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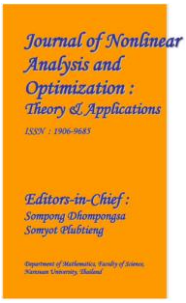

IOT BASED SMART GAS LEAKAGE DETECTION AND ALERT SYSTEM

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Abstract

Gas or liquefied petroleum gas (LPG) is a chemical substance resultant from petroleum and could be dangerous in industrial places or those that deal with this substance. Gas leakage causes many health issues. So, to prevent such catastrophes and in order to maintain a clean air environment, the workspace atmosphere should be frequently monitored and controlled. The proposed monitoring gas leakage detector system is based on Internet of Things (IoT) technology. NodeMCU ESP8266 Wi-Fiis used to be the micro-controller for the whole system. The combustible gas sensor (MQ2) is used in order to detect the presenceof methane (CH4) and carbon monoxide gas (CO). MQ2 sensor will detect the concentration of the gas according to the voltageoutput of the sensor and the ESP8266 will send the data reading from the gas sensor to Blynk IoT platform over an IOS phone; data visualization is done using Thingspeak IoT Platform. Besides, a fan will immediately work upon the leakage occurs alongwith an alarming buzzer.

Keywords: Arduino UNO, MQ6 gas sensor, Buzzer, Gas leakage, Thingspeak, LPG, Alarm system

Introduction

There are lots of devices to avoid accidents of gas leakage. Like smoke detectors, fire extinguishers etc. These devicescan prevent fire exposure only, they can't protect people from getting injured. In past, accidents like Bhopal gas tragedy, On December 1984, more than 3,000 people were killed when methyl isocyanate leaked out. Nagaram, Andhra Pradesh, On June 2014, the pipe was rusty which led to a gas leak, blastin Gas Authority of India Limited's plant, killed 29 peopleetc. So to protect people from this hazardous disaster needto upgrade the technologies. Major damage can cause, if gas outflow is not detected early.

MQ6 sensor is a device which will not only detect alsoit will prevent accident by turning the main supply off. Ithas a high sensitivity and fast response time. This detector contains a sensitive filament made from SnO2. This filament keeps electrical conductivity lower in the presence of clean air. The filament's conductivity increases when a combustible gas commenced like LPG. This sensor can simply interfaced with Arduino. So its a Arduino based gas leakage detection, in which device can get connected to WIFI using ESP8266 WiFi module, the maximum and mininum variable will be set consequently. After detection the alert SMS will be sent to theowner.

A. LPG

Auto gas has a risky subject of 1.8 and 9.5 percentage container of gas in air. This is altogether smaller than other regular vaporous powers. Gas moreover with other oil determined can be joined with sustainable power sources to give more prominence unwavering quality while as yet accomplishing some decrease in CO2 transmission.

Gas vapors can keep operating for long separations along theground and can gather in the channel or cylinder can detonate whenever engaged in a fire. The state of being way this hazardous gas can make cool consumes the skin and it can go about as an unconsciousness at high focuses. Break cause a negative impact to the state of being with the end goal that the hydrocarbons and different synthetic concoctions of the Gas causes long rest. It likewise causes bothered respiratory tract, nose and eyes.

B. Problem Statement

To investigate Gas spilling and alarming the citizens about the spilling who are situated locally and remote location through this system Examinations by oil organizations found that numerous LPG customers are ignorant of security checks of gas chambers [10] .Another reason is unlawful filling of

gas barrel likewise causes disasters. There is a requirement for a framework to identify and furthermore avert spillage of LPG.

1. To detect the leakage of LPG system
2. By sending message through E-mail, text messages, light control system and audio indication (voice) to alert the people about the gas leakage.
3. To alert the gas office about the spillage of gas by instantmessages with individual locations.

Gas Leakage Detection Techniques

There are several different techniques to design a gas leakagedetector, the most popular techniques are as follows:

a) Robots-based gas leakage detector: it is an automatic gas detection and indication robot. The prototype depicts a mini mobile robot that is capable to detect gas leakage in hazardous places. Whenever a gas leakage occurs in a particular place, the robot directly reads the data and sends it to the android mobile via a wireless connection such as Bluetooth. An android application for Android-based smartphones could be used, which can receive data from robots directly through Bluetooth. The application warns with an indication whenever there is an occurrence of gas leakage. Fig. (1) illustrates this prototype.

