Gas leakage monitoring and alerting systemfor industries

PROJECTNAME	GASLEAKAGEMONITORING&ALERTINGSYSTEMFOR INDUSTRIES
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Abstract:-

Internet of Things (IoT) is the networking of 'things' by which physical thingscan communicate with the help of sensors, electronics, software, and connectivity.These systems do not require any human interaction. Internet of Things aim

towardsmakinglifesimplerbyautomatingeverysmalltaskaroundus.AsmuchisIoThelping in automating tasks, the benefits of IoT can also be extended for enhancingthe existing safety standards.Safety plays a major role in today's world and it isnecessary that good safety systems are to be implemented in places of educationandwork.Thisworkmodifiestheexisting safetymodelinstalledin

industries and this system can also be used in homes and offices. The traditionalGas Leakage Detector Systems though have great precision, fail to acknowledgea few factors in the field of alerting the people about the leakage. Therefore wehave used the IoT technology to make a Gas Leakage Detector for society whichhavingSmartAlertingtechniquesinvolvingsendingtextmessagetotheconcerne dauthority andanability performingdataanalyticsonsensorreadings.

Introduction:-

The Internet of Things is an emerging topic of technical, social, and economicsignificance. Consumer products, durable goods, cars and trucks, industrial andutility components, sensors, and other everyday objects are being combined withInternet connectivity and powerful data analytic capabilities that promise to transformthe way we work, live, and play. Projections for the impact of IoT on the Internet andeconomy are impressive, with some anticipating as many as 100 billion connectedIoT devices and a global economic impact of more than $11 trillion by 2025. TheInternet of Things (IoT) is an important topic in technology industry, policy, andengineering circles. This technology is embodied in a wide spectrum of networkedproducts,systems,andsensors,whichtakeadvantageofadvancementsincom puting power, electronics miniaturization, and network interconnections to offernewcapabilities.Thelarge-scaleimplementationofIoTdevicespromisestotransform many aspects of the way we live. For consumers, new IoT products likeInternet-enabled appliances, home automation components, energy managementdevices are moving us toward a vision of the "smart home'', offering more securityandenergyefficiency.IoTsystemslikenetworkedvehicles,intelligenttrafficsyste ms, and sensors embedded in roads and bridges move us closer to the idea of"smartcities'',whichhelpminimizecongestionandenergyconsumption.IoT

technologyoffersthepossibilitytotransformagriculture,industry,andenergypro
ductionanddistributionbyincreasingtheavailabilityofinformationalongthevalue
chain ofproductionusing networkedsensors.

Objective:-

The design of a sensor-based automatic gas leakage detector with an
alertand control system has been proposed. This is an affordable, less power
using,lightweight, portable, safe, user friendly, efficient, multi featured and simple
systemdevicefordetectinggas.Gasleakagedetectionwillnotonlyprovideuswithsignifica
nce 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 wastageof gases will
hurt our economy. The need for ensuring safety in workplaces isexpectedtobethe
keydrivingforcefor themarketover thecoming years.

Problem Formulation:-

Gas leakage is nothing but the leak of any gaseous molecule from
astove,or a pipeline, or cylinder etc. This can occur either purposefully or
evenunintendedly.Asweareawarethatthesekindsofleaksaredangerous
toourhealth, and when it becomes explosive it could cause great danger to
thepeople,home,workplace,industry and theenvironment.

Few of the major incidents that took place due to gas leakage include the
BhopalDisaster and the Vizag Gas leak. The Bhopal disaster is known to be the
worstindustrial accident ever. Approximately 45 tonsof Methyl Isocyanate was
leakedfromthisinsecticideplant.MethylIsocyanateisanorganiccompoundand a

chemicalthatcouldcomefromthecarbamatepesticides.Thiscolorless,poisonousandflammableliquidissomething thathuman beingshavetobeawayfrom.

VizagGasleakwasaresultantoftheescapeofstyrenethatwereunattended for a long period. This colorless oily liquid can spread in fumes. So, adetector 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 beattachedwithcertain parametersthatcouldhelptopreventthe issue.

