

IoT BASED AUTOMATIC GAS LEAKAGE PROTECTION

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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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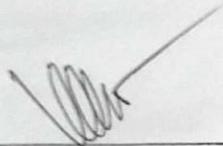
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APPROVAL

This Project/internship titled **IoT Based Automatic Gas Leakage Protection**, submitted by Md.Anamur Rabby, ID No: 143-15-4533 to the Department of Computer Science and Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 02/05/2015.

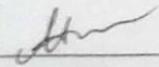
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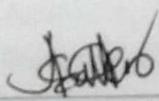
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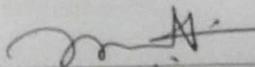
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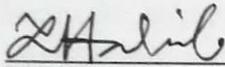
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DECLARATION

I hereby declare that, this research-based project has been done by us under the supervision of **Md. Tarek Habib** Assistant Professor Department of Computer Science and Engineering, Daffodil International University. We also declare that neither this research-based project nor any part of this research-based project has been submitted elsewhere for award of any degree or diploma.

Supervised By



Md. Tarek Habib

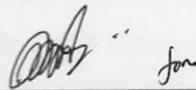
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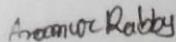
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To begin with, I express my heartiest thanks and thankfulness to Almighty God for His blessing makes my conceivable to finish the last year project effectively.

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I would like to express our heartiest gratitude to **Dr. Syed Akther Hossain**, Professor and Head, Department of CSE, for his kind help to finish my project and also to other faculty member and the staff of CSE department of Daffodil International University.

I might want to thank our whole course mate at Daffodil International University, who took part in this discourse while finishing the coursework.

Finally, I must acknowledge with due respect the constant support and patients of our parents.

ABSTRACT

Liquefied petroleum gas (LPG) is the basic one for all cooking applications. The majority of us are inclined to much trouble when the gas chamber gets purged amid the pinnacle cooking hours. We present this project so as to make mindfulness about the diminishing load because of utilization of the gas and to consequently dial to the gas booking office. Ceaseless estimation of the weight is impossible utilizing electronic weight measures, since it causes weakness in the springs. Consequently, we move to contact less recognition including acoustic wave. In this system, the inbuilt temperature sensor in LM35 is utilized to gauge the dimension of the gas inside the cylinder. The goal of this paper is to build up a framework that can identify the spillage of Liquefied Petroleum Gas in the region where it is put into administration and makes important move to keep away from disasters. The proposed framework is tried and the outcomes are checked by delivering an early cautioning sign under the less serious condition and initiate a sharp alert amid the spillage of LPG and consequently closed down the gas pipeline amid the spillage of gas to give a project to the clients.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

This technique makes you upgrade your prosperity rules, concur statutory requirements on characteristic duties and most basic and key limit being keep away from setbacks and shield life and property from disaster. Already, it has been a standard practice to use consuming mechanical get together, for instance, a warmer, radiator, stove or Liquefied Petroleum Gas (LPG) pack in vehicles, which utilizes a combustible vapor or gas to convey heat imperativeness when properly contacted off. LPG is a smoke-free fuel routinely used in cooking, water warming systems and other warming purposes for nearby, business and agronomic applications. LPG speaks to Liquefied oil gas contain propane (C_3H_8) or butane (C_4H_{10}) or mixes including both propane and butane. An examination has exhibited that cooking in customary manner, using fuel or dairy creatures' compost, is indistinguishable to smoke 400 cigarettes for every day. Generally, customers of fuel and cow squander requirements to try and perseverance to set up the dinner joining blowing air in the fuel kindling and breathing the smoke may have debilitated effect their prosperity. This standard cooking system has been overpowered with the use of LPG cooking as a fuel anyway diminishes the destructive effect of using fuel and bovine waste and besides "LPG envisions in-house sullyng". On 1 May, 2016, Government of India dispatches an arrangement to give free relationship with BPL gatherings of rustics what's progressively, urban areas. As indicated by parchment report, data shows that year to year increase in the usage of LPG climbed from 9.00% to 9.80%, from 2015-16 to 2016-17, while the extension of LPG customers in a comparable time span rose from 10.20% to 16.20%.

1.2 Motivation

In this project I am working with microcontroller to detect Liquefied petroleum gas (LPG) gas and alerting that on individual alarming system which is sending vital signals. Also, it can detect alcohol and smoke. At gas station, a siren will start ringing and a notification will come on separated signal system and automatically switch the gas leaking system off. The present advancement is to give a novel security means to recognize the indefinite quantity of

gas into the district of a machine when the contraption is in a termination condition and not to movement. One more object of the present assibilation is to give a novel gas revelation and watching structure which is moderate to manufacture and which may be immediately presented in normal trailers, barges or the like which are regularly destitute upon a secured supply of maintained gas.

