

Iot Based Gas Leakage Dectector

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Abstract

Liquefied Petroleum Gas (LPG) is readily available to consumers around the world because LPG is a clean, portable, and efficient source of energy. LPG is currently used by hundreds of millions of people in the world and there are more than 1000 applications. LPG cylinder may leak as a liquid or a gas. If the source of ignition and gas meets LPG can explode or burn. LPG can make the lives of the people in the house endangered and can cause cold burns to the skin. To ensure the safety and security of the consumers using LPG the study aims to develop a device that can detect gas from the LPG cylinder and can alarm the owner using a buzzer and when the gas starts to leak the exhaust fan will starts to rotate. An LCD display is used to display gas value, whether it is abnormal Regulator of a LPG gas cyclinder is close automatically by using servo motor and simultaneously the gas leakage notification is send to mobile with the use of IOT. Then by detecting the gas leakage we can prevent the LPG gas burst accidents in the home. By applying This system it will be reliable and efficient when using at home by the consumers.

Keywords:

1. Introduction

LPG (Liquified Petroleum Gas), simply called as propane or butane, is highly flammable gas that is often used as fuel for cooking purposes. Due to the flammable nature of LPG, its leakage can cause damage to life and property. It is very important to be sure that gas leakage has not occurred in our kitchen. LPG, being heavier than air, does not disperse easily and leads to suffocation when inhaled. The ignition of leaked gas leads to explosion [1]. It is also important to be sure that kitchen has not been caught with fire. It is often found that a person forgets to book gas cylinder due to his/her busy schedule.

The proposed topic "Gas leakage detector using IOT" deals with gas leakage detection and automatic closing of gas valve in a LPG gas cylinder. This system makes use of gas sensor to detect the gas leakage and continuously monitor the amount of gas leakage . The Arduino board is the heart of our system which is widely used for the experimental and modern application of its direct ability to load the programs into the device. Arduino also enables the use of the Internet Of Things which forms the core of our system. The application we develop for the system takes current values present from the sensor and this can be graphically plotted for representation to know the gas level. The main idea of this LPG Gas Leakage Detection and Monitoring system is to send alert messages to the people's mobiles through the Internet of Things when the LPG gas level exceeds. The user can keep track of the gas that is coming out, using the system

2. Proposed System

In this paper, we develop a smart system for monitoring the LPG gas values in the Home that as been proposed about the safety levels. The gas sensor is connected to the microcontroller to detect the accurate values present in the environment. Internet Of Things is used for transmitting the data from controller to

mobile, if the gas values increases. The system is using an MQ2 sensor where, the use of a lighter helps release of gases which we want to detect. The leakage of gases such as LPG is prevented so as to provide a measure of safety to the surroundings. It is designed in such a way that the Arduino Uno is operated with a +5V DC power supply. Data is sent through the Arduino and is transmitted into the WiFi module for communication through the internet. The use of a gas sensor (MQ2) is to mainly detect gases such as LPG which are prone to cause serious damage to the environment. This data from the gas sensor when leakage occurs is transmitted (in Volts) to the Arduino. The buzzer will beep for alert the person and the valve of a cylinder is closed automatically by using a servo motor at the same time the Exhaust fan will start to rotate to reduce the gas level present in the atmosphere. The sensitivity can be varied by adjusting the potentiometer for faster data communication.

3..Existing System

Recent accidents have raised the need for safety precautions that will ensure accident-free running. The gas that stands out as the most dangerous disease is LPG which is almost used by most people. The basic principle behind this technique is that the modification in concentration of the LPG is detected. Associated with it, it activates an audio alarm once it exceeds an explicit threshold value. Further, it sends another alarm message through a radiofrequency (RF) system to the receiver module. The transmitter is an encoder kit which is fixed in the main board and the receiver is a decoder kit which is fixed in the sub board. The microcontroller reads the voltage from the detector and uses it to calculate modification in concentration. The temperature sensor is also used in order to detect the errors which occur due to the surrounding environment. The microcontroller reads the voltage from the detector and uses it to calculate modification in concentration. The gas detector is sensitive to many gases and actually gas kind can't be determined. Instead, during this work, it was absolutely assumed that the gas sensing element has the identical sensitivity for LPG 3.1

