port 10. Fifth pin is TXD which is also connected with another digital port 11. Sixth pin is GND, connected with arduino's GND port.

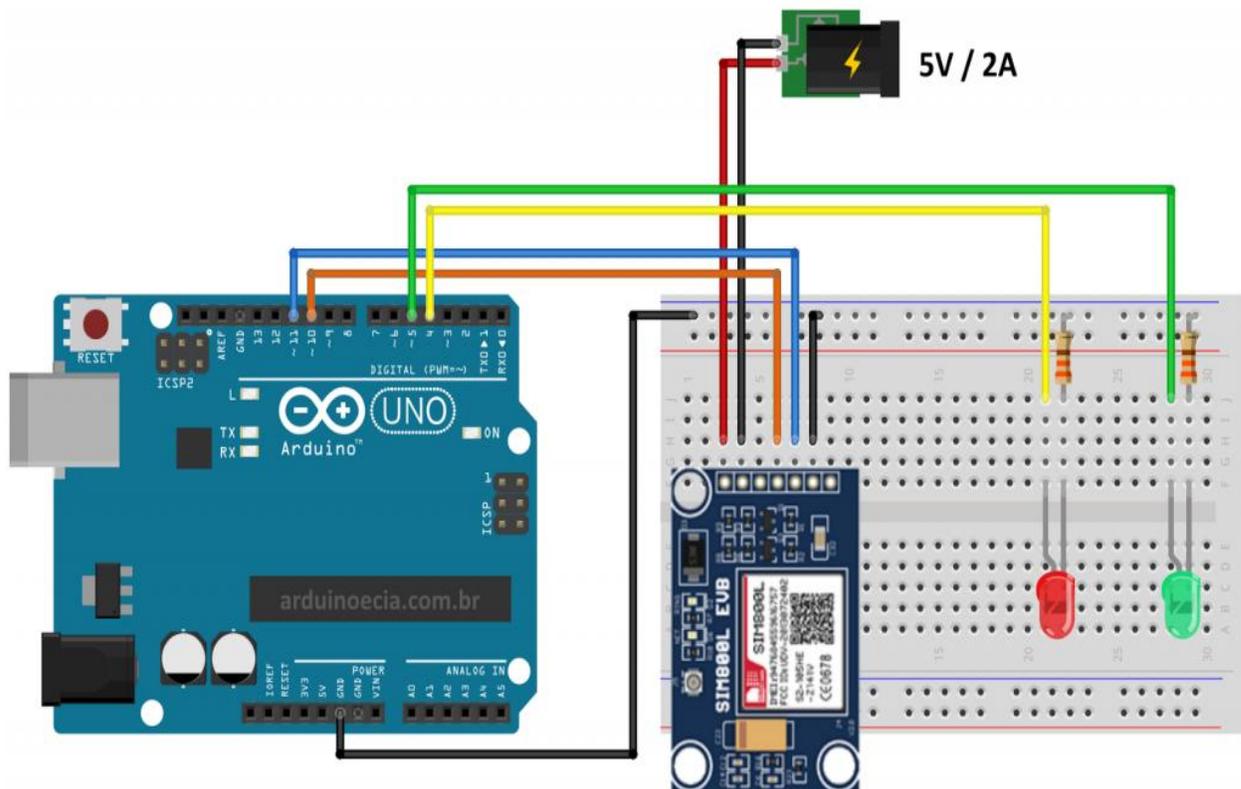


Figure 5.4 Arduino Uno to GSM module connection for sending message

5.2 Implementation of Interaction

Our gas leak detector product interaction plays a significant role for providing a security which may save a person from a life threat. It is an effective product for any kind of social condition.

Leaking gas and occurring a life threatening accidents are our daily concern. Our product's interaction with the environment makes it capable to prevent these accidents. These application basically to communicate with people and make their life better.[12] This paper presents a platform which shows our developed product's interaction with human.

Now our implementation depends on the test quality. Which means the quality of environment, the awareness of people how to use it. Project testing is our final step. After completing the code we upload it on Arduino Uno board. Using A2B cable for uploading and connected with the Arduino. After detecting gas it shows a message in serial monitor.

