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## DETECTING THE LEAKAGE OF LPG USING GSM MODULE

R. Vinifa<sup>1</sup>, S. Ajaymoorthy<sup>2\*</sup>, Anish Kumar<sup>2</sup>, Iyyappan V<sup>21</sup>

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### Abstract

Gas leaks are a major problem in the industrial sector, in the domestic environment, and in gas-powered vehicles such as CNG (compressed natural gas) buses, automobiles, and other vehicles. Establishing a gas leak detection system in sensitive areas is one of the prevention techniques to prevent accidents caused by gas leaks. The system uses a gas sensor to detect liquefied petroleum gas (LPG) leaks and uses Global System for Mobile Communication (GSM) to send an SMS to the person concerned about the leak. When the concentration of LPG in the air reaches a certain limit, the sensor detects a gas leak and the output of the sensor is low. The gas sensor detects the presence of gas, and the LED and buzzer are operated simultaneously by the microcontroller. The user receives an alert, which includes an SMS sent to the programmed mobile number.

**Keywords:** Gas Leakage, Arduino, GSM Module, MQ2 Sensor.

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<sup>1</sup> Assistant Professor, Department of Electrical and Electronics Engineering, Saveetha Engineering College, Chennai – 602105, [rvinifa@yahoo.com](mailto:rvinifa@yahoo.com).

<sup>2</sup>UG Students, Department of Electrical and Electronics Engineering, Saveetha Engineering College, Chennai – 602105

\* [ajaymoorthy19@gmail.com](mailto:ajaymoorthy19@gmail.com)

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## 1. Introduction

The use of gas causes many problems at home and in the workplace. Combustible gas, liquefied petroleum gas (LPG), is often used at home and at work. Gas leaks have a devastating effect on people's lives and their cultural heritage. As a result, it is decided to design an inspection system to detect LPG gas leaks and protect workplaces by taking appropriate precautionary measures at the appropriate time, as stated in the project idea.

When a gas leak is detected, sensors in the project are employed to detect the leak and if a gas leak is detected, the sensors in the leak detection program will be used to quickly activate the buzzer for danger alert. A buzzer indicates the presence of a gas leak. When the dangerous gas was detected, its operator received a dangerous message from GSM. Detecting a gas leak is just as important as stopping the leak.

## 2. Related Works

Many techniques are implemented to detect the gas leakage in literature. GSM is used in [1] to detect the gas leakage and gives wireless warning. The authors suggested a WSN-based smart system for the detection of LPG and combustible gases in the flexible modes of smart gas detection [2] based on modern methods. [3]'s authors proposed an embedded system for hazardous gas detection and alert, combining all hardware into a single embedded board for convenience, affordability, and long-term use. The performance and functional characteristics of the ARM-based sensor are described in [4].

Changes in CO<sub>2</sub> and temperature are monitored, and an alert is sent to a distant site. Monitor the parameters humidity, light, and oxygen surrounding the pipeline using a wireless sensor node based on the PIC18LF4620 [5].

The authors of [6] proposed a sensor-based dynamic adaptive pedestrian crossing system for traffic intersections. This system

uses an ARM microprocessor, Wi-Fi, and a camera module to create a type of crossroads framework that may provide pedestrian safety as well as allow automobiles to notice persons on foot before entering potentially dangerous situations. The authors of [7] offer a low-cost, adaptable, and dependable home monitoring and management system with added security based on the ESP32, with IP connectivity through local Wi-Fi allowing formal users to view and control equipment remotely using an Android smart phone application.

The authors of [8,9] presented Modernization of Indian Agricultural System Using Microcontrollers with the 8051 and GSM. This paper aims at the social welfare of the Indian agricultural system and the approach of the irrigation system to provide better irrigation in a particular area. The soil moisture sensor detects whether the soil is dry or wet and provides data to the microcontroller. The amount of water in the water source was detected by the water level sensor and passes the information as SMS through microcontroller and GSM[10].

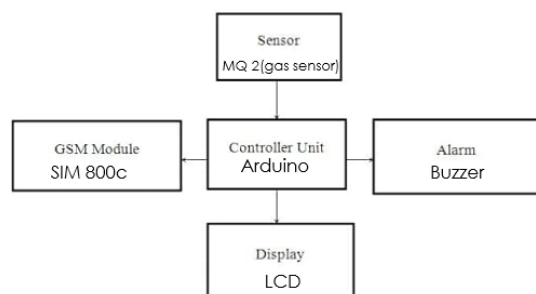
A system is provided which uses the above work to detect gas leaks simultaneously in three separate locations, and will notify people through buzzer. In the source code, the mobile number of the person to be given has been added. SMS will be sent to that mobile number.