1.3 Objective

The substantial objects of the present endeavor to give a novel method to safely recognizing any breakdown of a pressurized gas framework to turn away accumulation of combustible gases with the objective that mischief or impact due to such a social affair of gases is hindered.

- It is used in house, gas cars, industries as LPG leakage detection
- This system saves the precious time of users.
- It's very easy to use.
- Cost efficient and less power consumer.
- It has a small size and it's portable; it can be carried to everywhere and can be set to every place.

1.4 Expected Outcome

As it is project so our expected outcome from this project is software-based hardware.

The following expected outcome:

- Intelligent & Security based Application.
- Mobile app-based model.
- This system can be controlled from anywhere.
- It's should be used safety purpose.
- Large industries which uses gas as their production.

1.5 Report layout

Chapter 1: Introduction

In this chapter, I am discussed about the ethics, objective, overview and the expected outcome of this project. Later carried by the report layout

Chapter 2: Background

In this section, I am discussed about the background circumstances of the project. I am also writing about the connected work of the project, comparative studies and the scope of the problem and challenges of this project.

Chapter 3: Requirement Specification

In this chapter, I am covering about the requirement collection and analysis, also writing about the basic modeling and description.

Chapter 4: Design Specification

In this chapter, I am covering about the front-end design and back-end design. It's also described about the (UX) user's point of view.

Chapter 5: Implementation

In this chapter, I am discussed about the execution of UX, testing execution, test impact and implementation requirements.

Chapter 6: Conclusion

In this section, I am discussed about the conclusion of this project and further development of this project

