GAS LEAKAGE MONITORING AND ALERTING SYSTEM FOR INDUSTRIES

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Project Title	Gas leakage monitoring and alerting system for industries

Abstract:

Safety plays a major role in today's world and it is necessary that good safety systems are to be implemented in places of education and work. This work modifies the existing safety model installed in industries and this system also be used in homes and offices. Gas Leakages in open or closed areas can prove to be dangerous and lethal. Leakage in any kind of gas are concern in recent years,whether it is an residential area, a cafe, or a canteen or industrial sectors. The traditional Gas Leakage Monitoring Systems though have great precision, fail to acknowledge a few factors in the field of alerting the people about the leakage. Therefore we use latest technology like Internet of Things based Gas leakage monitoring, leakage detecting and alerting system is proposed. The moment gas leakage will probably be recognized, users will be informed via SMS through GSM module. The system will monitor the gas and display through LCD display. Whenever the leakage is detected the buzzer begins sound. Also store the data using cloud data storage. This will detect the harmful gases in environment and alerting to the user through alarm and sending notification.

Introduction:

Internet of Things aim towards making life simpler by automating every small task around us. As much is IoT helping in automating tasks, the benefits of IoT can also be extended for enhancing the existing safety standards. Safety has always been an important criterion while designing home, buildings, industries as well as cities. The usage of the gas brings great problems in the domestic as well as working places. The inflammable gas such as Liquidized petroleum gas (LPG), which is excessively used in the house and at work places. The leakage of the gas causes destructible impact to the lives and as well as to the heritage of the people. Some traditional model to detect the leakage are fails due to the industrial factors. So we have to develop the gas leakage monitoring and alerting system using iot device. The device will monitor the gas level through LCD display and it to the cloud storage and the device detect the gas leakage it immediately raise the buzzer alarm and send SMS alert to user using GSM module.The main objective of this project is that it is extremely accurate with a least cost, this project system is best to detect gas leakage and also warn people around by buzzer beep sound and an SMS is been send to the responsible person.

Objective:

The device is developed based on sensor-based automatic gas leakage detector it raise buzzer alarm and send notification to the responsible person phone number.

The gas sensors help detect the concentration of the gases present in the atmosphere to avoid hazardous consequences like fire breakouts.Gas leakage occurs it affect lot of people and it makes big disaster.

Problem Formulation:

In our day-to-day life we all are using gas for cooking purpose and many industry use different types of gas. In home we use LPG gas sometimes we didn't notice gas leakage so it cause disaster. In Industries use different type of gas, the gas is transferred through pipeline so incase leakage occur it affect the all worker life. For example the recent accidents in 2022 is surat gas leakage. The surat gas leakage cause lot of damage and many people are died due to this incidents. The reason behind this accident is the industry doesn't take care of employees and the industry dump the chemical waste drain so it cause gas leakage. Many of the industry doesn't use the device to detect the gas leakage avoid the disaster. So we use detector to detect the harmful and hazardous gas in environment so industries must use detectors to prevent from disaster.

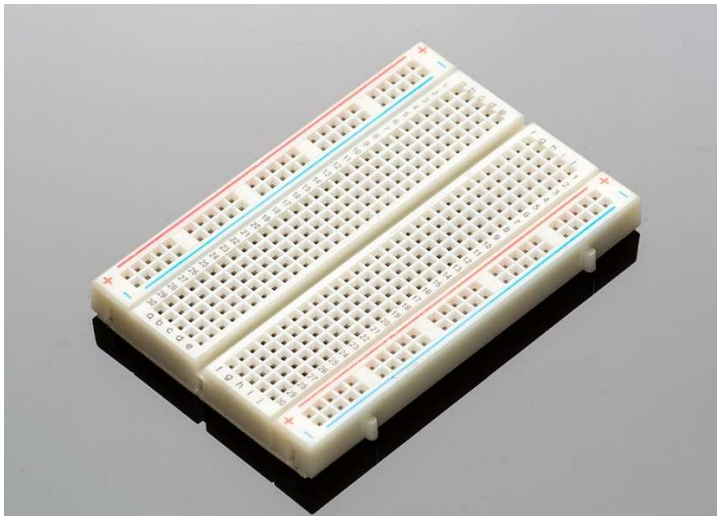
List of Component:

S.NO	Components
1.	Arduino Uno R3
2.	Breadboard
3.	Piezo
4.	Resistor
5.	LCD 16 X 2
6.	DC Motor
7.	Gas Sensor
8.	LED
9.	Pushbutton
10.	Rotary Potentiometer

1. Arduino Uno R3:

Arduino Uno R3 is one kind of ATmega328P based microcontroller board. It includes the whole thing required to hold up the microcontroller; just attach it to a PC with the help of a USB cable, and give the supply using AC-DC adapter or a battery to get started. The term Uno means “one” in the language of “Italian” and was selected for marking the release of Arduino’s IDE 1.0 software. The R3 Arduino Uno is the 3rd as well as most recent modification of the Arduino Uno. Arduino board and IDE software are the reference versions of Arduino and currently progressed to new releases. The Uno-board is the primary in a sequence of USB-Arduino boards, & the reference model designed for the Arduino platform.

2. Breadboard:

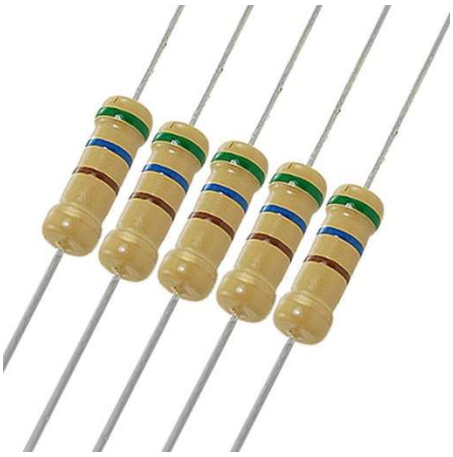


A Breadboard is simply a board for prototyping or building circuits on. It allows you to place components and connections on the board to make circuits without soldering. The holes in the breadboard take care of your connections by physically holding onto parts or wires where you put them and electrically connecting them inside the board. The ease of use and speed are great for learning and quick prototyping of simple circuits. More complex circuits and high frequency circuits are less suited to breadboarding. Breadboard circuits are also not ideal for long term use like circuits built on perfboard (protoboard) or PCB (printed circuit board), but they also don't have the soldering (protoboard), or design and manufacturing costs (PCBs).

3. Piezo:

Piezo buzzers are simple devices that can generate basic beeps and tones. They work by using a piezo crystal, a special material that changes shape when voltage is applied to it. If the crystal pushes against a diaphragm, like a tiny speaker cone, it can generate a pressure wave which the human ear picks up as sound.

4. Resistor:



A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element. In electronic circuits, resistors are used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines, among other uses.

5. LCD 16 x 2:

An electronic device that is used to display data and the message is known as LCD 16×2. As the name suggests, it includes 16 Columns & 2 Rows so it can display 32 characters (16×2=32) in total & every character will be made with 5×8 (40) Pixel Dots. So the total pixels within this LCD can be calculated as 32 x 40 otherwise 1280 pixels.

6. DC Motor:

The Direct Current motor or the DC motor helps to convert electrical energy into mechanical energy. It is used in majority of household applications and electronic devices. It is widely used in CD players, computers, remote control airplanes, electric razors and so forth.

7. Gas Sensor:

A gas sensor is a device which detects the presence or concentration of gases in the atmosphere. Based on the concentration of the gas the sensor produces a corresponding potential difference by changing the resistance of the material inside the sensor, which can be measured as output voltage. Based on this voltage value the type and concentration of the gas can be estimated.

8. LED:

LED (Light Emitting Diode) is an optoelectronic device which works on the principle of electro-luminance. Electro-luminance is the property of the material to convert electrical energy into light energy and later it radiates this light energy. In the same way, the semiconductor in LED emits light under the influence of electric field. The symbol of LED is formed by merging the symbol of P-N Junction diode and outward arrows. These outward arrows symbolise the light radiated by the light emitting diode.