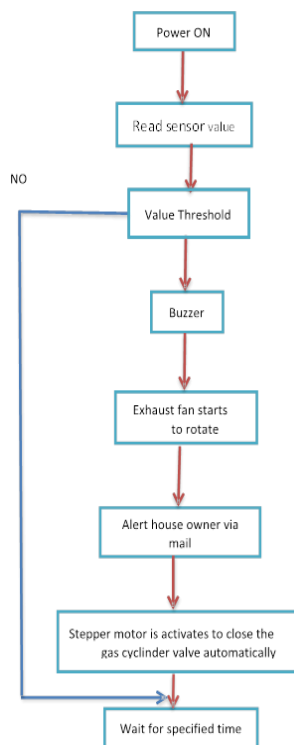
Disadvantages

- a. Precaution steps are not possible.
- b. No alert notification.
- c. Lot of manual work.

4.Algorithm

The flowchart of the proposed venture is given below:

5.Working



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Fig ,1 Implemented setup for proposed system

To demonstrate gas leakage, as the gas sensor is sensitive to both butane and LPG, cigarette lighters were used as they contain butane. The gas was made to leak from the lighter by extinguishing the flame. When the sensor detected a leakage, an alarm was raised, thereby switching off the regulator knob with the help of servo motor. In addition to this, a warning signal was also sent to the mobile application. The Exhaust fan will starts to rotate to reduce the gas level with a help of relay.

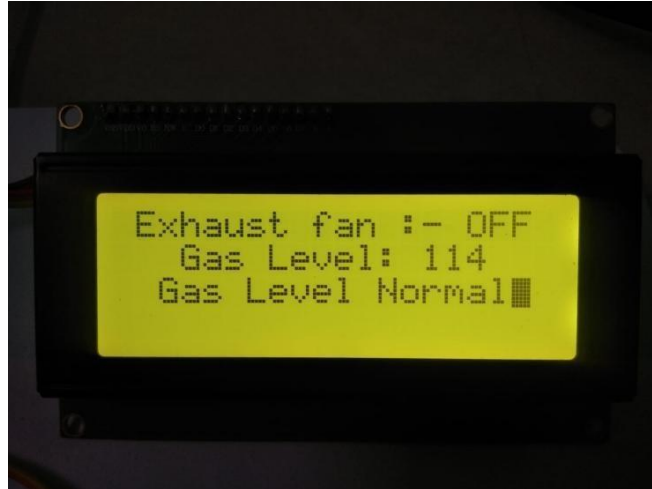


Fig:2 result of LCD when the gas level below to the threshold value

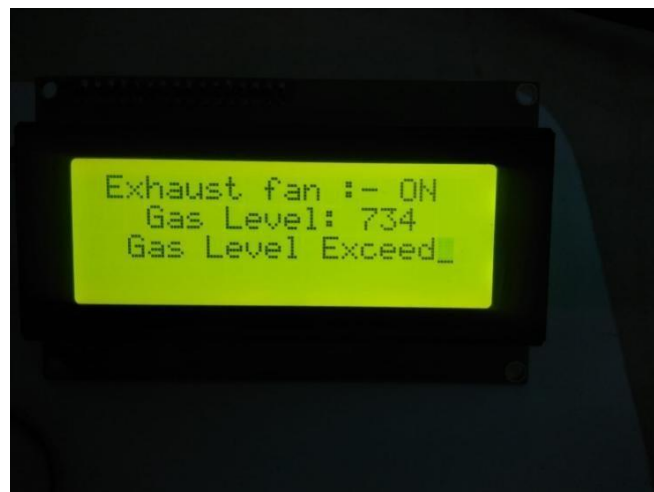


Fig.3 result of LCD when the gas level above the threshold value

The figure of LCD displays shows the results whether the gas is present or not. if it present the displays shows the alarm notification as gas level exceed and exhaust fan ON also it shows the amount of gas level which is present in the surrounding.if there is no leakage in a cyclinder and presence of gas the display shows Gas level is normal and exhaust fan is OFF.