CHAPTER 2 BACKGROUND

2.1 Introduction

The following figure 2.1 Gas Leakage Protection Circuit Diagram

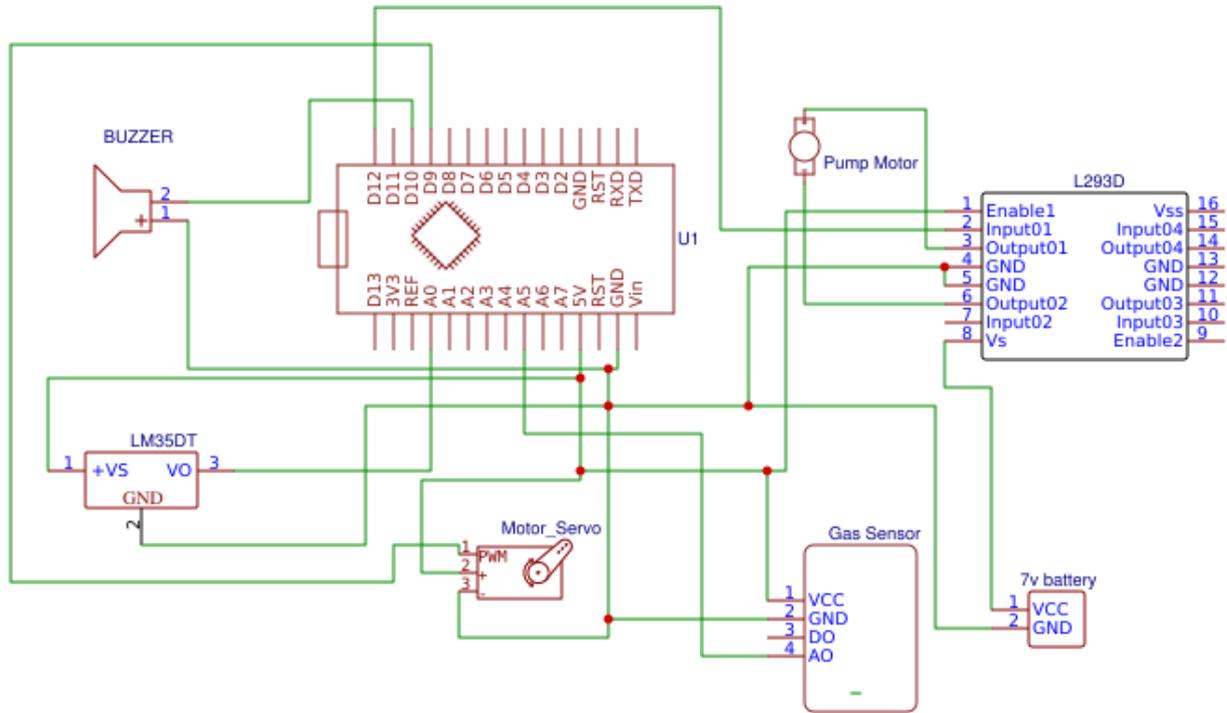


Figure 2.1: Gas Leakage Protection Circuit Diagram

2.2 Related Works

The weight can likewise be estimated by applying the Euler Bernoulli Theorem, where the gas chamber is thumped utilizing a mallet and the acoustic vibration is identified with the weight inside the cylinder. By thumping on the outside of the tank, the recurrence of the sound creating from the vibration of the mass of the tank can be utilized to evaluate the amount of the gas. At the point when a sledge was utilized to thump the barrel surface the activated transverse vibration can be viewed as mechanical vibration which is like that of Bernoulli-Euler pillar mostly stacked with a disseminated mass. Euler-Bernoulli hypothesis is utilized as the computation show for assessing vibrating frequencies of a tube-shaped cylinder. By discharged gas out of tank well ordered the common sound frequencies of the gas tank with various loads can be estimated [3].

2.3 Comparative Studies

There are many products in the market related to my project, here I will compare one of the best products with my project.

The following table 1 comparative studies

Topic	IoT Based Automatic Gas Leakage Protection (My Project)	Propane LPG Natural Gas CH4 CNG LNG Combustible Gas Leak Alarm Detector
High precision	Has great susceptibility and good stability	Has susceptibility and good stability
Water supply	If there any fire, it provides water to put out	This feature is not available in this project
Detection	It can detect both Gas and Temperature	It can only detect Gas
High intelligent digitalization	It works speedy due to its high-performance micro technology microcontroller	Its high-performance micro technology enables self-inspection, automatic fault identification, automatic alarm and automatic linkage functions.
Multiple output method	It can be linked to solenoid valve/robot/exhaust fan and it can be entering the community intelligent security/fire protection system	It has no multiple output system
Remarkable alarm effect	It has sound alarm of 85dB buzzer	It has sound alarm of 85dB buzzer and light alarm of highlight indicator light
Communication expansion	In future it can be connected to Abus +, WiFi, GPRS and other communication expansion	It can be used for Abus +, WiFi, GPRS and other communication expansion

Table 1: Comparative Studies

2.4 Scope of problems

- This system will work automatically, if the temperature increases due to surrounding environment.
- There will be some systematic problem after long term use.
- If the water connection is not appropriate, the system would not work properly.
- The system should have to be checked before using second time or reuse.
- It would not be possible every time automatically, if there is a big accident.

2.5 Challenges

- Motor Driver IC overheats.
- External Power Source for Pump motor.
- Gas Leakage sensor value setting related problem.
- Its susceptibility depends on Humidity and temperature.

CHAPTER 3

REQUIREMENT SPECIFICATION

3.1 Requirement collection and analysis

At first, I look at what are needed to run this system such as MQ-6 sensor. The value of MQ-6 sensor is 620 intensity then I had to learn about the normal room temperature and what will happen after it goes to overheat. That's the reason behind I put fixed this value to 50 degree centigrade.

Arduino Nano: The Arduino Nano dependent on the AT mega 328 is a microcontroller board works on outer power supply or by means of USB association. The outer power can be given through an AC-DC connector or through a battery. The board can work on an outside supply of 6-20 Volts. On the off chance that the supply is under 5Volts, the board might be tolerable. In the event that utilizing more than 12Volts the voltage controller may over warmth and harm the board. Thusly, the suggested range is 7-12 volts. It has 14 input/output computerized pins, out of which 6 give PWM yield. It additionally includes 6 simple pins (for example from A0-A5), 6 control sticks, a 16 MHz earthenware resonator, a USB association, a power jack, an ICSP (In-Circuit Serial Programming), TX/RX LEDs, "TEST" LED 13 and reset catch [2].