9. Pushbutton:

A **push-button** (also spelled **pushbutton**) or simply **button** is a simple switch mechanism to control some aspect of a machine or a process. Buttons are typically made out of hard material, usually plastic or metal.

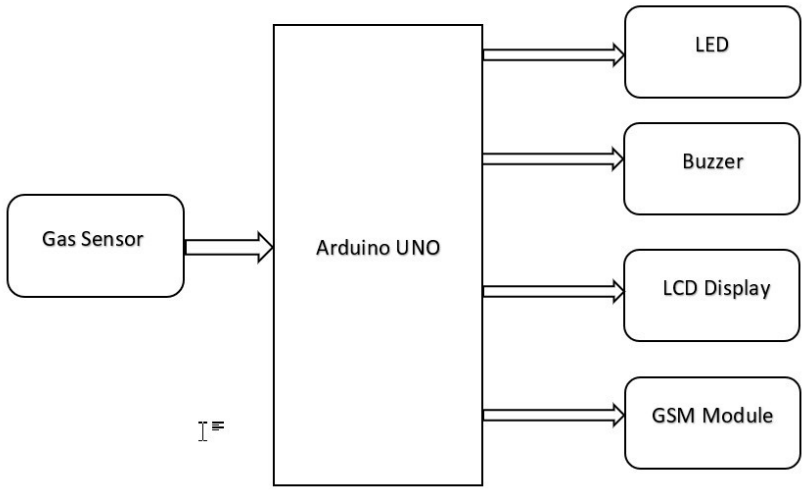
10.Rotary Potentiometer:

The rotary type potentiometers are used mainly for obtaining adjustable supply voltage to a part of electronic circuits and electrical circuits. The volume controller of a radio transistor is a popular example

of a rotary potentiometer where the rotary knob of the potentiometer controls the supply to the amplifier.

This type of potentiometer has two terminal contacts between which a uniform resistance is placed in a semi-circular pattern. The device also has a middle terminal which is connected to the resistance through a sliding contact attached with a rotary knob. By rotating the knob one can move the sliding contact on the semi-circular resistance.

