

Gas Leakage Monitoring and Alerting System for Industries using IOT
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ELECTRONICS AND COMMUNICATION ENGINEERING

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ABSTRACT:

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, the elementary concern of any project, has not been left untouched by IoT. Gas Leakages in open or closed areas can prove to be dangerous and lethal. The traditional Gas Leakage Detector Systems though have great precision, fail to acknowledge a few factors in the field of alerting the people about the leakage. Therefore we have used the IoT technology to make a Gas Leakage Detector for Society. Leakage of gas is a major issue in the industrial sector, residential buildings, and gas-powered vehicles, one of the preventive methods to stop accidents associated with gas leakage is to install gas leakage detection devices. The focus of this work is to propose a device that can detect gas leakage and alert the owners to avert problems due to gas leakages. The system is based on a microcontroller that employs a gas sensor as well as a Arduino UNO R3, LCD display 16*2. The system was designed for gas leakage monitoring and alerts with SMS via and display through LCD. The circuit contains a Microcontroller gas sensor, LCD display, and LED, Piezo, DC Motor when the sensor detects gas leakage it transmit the information to the Microcontroller while the microcontroller makes a decision and then it will display on LCD. The output of this project will be significant in averting problems associated with gas leakages now and in future.

Index Terms: Gas Leakages, Gas Leakage Detector, Gas Sensor, Internet of

Things

INTRODUCTION:

The Internet of Things is a developing theme of specialized, social, and monetary centrality. Customer items, tough goods, cars and trucks, modern and utility segments, sensors, and other regular articles are being joined with Internet availability and amazing information systematic capacities that guarantee to change the manner in which we work, live, and play. The Internet of Things (IoT) is an essential theme in innovation industry, strategy, and designing circles . The focus of this work is to design a system that monitors gas leakage in an enclosed system using an Arduino Uno microcontroller and an alarm system are used to alert people within leakages neighborhood while SMS will be sent to the premises owner or safety organization to towards making decision to avert damages and loss of lives/properties. The objectives among others if the design is implemented are:

- i. To prevent loss of lives and properties when gas leakages occur
- ii. To enable prompt action by the premises owner and safety organization towards avert problems that may be associated with gas leakages.
- iii. To enable people around the gas leakages premises take action to prevent damages escalation.

Objective :-

The design of a sensor-based automatic gasleakage detector with an alert and control system has been proposed. This is an affordable, less power using, lightweight, portable,safe, user friendly, efficient, multi featured and simple system device for detecting gas. Gas leakage detection will not only provide us with significance in the health department but it will also lead to raise our economy, because when gas leaks it not only contaminates the atmosphere, but also wastage of gases will hurt our economy. The need for ensuring safety in workplaces is expected to be the key driving force for the

market over the coming years.

Problem Formulation:-

Gas leakage is nothing but the leak of any gaseous molecule from a stove, or a pipeline, or cylinder etc. This can occur either purposefully or even unintendedly. As we are aware that these kinds of leaks are dangerous to our health, and when it becomes explosive it could cause great danger to the people, home, workplace, industry and the environment. Few of the major incidents that took place due to gas leakage include the Bhopal Disaster and the Vizag Gasleak. The Bhopal disaster is known to be the worst industrial accident ever. Approximately 45 tons of Methyl Isocyanate was leaked from this insecticide plant. Methyl Isocyanate is an organic compound and a chemical that could come from the carbamate pesticides. This colorless, poisonous and flammable liquid is something that human beings have to be away from. Vizag Gas leak was a resultant of the escape of styrene that were unattended for a long period. This colorless oily liquid can spread in fumes. So, a detector must be made in such a way that could detect any kind of gas, fume, leak, smoke etc. However harmful and dangerous it can be, the detector could be attached with certain parameters that could help to prevent the issue

List of Components :-

S. No	Name of the Component	Quantity
1.	Arduino UNO R3	1
2.	Breadboard	1
3.	LED	2
4.	Resistor	5
5.	Piezo	1
6.	Gas Sensor	1
7.	LCD 16*2	1