The following figure 3.1 Arduino Nano

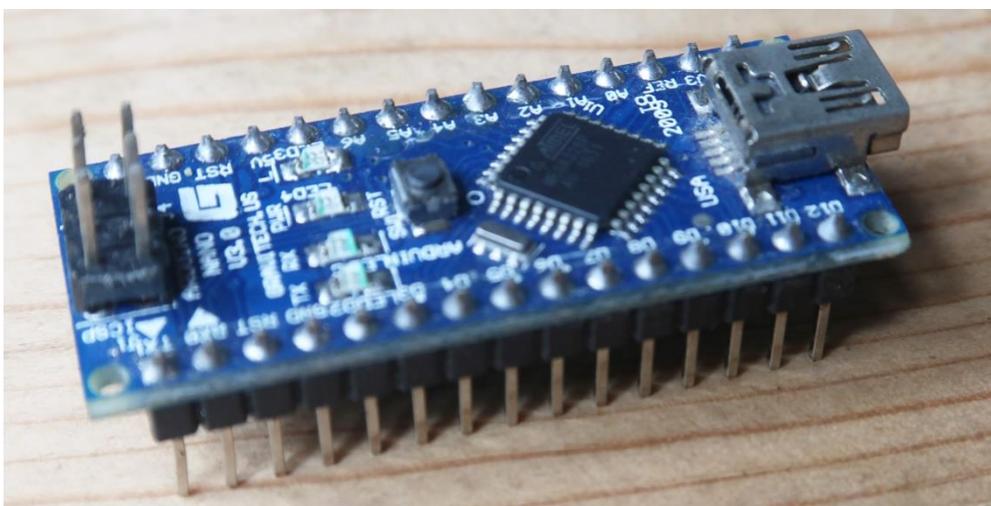


Figure 3.1: Arduino Nano

MQ-6 Gas Sensor: In this assignment, MQ-6 gas sensor is utilized which is a very delicate of LPG, iso-butane, LNG & propane and low touchy in liquor and fume. As the convergence of spilled gas expands, the conductivity of gas sensor increments and changes over the one type of flag into another type of flag. MQ-6 sensor includes a radiator that need a supply heat up and sets aside least effort to distinguish the LPG. It has expedient reaction, strong and long life and is basic in task [1].

The following figure 3.2 MQ-6 Gas Sensor

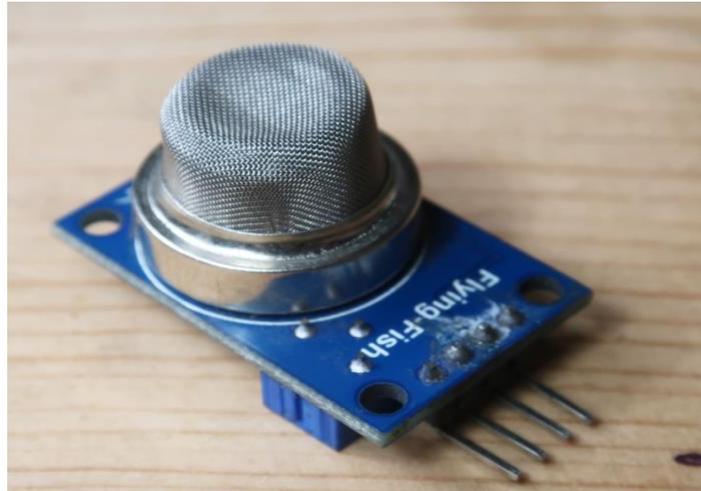


Figure 3.2: MQ-6 gas sensor

LM-35 Temperature Sensor: The LM35 course of action are exactness facilitated circuit temperature devices with a yield voltage straightly in respect to the Centigrade temperature. The low-yield impedance, direct yield, and accurate natural alteration of the LM35 contraption makes interfacing to readout or control equipment especially straightforward.

The following figure 3.3 LM-35 Temperature Sensor

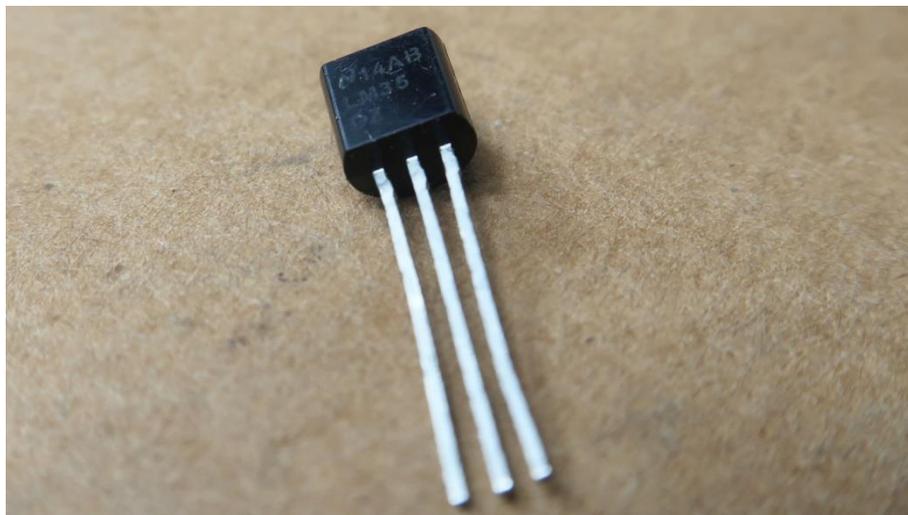


Figure 3.3: LM-35 temperature sensor

Audio Indicator: Contingent on the application, the audio indicator or sound maker yield might be neighborhood, remote or a mix. In this work, solenoid-based alarm alert, which is a nearby caution which do exclude observing is utilized, however may deliver sound which might be valuable for the general population to clear amid any risky condition.

