NATIONAL INSTITUTE OF TECHNOLOGY, AGARTALA

GAS LEAK DETECTOR PROJECT REPORT

Industrial Instrumentation Laboratory Project

Department of Electronics and Instrumentation Engineering

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BONAFIDE CERTIFICATE

This is to certify that this project report titled "Gas Leak Detector", submitted to the National Institute of Technology, Agartala, is a bonafide record of work done by:

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During the Fifth Semester, 2023.

Place : NIT Agartala   Signature of Supervisor

Date : 02-11-2023 (Thursday)

DECLARATION BY AUTHOR(S)

This is to declare that this project report has been written by me/us. No part of this report has been plagiarized from other sources. All the information included from other sources have been duly acknowledged. I/We shall take full responsibility in case if any part of the report is found to be plagiarized.

Place : NIT Agartala   Signatures

Date : 02-11-2023 (Thursday)

ACKNOWLEDGEMENT

We wish to express our sincere appreciation to Dr. Rupam Gupta Roy, Mr. Kailash Pratim Phukan & Mr. Suraj Das for their exceptional guidance and supervision during the preparation of an enthralling project that has provided us with an unparalleled learning experience. Their mentorship has been invaluable in enabling us to enhance our professional and personal growth, which has made us more confident and competent in our field of work. Their unwavering support has been instrumental in helping us successfully complete the project to the highest standards possible. We are deeply grateful for their significant contributions, which have had a positive impact on our academic and professional journey.

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Date : 02-11-2023 (Thursday)

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AIM

To design an automatic CNG/LPG gas leakage detection & accident prevention system using an MQ6 & Arduino Uno.

OBJECTIVE

Gas leakage tragedies and accidents have led to heavy losses over the years. So, it is very important to detect the presence of gas leaks, raise timely alarms, and enhance safety by preventing potential hazards associated with gas leaks. So here we propose a system to detect LPG/CNG gas leakage scenarios and provide a security alert to intended users. We have built the system using an MQ6 gas detection sensor and interface it with an ATmega328 microcontroller Arduino UNO R3. The system typically aims to:

- Detect gas leaks
- Provide early warnings
- Ensure safety
- Monitor gas levels
- Enable automation in some cases

COMPONENTS REQUIRED

Serial No.	Name of the component	Specification	Quantity
1	Arduino Uno R3	Microcontroller ATmega328 – Interface CH340G Operating Voltage: 5V Digital I/O Pins: 14 Analog Input Pins: 6	1
2	MQ6 gas sensor	Operating Voltage: 5V MOS type	1
3	Relay Module	Single Channel Input/Trigger Voltage: 5V Current: 20mA (max) Status Indicator LEDs	1
4	Exhaust Fan	Number of blades: 9 Rated voltage: DC 5V Current rating: 0.15A Power consumption:1.8W Brushless	1
5	LED	Round shaped Rated voltage: DC 5V Power consumption:1W	1
6	Piezo Buzzer	Input Voltage: 5V DC Sound Output - ~85dB	1
7	Rechargeable Battery (with charger & clips)	Lead Acid 4v, 2.0AH	3
8	Stepper Motor (with attached fan)	Voltage: 3-6V Speed: 9000-15000 RPM	1
9	Male-to-male jumper wires	-	As required