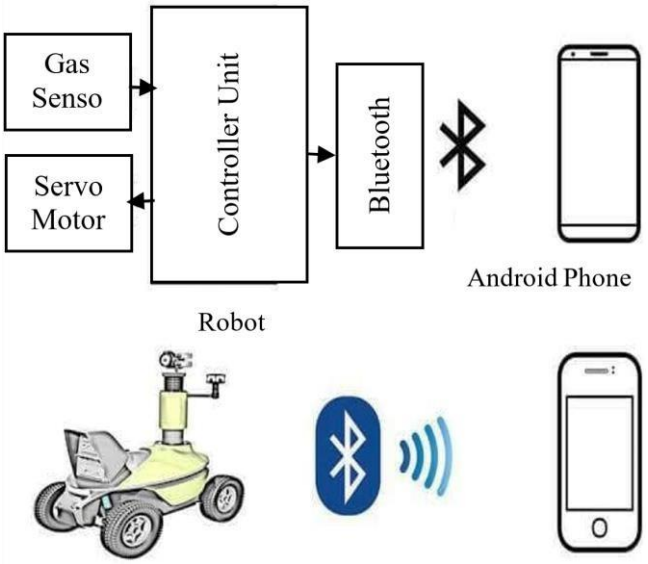

Fig. 1: Robot-based gas leakage detector.

b) GSM-based gas leakage detector: An LPG gas sensor is used for sensing the leakage and produce the result in Short Message Service (SMS) with help of Arduino Uno to alert humans. The sensor has excellent sensitivity combined with a quick requital time and also sense iso-butane, propane, Fig. (2) shows the prototype of GSM based gas leaks detector.

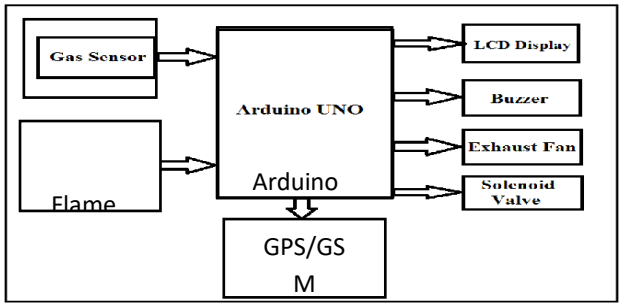

Fig. 2 : GSM based gas leaks detector.

c) IoT-based gas leakage detector: in this type of gasleak detection, ESP2866 node MCU is usually usedas a microcontroller and a wifi module.

This system records the value of the LPG leak level on an IoT platform –which could be a cloud platform of application platform- and the awareness message is sent to the smartphone through the wifi on an IoT application such as Blynk IoT application.

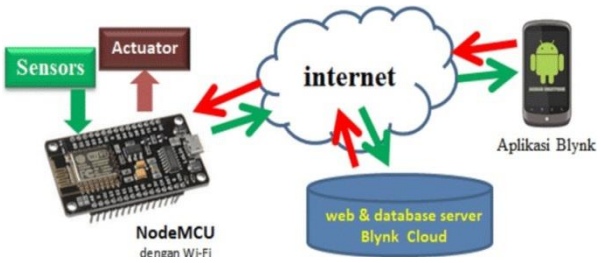

Fig.3: IoT Based Gas Leakage Detector.

Methodology

When a gas leak occurs, which is detected by a gas sensor MQ-2, it will send data to the controller (ESP8266) via the controller analog port. Then the controller (ESP8266) will send a warning text message alerting the occurrence of a gas leak via (Wi-Fi) technology in conjunction with Blynk Application which works on Android and IOS operating systems, the proposed system used IOS Blynk App. At the same time, the buzzer will be on for an alarming, by connecting it to the microcontroller digital port (D5), and the fan will be working to change the air of the place and get rid of leaking gas. A transistor works in the form of a switch that turning on and off low loads, when the circuit is closed -while the red LED is on- the relay is turning on and off the high loads, where the high load performs the fan.

Implementation

IoT-based intelligent (LPG) leakage detector project is implemented using an ESP8266 chip. The circuit diagram shown below in fig:2. MQ6 gas sensor has given input to Arduino which after detection of leakage action will be taken. The output will be displayed on IOT based display about the gas level, which will show the percentage of gas level as per set value. If leakage is detected stepper motor will be informed to turn on the valve simultaneously buzzer will be turned on till user turns off after getting sms about the leakage.

Arduino

An Arduinos are circuit boards that have micro controller chips on them and lots of stuff. It is easy to use for beginners. It can be used to control motors, lighting, cameras, or even build a simple robot. It is created in that manner so that its software can work on Windows, Linux and Mac, which makes uploading codes as simple as connecting a usb cable and clicking a button. A programming language that lets user configure all the arduino hardware products in the same way. It is a open-source platform provides integrated development enviroment(IDE) and simple c language is used. The program can be implemented easily by connecting arduino board to laptop using connector cable. It has wide use in this system to turn of the supply of gas when it gets information from the sensing device and alerts the neighbour by turning on buzzer and exhaust fan.It even sends sms to the owner including images of the activities.