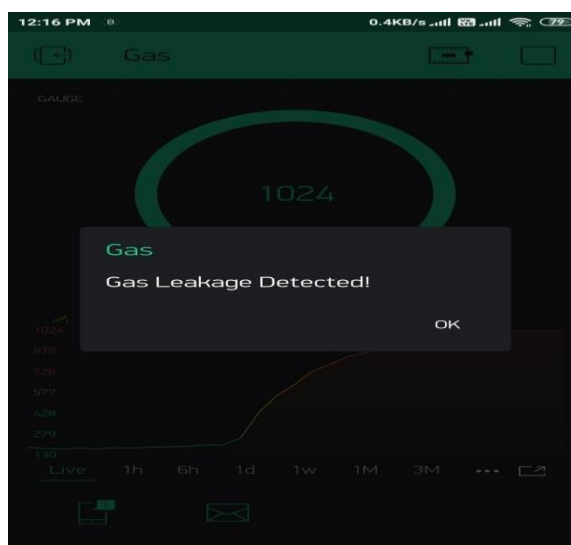


Fig.4 Screenshot of Gas detected notification

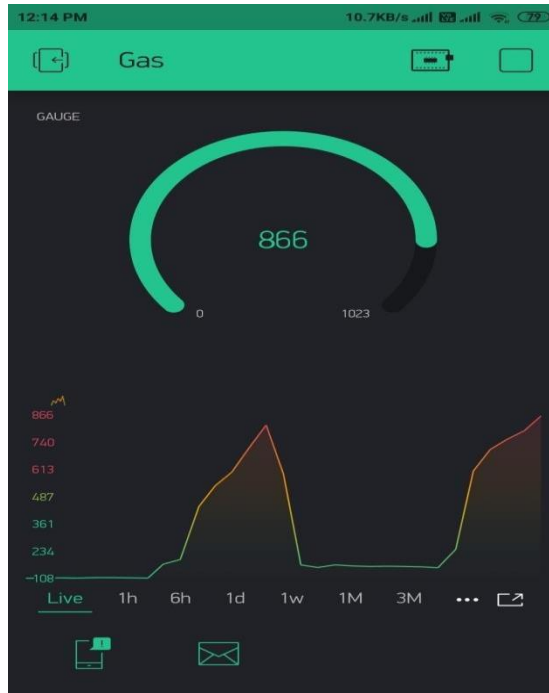


Fig .5 Gas values

The screenshot shows the Gas levels in graph values according to time and it shows the accurate gas value present on there. so we easily know the danger value of gas to identify even the person is inside the home or not.



Fig.6 Alert notification to mail

This is a notification alert which was sent to mail for a consumer as Gas level exceeds. These all things are carried out by with the help of IOT.