Listof Components:-

S.No	NameoftheComponent	Quantity
1.	ArduinoUNOR3	1
2.	Breadboard	1
3.	LED	2
4.	Resistor	5
5.	Piezo	1
6.	GasSensor	1
7.	LCD 16*2	1

Arduino UNOR3:-

Arduino Uno R3 is one kind of ATmega328P based microcontrollerboard.includesthewholethingrequiredtoholdupthemicrocontroller;ju stattach it to a PC with the help of a USB cable, and give the supply using AC-DCadapter 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 ArduinoUno. Arduino board and IDE software are the reference versions of Arduino andcurrentlyprogressedtonewreleases.TheUno-boardistheprimaryinasequenceofUSB-ArduinoBoard,&thereferencemodeldesignedfortheArduinoplatform.ArduinoUNOis amicrocontrollerboardbasedontheATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWMoutputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, apower jack, an ICSP header and a reset button. It contains everything needed tosupport the microcontroller; simply connect it to a computer with a USB cable orpower it with a AC-to-DC adapter or battery to get started. You can tinker withyour UNO without worrying too much about doing something wrong, worst casescenarioyou canreplacethechip forafewdollars andstart overagain.

Breadboard :-

A Breadboard is simply a board for prototyping or building circuitson. It allows you to place components and connections on the board to makecircuitswithout soldering. Theholesinthebreadboardtake careofyourconnections by physically holding onto parts or wires where you put them andelectrically connecting them inside the board. The ease of use and speed aregreatforlearningandquickprototypingofsimplecircuits.Morecomplexcircuitsa ndhighfrequencycircuitsarelesssuitedtobreadboarding.Breadboard circuits are also not ideal for long term use like circuits built onperfboard (protoboard) or PCB (printed circuit board), but they also don't havethesoldering(protoboard),or designandmanufacturingcosts (PCBs).

Abreadboardishandybecauseyoucansetupcircuitsquicklyandtemporarily to test them and move on to a more permanent arrangement afterinvestigating how it works on the breadboard. They are great for hobbyists andtinkerers to set up projects as a standalone device, or as a peripheral to an Arduino,Raspberry Pi, LaunchPad, BeagleBone, and many other development boards. Theycomeinmanysizestofitprojectslargeandsmall.Breadboardsarealsoinexpensive,a ndthepartsthat workwiththemarealsotypicallyinexpensivetoo.

LED :-

A Light Emitting Diode (LED) is a semiconductor device, which canemit light when an electric current passes through it. To do this, holes fromp-typesemiconductorsrecombinewithelectronsfromn-typesemiconductorstoproducelight.Thewavelengthofthelightemitteddepends on the bandgap of the semiconductor material. Harder materialswith stronger molecular bonds generally have wider bandgaps. AluminumNitridesemiconductors areknownasultra-widebandgapsemiconductors.

Resistor:-

The term "resistor" refers to a device that acts as a two-terminalpassiveelectricalcomponentthatisusedtolimitorregulatetheflowofelectric currentinelectricalcircuits.Anditalsoallowsustointroduceacontrolled amount of resistance into an electrical circuit. The most importantandcommonlyusedcomponentsin an electroniccircuitare resistors.

A resistor's main job is to reduce current flow and lower voltage in aspecific section of the circuit. It's made up of copper wires that are wrappedaround aceramicrod andcoatedwithinsulatingpaint.

The basic idea is known to all about how electricity flows through anelectronic circuit. Here, two categories can be identified which are conductorsand insulators. Insulators do not allow the flow of electrons, but the conductordoes.However,theresistordeterminestheamountofelectricitythatisallo wed to pass through them. The total voltage passes through when it ispassed through a conductor like the metal; by introducing the resistors, theamountofvoltage andcurrentcan becontrolled.

The ease at which the electrons will allow the electricity to flowthroughitisknownasresistance.Aninsulatorhasbetterresistancethanthe conductor, and the term resistance is defined as the electrical quantityusedbythe resistortocontroltheflowofelectrons.