The following figure 3.4 Audio Indicator (Buzzer)



Figure 3.4: Audio indicator (Buzzer)

Servo Motor: A servomotor is a direct actuator or rotational actuator that thinks about careful control of exact or straight position, speed and increasing speed. It contains a sensible motor coupled to a sensor for position input. It moreover requires a tolerably refined controller, routinely a dedicated module organized expressly for use with servomotors.

The following figure 3.5 Servo Motor

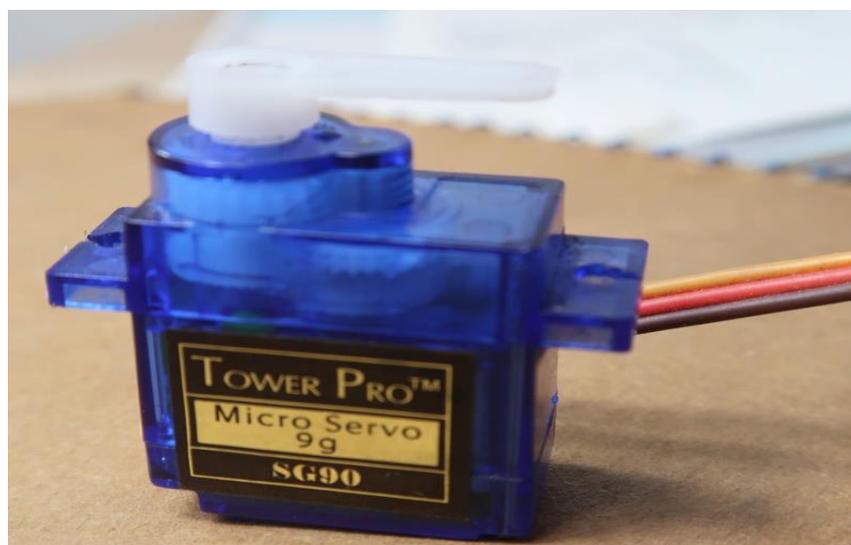


Figure 3.5: Servo motor

Pump Motor: Pump is driven by engine as it were. A Pump does not change over one type of vitality to an alternate type of vitality; however, the Engine changes over electrical vitality to mechanical vitality. A Pump requires a driving component, for example, an engine or a motor to work. The Pump is a gadget that is utilized to move liquids.

The following figure 3.6 Pump Motor



Figure 3.6: Pump motor

3.2 Modeling and Description

The raised process contains LPG gas sensor, Arduino NANO, LM-35 Temperature sensor, Auto On-Off method, LCD display and alert circuit.