6..Block Diagram

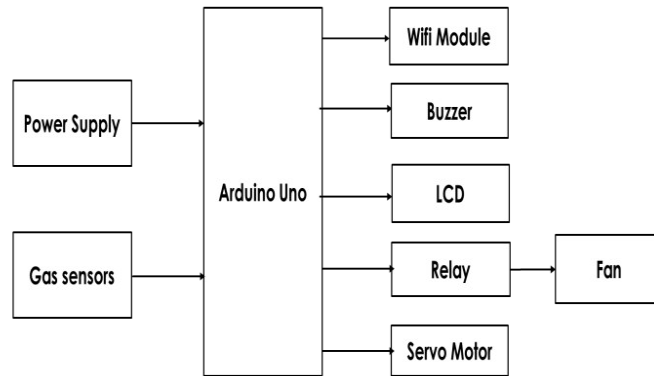


Figure .7 Block Diagram

The block diagram displaying the overall interconnections between different components is represented in Figure The Arduino Uno [5] is a member of the Arduino family, a microcontroller board based on the ATmega328P. It has 14 digital input/output pins, 6 analog inputs, a USB connection, a power jack, and a reset button. The versatile functionality of Arduino is the reason why it was chosen for this system. operate. Its backlight and contrast are adjusted by potentiometer. A MQ-2 gas sensor is used to detect the leakage in the LPG. This is connected with the Arduino and it sends a signal whenever a gas leakage is detected and in turn the Arduino sends a signal to the buzzer which indicates that there has been a leakage.and the exhaust fan will rotate. the Arduino also sends a signal to the servo motor which is connected to the regulator.This servo motor turns the regulator knob off, in case of leakage or if initiated by user. A servo motor is an electrical device which can provide torque to an object with great precision. It is just made up of simple motor which runs the through servo mechanism. Next is the Wi-Fi module, ESP8266 which enables data to be sent over internet.

6.1.ArduinoUNO



Fig.9 Arduino UNO

6.2. Components:

The components used in this model are:

- **MQ2 Sensor**
- **Arduino UNO**
- **Buzzer**

- **LCD Display**
- **Relay**
- **Servo motor**
- **Wifi module**

MQ-2 Sensor



Fig. 8 MQ-2 Sensor

MQ-2 Gas Sensor is a gas sensor having high sensitivity to LPG, Propane and hydrogen. That's why, it is most widely used for the purpose of gas leakage detection. Potentiometer can be used to adjust its sensitivity. The main features of MQ-2 Sensor is that having high sensitivity and fast response time, measurements can be taken as soon as possible. It is capable of detecting natural gas concentrations in the range of 300-1000ppm.

The Arduino UNO is a Microcontroller board Which is based on the Microchip ATmega 328p Microprocessor this Board is consist of 14 digital and 4 analog pins it can be Programmed with the Arduino IDE by means of a type B USB cable.it is operated at the voltage of 12v.

6.3.Buzzer



Fig.10 Buzzer

Buzzer, often called as beeper, is an audio signaling device that may be either mechanical, electromechanical, or piezoelectric. It makes use of transistor and capacitor to convert electrical energy into sound energy [12]. The most popular applications of buzzer include alarm devices, timers, and confirmation of user input (for e.g. mouse click or keystroke). It starts beeping when some action has been performed. (Ex: In our proposed topic, the buzzer starts beeping when no vessel is detected over gas burner even after specified time period).

6.4.LCD Display



FIG .11 LCD DISPLAY

This is a large 20x4 character LCD module with selectable interface modes(I2C, UART, SPI). Some of the other unique features include software control of backlight brightness as well as contrast, allowing for quick adjustments depending on ambient light conditions or user preference.

6.5.Relay

Relay is an electromechanical device that uses an electric current to open or close the contacts of a switch. The single-channel relay module is much more than just a plain relay, it comprises of components that make switching and connection easier and act as indicators to show if the module is powered and if the relay is active or not.

6.6.Servomotor



6.7.ESP8266 wifi module



Fig.13 wifi module

The **ESP8266** is a very user friendly and low cost device to provide internet connectivity to your projects. The module can work both as a Access point (can create hotspot) and as a station (can connect to Wi-Fi), hence it can easily fetch data and upload it to the internet making **Internet of Things** as easy as possible.

7. Conclusion

This paper presents a simplified solution for monitoring and detecting LPG using IoT.IoT has so many applications in daily life and it's very reliable. also a main advantage of this system is to close the valve of a cyclinder when there is a leakage.This research finds a new solution to solving the LPG leakage problem. This smart electronic system notifying people about gas leakage in multiple ways. Besides the onsite buzzer alarm, it sends notification alert.A combination of multiple observation ways from a remote distance makes this system more unique and effective. Multiple systems can be viewed by using a mobile phone. Sometimes this system can trigger an alarm for the presence of a small presence of LPG nearside cooking stove during cooking. However, it's a low-cost system but very effective on gas leakage monitoring and able to play a vital role to prevent exploration due to LPG Gas leakage