10	Double tape	-	As required
11	Cardboard	-	1
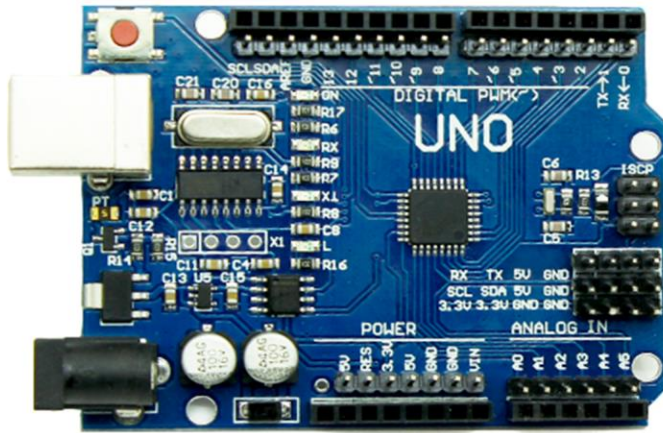
Arduino Uno R3
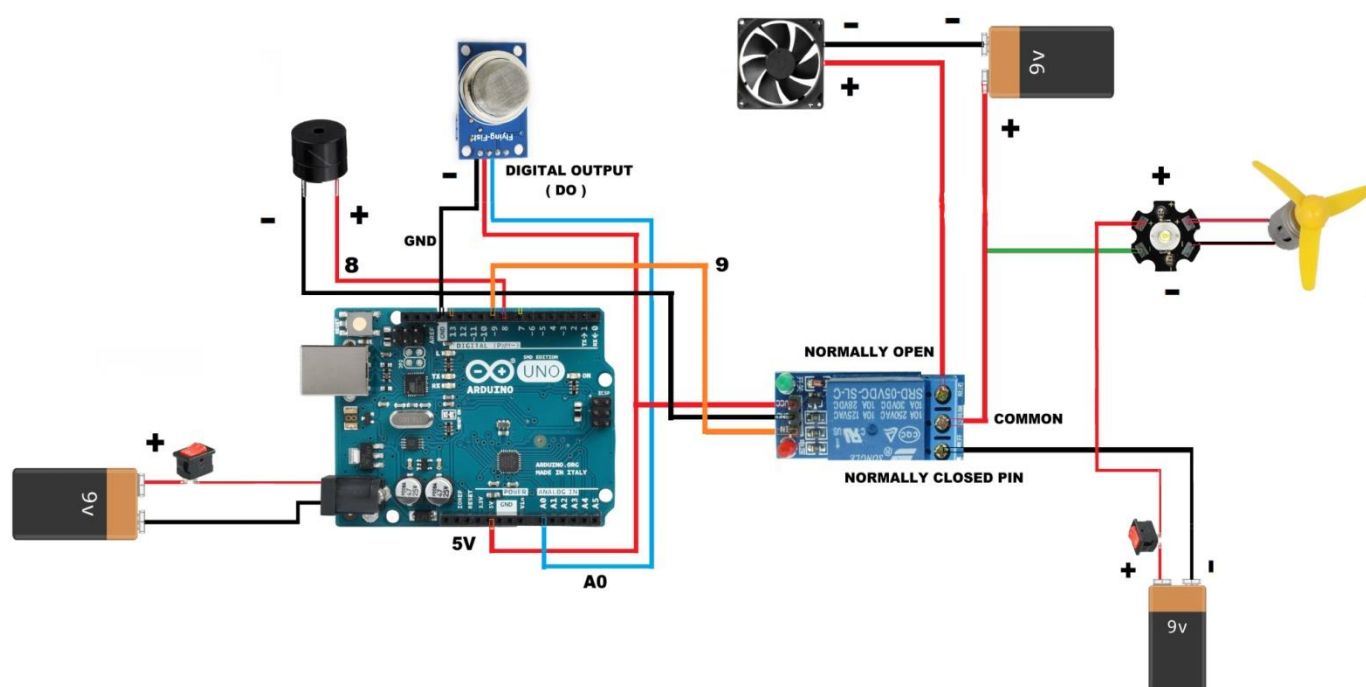

MQ-6 gas sens

Small Round LED

Piezo Buzzer

CIRCUIT DIAGRAM

WORKING

Our system uses the gas sensor to detect LPG/CNG gas leakages. The gas sensor sends out a signal to the microcontroller as soon as it encounters a gas leakage. The Arduino reads sensor data and compares it to preset thresholds. The microcontroller processes this signal and all of the lights & fans are turned off & the buzzer starts beeping in order to alert the person inside the room. Also, the exhaust fan turns on itself after the leak is detected to air out the leaked gas. After all of the gas is cleared, the buzzer will stop beeping & all of the lights & fans will turn back on. Some systems may offer real-time gas concentration displays, data logging, and notifications. This safety device continuously monitors the environment, aiming to prevent accidents, fires, or health hazards associated with gas leaks, ensuring timely detection and response to gas leak incidents.

