University Of Petroleum And Energy Studies

PROJECT TITLE-
IoT Based Gas Leakage Monitoring System using FPGA

PROJECT SYNOPSIS

IoT Based Gas Leakage Monitoring System using FPGA

Bachelor of Computer Applications(BCA)

Internet Of Things(Iot)

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6. Proposed Topic - **IoT Based Gas Leakage Monitoring System using FPGA**

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Introduction

Gas leak detection is the process of identifying potentially hazardous gas leaks by mean of sensors. These sensors usually employ an audible alarm to alert people when dangerous gas has been detected. The primary objective of this project is to design a Gas Leakage Detection and Monitoring system for industries and homes, which is based on the FGPA or its prototype, Arduino. The proposed system uses a MQ2 Gas Sensor Module, which is interfaced with the Arduino board, further board will send the instruction to Relay which will cut OFF the Running Power, the total circuit units are arranged on breadboard.

Problem definition-

Gas leakage leads to various accidents resulting in both material loss and human injuries. After the effects of harmful gases on human health were discovered gas leak detection methods became concern.

Objective/Aim-

A gas detector is a device that detects the presence of gases in an area, often as part of a safety system where security is an important issue. Gas detectors can be used to detect combustible,
flammable and toxic gases, and oxygen depletion. This type of device is used widely in industry and home. Our aim is to make a very accurate and cheap sensor which gives the precise readings and alerts the user.

Literature Survey:

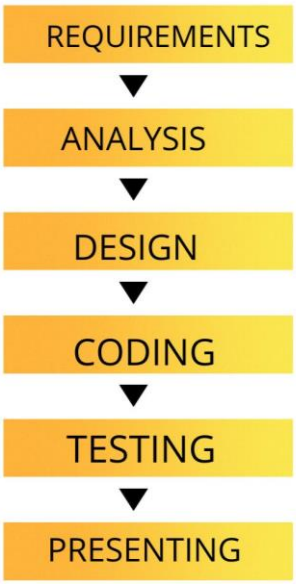
In the year 2019 a paper: “Gas Leakage Detection Based on IOT” Amatul Munazza (Dept. ECE GITAM School of Technology Bengaluru, India) proposed a microcontroller-based system applying IOT to gas booking and gas detection. The sensor used in this system is capable of sensing and detecting leakage of gas, and the user receives notifications regarding the remaining gas in the cylinder as well as certain actions can be taken in order to prebook the new cylinder without any obstacles. This unit can be simply combined with an alarm unit, or a visual indication of the LPG awareness for further benefits.

In the year 2013 a paper: “GSM based gas leakage detection system” Rupa Tejaswi (Dept. ECE GITAM School of Technology Bengaluru, India) described a new method for gas leakage detection system at a low concentration. The leakage is sensed with the help of MQ-6 gas sensor. Sensor sends a signal to microcontroller. In the following step microcontroller sends an active signal to additional externally connected devices. Multiple SMS can be sent by altering programming GSM module. To change the SIM card, we have to make variations in program.

In the year 2019, “An IoT based LPG Leakage Sensing and Alerting System” Mrs. Saranga Mohan (Assistant Professor, Dept. ECE GITAM School of Technology Bengaluru, India) the paper focus on framework produced utilizing the Raspberry Pi 3. Raspberry Pi may be digital computer which might create and adjusted completely different ways it permits us to run different projects and moreover bolster distinctive peripherals that are to ways in which it permits us to run different projects and moreover bolsters numerous peripherals which are to be utilized in our framework MQ6 sensors are introduced on the point of the LPG Supply to acknowledge the spillage of gas, Once the button edge is achieved it will send an alarm message to power versatile, The message is send to Email. LED is warned while gas spillage takes places. The sound sign is associated with the framework. This data is kept in a webpage utilizing it. The whole working on the framework can be accomplished by executing a python code and by introducing the required sensor libraries.

Methodology/ Planning of work

- The main aim of this project is to ensure safe and easier gas leakage detection to avoid disasters that may occur due to negligence.



- The hardware required for this project are Arduino UNO, MQ2 gas sensor, LCD, Relay, Battery, GSM module, Buzzer, Connecting Wires.
- Gas leakage is detected through gas sensor MQ2 which is interfaced through Arduino.

- Along with the Arduino board we have interfaced buzzer.
- We have also used relay module which control one electrical circuit by opening and closing contacts in another circuit.

- As soon as the gas leakage is detected instantly a signal is sent through the MQ2 sensor to the Arduino.

