LPG GAS DETECTOR USING ARDUINO

Submitted in partial fulfillment of the requirements
of the Mini-Project 1/2 for Second Year/Third Year of

Bachelor of Engineering

By

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Guide:

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CERTIFICATE

This is to certify that the mini-project entitled **"LPG GAS DETECTOR USING ARDUINO"** is a bonafide work of **(Wasimuddin Mallick (24),Arshad Khan (14),Shamim Khan (19),Sabir Khan (18))** submitted to the University of Mumbai in partial fulfillment of the requirement for the Mini-Project 1/2 for Second / Third Year of the Bachelor of Engineering in **"Computer Engineering"**.

(Name and sign)
Guide

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Head of Department

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Principal

DECLARATION

I declare that this written submission represents my ideas in my own words and where others' ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will cause disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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ABSTRACT

LPG leak detector model is a compact electronic device which detects the presence of LPG in the air. Gas leak detection is the detection of gas leaks with a sensor specially designed to identify the leaks. To detect gas leaks with traditional methods, the gas itself must either be near the detector or within a pre-defined area. Outdoor environmental conditions such as changing wind directions and quick dispersion of a potential gas cloud, which can be found e.g., on an offshore platform, can result in undetected gas leaks, leading to extremely dangerous situations.

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Chapter 1

Introduction

LPG leak detector model is a compact electronic device which detects the presence of LPG in the air. Gas leak detection is the detection of gas leaks with a sensor specially designed to identify the leaks. To detect gas leaks with traditional methods, the gas itself must either be near the detector or within a pre-defined area. Outdoor environmental conditions such as changing wind directions and quick dispersion of a potential gas cloud, which can be found e.g. on an offshore platform, can result in undetected gas leaks, leading to extremely dangerous situations.

Gas is intentionally odorized so that the average person can perceive it at a concentration well below the explosive range. That odorant concentration is generally between 0.5 to 1.0 percent by volume or as local applicable codes dictate. Gas odor is a common and effective indication of a leak. A report of gas odor should be investigated immediately. If a leak is found, the migration pattern of the gas should be determined. If an immediate hazard is determined to exist, the hazard potential should be eliminated, and the leak repaired immediately. Odor is not always totally reliable as an indicator of the presence or absence of gas leaks. For this reason, all gas leak reports should be investigated using a leak detection instrument. Gas personnel should remember that the primary purpose of the gas odor is to provide a warning to the public, who do not have gas detection instruments.

LPG gas detection projects' main idea is to implement a security system for detecting leakage of gas in closed environment. In this project gas leakage is identified by using sensors which work only in closed environments. In the present situation there are many cases related to gas leakage which cause innocent people's lives and property damage. Implementing this application can be useful for companies and houses, which can save lives of people.

We use 8-bit microcontroller to perform the desired task by interfacing Gas sensor, Buzzer and LCD to display. The output of the Gas sensor is in analog form which can be converted into digital form using MCP3201 which is an ADC (Analog to Digital Converter). Initially when there is a leak the Gas sensor detects it and gives voltage related to the amount of gas that is getting escaped from the apparatus. We create a set-point to the microcontroller

so as if the Gas sensor gives the output above the set-point the controller drives the buzzer ON as an indication to the user.

This can be used as an application in chemical and hazardous industries where there is a continuous need to monitor the gas leaks. By using different kinds of sensors for every gas we can identify leaks for every kind of gas. So many incidents that may threatened people's lives, one factor of it are fire and explosions caused by the leaking of LPG gases just like the incident happened on June 7, 2013 as reported in GMA news, "The explosion is more likely to have been caused by combustion or reaction of chemical substances," Roxas said. "In view with the foregoing, the blast was consistent with a gas explosion, most likely LPG (Liquefied Petroleum Gas)". Another related incident also happened at Ramanathapuram last May 11, 2013 where a girl was killed and three members of her family were seriously injured in a blaze caused by a leak in LPG cylinder at their house. These are just one of the million reported incidents caused by LPG gas leakage if not detected and notified and in this chapter the researchers present some related literature, studies, and prior arts.