CODE (FOR ARDUINO)

```
#define Sensor pin = A1;
#define relay pin = D9;
#define Buzzer Pin = D8;
#define sensorDigital A1
#define relay 9
#define buzzer 8
#define sensorAnalog A1
void setup()
{
pinMode(sensorDigital, INPUT);
pinMode(relay, OUTPUT);
pinMode(buzzer, OUTPUT);
Serial.begin(9600);
}
void loop()
```

```
{
bool digital = digitalRead(sensorDigital);
int analog = analogRead(sensorAnalog);
Serial.print("Analog value : ");
Serial.print(analog);
Serial.print("t");
Serial.print("Digital value :");
Serial.println(digital);
if (digital == 0){
digitalWrite(relay, LOW);
digitalWrite(buzzer, HIGH);
delay(5000);
digitalWrite(relay, HIGH);
digitalWrite(buzzer, LOW);}
else{
digitalWrite(relay, HIGH);
digitalWrite(buzzer, LOW);}
}
```

APPLICATIONS

1. Home Safety: Detecting gas leaks in residential areas, such as natural gas or propane, to ensure the safety of occupants.

2. Industrial Safety: Monitoring for gas leaks in industrial settings, where various gases may pose safety risks.

3. Laboratory Use: Ensuring the safety of personnel and experiments by detecting gas leaks in laboratories where hazardous gases are used.

4. Commercial Kitchens: Detecting gas leaks in restaurants and commercial kitchens where natural gas or propane is used for cooking.

5. HVAC Systems: Monitoring for refrigerant leaks in air conditioning and refrigeration systems to maintain efficiency and reduce environmental impact.

6. Fuel Stations: Ensuring the safety of fuel stations by detecting gasoline or diesel fuel leaks.

7. <u>Waste Management</u>: Monitoring for landfill gas leaks, such as methane, in waste disposal facilities.

8. <u>Chemical Plants</u>: Detecting gas leaks in chemical processing plants to prevent accidents and protect workers.

These applications demonstrate the versatility and importance of gas leak detector systems built with Arduino Uno in various environments where gas leaks can be a safety concern.

ADVANTAGES	DISADVANTAGES
1. Cost-Effective: Arduino Uno is an affordable microcontroller, making the system cost-effective for DIY projects and small-scale applications.	1. Limited Sensing Range: Arduino Uno may have limited sensing range, requiring multiple sensors for larger areas.
2. Customizability: It allows for easy customization and integration with other sensors or systems, adapting to specific needs.	2. Complexity: Designing a reliable gas leak detection system with Arduino may require technical expertise.
3. User-Friendly: Arduino's open-source platform is user-friendly, making it accessible to hobbyists and enthusiasts.	3. False Alarms: Depending on sensor quality, the system may be susceptible to false alarms or inaccuracies.
4. Versatility: Arduino can be used to detect various types of gases by	4. Power Limitations: Arduino Uno may have power limitations, which can be a drawback for continuous monitoring

selecting appropriate gas sensors.	applications.
5. Real-time Monitoring: Gas leak detection and alerts can be provided in real-time, enhancing safety.	5. Limited Connectivity: Built-in connectivity options for remote monitoring may be limited without additional components.
	6. Scalability: Scaling up the system for extensive industrial use may be challenging without more powerful hardware.

CONCLUSION

In conclusion, such a system offers a versatile and accessible solution for detecting gas leaks in various applications, ranging from home safety to small-scale industrial settings. While it provides real-time monitoring and user-friendly customization, it has limitations such as a restricted sensing range, potential for false alarms, and power constraints. This system is well-suited for smaller-scale projects and environments but may not be suitable for large or complex industrial applications without additional hardware and expertise. Overall, it is a valuable solution for smaller-scale projects and applications where cost-effectiveness and customization are priorities.

BIBLIOGRAPHY

1. Images: Instrumentation Tools
            Innovativeideasyoutube

2. https://nevonprojects.com/gas-leak-detector

3. https://electronicsprojects.in/lpg-gas-leakage-detector-using-arduino-mq6-gas-sensor-led-and-buzzer/

4. https://www.irjmets.com/uploadedfiles/paper/issue_4_april_2022/20877/final/fin_irjmets1650097715.pdf

5. https://techatronic.com/lpg-gas-leakage-detector-using-arduino-arduino-project/

6. https://www.ijert.org/gas-detection-system-using-arduino

7. https://www.researchgate.net/publication/347495607_Gas_leakage_detection_and_alerting_system_using_Arduino_Uno