- Once the signal is received in Arduino all the electric devices gets turned off through relay which inturn turns on exhaust fan and also turns on the beep sound of the alarm.It alerts person who is at some distant point from the spot.

- Once the leaked gas is completely removed again a signal is sent to the Arduino and subsequently to the relay which again turns on all the electronic devices.
- We have also interfaced a LCD which is used for displaying the status of gas leakage.

- The detection system uses FGPA to detect the leakage and automatically initiate a warning message through a GSM.

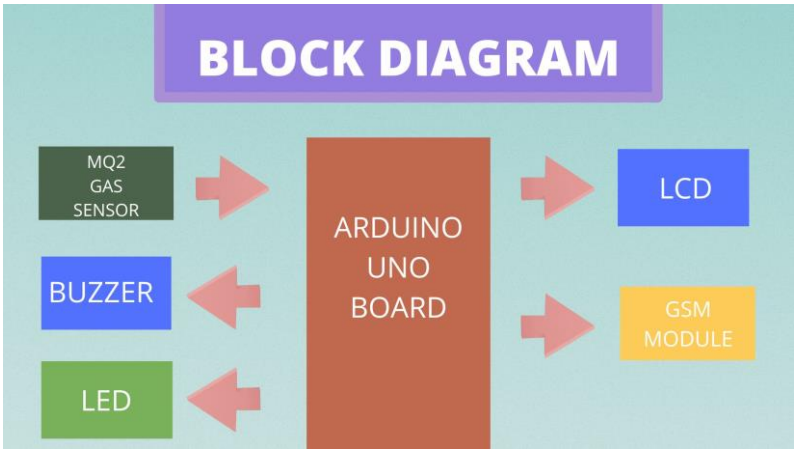


Fig.Block Diagram

Software/Hardware required

MQ2 Gas sensor (Fig.1.0) is a Metal Oxide Semiconductor (MOS) type Gas Sensor mainly used to detect gases like Methane, Butane, LPG, Smoke, etc. It is also known as Chemiresistors as the gas detection is based on the change of resistance of the sensing material when the Gas comes in to contact. If you want to measure a different type of Gas you can check these Gas Sensors. MQ2 Gas sensor module works on 5V DC and uses around 800mW. It can detect LPG, Smoke, Alcohol, Propane, Hydrogen, Methane and Carbon Monoxide concentrations in a range of 200 to 10000 ppm(Parts-per-million)

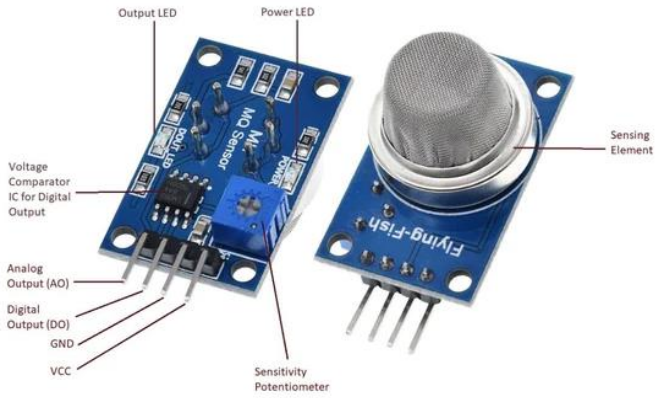


Fig.1.0

Arduino Uno R3 ATmega328P

An Efficient controller and smooth working is needed to continuously sense both leakage and level of the gas and also fast response is required when leakage found. Arduino is an open-source electronics platform based on easy to-use hardware and software.

The Arduino Uno R3 is an ATmega328P (Fig.2.0) microcontroller-based development board. This is widely popular in Embedded electronics because of the available resources and easy to use by everybody features. With 14 digital input/output pins where 6 can be configured and used as PWM outputs, 6 as analog inputs is a great addition for I/O related operations. Powered with a 16 MHz ceramic resonator, an USB connection, a power jack, an ICSP header, and a reset button.