Chapter 2

Review of Literature

A few reviews about gas leakage detection techniques were done in the past either as part of research papers/technical reports on a certain leak detection method or other gas related subjects. Ch. Manohar Raju and N. Sushma Rani, 2008; they introduce an android based automatic gas detection and indication robot. They proposed a prototype depicting a mini mobile robot which is capable of detecting gas leakage in hazardous places. Whenever there is an occurrence of gas leakage in a particular place the robot immediately reads and sends the data to android mobile through wireless communication like Bluetooth. We develop an android application for android based smart phones which can receive data from robots directly through Bluetooth. The application warns with an indication whenever there is an occurrence of gas leakage, and we can also control the robot movements via Bluetooth. by using text commands as well as voice commands. Previous mobile robots were based on heterogeneous technologies like GSM, GPS, internet based etc., but the main disadvantage of those prototypes was the absence of communication in particular areas. So, with the rapid developments and tremendous changes in technology we have lots of techniques to eradicate previous problems. Wireless communication protocols play a vital role in present trends. Bluetooth, Wi-Fi, Zigbee etc., we use one of the best features of smart phones, i.e., the Bluetooth technology to control and monitor parameters driven by a robot. LPG Gas Leakage Detection Control System by Hitendra Rawat et al (2014) which they use the same concept but only valve is shut off while on D. Hari Priya and Lalith Babu (2014) uses only a sound alarm as an alertness to users when leak is detected in their system Gas Leakage System.

Chapter 3

Report on the Present Investigation

COMPONENTS ARE IN USE:

1. Hardware Components:

- Arduino Nano
- 16X2 (1602) LCD Display
- MQ2 gas sensor
- Active Buzzer
- 10K Potentiometer
- Female header pins
- Perfboard or dotted board
- For power
- 5v charger or power bank

2. Software Components:

- Arduino IDE 2.1.0: The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. This software can be used with any Arduino board.

3. Connection Details:

- LPG gas leakage detector using Arduino circuit.
- Connect all parts according to circuit diagram.
- Mq2 gas sensor D0 pin connected to Arduino D7 pin & gas sensor Vcc is connected to Arduino 5v & GND to Arduino GND.

4. LCD connection details

- LCD pin 1 VSS is connected to Arduino GND
- LCD VCC is connected to Arduino 5V
- LCD VEE/ Vo is connected to 10K Potentiometer middle pin
- LCD RS is connected to Arduino D12
- LCD R/W is connected to Arduino GND
- LCD E is connected to Arduino D11
- LCD D4 is connected to Arduino D5
- LCD D5 is connected to Arduino D4

- LCD D6 is connected to Arduino D3
- LCD D7 is connected to Arduino D2
- LCD LED A pin is connected to Arduino 3.3v
- LCD LED K pin is connected to Arduino GND
- Buzzer + is connected to Arduino pin D13 & buzzer (-) pin is connected to GND.

Working Principle:

The LPG leakage detection and alert system presented in this section is simple as shown in Figure 1, yet reliable. It is battery operated and hence portable. It is designed in such a way that it can also be operated with ac power supply. To support the latter case, it has a bridge rectifier with a capacitor filter. This is followed by a regulator designed with IC7805 which provides +5V regulated power supply. To detect the LPG, MQ-6 gas sensor is employed. This sensor can be operated at +5V. The sensitivity of this sensor is very high, and it has quick response time. It can detect the LPG concentration in the range of 200-10000ppm. The gas sensing layer of this sensor is made of Tin Dioxide (SnO_2) and gold (Au) electrodes. The output of the gas sensor is given to LM358 dual operational amplifier where it is compared with the threshold value for gas density which is set using preset potentiometers and amplified. If the sensed voltage is greater than the preset threshold voltage, the operational amplifier output fires the driver circuit for LED and Buzzer. As a result, the LED will glow and the buzzer starts to produce an alarm sound.

