Arduino Based Gas Leakage Detection System Using IoT

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Abstract - **Recent trend is the development of Smart homes all around the world. Home automation has become very affordable and many people, industries has started to automate daily routines like light, fans, setting the temperature, etc, The main objective of the project is to build a Gas leakage detector using LPG gas sensor this device will continuously monitor the level of LPG gas present in the air and also connect it with IoT using ESP module for safety and security. This system can be installed in homes, hotels LPG gas storage areas. Arduino is used as the main controller. The final output of the project is used to detect leakage if gas from cylinders and also notify the user. Accidental explosions in the home are not uncommon which may be associated with gas leaks, the storage of explosive material such as propane. In the modern world, human adopted to LPG (Liquid Petroleum Gas) supply system for cooking. During the usage of the LPG system, number of occurrences that will happen around us that may cause death of human beings. Hazards due to gas leakage are dangerous and can become uncontrollable if timely actions are not taken. But this gas leak mostly remains unnoticed and there should be some means to observe them so that a quick action can be brought. To prevent this to happen knowingly or unknowingly, this document gives the detection of leakage of LPG cylinders in particular areas like kitchen and alert the user regarding leakage.**

Index Terms - **Node MCU, LCD, Buzzer, Gas Sensor, Internet of Things.**

I.INTRODUCTION

It has become important factor nowadays to bring the technology into our home and office. By making the place smart, the day-to-day activities are becoming more and easier. The development of home automation has become mandatory in homes as people are moving towards to the smart home concepts. The supply gas will also be stopped with the use of solenoid, ultimately preventing the chance of accident. This system will not only able to detect the leakage of gas but also alerting through audible alarms. Presence of excess amounts of harmful gases in environment then this system can notify the user. System can notify to society admin about the condition before mishap takes place through a message. This system will not only able to detect the leakage of gas but also alerting through audible alarms. Presence of excess amounts of harmful gases in environment then this system can notify the user. The people in the neighbors can also be included in case of an emergency. LPG gas sensor is used for input. A buzzer is connected along with the circuit to indicate the user offline.

II.LITERATURE SURVEY

| Year	Author	Title of Paper	Deliverables
2011	Shashi Kumar, Pranita Padole, Shweta Salve, Aditya Sachdev	Smart LPG Monitoring & Automatic Gas Booking System	Depending on the sensor values showing the variation in the gas concentration measurements and audio-visual alarms were activated.
2016	R. Naresh Naik, P. Siva Nagendra Reddy, S. NandaKishore, K. Tharun Kumar Reddy	Arduino Based LPG gas Monitoring & Automatic Cylinder booking with Alert System	Sending SMS by GSM module, turn on the alarm, and open the room window and door by DC motor.
2017	Kumar Keshamoni and Sabbani Hemanth.	Smart Gas Level Monitoring, Booking & Gas Leakage Detector over IoT.	Continuous weight measurement of the container integrated.
2017	Shruthi Unnikrishnan, Mohammed Razil, Joshua Benny, Shelvin Varghese.	LPG Monitoring and Leakage Detection System	The user gets alert buzzer whenever a small LPG gas is

			brought near the MQ-6 gas sensor.
2017	Mr. Arijit Banik, Mr.Bodhayan Aich, Mr. Suman Ghosh.	Micro-controller Based Low-Cost Gas Leakage Detector with SMS Alert	The system then alerts the customer by sending an SMS to the specified mobile phone.

III.PROPOSED SYSTEM

The proposed project is an LPG leakage detection and alert that provide user an easy way to monitor the LPG gas in cylinder with android application. To detect Gas leakage in home, hotels, schools and other domestic areas, and gives alert message to the surrounding people. Nowadays Gas sensors are being used globally in the field like safety, health, instrumentation etc. This paper is an implementation of the same using gas sensor. The sensor is commonly used for detecting gas leakage for various applications of surrounding area. The device also keeps displaying the leakage amount on an LCD display. The gas sensor detects the concentration of gas in ppm and outputs analog value which can be converted to a digital signal using inbuilt Analog to Digital Convertor of Node MCU. It allows the user to set the low, medium and dangerous level for leakage based on the same digital measure. This is possible because of the smart phones and internet that we are widely using.

