Automatic Gas Leakage Detection using IOT

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Abstract. The gas detectors can be used for the detection of combustible, flammable and poisonous gases and for loss of oxygen, and also to detected a gas leak or other pollutants. It makes the area where the leak occurs an warning sound and instructs operators to leave the area. The system proposed is planned, built and sent an SMS warning system for detection of gas leakages. Infrared imaging sensors have recently been used for a number of applications in industrial plants and refineries.

1. Introduction
The leakage of liquefied oil gas (LPG) is known to lead to serious accidents that resulted in thousands of thousands of dollars in deaths and property worldwide. LPG is one of the most commonly used fuels in India and as such precautions have to be taken in order to safe guard against accidents such as explosions and suffocation that are associated with its usage [4]. LPG consists of propane and butane mixtures that are combustible substances. Because of the smellless nature of these chemicals, the odour is applied to keep the gas odourless. However, some people are not sensitive to the smell particularly at low levels and thus, in households, factories and automobiles that rely on the use of gas, an efficient and accurate system for detecting gas is required.

2. Proposed System
Design and development of the gas detection, alarm and automatic windows opening system, we achieve the project via the MQ-2 sensor to feel nearby gases [5]. So we use arduino software to write the functionality of the system how and when it should works by feeding code in arduino board. To design and develop a Gas Leakage Detection System and send an alert message, automatically open the windows. Our goal is to establish an automatic gas detector system, and if the people are close by, they will take protective action while they are missing, so that there are no fire accidents to avoid an SMS warning from being sent to the receiver and to open the windows near the receiver in order to save at least part of the gas from fire accidents[6].

Even though there have been great strides in developing effective LPG leakages detection and response systems over the past years, there are still improvements that can be made to previous designs. Most systems developed focus on the detection of the leakage and sounding of an alarm in response to the detection by using microcontroller and also send SMS to the appropriate person. A much more improved version has a power fan installed for circulating the gas.

These designs even though prudent do not solve the leakage problem. The objective of the project is to create a system that can detect the leakage of LPG and shut down the house's power supply...
automatically. The device would also send an SMS to the appropriate authority via the GSM module, to investigate the leakage, alert the people in the house via Buzzer, and open windows automatically. The system consists of a sensor (MQ-2) that is highly sensitivity to propane (C3H8) and butane (C4H10), an Buzzer, a UNO Arduino (microcontroller), a GSM SIM 800C module, two channel relay module, 16x2 LCD display and a Servo motor [7]. Not only does this device monitor LPG leakage but it also shuts down the supply in order to mitigate pollution, accident and leakage expense.

3. Objective

The main objective of this paper, using gas detector to detect gas leakage and also gives alarm sound to the area where the leak is occurring, instructing operators leave from that place using IOT.

4. Block Diagram

![Figure 1 Block Diagram](image)

5. Working Principle

5.1. Circuit Explanation
This is the circuit for the gas leakage detection system that has MQ-2 gas sensor to the Arduino and connected to the bread board. Next the LCD display (16*2) is interfaced to the arduino board to display the gas level and if the gas level increases it shows 'gas is leaking'. We also added a 5v buzzer so that it buzzes a sound when a sensor detects a gas leakage. Then by using the GSM module connected to the arduino, when the gas leaks it also sends an alert message to the receiver. We use the Arduino software to define pin Mode of buzzer, LCD display, MQ-2 gas sensors. Cable is connected to the Laptop to get power supply and upload the functionality of the code into the circuit.

5.2. Model Explanation
This model is working on the logic of detecting a harmful gases present in the surroundings so that the sensor detects them and it sends a signal to the arduino board. First we place the sensor to the system so that it can detect the gas which is present in (200-10000) ppm. Then we are adding a LCD display
and buzzer so that when the arduino gets the signal from the arduino the display shows the gas is leaking and buzzer starts sound to alert the system. If the gas leakage is heavy and it starts sending an alert message by using GSM module to the receiver. As there are no one present around it will take automatic preventive measures so that the power of the house shutdowns so not to happen any fire accidents. Finally after sending an alert message and power goes off and the windows opens by using mini servo motors. After the leakage stops it also again sends a message tells that gas leaking is stopped.

5.3. Simulation of the Model

![Circuit diagram of proposed model.](image)

The figure 3 shows the idea how we want to implement the simulation model for working. By this we have an idea how to develop the model using the cardboard.

![Real time model](image)

5.4. Steps in Model-Building

- To look at the actual system and their relations and to gather data on the behaviour of its different elements.
- Conceptual model construction.
- Creation of an operating model
- Check the model for anyone else.
- Create a flow map that theoretically contains any potential step when an occurrence happens. a machine should take
• Consider the model output in a variety of input parameter settings for reasonability in detail. (Often over looked!).
• At the end of the simulation, press the input parameters, make sure they are not inadvertently changed.
• Make the operational model possible as self-documenting.
• Verify that what is displayed in the animation imitates the real structure, whether the operating model is animated.
• Use the debugger.
• Use a graphic representation of the model if possible

5.5. Calibration and Validation of Model
Figure 4 shows Calibration and Model Validation

![Figure 4 Calibration and Validation of Model](image)

5.6. Hardware Setup:
The hardware configuration model is shown in Figure 5.

![Figure 5 Hardware setup](image)
5.7. Testing and Analysis

- The above pictures are the simulated models for the real world model, where we developed the model according to the steps discussed above.
- Testing is the crucial part in the model, where we need to test the model in different aspects by giving inputs of different values and observing the results provided by the simulated model, we need to analyse the result such that the model should produce the accurate result without any fault, where it is predominant to work in real time system.
- For that we need to create a test cases that should be implemented on the model and note the results provided by the model. Where we can say it is working properly and suitable to real world system or not.

5.8. Test-Cases To Check

- Detection Of Gas By Sensor: To validate this test case we must release as much gas close the sensor and validate that the sensor detects or does not detect the gas, this can be identified by the sensor light.
- Working Of LCD Display And Buzzer In Proper Way: We need to check the LCD working by giving proper delay for each component in arduino and check buzzer is buzzing for the given delay or not.
- System Working: The LCD monitor should indicate the gas level normal if there is no gas leakage.
- Working Of Power Supply And Mini Servo Motors: When the sensor starts detecting the gas the power supply of the house goes off and automatically windows should open by using arduino voltage.

5.9. Output Results

Message received to mobile when gas leaks & intimating after stops which is shown in the figure 6

![Figure 6 Mobile Snipper](image_url)
The proposed device would include a solution in which the MQ2 sensor gas is used to regulate the device and to isolate the main power & gas source in the event of leakage, to avoid incidents such as gas leakages in households and factories. The model can be extended further in future such as adding various sensors like fire sensor, PIR sensor for total automation detection and alert system.

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