PROPOSED WORK:

We have concluded from these existing and above discussed technology. We shall use a new technology, IOT (Internet of Things) to get fastest notification of gas leakage. We shall use a stepper motor to OFF the knob of cylinder regulator to avoid accidental cases due to gas leakage. We will also use a website or application under the IOT technology to get the fastest response from the module. The other module and things which are used in this project are microcontroller, exhaust fan, LED for indication, a buzzer to notify local peoples and MQ 5 or MQ 6 gas sensor module to sense the gas leakage [6].

In this proposed model we want to achieve five aspects**:**

To Design an Embedded System

In this we use the AVR microcontroller that controls all the module and things.

Accident Avoiding Feature

In this we use the exhaust fan to reduce the gas from the place, a stepper motor that OFF the cylinder knob and for notify the local people automatically weeping the buzzer.

IOT Module Sensor Module

This module is used to sense gas leakage. In this module we use a sensor MQ 2 or MQ 6 to perform the leakage detection operation.

Chapter 4

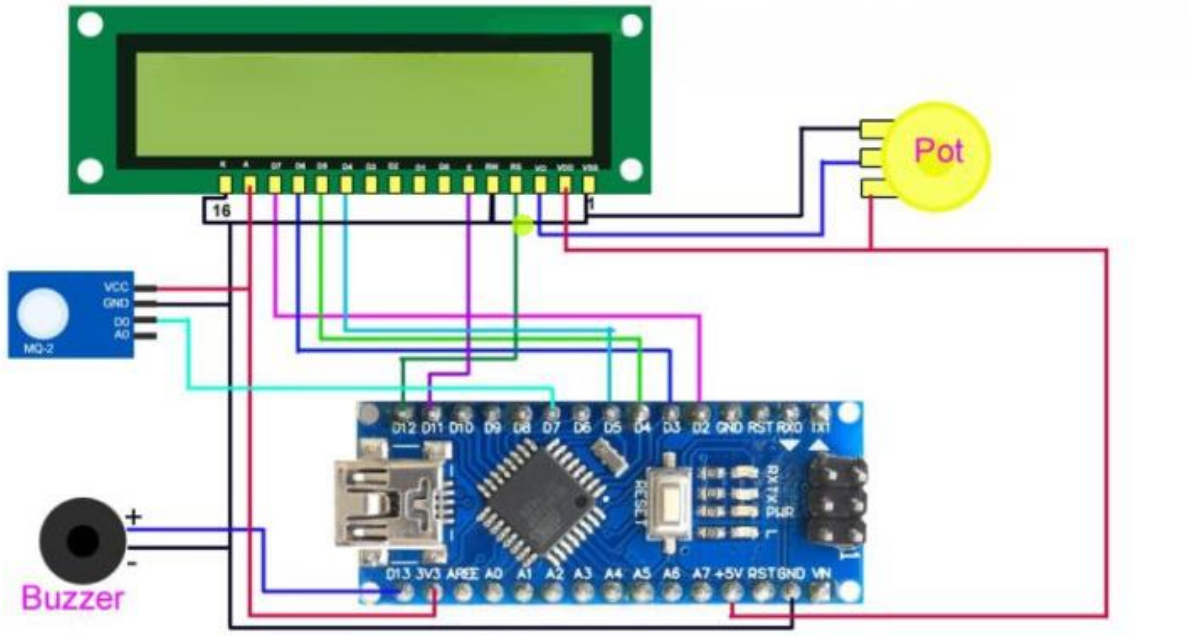
Results and Discussions

Programs:

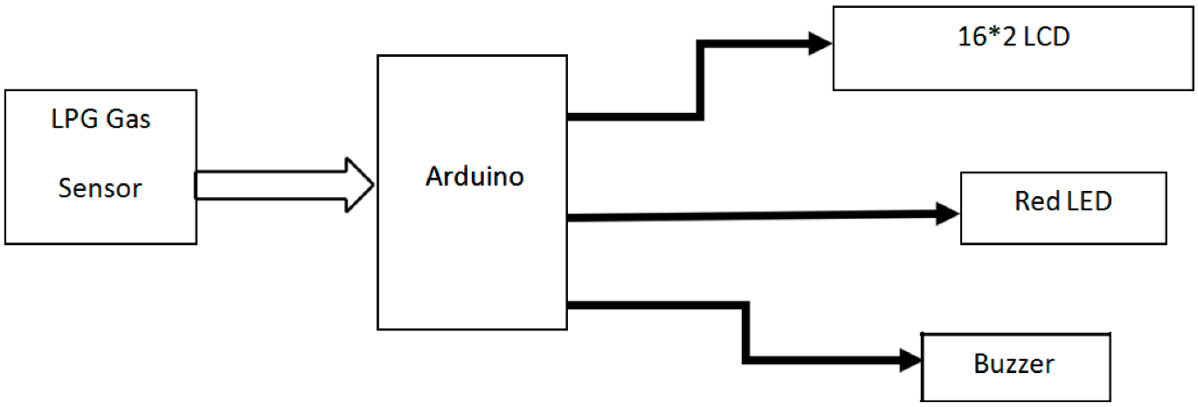
```
#include <LiquidCrystal.h>

LiquidCrystal lcd(12, 11, 5, 4, 3, 2);

#define lpg_sensor 7

#define buzzer 13

void setup()

{

  pinMode(lpg_sensor, INPUT);

  pinMode(buzzer, OUTPUT);

  lcd.begin(16, 2);

  lcd.print("LPG Gas Detector");

  lcd.setCursor(0,1);

  lcd.print("Techno Review 85");

  delay(2000);

}

void loop()

{

  if(digitalRead(lpg_sensor))

  {
```

```
    digitalWrite(buzzer, LOW);
    lcd.clear();
    lcd.print("   NO LPG GAS   ");
    lcd.setCursor(0, 1);
    lcd.print("    LEAKAGE     ");
    delay(400);
    digitalWrite(buzzer, LOW);
    delay(500);
  }
  else
  {
    digitalWrite(buzzer, HIGH);
    lcd.clear();
    lcd.print(" LPG Gas Leakage ");
    lcd.setCursor(0,1);
    lcd.print("     Alert    ");
    delay(1000);
  }
}
```