Piezo :-

A piezo is a device that generates a voltage when force is applied orbecomes deformed when voltage is supplied. Piezoelectricity is the electric chargethat accumulates in certain solid materials—such as crystals, certain ceramics, andbiological matter such as bone, DNA, and various proteins—in response to appliedmechanicalstress.Thewordpiezoelectricitymeanselectricityresultingfrompressureandlatentheat.ItisderivedfromtheGreekword,whichmeanstosqueezeorpress, whichmeansamber,anancientsourceofelectriccharge.

Thepiezoelectriceffectresultsfromthelinearelectromechanicalinteraction between the mechanical and electrical states in crystalline materialswith noinversion symmetry. The piezoelectric effect is areversible process:materials exhibiting the piezoelectric effect also exhibit the reverse piezoelectriceffect, the internal generation of a mechanical strain resulting from an appliedelectricalfield.Forexample,leadzirconatetitanatecrystalswillgeneratemeasurable piezoelectricity when their static structure is deformed by about 0.1%of the original dimension. Conversely, those same crystals will change about0.1% of their static dimension when an external electric field is applied. Theinverse piezoelectriceffectisused intheproductionofultrasoundwaves.

GasSensor :-

Gassensors(alsoknownasgasdetectors)areelectronicdevices that detect and identify different types of gasses. They are commonlyused to detect toxic or explosive gasses and measure gas concentration. Gassensors are employed in factories and manufacturing facilities to identify gasleaks, and to detect smoke and carbon monoxide in homes. Gas sensors varywidely in size (portable and fixed), range, and sensing ability. They are oftenpart of a larger embedded system, such as hazmat and security systems, andthey are normally connected to an audible alarm or interface. Because gassensors are constantly interacting with air and other gasses, they have to becalibratedmore often thanmany other typesofsensors.

LCD16*2 :-


An electronic device that is used to display data and the message isknown as LCD 16×2. As the name suggests, it includes 16 Columns & 2 Rowsso it can display 32 characters (16×2=32) in total & every character will bemade with 5×8 (40) Pixel Dots. So the total pixels within this LCD can becalculatedas32x40otherwise1280pixels16X2displaysmostlydependon .multi-segment LEDs. There are different types of displays available in themarketwithdifferentcombinationssuchas8×2,8×1,16×1,and10×2,however, the LCD 16×2 is broadly used in devices, DIY circuits, electronicprojectsduetoless cost,programmablefriendly &simple toaccess.