## 3. Proposed System

Figure 1. shows the components involved in gas leakage detection. The Arduino UNO (Atmega-328) is the system's primary unit, and it performs the following functions. The output signal of the sensor, which is delivered as input to Arduino, is used to condition the signal of the Arduino UNO. On the LCD, the detection findings are presented. Indicates that individuals are in risk at work, at the factory, or at home.

There is buzzer activity with a beep(siren) sound.

Using a GSM modem, send an alarm SMS to the plant's in charge, whose number is recorded in the SIM card. The SMS received is determined by the presence of a gas leak in the sensor's detecting region.



**Fig. 1.** Block Diagram

#### 4.Hardware Description

**Arduino UNO:** Figure 2 shows the Arduino UNO microcontroller used in this work. The Arduino board serves as the system's key component, with all the components are externally interfaced on the board. The board is programmed according to the functions to operate in unison. It is an electronic prototyping platform that supports the Atmega-328, an 8-bit, 16-Mhz microcontroller. Serial communication is enabled at this time, and the board contains 14 digital I/O pins with 6 analogue input pins and 6 PWM pins runs on 5 volts. Each pin has a distinct purpose to govern.

EEPROM and Non-volatile storage are used for storing. The unmistakable fact that non-volatile storage contents are erasable is the primary comparison of a non-volatile storage with an EEPROM. The whole device is wiped, unlike an EEPROM. Based on Byte and Section, the selected part of the program can be erased. The BIOSROM of the PCB is a relatively new addition that is widely utilised.



**Fig. 2.** Arduino UNO

**MQ2 SENSOR:** Figure 3 depicts the MQ-2 gas sensor module, that detects smoke concentrations and flammable gas in the air, and the output is measured as an analogue voltage and digital value output.

The supply voltage is 5 volts. H<sub>2</sub>, LPG, CH<sub>4</sub>, CO, SMOKE, and PROPANE are all extremely toxic to it. It includes three pins for transmitter, receiver, and ground, and the potentiometer may be used to modify the sensitivity. Detects LPG at concentrations ranging from 200 to 10,000 ppm.



**Fig. 3.** MQ-2 Gas Sensor

**GSM MODULE:** - The SIM800C GSM module is used to deliver SMS alerts in the event of a gas detection. The GSM SIM card is used to control the wireless node. The GSM requires a DC source of 5 volts in order to work. To communicate with the Arduino controller Atmega-328, the modem simply requires three connections: receiver, transmitter, and ground. The microcontroller is plugged in with the device's receiving pin. The Arduino

communicates with the GSM device [2] to send SMS to a number typed into the code via the SIM installed into the SIM slot to inform about the leaking of LPG gas or any other gas identified by the sensor. Figure 4 shows how AT instructions are used to connect with the GSM module.



Figure 4: - GSM Module

**Buzzer:** A buzzer is a device that emits a beeping sound to alert and warn those working in the vicinity of a risk. The system's output is the buzzer. The buzzer makes a beep-beep sound, which signifies danger.



Fig. 5. Buzzer

**LCD:** An LCD is programmed to display the message "gas detected at zone". The message is shown on the LCD, and the data and command are both LCD registers, as illustrated in fig.6. The register selections are used to make changes to the registers.

The data register is RS=1, while the command register RS is equal to 0.



Fig. 6. LCD display

## V. SOFTWARE IMPLEMENTATION

Figure 7 depicts the flowchart of the proposed implementation of the software. This device uses a sensor to detect the gas and smoke levels. If any gas is detected, the sensors' signal drops to zero, triggering the Arduino UNO. If no gas is detected, the LCD shows "NO GAS DETECTED" in its 16x2 display.

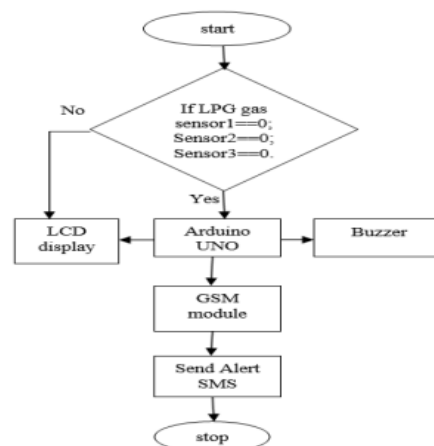
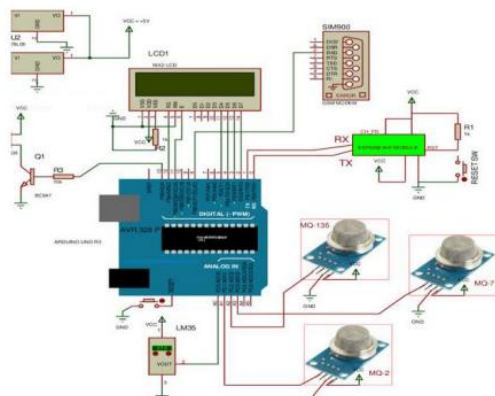