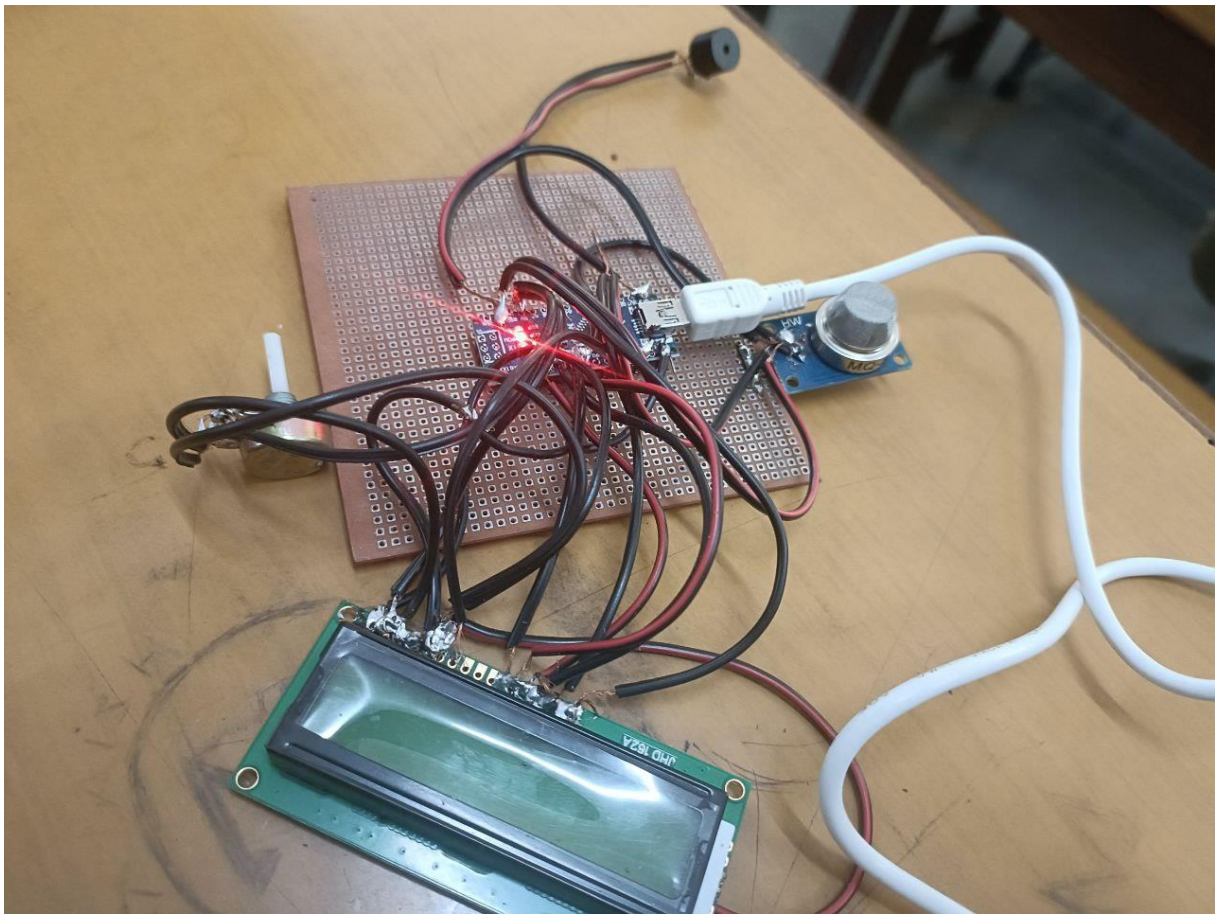
Connection design: -

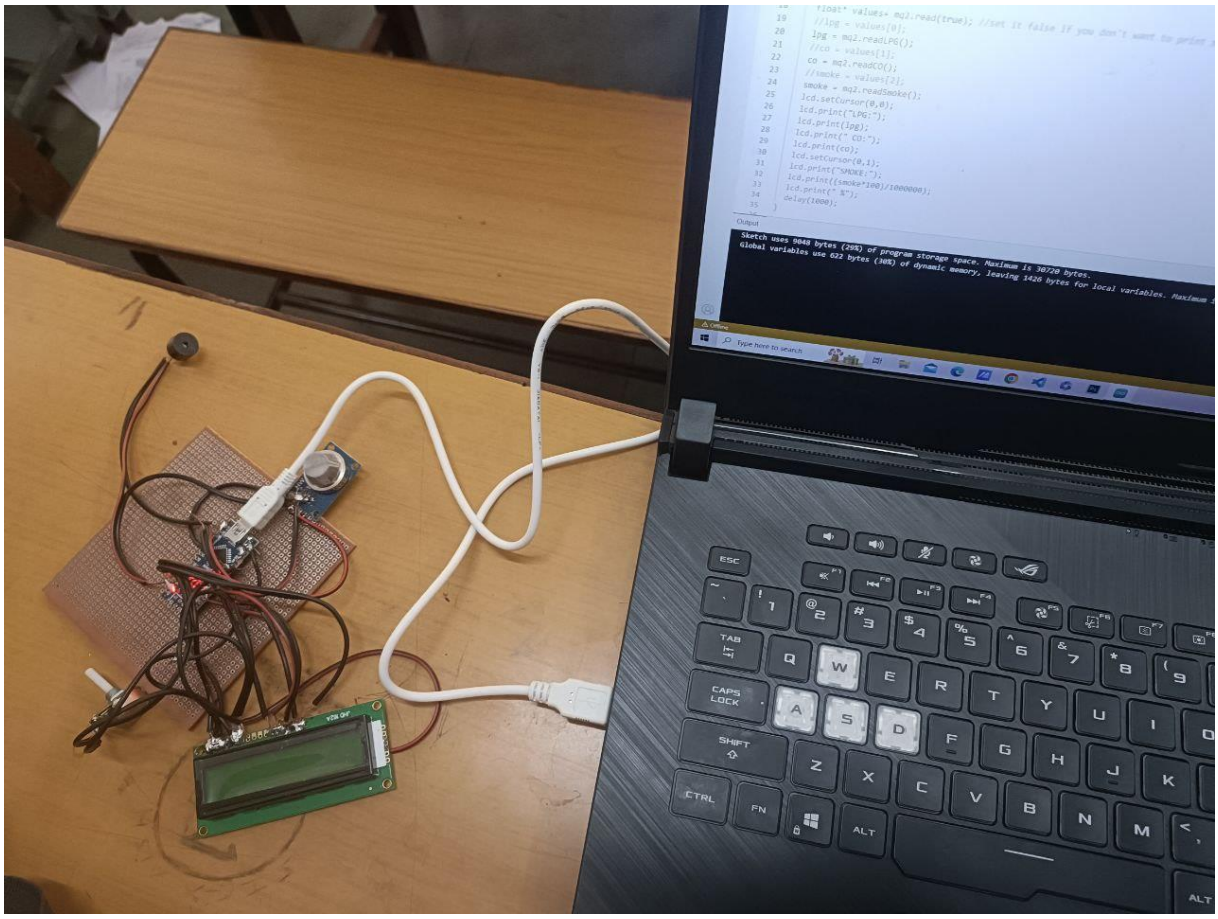


Flowchart:



Output:




float values= mq2.read(true); //set it false if you don't want to print
//lpg = values[0];
lpg = mq2.readLPG();
//co = values[1];
co = mq2.readCO();
//smoke = values[2];
smoke = mq2.readSmoke();
lcd.setCursor(0,0);
lcd.print("LPG:");
lcd.print(lpg);
lcd.print(" CO:");
lcd.print(co);
lcd.setCursor(0,1);
lcd.print("SMOKE:");
lcd.print((smoke*100)/1000000);
lcd.print(" %");
delay(1000);
Output
Sketch uses 9048 bytes (29%) of program storage space. Maximum is 30720 bytes.
Global variables use 622 bytes (30%) of dynamic memory, leaving 1426 bytes for local variables. Maximum
Type here to search
ESC
TAB
CAPS LOCK
SHIFT
CTRL
FN
ALT

Chapter 5

Conclusions

Finally, we conclude in recent households, the use of LPG is taking a big troll. From the use of cylinders up to the use of petroleum pipelines. The biggest threat to using this technology is security. And our project will prove to be boom for households and industries. A wide variety of leak detection techniques is available for gas pipelines. Some techniques have been improved since their first proposal and some new ones were designed because of advances in sensor manufacturing and computing power. However, each detection method comes with its advantages and disadvantages. Leak detection techniques in each category share some advantages and disadvantages. For example, all external techniques which involve detection done from outside the pipeline by visual observation or portable detectors can detect very small leaks and the leak location, but the detection time is very long. Methods based on the mathematical model of the pipe have good results at high flow rates while at low flow rates a mass balance-based detection system would be more suitable. Hybrid systems benefiting from the real-time detection capability of a software-based method and the high localization accuracy of a hardware-based technique, along with other specific advantages of both approaches, seem to be the future trend in gas leak detection. Selecting from the wide variety of commercial solutions available is ultimately an action that must be taken after assessing the needs of the system in which gas leak detection is needed. Gas leakage leads to severe accidents resulting in material losses and human injuries. Gas leakage occurs mainly due to poor maintenance of equipment’s and inadequate awareness of the people. Hence, LPG leakage detection is essential to prevent accidents and to save human lives. This paper presented LPG leakage detection and alert system. This system triggers LED and buzzer to alert people when LPG leakage is detected. This system is very simple yet reliable.