Fig 1.0 System Architecture

Fig 1.0 is the system architecture of the project where we can see sensors, buzzer and LCD interaction with the system. Sensors provides the input data to the node MCU which is return gives and output via buzzer and LCD. Then data is sent via cloud to the ThingSpeak and then user.
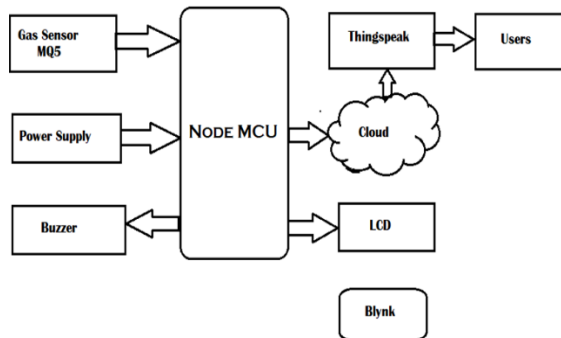
IV.SYSTEM SPECIFICATION

a)Software Requirement

Arduino IDE

Arduino IDE is an open source software that is mainly used for writing and compiling the code into the Arduino Module. It is an official Arduino software, making code compilation too easy that even a common person with no prior technical knowledge can get their feet wet with the learning process. It is easily available for operating systems like MAC, Windows, Linux and runs on the Java Platform that comes with inbuilt functions and commands that play a vital role for debugging, editing and compiling the code in the environment.

ThingSpeak

ThingSpeak is an IOT analytics platform. In which we allowed to monitor live data in cloud. We can send data to thingspeak from our device. API key- There are two types of API key. Read API and Write API. Write API Key –It is 16 digit code that allows an application to write data to a channel. Read API Key – It is 16-digit code that allows an application to read the data stored in a channel. ThingSpeak provides instant visualizations of data posted by your devices to ThingSpeak. ThingSpeak is often used for prototyping and proof of concept IoT systems that require analytics.

BLYNK Framework

BLYNK is a new platform that allows you to quickly build interfaces for controlling and monitoring your hardware projects from your iOS and Android device. After downloading the BLYNK app, you can create a project dashboard and arrange buttons, sliders, graphs, and other widgets onto the screen. Using the widgets, you can turn pins on and off or display data from sensors. Whatever your project is, there are likely hundreds of tutorials that make the hardware part pretty easy but building the software interface is still difficult. With BLYNK, though, the software side is even easier than the hardware.

b)Hardware Requirement

Node MCU

Node MCU is an open –source Lua based firmware and development board specially targeted for IoT Applications. ESP8266 Wi-Fi module is a device which is interfaced with the Arduino board gives Wi-Fi ability which works similar to Wi-Fi shield. It works with AT command set. This module has power

on board processing and storage capability that allows it to be integrated with the sensor and other application through its GPIOs. ESP8266 Wi-Fi module used for storing data in the cloud. Node MCU can be powered using Micro USB jack and VIN pin (External Supply Pin). It supports UART, SPI, and I2C interface Then processes it and then gives the output signal. It has inbuilt Wi-Fi module on it. Arduino IDE is the software used for programming. Node MCU is compatible with PC and it can be easily connected to PC with the help of a USB cable

Fig 2.0 Node MCU

MQ 5 Gas Sensor

Gas Sensor (MQ5) module is useful for gas leakage detection (in home and industry). It is suitable for detecting H2, LPG, CH4, CO, Alcohol. Due to its high sensitivity and fast response time, measurements can be taken as soon as possible. The sensitivity of the sensor can be adjusted by using the potentiometer. The working principle behind the MQ-5 gas sensor is as follows: The sensor has a sensitive filament made of SnO_2. In the presence of clean air, this filament tends to have lower electrical conductivity. When a combustible gas such as LPG is introduced, the filament's conductivity rises, and the amount of change in its conductance/resistance can be used to indicate the equivalent gas concentration. This effect tends to be particularly pronounced at higher temperatures, and resistive heating element is present as well. SnO_2 is particularly sensitive to Methane, Butane and Propane, but is also sensitive to other combustible gases as well. Gas sensor, as one of the most important devices to detect noxious gases, provides a vital way to monitor the concentration and environmental information of gas in order to guarantee the safety of production.