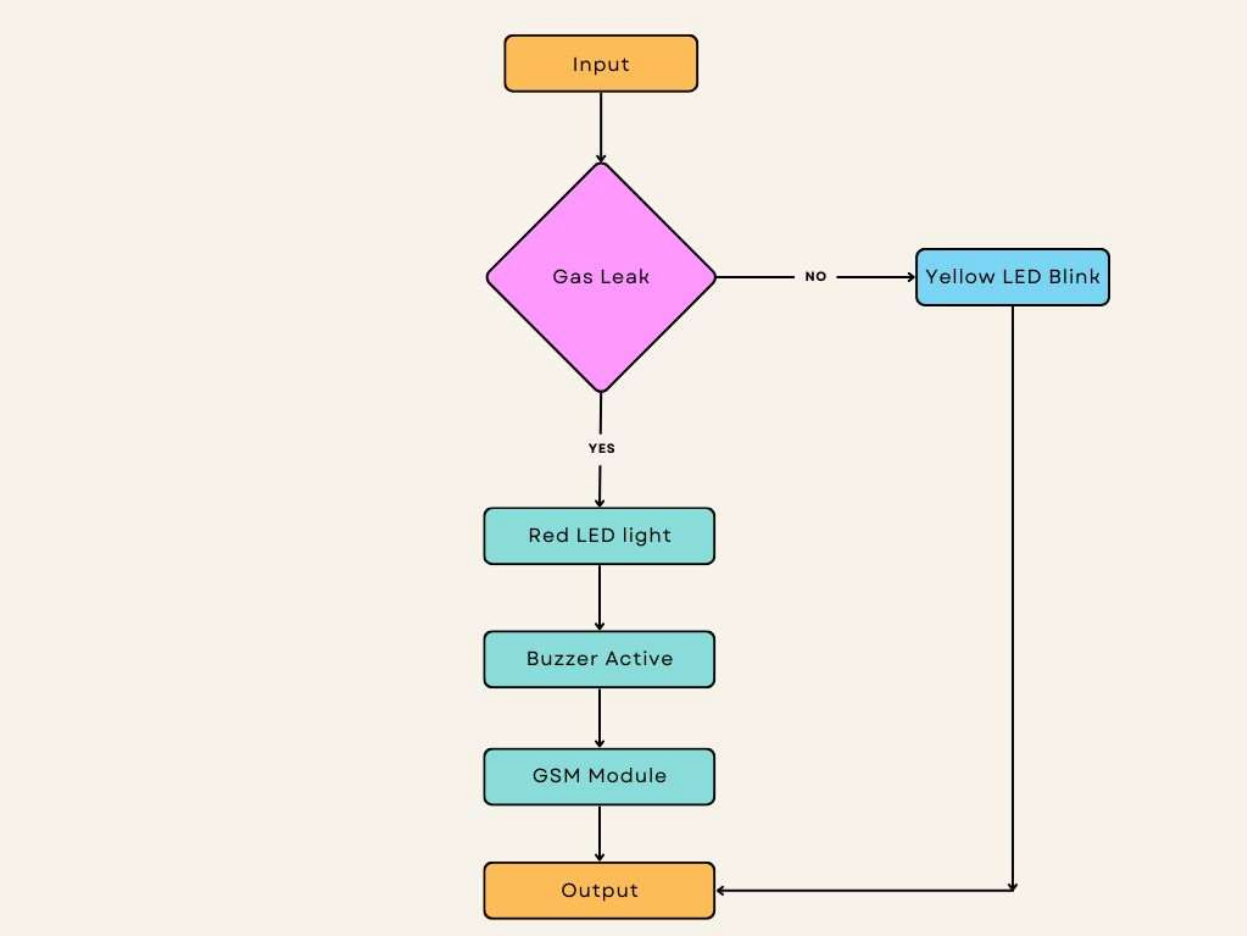
Block Diagram:



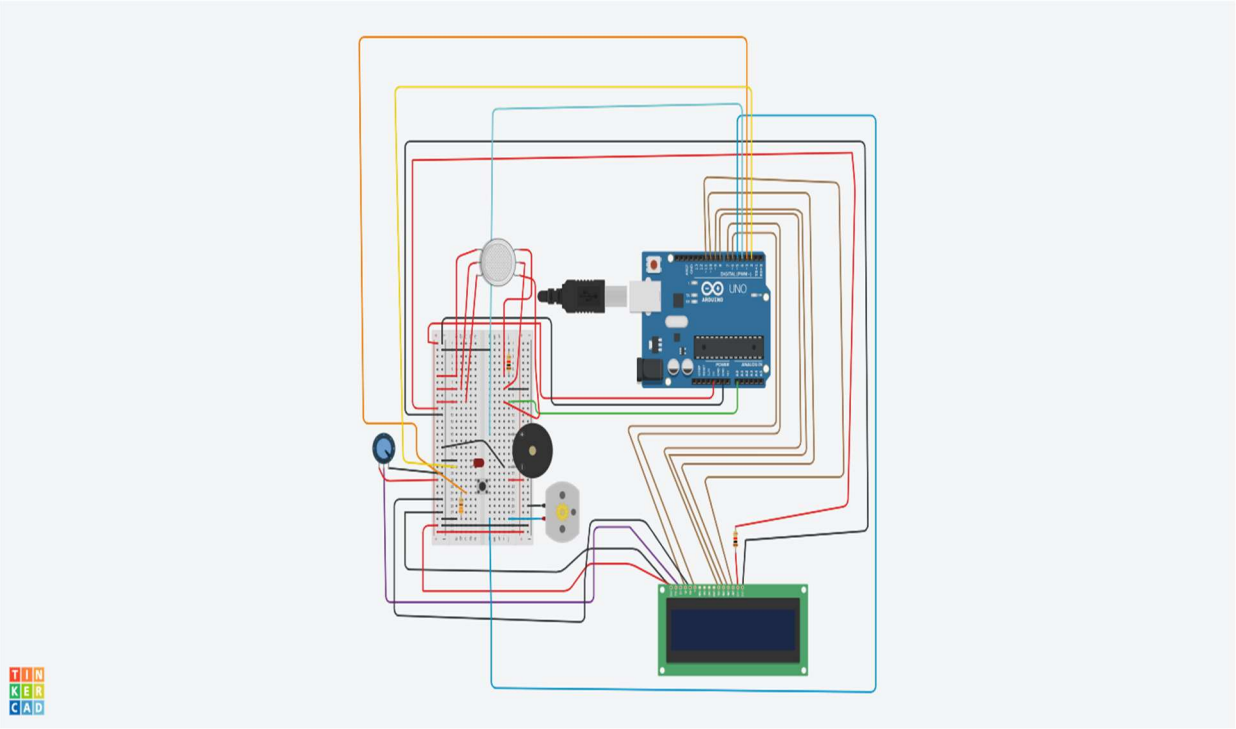
Proposed method:

Arduino UNO (Atmega-328) is the main unit of the system which performs the following tasks. A signal conditioning of the Arduino UNO is done by output signal of the sensor, provided input to Arduino. The detection results displayed on LCD. Indicates the people of danger in work place, factory, home. Buzzer activity with beep(siren) sound is made. Also send alert SMS to the in charge of the plant whose number is saved in SIM card by using GSM modem. The SMS received depends upon the leak of gas in the detection area of the sensor.

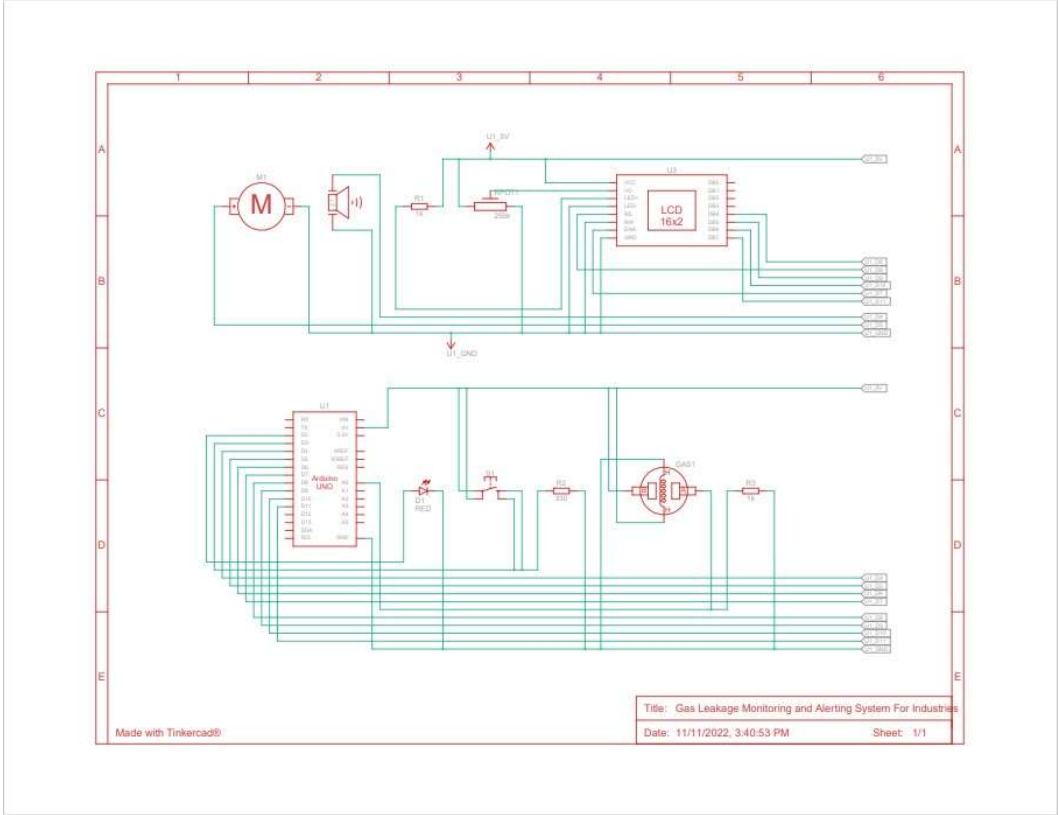
Flow Chart:


Input
Gas Leak
NO
Yellow LED Blink
YES
Red LED light
Buzzer Active
GSM Module
Output

Circuit Diagram:



Schematic Diagram:



CODE:

```
#include <LiquidCrystal.h>
LiquidCrystal lcd(6, 7, 8, 9, 10, 11);
float gasPin = A0;
float gasLevel;
int ledPin = 2;
int buttonPin = 3;
int buzzPin = 4;
int buttonState;
int fan = 5;

void setup(){
  pinMode(ledPin, OUTPUT);
  pinMode(buttonPin, INPUT);
  pinMode(gasPin,INPUT);
  pinMode(fan,OUTPUT);
  Serial.begin(9600);
  lcd.begin(16, 2);
  lcd.setCursor(0,0);
  lcd.print(" Welcome");
  lcd.setCursor(0,2);
  lcd.print("PNT2022TMID19555");
```

```
  delay(500);
  lcd.clear();
}

void loop(){
  // Read the value from gas sensor and button
  gasLevel = analogRead(gasPin);
  buttonState = digitalRead(buttonPin);

  // call the function for gas detection and button work
  gasDetected(gasLevel);
  buzzer(gasLevel);
  exhaustFanOn(buttonState);
}
// Gas Leakage Detection & Automatic Alarm and Fan ON
void gasDetected(float gasLevel){
  if(gasLevel >= 200){
   digitalWrite(buzzPin,HIGH);
    digitalWrite(ledPin,HIGH);
    digitalWrite(fan,HIGH);
    lcd.setCursor(0,0);
   lcd.print("GAS:");
```

```
   lcd.print(gasLevel);
  lcd.setCursor(0,2);
  lcd.print("FAN ON");
  delay(1000);
  lcd.clear();
 }else{
  digitalWrite(ledPin,LOW);
   digitalWrite(buzzPin,LOW);
   digitalWrite(fan,LOW);
   lcd.setCursor(0,0);
  lcd.print("GAS:");
   lcd.print(gasLevel);
  lcd.setCursor(0,2);
  lcd.print("FAN OFF");
  delay(100);
  lcd.clear();
 }
}
//BUZZER
void buzzer(float gasLevel){
if(gasLevel>=200)
 {
```

```
  for(int i=0; i<=30; i=i+10)
  {
  tone(4,i);
  delay(300);
  noTone(4);
  delay(4300);
  }
  }
}
// Manually Exhaust FAN ON
void exhaustFanOn(int buttonState){
  if(buttonState == HIGH){
    digitalWrite(fan,HIGH);
    lcd.setCursor(0,0);
   lcd.print("Button State:");
    lcd.print(buttonState);
    lcd.setCursor(0,2);
    lcd.print("FAN ON");
    delay(10000);
    lcd.clear();
  }
}
```

Solution Statement:

This project mainly focuses on the detection of gas leakage and providing security when the user is around or away from home. The use wireless technology for providing security against gas leakage to users hence cost effective and more adaptable. The system comprises of sensors for detecting gas leak interfaced to microcontroller that will give an alert to user whenever there is a gas leakage, display warning information by using Liquid Crystal Display (LCD). This will enable the user to take precaution of explosion disaster which may result on Liquefied Petroleum Gas (LPG) cookers like loss of properties, injury or even death. GLDS provides ideal solution to gas leakage problems faced by home owners in daily life.

Conclusion:

After this project performance, can conclude that detection of the LPG gas leakage is incredible in the project system. Applicable usefully in the industrial and domestic purpose. In danger situations we are able to save the life by using this system. An alert is indicated by the GSM module. A sensor node senses gas like CO2, oxygen, propane. The estimated range of transmission and consumption of power is obtained. The simple procedures and Arduino UNO Micro controller area used to build the sensor.