References

- [1] V. Suma, R. R. Shekar and K. A. Akshay, "Gas Leakage Detection Based on IOT," 2019 3rd International conference on Electronics, Communication and Aerospace Technology (ICECA), Coimbatore, India, 2019, pp. 1312- 1315, doi: 10.1109/ICECA.2019.8822055.
- [2] R. Kurzekar, H. Arora and R. Shrestha, "Embedded Hardware Prototype for Gas Detection and Monitoring System in Android Mobile Platform," 2017 IEEE International Symposium on Nanoelectronic and Information Systems (iNIS), Bhopal, 2017, pp. 6-10, doi: 10.1109/iNIS.2017.11.
- [3] S. Garg, J. Moy Chatterjee and R. KumarAgrawal, "Design of a Simple Gas Knob: An Application of IoT," 2018 International Conference on Research in Intelligent and Computing in Engineering (RICE), San Salvador, 2018, pp. 1- 3, doi: 10.1109/RICE.2018.8509034
- [4] Banik, B. Aich and S. Ghosh, "Microcontroller based low cost gas leakage detector with SMS alert," 2018 Emerging Trends in Electronic Devices and Computational Techniques (EDCT), Kolkata, 2018, pp. 1-3, doi: 10.1109/EDCT.2018.840509
- [5] Nag, A. I. Zia, X. Li, S. C. Mukhopadhyay and J. Kosel, "Novel Sensing Approach for LPG Leakage Detection: Part I—Operating Mechanism and Preliminary Results," in IEEE Sensors Journal, vol. 16, no. 4, pp. 996- 1003, Feb.15, 2016, doi: 10.1109/JSEN.2015.2496400
- [6] A. K. Srivastava, S. Thakur, A. Kumar and A. Raj, "IoT Based LPG Cylinder Monitoring System," 2019 IEEE International Symposium on Smart Electronic Systems(iSES)
- [7] (Formerly iNiS), Rourkela, India, 2019, pp. 268- 271, doi: 10.1109/iSES47678.2019.00066.
- [8] M. Santiputri and M. Tio, "IoT-based Gas Leak Detection Device," 2018 International Conference on Applied Engineering (ICAE), Batam, 2018, pp.1 - 4, doi: 10.1109/INCAE.2018.8579396S. Unnikrishnan, M. Razil, J. Benny, S. Varghese and
- [9] C. V. Hari, "LPG monitoring and leakage detection system," 2017 International Conference on Wireless Communications, Signal Processing and Networking (WiSPNET), Chennai, 2017, pp. 1990-1993, doi: 10.1109/WiSPNET.2017.8300109.
- [10] B. Zuo, "Grove - Gas Sensor(MQ5) - Seed Wiki", Wiki.seeedstudio.com, 2020. [Online]. Available: https://wiki.seeedstudio.com/Grove-Gas_Sensor-MQ5/. [Accessed: 28- May- 2020].
- [11] P. M. Vidya, S. Abinaya, G. G. Rajeswari, and N. Guna, "Automatic lpg leakage detection and hazard prevention for home security," in Proceeding of 5th National Conference on VLSI, Embedded and Communication & Networks on April, vol. 7, 2014. Chraim, Y. Erol, and K. Pister, "Wireless gas leak detection and localization," IEEE Trans. Ind. Inf., pp. 1–13, 2015.
- [12] V.Naren, P.Indrajith, R.Aravind Prabhu, C S Sundar Ganesh. 'Intelligent Gas Leakage Detection System with IOT Using Esp 8266 Module'. International Journal of Advanced Research in Electrical, Vol. 7, No. 12, December 2018. Government of India: Details of Accidents and Fatalities Relating to LPG from 2016-17 to 2018-19.
- [13] Macker, Alan, et al. "ARDUINO Based LPG Gas Monitorin & Automatic Cylinder Booking with Alert System." 2018 2nd International Conference on Trends in Electronics and Informatics (ICOEI). IEEE, 2018.
- [14] Jolhe, B. D., P. A. Potdukhe, and N. S. Gawai. "Automatic Lpg Booking, Leakage Detection and Real Time Gas Measurement Monitoring System." International Journal of Engineering Research & Technology (IJERT) 2.4 (2013): 1192-1195.
- [15] Keshamoni, Kumar, and Sabbani Hemanth. "Smart Gas Level Monitoring, Booking & Gas Leakage Detector Over IoT." 2017 IEEE 7th International Advance Computing Conference (IACC). IEEE, 2017. MQ-6 Gas Sensor Technical Data, Hanwei Electronics Co. Ltd, 2002.
- [16] Fraiwan, L. Lweesy, K. Bani-salma, A. Mani, N, "A wireless home safety gas leakage detection system", Proc. Of 1st Middle East, Conference on Biomedical Engineering, pp.11-14,2011.
- [17] Priya, K. P., Surekha, M., Preethi, R., Devika, T., & Dhivya, N. (2014). Smart gas cylinder using embedded system. International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering (IJIREEICE) Vol, 2, 958-962.

