A Practical activity Report submitted

for Engineering Design Project-II (UTA-014)

by

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Submitted to

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Objective: To design a microcontroller based LPG detection system.

Components Used:

S.No.	Material	Description	Quantity	Cost
1.	Arduino UNO	Microcontroller	1	380
2.	MQ-6	Gas sensor	1	115
3.	Piezo Buzzer	5V Active buzzer	1	40
4.	Jumper wires	-	10-20	20
5.	LED	5mm	2	2*2=4
6.	Resistors	1kohm,4.7kohm	3,1	2.5*3+2=9.5
7.	LCD display	16x2 LCD display	1	90
8.	Breadboard	-	1	70

Tentative Cost: The tentative cost for the LPG detection system comes out to be ₹ 728.5 (this is an approximate value).

Introduction: There are many things which are essential to human life and yet dangerous but they are so intertwined with our life that it is not easy to give upon them. LPG is one such example as it is a highly flammable gas yet is a necessity in every household. Even though a compound name Ethanethiol is added to LPG for a distinct odor so leakage is detected still sometimes it is hard to detect LPG leak. Hence, we have designed a LPG detection system to alert about the leakage with help of a buzzer, LED and LCD display.

Description of main components used in the circuit:

1. **Arduino UNO:** Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller. It is used to control the whole system by programming it accordingly.

2. **MQ 6 (Gas Sensor):** MQ-6 is a gas sensor is sensitive to propane, butane and LPG. Sensitive material of MQ-6 gas sensor is SnO2. When the target combustible gas comes in contact with the sensor, the sensor's conductivity increases in direct proportion with the gas concentration.

3. **Piezo Buzzer:** Piezo buzzers are simple devices that can generate basic beeps and tones. They work by using a piezo crystal which changes its shape when voltage is applied to it.

4. **LCD Display:** An LCD is an electronic display module that uses liquid crystal to produce a visible image. It is 16×2 LCD display and it is named so because it has 16 Columns and 2 Rows.

5. **LED:** A light-emitting diode (LED) is a semiconductor light source that emits light when current flows through it. It has two leads, positive lead (Anode) and a negative lead (cathode).The longer lead of the LED is generally anode.

Working of the unit:

When the gas interacts with the sensor it is ionized into its constituents and is then adsorbed by the sensing element. This adsorption creates a potential difference on the element .The sensor outputs a voltage that is proportional to the concentration of gas i.e. greater the concentration of the gas, greater will be the output voltage.

Sensitivity of the sensor can be adjusted using in built potentiometer depending on how accurate a gas has to be detected. The output can be an analog signal or a digital output. The sensor's output is then processed by Arduino which further activates the piezo buzzer, LED and display a message on the LCD display accordingly.

Working of components on per scenario basis:

1. When there is no LPG leakage :
    - Green LED will glow.
    - "Safe – All Clear" message will be displayed on the LCD display.
2. When there is LPG leakage:
    - Red LED will glow.
    - Piezo buzzer will be activated and it will start beeping.
    - "Alert-Evacuate" message will be displayed on the LCD display.

Selection criterion of the sensor: Reasons of selecting MQ6 sensor over other alternatives (MQ-2, MQ-5,AQ-2, MQ-306A, AQ-3) are:

- Fast response
- Stable and long life
- Inexpensive
- Simple drive circuit
- Highly sensitive to combustible gases.

Selection criterion for the microcontroller:

- Easy to use hardware.
- Open source and extensible software.
- The hardware consists of a micro-controller with other electronics components which can be programmed using the software to do almost any task.
- Simple and clear programming environment.

Signal Conditioning:

When the leakage is detected by the MQ6 gas sensor it sends analog values (0-5V) to the microcontroller. This voltage value is directly proportional to the concentration of the LPG as we already discussed.

When the concentration of LPG gas exceeds the threshold value set by us, the microcontroller reacts by activating the buzzer, flashing the red LED light and even displaying a message on the LCD display.