The following figure 3.7 Basic Model

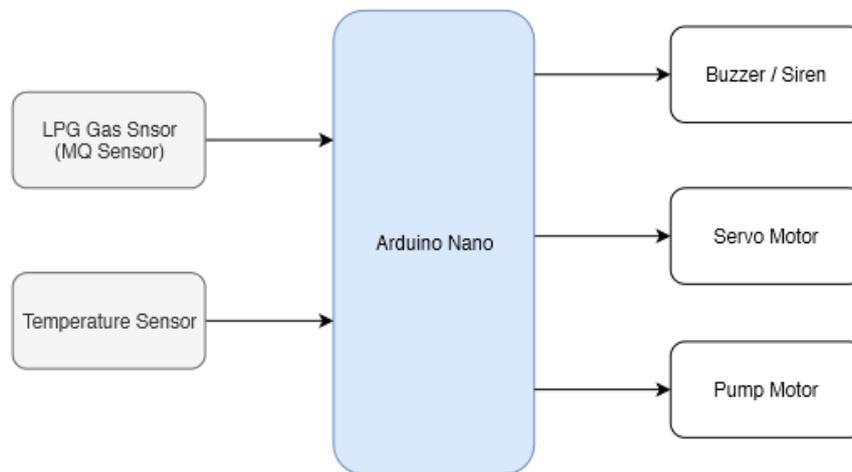


Figure 3.7: Basic model of the system

CHAPTER 4

DESIGN SPECIFICATION

4.1 Front-end design

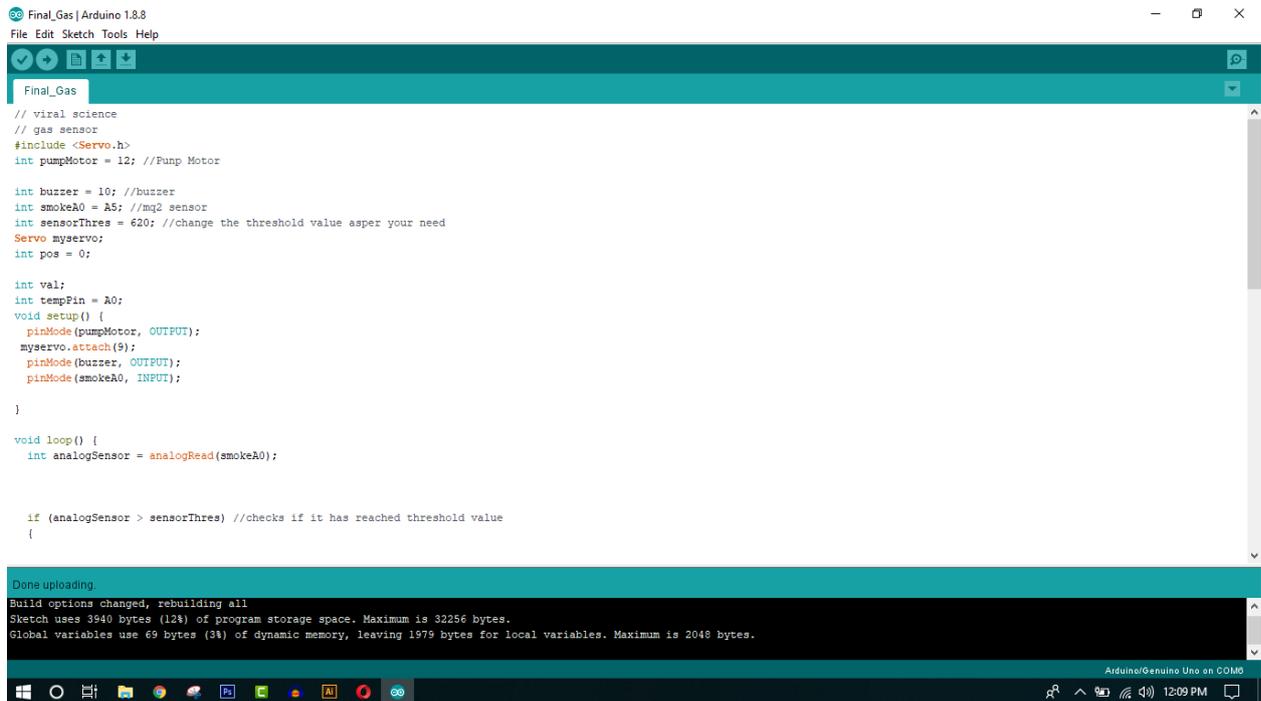
The following figure 4.1 Flow chart of the system