Fig. 7. Flow Chart

## 6. Results & Discussions

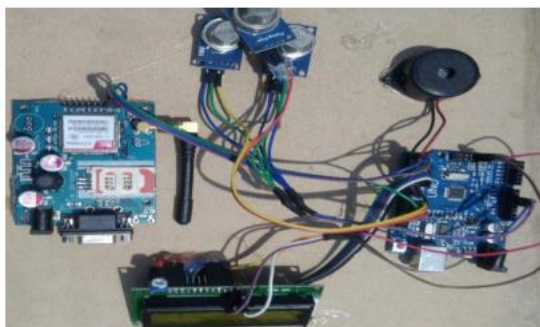
The project's schematic design is shown in Figure 8. This approach has been tested by a gas leak near the sensors; the MQ2 gas sensor detects the gas leak and provides a signal to the Arduino UNO. Arduino sends strong signals to other externally connected devices like the LCD, buzzer, and GSM. As a consequence, the GSM module sends an SMS to the specified cell phone number. The results for the individuals who are in

the vicinity are shown on the LCD. Also, a beep sound is created to indicate the risk.



**Fig. 8. Schematic of Proposed System**

Figure 9 depicts the experimental setup of the proposed system. The complete hardware is housed on a single board with a wireless GSM result. Figure 10 depicts the result of sensor 1 displayed in LCD, which reads "GAS DETECTED AT ZONE 1,"



**Fig. 9. Experimental setup**



**Fig. 10. Results of proposed system**

## 7. Conclusion

The detection of LPG gas leakage in this project is remarkable. It may be used for both industrial and home purposes. We can use this technique to save lives in dangerous situations. The GSM module sends out a

warning. Gases such as CO<sub>2</sub>, oxygen, and propane are detected by a sensor node. The predicted transmission range and power consumption are obtained. The sensor was built using basic techniques and an Arduino UNO Micro controller.

## References

- [1] Pratima S. Kabadi, Ankita M. Patil, Pranita A. Patil, 2015, Security Against Gas Leakage using GSM Modem, International Journal of Engineering Research & Technology (IJERT) Iconect – 2015 (Volume 3 – Issue 06),
- [2] Hema, L. K., Murugan, D., & Chitra, M. WSN based Smart system for detection of LPG and Combustible gases. In National Conf. on Architecture, Software systems and Green computing-2013.
- [3] Ramya, V & Palaniappan, B. (2012). Embedded system for Hazardous Gas detection and Alerting. International Journal of Distributed and Parallel systems. 3. 10.5121/ijdp.2012.3324.
- [4] Kristofferson A, Du J, Ehn M. Performance and Characteristics of Wearable Sensor Systems Discriminating and Classifying Older Adults According to Fall Risk: A Systematic Review. *Sensors (Basel)*. 2021 Aug 31;21(17):5863. doi: 10.3390/s21175863
- [5] Ortiz Perez A, Bierer B, Scholz L, Wöllenstein J, Palzer S. A Wireless Gas Sensor Network to Monitor Indoor Environmental Quality in Schools. *Sensors*.2018;18(12):4345.https://doi.org/10.3390/s18124345.
- [6] Saad, Wasan & Hashim, Yasir & Al-Areeqi, Waheb. (2020). Design and Implementation of Portable Smart Wireless Pedestrian Crossing Control System. *IEEE Access*. PP. 1-1. 10.1109/ACCESS.2020.3000014.
- [7] Ch, Rajendra Prasad. (2019). Internet of Things Based Home Monitoring and

- Device Control Using Esp32. International Journal of Recent Technology and Engineering. 8. 58-62.
- [8] Ramu, M & Ch, Rajendra Prasad & Tech, M & Anantasagar, Dept. (2013). Cost effective atomization of Indian agricultural system using 8051 microcontroller.
- [9] Sachin Prabhakar Bandewar, Aditi V. Vedalankar, 2013, Design of GSM Based Embedded System for Irrigation, International Journal Of Engineering Research & Technology (IJERT) Volume 02, Issue 06 (June 2013),
- [10] Siva, B & Raju, Naga & Sushil, V & K, Raghava. (2021). Water Tank Level Monitoring For Wireless Sensor With Gsm/Gprs Mobile Network. 2. 422-425.