Proposed Method:-

ArduinoUNO(Atmega-328)isthemainunitofthesystemwhichperforms the following tasks. A signal conditioning of the Arduino UNO is done byoutputsignalofthesensor,providedinputtoArduino.Thedetectionresultsdisplayed on LCD. Indicates the people of danger in work place, factory, home.Buzzeractivitywithbeep(siren) sound ismade. Alsosend alertSMStotheincharge
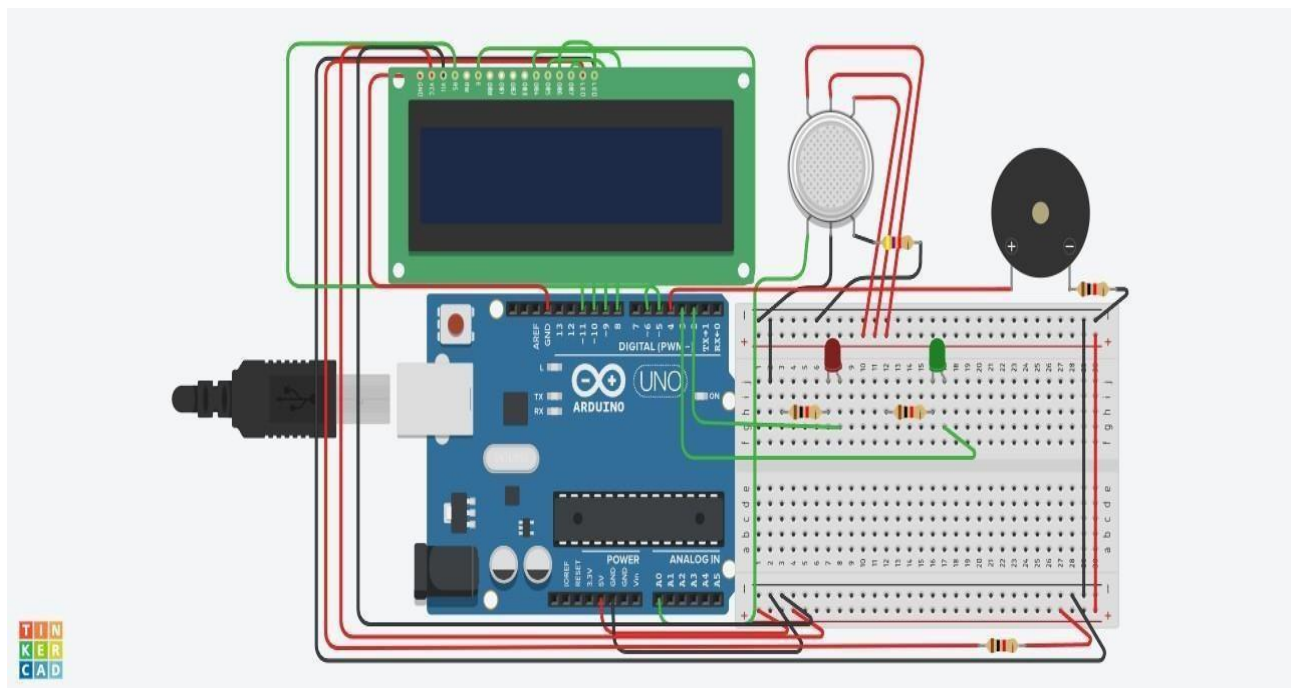
oftheplantwhosenumberissavedinSIMcardbyusingGSMmodem.TheSMSreceiveddep

ends upontheleakofgasin thedetectionarea of thesensor.