A. **LCD**

LCD means 16*2 liquid crystal Display. In this system used it to interface with arduino and dispaly the output of the leakage. It can be controlled by arduino if there is a leakage it will display Gas is leaking or else No leakage.

B. **MQ6 Sensor**

This detector can sight gases (Iso gas, butane) at concentra- tions of 200–1000ppppm. Avoid the noise of alcohol, smoke, etc. once gas is detected by the detector it compares with the comparator extant within the detector to provide the digital logic information output for the Arduino. The enclosed MQ-6 has vi pins, four of them square measure accustomed fetch signals, and therefore the different two square measure used for providing heating current.

C. **ESP8266 WiFi module**

ESP8266 is a low cost wifi module with full tcp/ip stack and MCU. It operates in soft access point mode. It has only two input output pins. The program gets uploaded in MCU to GPIO board. This wifi module used to send the data on websites and can even receive the data from website. It can be used directly connecting to computer using usb cable or can be used by connecting it to arduino board

D. Flowchart

Fig. 3 represents the flow of gas level. It shows how much gas present in the air. In starting if gas leaks it will be detectedby the sensor and check the threshold value. As per result it turn on the motor and cylinder valve will be closed if still threshold is lower than gas value then alert message will be sent to the fire station and power will shut automatically. And even user will get the alert message immediately to act as per.

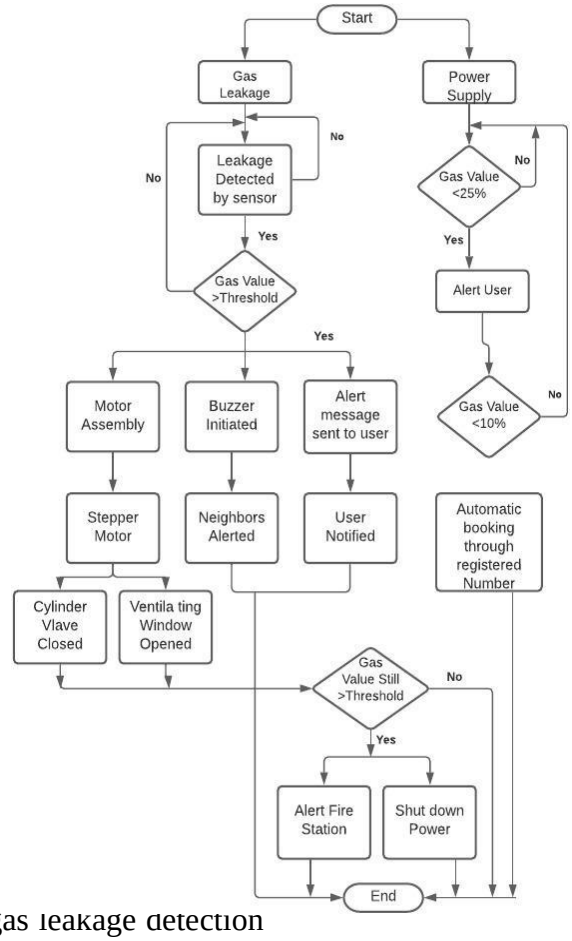

Fig. 4. Flowchart of the gas ıeaĸage ɑetectıon

Future Scope

The conduct of the gases is reliant on the Temperature and Humidity of the air around. A gas at certain focus probably won't be combustible at low temperature yet may have touchy nature at high temperature. Therefore expansion of a Temperature and Humidity Sensor will be exceptionally useful. The other alteration which can be actualized in this gas spill locator is utilizing a tripped circuit which will trip off the principle supply once the gas spill is distinguished. During a gas spill it is unsafe to switch any apparatuses as it might start and this tripper circuit helps to reduce the electrical risks that can be caused because of a gas release. Alongside the stumbling off of the primary supply it is especially important to kill the gas controller so no further spillage of the gas happens.

A robot has been utilized in trading human for taking care of different errands in a risky and perilous working environment where human life may in danger. A portable gas detecting robot can be built to detect the spillage of gas through pipelines as the robot can proceed onward a track which is arranged along the length of pipeline.

Conclusion

An arduino based system designed and implementedto detect the gas leakage in home, hotels, and in industrial applications. This system has a sensing range is set via IOT platform site if it is low then set range system is not on or doesn’t turn the valve and exhaust on, and it is in the 200-1000ppm range or greater than that the system detects a gas leak and alerts user via buzzer sound and if user can’t able to turn off the valve manually under 1 min. the system turns off the valve automatically and exhaust fan is on until the gas levels in ppm present in the room is decreased and fan is automatically off.

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