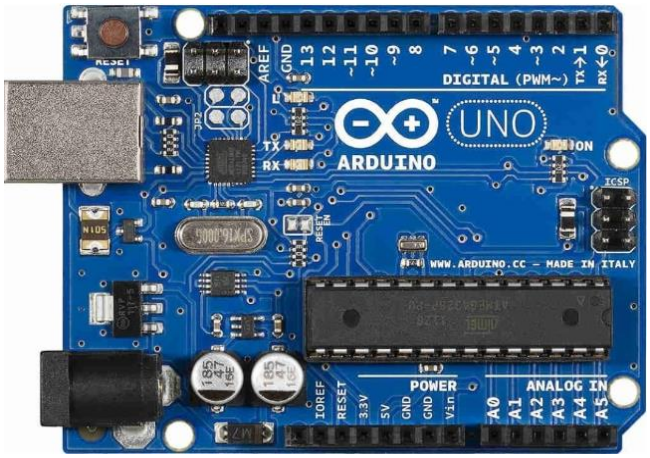


Fig.2.0

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LCD Display

It is necessary requirement to put a display about system monitoring and controlling performance which displays the alert message. Additionally, the system also displays the action carried out. For the work of displaying the alert message liquid crystal display(LCD)of 16*2characters operating of+5v supply and operated 4bit mode is implemented.

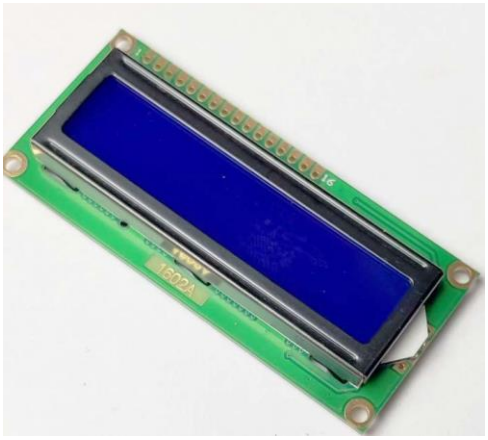

Fig.3.0

Buzzer

Buzzer A buzzer or beeper is a signaling device, usually electronic, typically used in automobiles and household appliances. It is an audible alarm for alerting the surrounding people.

Fig.4.0

Relay Module

Relay are the switches which aim at closing and opening the circuits. When the contact is open (NO), the relay isn't energizing with the open contact. However, if it is closed (NC), the relay isn't energize given the close contact. However, when the energy is supplied, the states are prone to change.

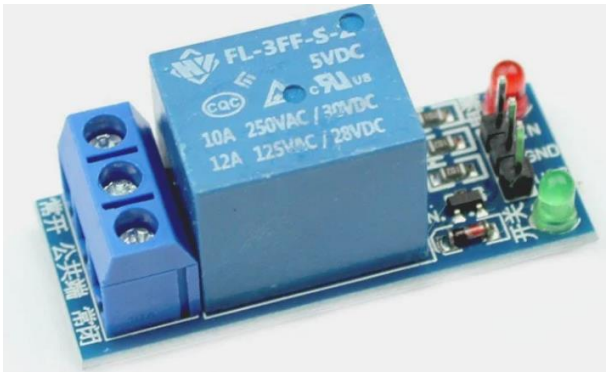

Fig.5.0

GSM Module

GSM (Global System for Mobile communication) Module (Fig.6.0) SIM900A The Global System for Mobile Communication is a standard developed by the European Telecommunications Standard Institute to describe the protocols for second generation digital cellular networks used by the mobile devices such as mobile phones and tablets. A GSM requires a SIM Card to be operated and operates over a network range subscribed by a network range subscribed by the network operator. It can be connected to a computer through serial, USB or Bluetooth connections.

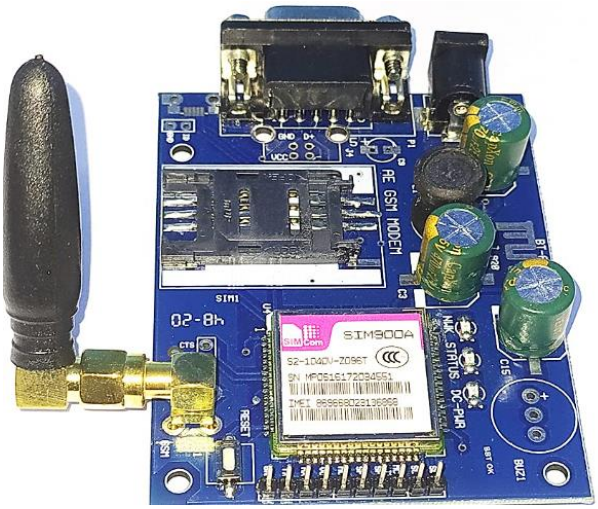

Fig.6.0

Basic Components -Breadboard (GL-12 840 Points), 3V Miniature DC Motor, 2-Pin SPST ON-OFF Mini Rocker Switch ,9V Battery, Jumper wires, LED

Application- Gas Industries, Nuclear PowerStation's, Municipal Gas Distribution, Mining of coal & other Material