Figure 4.1: Working procedure of the System

4.2 Back-end Design

The following figure of 4.2 Arduino code



```
Final_Gas | Arduino 1.8.8
File Edit Sketch Tools Help

Final_Gas
// viral science
// gas sensor
#include <Servo.h>
int pumpMotor = 12; //Pump Motor

int buzzer = 10; //buzzer
int smokeA0 = A5; //mq2 sensor
int sensorThres = 620; //change the threshold value asper your need
Servo myservo;
int pos = 0;

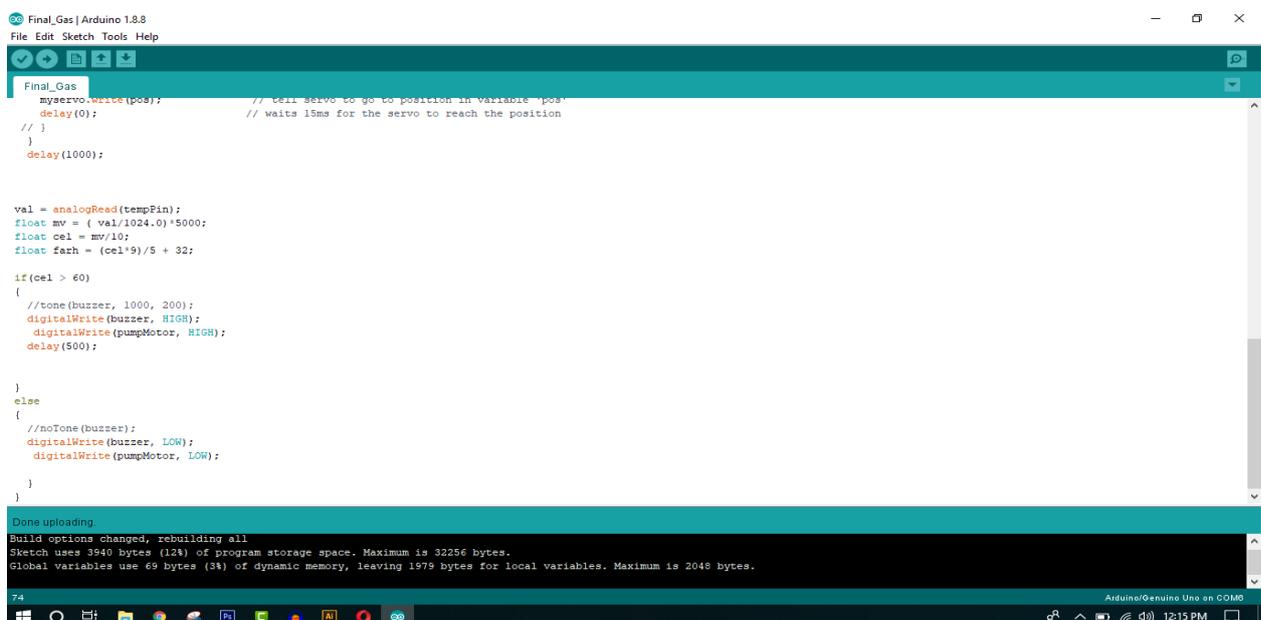
int val;
int tempPin = A0;
void setup() {
  pinMode(pumpMotor, OUTPUT);
  myservo.attach(9);
  pinMode(buzzer, OUTPUT);
  pinMode(smokeA0, INPUT);
}

void loop() {
  int analogSensor = analogRead(smokeA0);

  if (analogSensor > sensorThres) //checks if it has reached threshold value
  {
    Done uploading.
    Build options changed, rebuilding all
    Sketch uses 3940 bytes (12%) of program storage space. Maximum is 32256 bytes.
    Global variables use 69 bytes (3%) of dynamic memory, leaving 1979 bytes for local variables. Maximum is 2048 bytes.
    Arduino/Genuino Uno on COM5
    12:09 PM
```

Figure 4.2: Arduino code

The following figure of 4.3 Arduino code



```
Final_Gas | Arduino 1.8.8
File Edit Sketch Tools Help

Final_Gas
myservo.write(pos); // tell servo to go to position in variable 'pos'
delay(0); // waits 15ms for the servo to reach the position
// }
}
delay(1000);

val = analogRead(tempPin);
float mv = ( val/1024.0)*5000;
float cel = mv/10;
float fahr = (cel*9)/5 + 32;

if (cel > 60)
{
  //tone(buzzer, 1000, 200);
  digitalWrite(buzzer, HIGH);
  digitalWrite(pumpMotor, HIGH);
  delay(500);
}
else
{
  //noTone(buzzer);
  digitalWrite(buzzer, LOW);
  digitalWrite(pumpMotor, LOW);
}
}

Done uploading.
Build options changed, rebuilding all
Sketch uses 3940 bytes (12%) of program storage space. Maximum is 32256 bytes.
Global variables use 69 bytes (3%) of dynamic memory, leaving 1979 bytes for local variables. Maximum is 2048 bytes.
74
Arduino/Genuino Uno on COM5
12:15 PM
```

Figure 4.3: Arduino code

Pseudo code

```
set pumpMotorPin to 13
set buzzerPin to 10
set gasSensorPin to A5
set temperaturePin to A0
set sensorThrese to 620
set servoPosition to 0

loop infinity
  set analogSensor to input temperaturePin

  if analogSensor more than sensorThrese
    tone buzzerPin
    set servoPosition to 180
    wait 100 millisecond
  set value to get temperaturePin
  set celcius to (value/1024)*500
  if celcius more than 50
    tone buzzerPin
    start pumpMotor
    wait 500 millisecond
  else
    mute buzzerPin
```

4.3 UX (User Experience)

- Firstly, it can detect leakage gas. if it found any gas, it will shut down gas line automatically and provide harsh signal.
- Secondly, if there any unfortunate situation such as fire, it will throw water toward fire to extinguish it and give different type of warning.
- Cost efficient and less power consumer.
- It likewise recognizes liquor so it is utilized as alcohol analyzer.
- The sensor has superb conductivity joined with a spanking reaction time

4.4 Implementation Requirement

- Arduino Nano
- MQ-6 Gas Sensor
- LM-35 Temperature Sensor
- Servo Motor
- Pump Motor
- Audio Indicator (Buzzer)