Fig 2.1 MQ 5 Gas Sensor

LCD

The term LCD stands for liquid crystal display. It is one kind of electronic display module used in an extensive range of applications like various circuits & devices like mobile phones, calculators, computers, TV sets, etc. These displays are mainly preferred for multi-segment light-emitting diodes and seven segments. The main benefits of using this module are inexpensive; simply programmable, animations, and there are no limitations for displaying custom characters, special and even animations, etc. Here At the same time, electrical currents cause the liquid crystal molecules to align to allow varying levels of light to pass through to the second substrate and create the colors and images that you see.
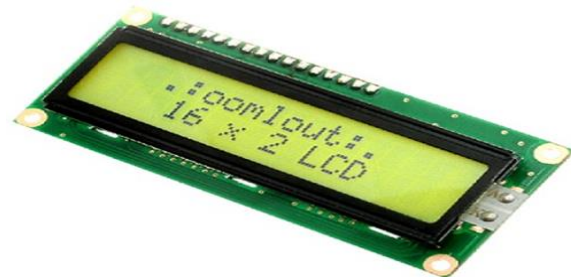

Fig 2.2 LCD Display

Buzzer

Buzzers are electric sounding devices that generate sounds. Typically powered by DC voltage, they can be categorized as Piezo buzzer and magnetic buzzer. They come in different designs and uses as well, and based on that, they can produce different sounds. A buzzer or beeper is an audio signal device, which may be mechanical, electromechanical, or piezoelectric (piezo for short). Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke.
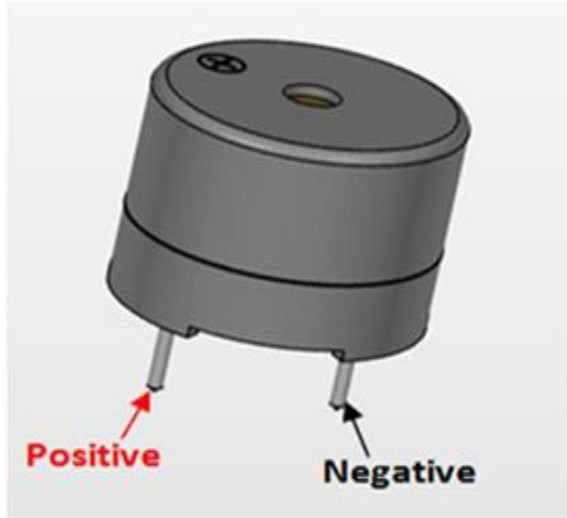
Fig 2.2 Buzzer