Iot Based Gas Leakage Dectector

- [18] Didpaye, B.B. and Nanda, S.K., 2015. Paper on “Automated Unified System for LPG using Microcontroller and GSM Module” in A Review. International Journal of Advanced Research in Computer and Communication Engineering, 4(1), pp.209-212
- [19] S. SHRESTHA, V. P. K. ANNE AND R. CHAITANYA, "IOT BASED SMART GAS MANAGEMENT SYSTEM," 2019 3RD INTERNATIONAL CONFERENCE ON TRENDS IN ELECTRONICS AND INFORMATICS (ICOEI),TIRUNELVELI, INDIA, 2019, PP. 550-555, DOI:10.1109/ICOEI.2019.8862639.
- [20] V. Tamizharasan, T. Ravichandran, M. Sowndariya, R. Sandeep and K. Saravanel, "Gas Level Detection and Automatic Booking Using IoT," 2019 5th International Conference on Advanced Computing & Communication Systems (ICACCS), Coimbatore, India, 2019, pp. 922- 925, doi: 10.1109/ICACCS.2019.8728532.
- [21] Mr. Mahesh S. Kholgade, Ms. Puja S. Dukare, Ms. Vaishnavi Reshmukh, Ms. Sneha V. Pathak, Ms. Minal P. Mahajan, “LPG Leakage Detection and Control System by Using Microcontroller”, International Journal of Research in Advent Technology (IJRAT), E-ISSN: 2321-9637,Special Issue National Conference “CONVERGENCE 2017”, 09th April 2017.
- [22] Harshada Navale, Prof. B. V. Pawar, “Arm Based Gas Monitoring System”, International Journal of Scientific & Technology Research Volume 3, ISSUE 6, JUNE 2014, ISSN 2277-8616.
- [23] Asmita Varma, Prabhakar S, Kayalvizhi Jayavel, “Gas Leakage Detection and Smart Alerting and Prediction Using IoT”, 2017 IEEE.
- [24] Prf.P. S. Sonawane, Darade Pooja, Kankrale Pratiksha, Shah Rozmin, “Automatic LPG Gas Cylinder Booking Software and Weight Measurement Using Load Cell & GSM”, IOSR Journal of Electronics and Communication Engineering (IOSR-JECE), e-ISSN: 2278-2834, p- ISSN: 2278-8735, PP 49- 52, www.iosrjournals.org.
- [25] Rohan Chandra Pandey, Manish Verma, Lumesh Kumar Sahu, “Internet of Things (IOT) Based Gas Leakage Monitoring and Alerting System with MQ-2 Sensor”, 2017 IJEDR, Volume 5, Issue 2, ISSN: 2321-9939.
- [26] O. Mohana Chandrika & B. Alekya Hima Bindu “Automatic Gas Alerting System”, Imperial Journal of Interdisciplinary Research (IJIR) Vol-2, Issue-6, 2016, ISSN: 2454-1362.