CHAPTER 5

IMPLEMENTATION

5.1 Implementation of UX

- High susceptibility LPG, iso-butane, propane and Small susceptibility, it likewise recognizes liquor so it is utilized as alcohol analyzer.
- The sensor has incredible susceptibility joined with a spanking and speedy response time.
- Durable execution and long life
- Basic drive circuit

5.2 Testing Implementation

The following figure of 5.1 Main system design

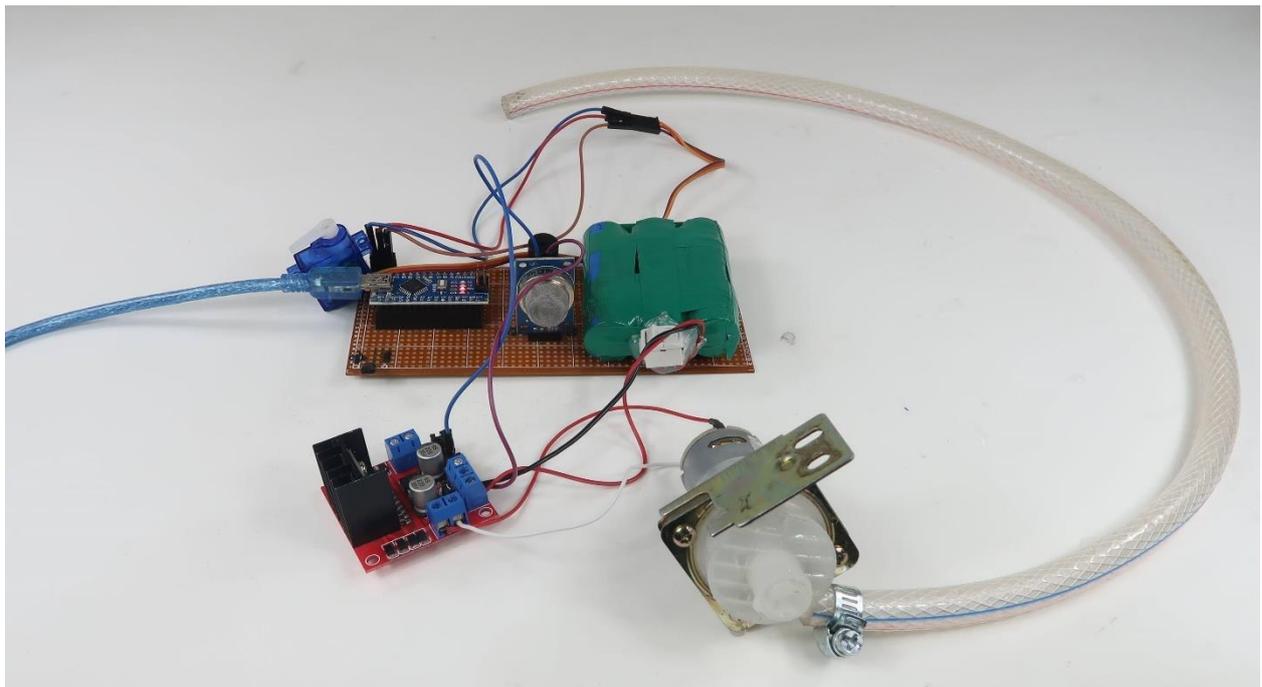


Figure 5.1: Main System

5.3 Test Result

- If gas intensity more than (>620), according to this condition servo motor remained constant around 15 seconds.
- If temperature more than or equal ($=<50^\circ$) at that movement pump motor are started and buzzer has played until temperature less than 50° .

CHAPTER 6

CONCLUSION

6.1 Conclusion

The improvement of the weight identification schematic gives the data about the adjustment in weight of the holder, the weight scope of gas inside the barrel and alerts the client. Persistent estimation was finished by utilizing a remote weight sensor inside the barrel. The refreshed esteem is shown and the caution is empowered as the edge comes to. The gas spillage if any is identified by the particular sensor and alerts the utilization. The test result affirms the ground-breaking and gainful movement of the model by perceiving up and down gas spillage levels and auto shut-down the gas supply and alert the customer by giving an equipped for being heard alarm forewarning signal. The recommended Arduino based gas spillage marker gives high and brisk response than the manual errand in the midst of the fundamental conditions. The system can be presented for recognizing the distinctive spillage gases at private, motel, restaurants, different business products and mechanical domain to avoid jeopardizing in human lives.

6.2 Scope of the further development

- Its defecting smoke and alcohol in using this system.
- It has a small size and it's portable; it can be carried to everywhere and can be set to every place.
- It's also cost effective and useful for large industries which are needed very much.

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