FlowChart:GasLeakageMonitoringandAlertingSystem

Input

GasLeak —No→ GreenLEDLight

Yes

RedLEDLight

BuzzerActive

Output
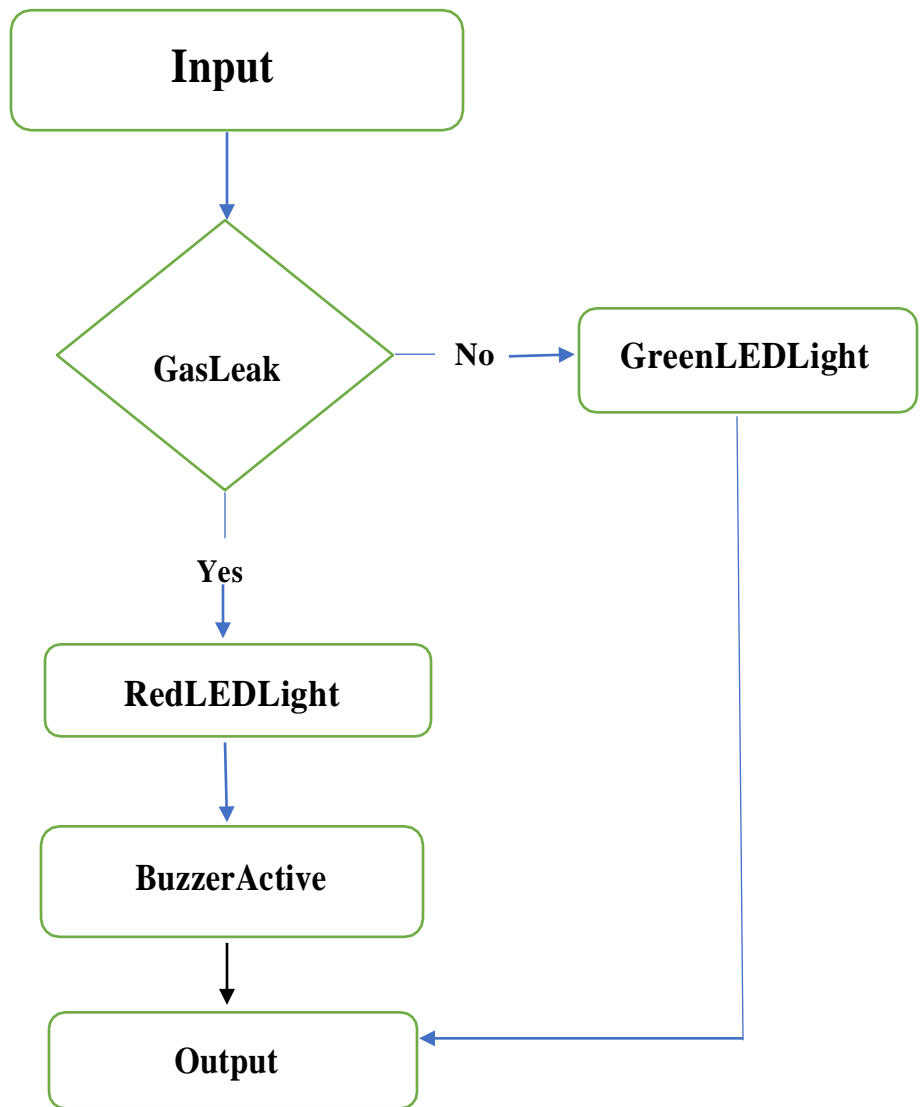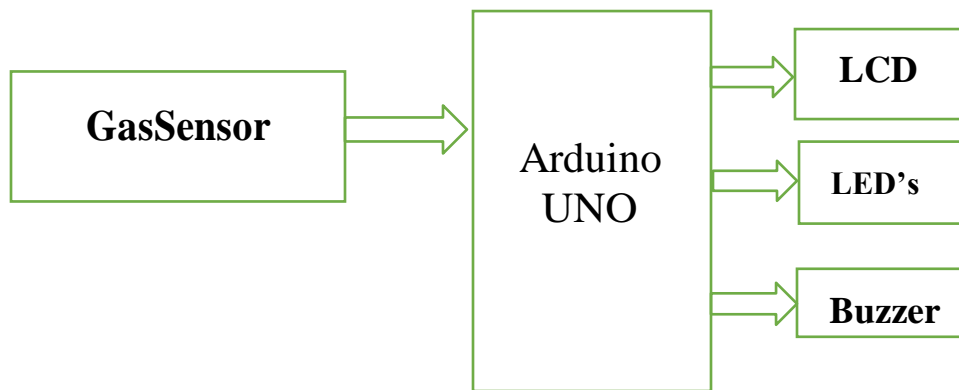
Circuit Diagram:-

SolutionStatement:-

The system can be taken as a small attempt in connecting the existingprimary 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 outputdatas are continuously transferred to the local server. The accuracy of sensors arenot upto the mark thus stray gases are also detected which creates an amount oferror in the outputs of the sensors, especially in case of methane. Further theavailability and storage of toxic gases like hydrogen sulphide also creates problemsfortestingtheassembledhardware.Asthesystemoperatesoutsidethepipeline,thecomplicationofsystemmaintenanceandmaterialselectionofthesystemincase of corrosive gases is reduced. Thus the system at this stage can only be usedasa primaryindicatorof leakageinside aplant

Conclusion :-

After this project performance, can conclude that detection of theLPG gas leakage is incredible in the project system. Applicable usefully in theindustrial and domestic purpose. In danger situations we are able to save thelife by using this system. An alert is indicated by the GSM module. A sensornodesensesgaslikeCO2,oxygen,propane.Theestimatedrangeoftransmission and consumption of power is obtained. The simple proceduresandArduinoUNO Micro controllerareausedtobuild thesensor.