Appendix

So basically, this project is useful when you are planning to secure your place from any type of gas leakage. When the LPG gas is detected by the MQ-2 gas sensor in **LPG Gas leakage detector using Arduino** then the green LED will go on otherwise red LED will glow.
To make this project more interesting and user friendly we attach a 16×2 LCD module to it.
You can see the real time status of the working of the gas sensor in this LCD screen.
The gas sensor is connected to analog pin A0 on the Arduino nano board.The buzzer and LED are connected to digital pins 8 and 9, respectively.
In the setup() function, the pinMode() function is used to set the buzzer and LED pins as output pins, and the Serial.begin() function is used to start communication with the serial port at a baud rate of 9600.
In the loop() function, the analogRead() function is used to read the gas sensor value, which is then printed to the serial monitor using Serial.print() and Serial.println() functions.
If the gas value is greater than 500 (which can be adjusted to a different threshold based on calibration), the buzzer and LED are turned on using the digitalWrite() function. If the gas value is lower than the threshold, the buzzer and LED are turned off.
The delay() function is used to wait for 1 second before the next loop iteration.
Note: This is a simple example and may need further calibration and testing to ensure accurate and reliable gas detection. It is important to follow safety guidelines and regulations when working with gas detectors.

Chapter 6

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ASME standard

Book,

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Wasimuddin Mallick

Arshad Khan

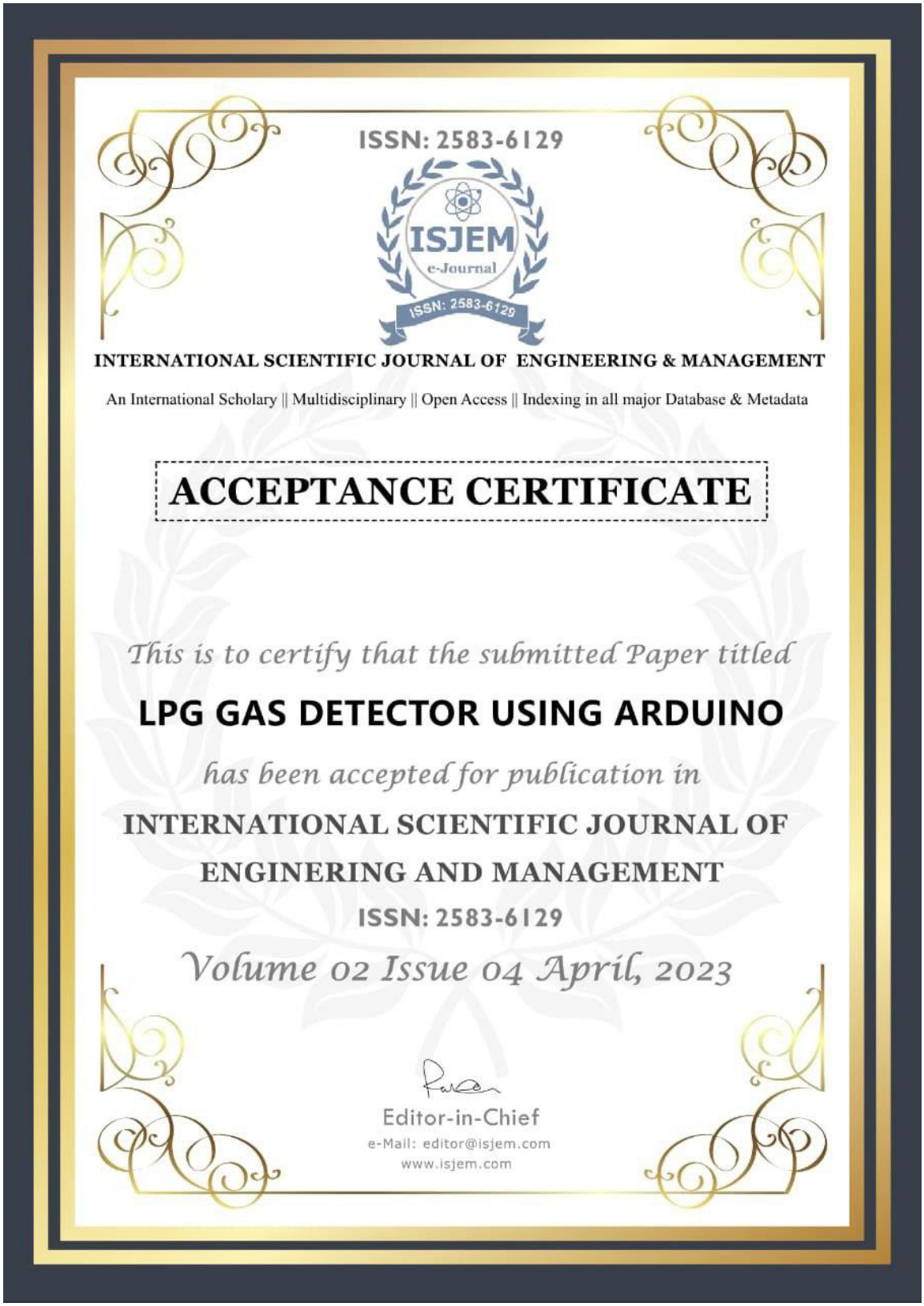
Shamim Khan

Sabir Khan

Publications

Our research paper published in International Scientific Journal of Engineering and Management (ISJEM)

https://isjem.com/



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MINI-PROJECT