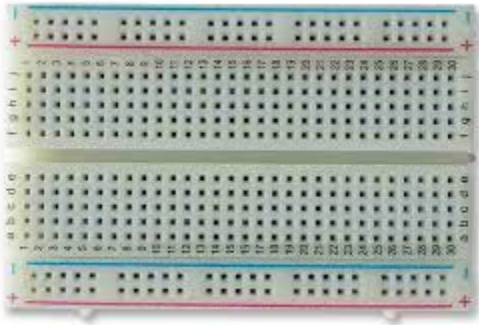
Arduino UNO R3 :



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 Board, & the reference model designed for the Arduino platform

Breadboard :-



A breadboard is a widely used tool to design and test circuit. You do not need to solder wires and components to make a circuit while using a bread board. It is easier to mount components & reuse them. Since, components are not soldered you can change your circuit design at any point without any hassle. It consist of an array of conductive metal clips encased in a box made of white ABS plastic, where each clip is insulated with another clips. There are a number of holes on the plastic box, arranged in a particular fashion. A typical bread board layout consists of two types of region also called strips. Bus strips and socket strips. Bus strips are usually used to provide power supply to the circuit. It consists of two columns, one for power voltage and otherfor ground. Socketstrips are used to hold most of the components in a circuit. Generally it consists of two sections each with 5 rows and 64 columns. Every column is electrically connected from inside.

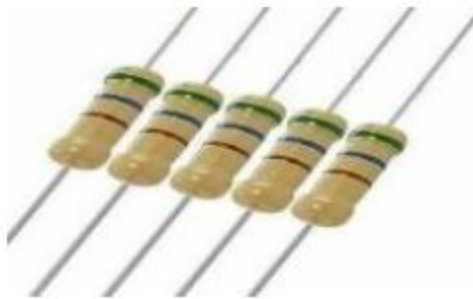
LED :-

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.



Resistor :-



A passive electrical component with two terminals that are used for either limiting or regulating the flow of electric current in electrical circuits.

Piezo :-

A piezo is a device that generates a voltage when force is applied or becomes deformed when voltage is supplied



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.