PTO

Block Diagram:

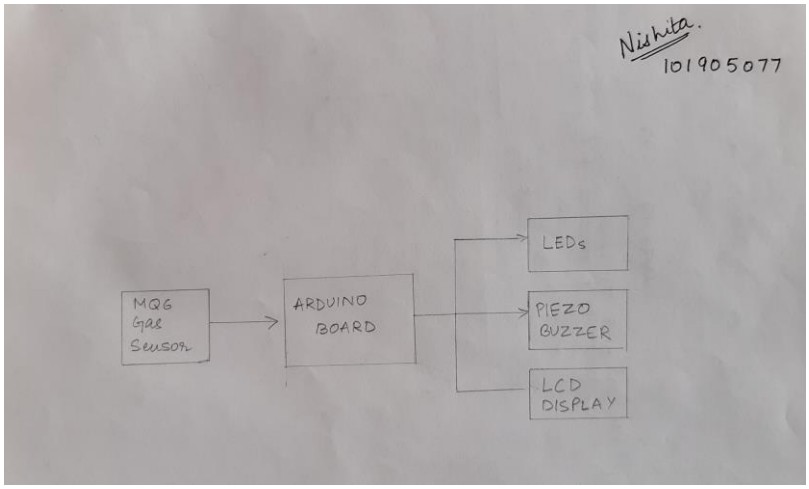

Fig1. Block diagram of the LPG detection system

Circuit Diagram:

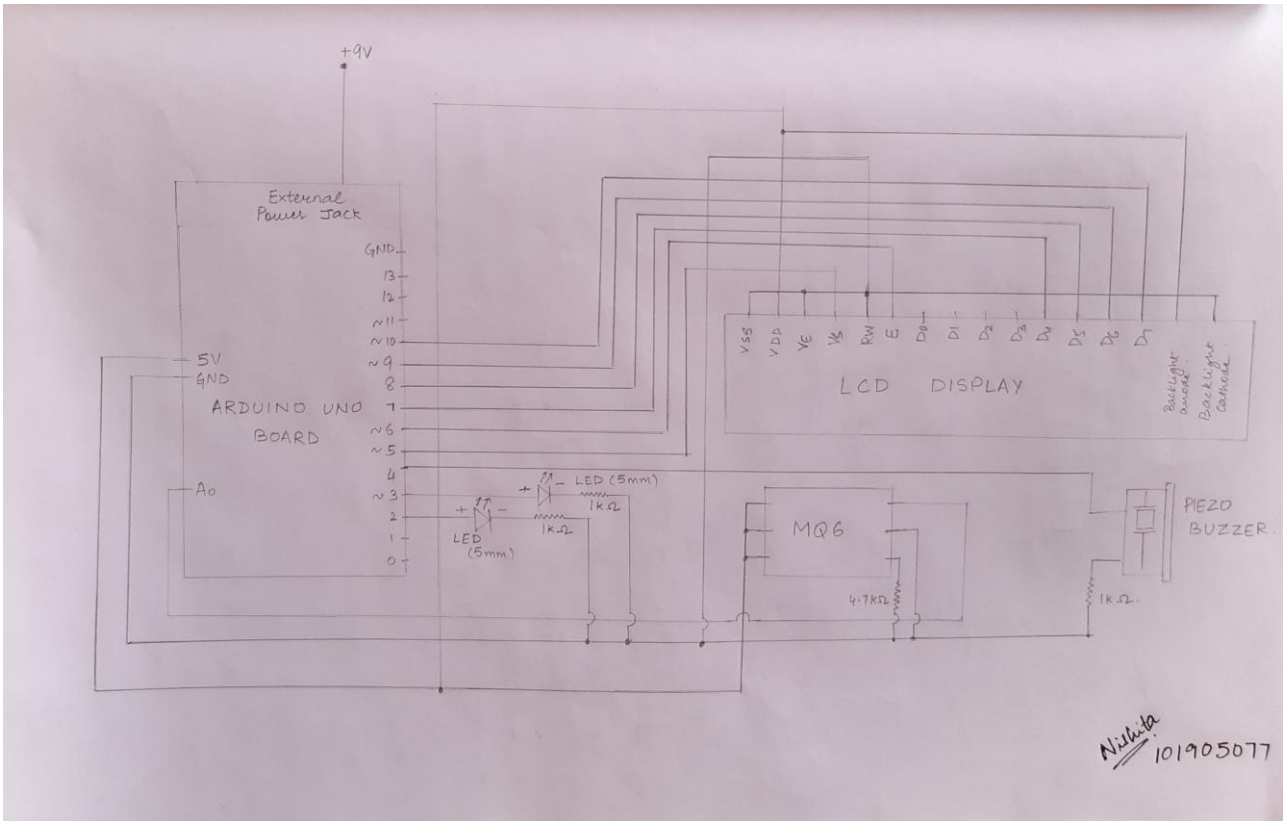

Fig2. Circuit diagram of the LPG detection system.

Discussion:

- We have designed a LPG detection system using a microcontroller(Arduino UNO) and a gas sensor(MQ 6).
- This module can be used to detect LPG leaks in households as well as industries.
- This module can further be incorporated with LCD display and a GSM module to display the gas concentration in ppm and send a message to user's device.

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Signature of Faculty Member