ASSESSMENT SHEET

Termwork: 25 marks

Group Members

Student 1 : _____

Student 2 : _____

Student 3 : _____

Student 4 : _____

Guide Name: _____

Attendance Percentage

Student	**Semester Attendance %**
Student 1	
Student 2	
Student 3	
Student 4	

Attendance to TW Conversion

>=90%	<90% & >=80%	<80% & >=70%	<70% & >=60%	<60%
5	4	3	2	1

Project Review Performance:

Rubrics used: Quality of survey/ need identification, Clarity of Problem definition based on need, Innovativeness in solutions, Feasibility of proposed problem solutions and selection of best solution, Cost effectiveness, Full functioning of working model as per stated requirements, Effective use of skill sets, Effective use of standard engineering norms.

Student	**Average Points of Rubrics received after Review**
Student 1	
Student 2	
Student 3	
Student 4	

Review RUBRICS to TW Conversion

>=18	<18 & >=10	<10 & >=5	<5 & >=3	<3
5	4	3	2	1

Rubrics for Report:

Criteria	1 Unsatisfactory	2 Average	3 Good	Assessed by Guide (1 to 3)
Content	Insufficient content	Some topics or part missing	All necessary topics covered.	
References	No research papers referred	Few research papers referred but no IEEE/ scopus indexed paper referred	Scopus / IEEE / reputed paper referred	
Representation	No alignment, No caption in figures and tables and no citation	Citation missing but alignment and caption proper	Citation to references present along with captions and alignment of content.	
Abidance to Template	Not at all	Some what	Good	
			Total	

Report Rubrics to TW Conversion

>=10	<10 & >=8	<8 & >=6	<6 & >=4	<4
5	4	3	2	1

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Attendance (To be filled by Project Coordinator)					5
Project Review Performance (To be filled by Project Coordinator)					5
Report (To be filled by Guide)					5
CIE by Guide (Weekly) (To be filled by Guide)					10
Total Term work					**25**

H.o.D. Computer **Project Coordinator** **Project Guide**