LCD 16*2 :-

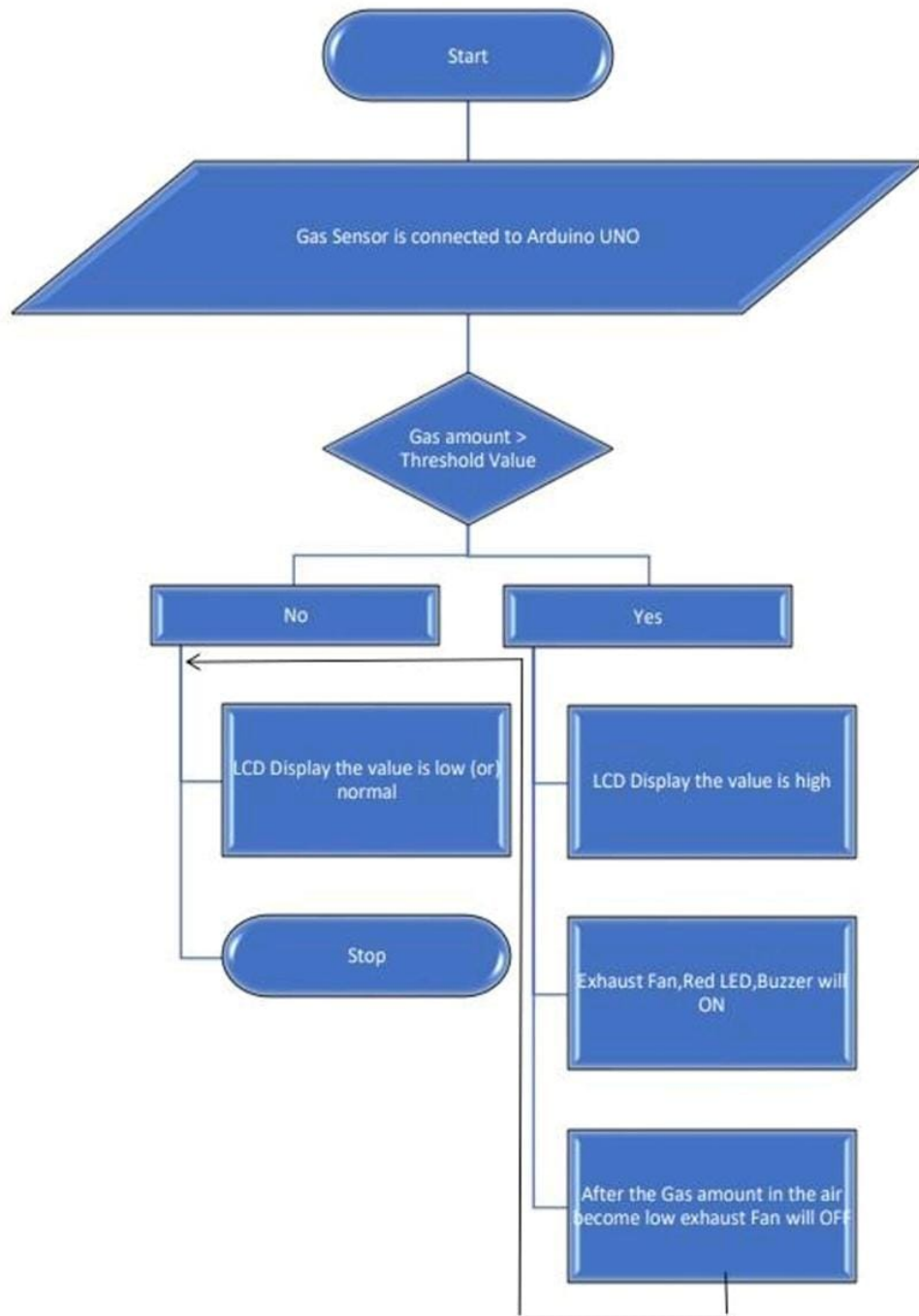


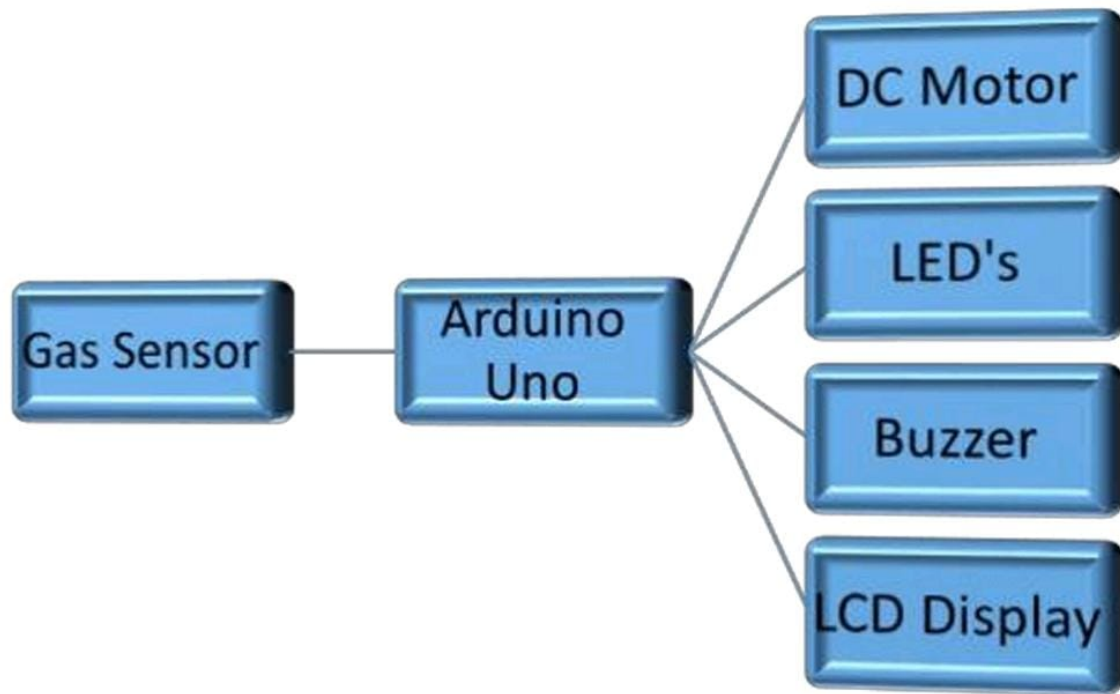
16×2 LCD is one kind of electronic device used to display the message and data. The term LCD full form is Liquid Crystal Display. The display is named 16×2 LCD because it has 16 Columns and 2 Rows. it can be displayed (16×2=32) 32 characters in total and each character will be made of 5×8 Pixel Dots. These displays are mainly based on multi-segment light emitting diodes. There are a lot of combinations of display available in the market like 8×1, 8×2, 10×2, 16×1, etc. but the 16×2 LCD is widely used. These LCD modules are low cost, and programmer-friendly, therefore, is used in various DIY circuits, devices, and embedded projects.