IV. IMPLEMENTATION RESULT

The ultimate use of the project is to make finished product of gas leakage detection system. With the advancement of internet in homes, the safety can be further increased with introduction of internet of things. The sensor used in this project are connected to Node MCU which continuously monitor the gas leakage. If any changes in this sensor values, then the application in the mobile sends the notification for the user. From blynk server the mobile application data are updated. The node MCU is interfaced with IoT software called Thingspeak. The main purpose of the software is to activate the online alert msg to users. MQ5 gas sensor is used to measure the LPG gas in the atmosphere. If the leakage is identified the applications gas indicator level increase to particular value. If the value is greater than threshold value then the system checks MQ5 sensor value. If gas is leakage then the alarm is ON. Buzzer and LCD also interfaced with Node MCU. If the gas is leakage then alarm system is ON and how much amount of gas is leakage is displayed on LCD. In this way many users including the neighborhood can be interfaced so that when there is problem anyone in surrounding gets to know and can act immediately. Fig 3.0 shows the gas leakage level of the atmosphere and Fig 3.1 shows the gas leakage alert notification. Fig 3.2 indicates the amount of gas detected by MQ5 sensor. This provides the user the awareness of the gas leakage and avoid major accident.
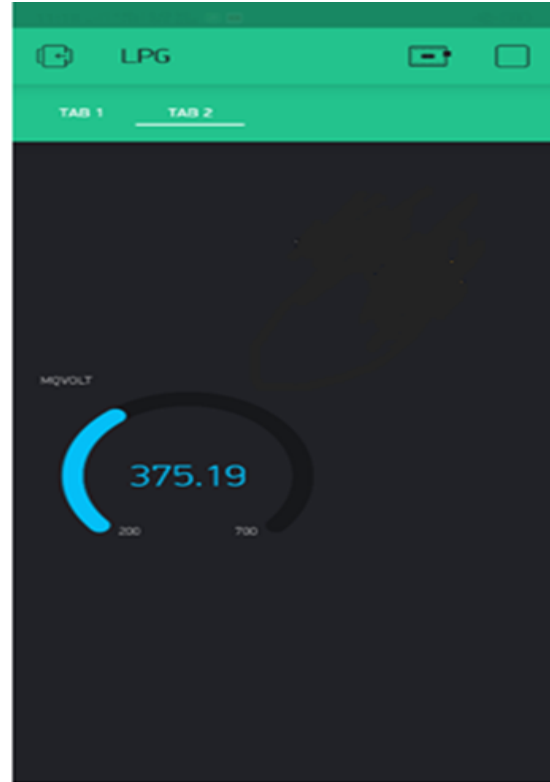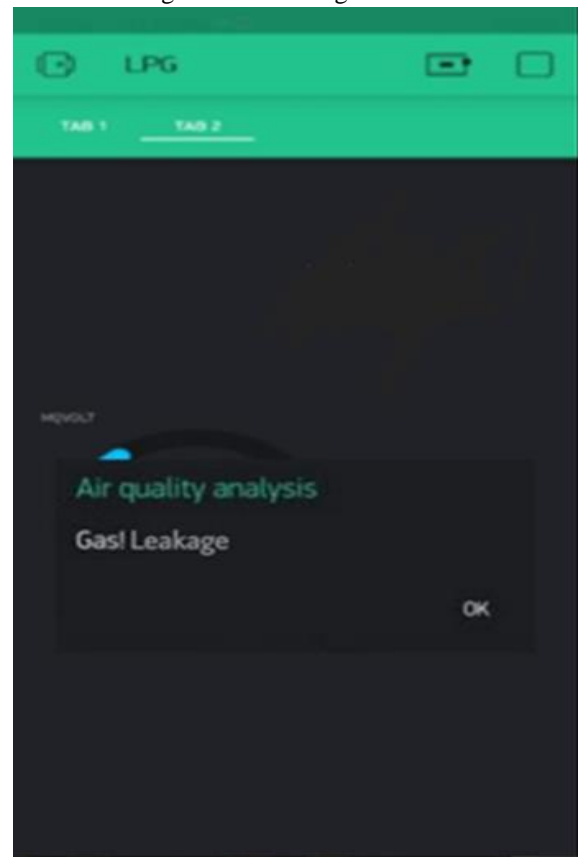

Fig 3.0 Gas Leakage Indicator

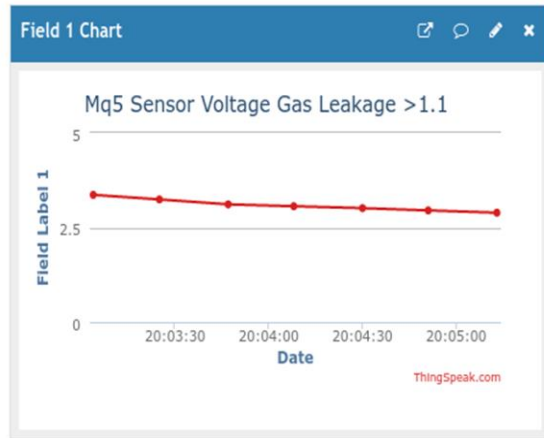
Fig 3.1 Gas Leakage Notification

Fig 3.2 Amount of gas detected by the MQ5 sensor

V.CONCLUSION

Gas leakage leads to severe accidents resulting in material losses and human injuries. Gas leakage occurs mainly due to poor maintenance of equipment and inadequate awareness of the people. It is an economical system which can be installed in apartments, hotels LPG gas storage areas and wherever it is needed. The cost of the proposed system is lesser than the commercially available detectors in the market. It can help us to prevent from accidents in all directions Hence, LPG leakage detection is essential to prevent accidents and to save human lives. we discussed the methods used for identifying the leakages which can save many life. This method provides the user live data so the user can be aware any time.

VI.FUTURE SCOPE

Gas leakage detector systems can be installed in homes, hotels gas storage areas. This device will continuously monitor the level of gas present in the air. A Mobile Application can be created for this system which can give information about the concentration of gas present in the area, setting reminders to check gas level, also to predict the gas leak by giving values. Relay motors can be added into the system to provide more safety. These motors can switch off the Main Gas Supply and Main Power supply in case the gas concentration exceeds certain limit. For industrial purposes mobile robot can be developed for detecting multiple gas concentrations.

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