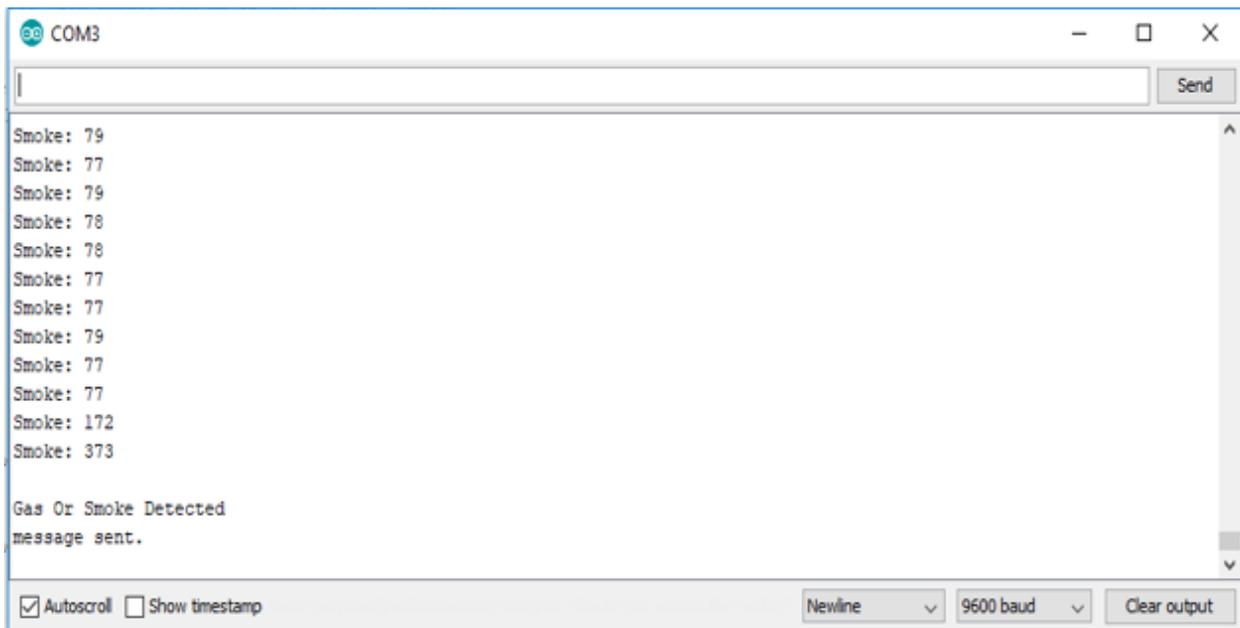


Figure 5.5 Confirmation of detecting the gas

5.3 Test Results and Reports

We have completed our project. Tested every aspect and functions. When we first set our product in a particular place it senses for increase in gas level. When a leak occurs, the LPG increase significantly. Now, the gas sensor detects the gas and enables our GSM module to send message to the user. User gets a message which was set in initial coding. User can take necessary steps after getting the message.

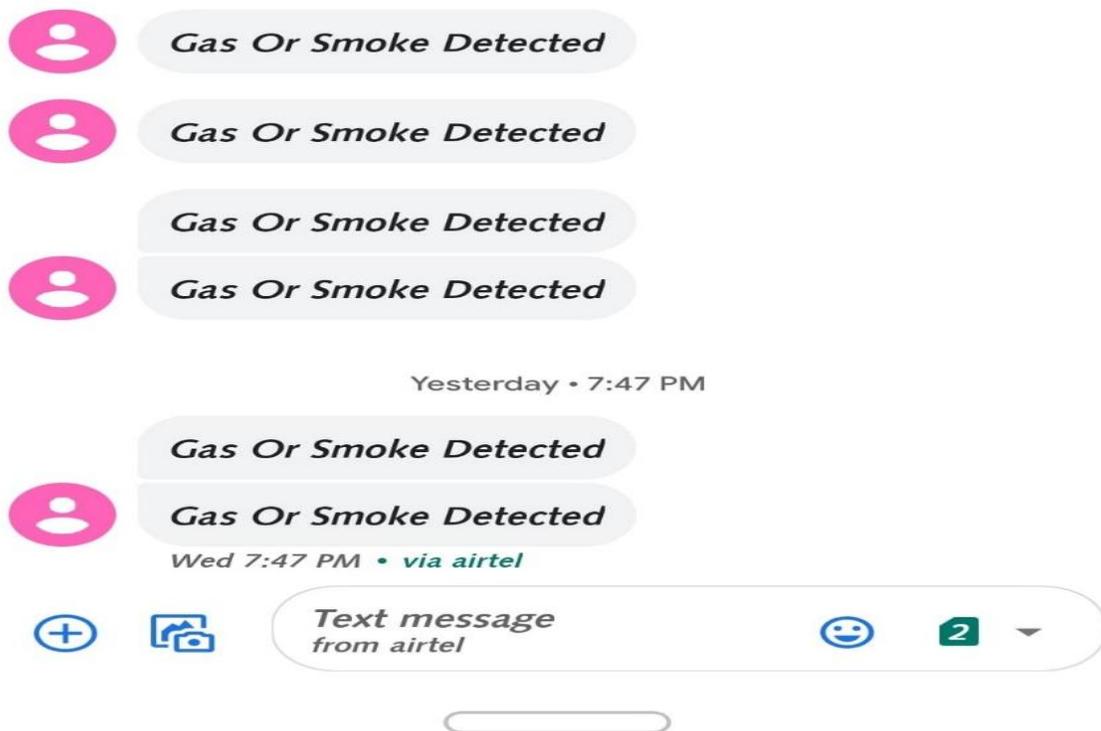


Figure 5.6 Text message from the Gas Leak Detector

CHAPTER 6

Conclusion and Future Work

6.1 Conclusion

This modern era science has become the part and parcel of our life. And this embedded system is one of biggest gift of modern science. Our gas leakage detection and message alert system is a part of embedded system. It will help us to detect poisonous gas from those place like kitchen, room etc. Through this project we can find the gas whether it's type is harmful or not. It will help to protect human being from being affected. Our plan is making this system more effective in future and working is under processing.

6.2 Future Work

Scope for Further Developments We could have done some more work. We need to continue with some related future work,

1. Making it more reliable as it can work within large space of range.
2. Making a fireproof cover for its internal part's safety.
3. We want to make product base on this project.
4. Increasing the accuracy of device performance.

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