Proposed Method :-

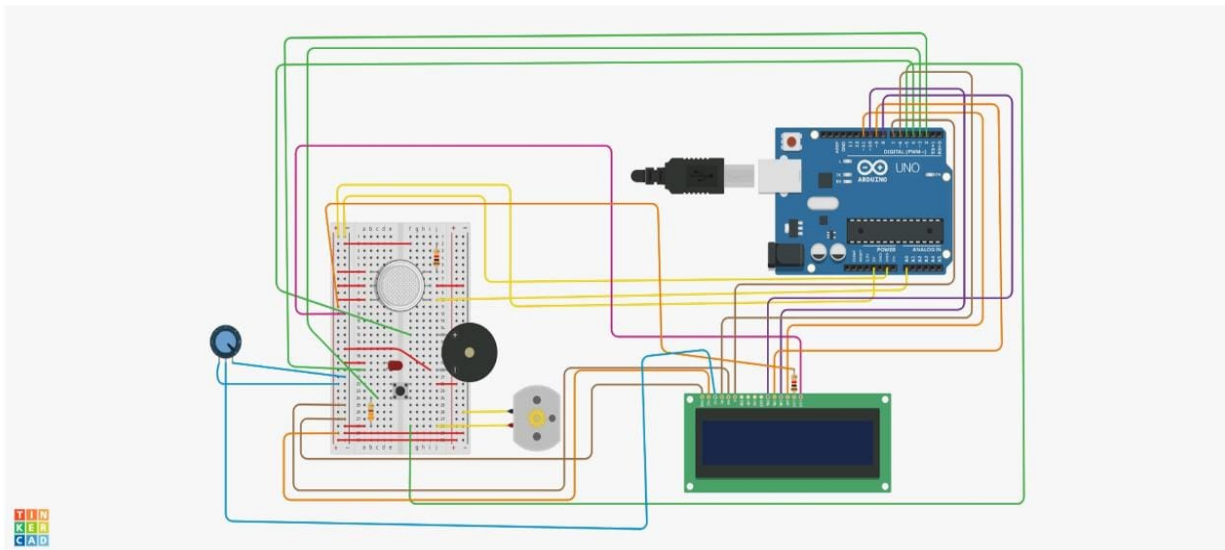
Arduino UNO (Atmega-328) is the main unit of the system which performsthe following tasks. A signal conditioning of the Arduino UNO is done by output signal of the sensor, provided input to Arduino. The detection results displayed on LCD. Indicates the people of danger in work place, factory, home. Buzzer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

Flowchart :-





Circuit Diagram :-



Solution statement:-

The system can be taken as a small attempt in connecting the existing primary gas detection methods to a mobile platform integrated with IoT platforms. The gases are sensed in an area of 1m radius of the rover and the sensor output datas are continuously transferred to the local server. The accuracy of sensors are not upto the mark thus stray gases are also detected which creates an amount of error in the outputs of the sensors, especially in case of methane. Further the availability and storage of toxic gases like hydrogen sulphide also creates problems for testing the assembled hardware. As the system operates outside the pipeline, the complication of system maintenance and material selection of the system in case of corrosive gases is reduced. Thus the system at this stage can only be used as a primary indicator of leakage inside a plant.

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 gaslike 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.