Gas Spilling Recognition and Prevention Using IoT with Alert System to Improve the Quality Service

Dr. Sanjeev Kulkarni

Associate Professor, Department of Information Science & Engineering, Yenepoya Institute of Technology, Mangalore, India, sanjeev.d.kulkarni@gmailcom

Aishwarya Shetty

Assistant Professor, Department of Information Science & Engineering, Yenepoya Institute of Technology, Mangalore, India, aishshetty@gmail.com

Mimitha Shetty

Assistant Professor, Department of Information Science & Engineering, Yenepoya Institute of Technology, Mangalore, India, mimithacharanraj@gmail.com

Archana H S

Student, ISE, Information Science & Engineering, Yenepoya Institute of Technology, Mangalore, India, archanahs133@gmail.com

Swathi B

Student, ISE, Information Science & Engineering, Yenepoya Institute of Technology, Mangalore, India, Swathishetty9924@gmail.com

Abstract: Safety is most important for anything which we have in our daily life, especially in the residences to prevent the explosion or blast of gases. As Liquefied Petroleum gas(LPG) is used for vivid needs at residences and in commercial sites, like cooking, heating, lighting, cooling, etc, safety is very important. Among the most common varieties of energy source used in domestic is propane in which liquefied gas contains. Now-a-days the blast or explosion of domestic LPG is increasing, which cause damage to human lives and property. This paper presents an Arduino UNO system, which detects a gas spilling and naturally turns off the gas regulator to stop gas leakage. Also alerts the user by sending messages or e-mails and alerts the close by region by making beep sound when it detects leakage. It provides more security by shutting down the main power supply, makes exhaust fan to pull out all leaked gases.

Keywords: MQ-6 Gas sensor; Internet of Things; Arduino UNO with ARDUINO; LCD; Wi-Fi module; USP

I. INTRODUCTION

Liquefied or condensed Petroleum Gas(LPG) is used for various purpose utilization at residential and in most of the business sites, for instance, cooling, cooking, lighting, heating, etc. LPG gas is essentially the blend of propane and butane, and it is odorless in its common state. The smell that we notice when there is a hole is really the odor of a completely unique operator, called Ethyl Mercaptan [1]. Whilst leaving the main storage areas, this substance is mixed with the gas. As we all know, LPG is very dangerous, because if it leaks, it can cause terrible fires and drastic blast[2].

To evade over one, Ethyl Mercaptan is added to the gas, which has that strong scent of destroyed or spoiled cabbages. The smell helps us detect when there is a flow of gas, which is required in the perspective of security and safety. Since a little break may step by step develop a touchy grouping of gas, spills are hazardous [2] [3].

Notwithstanding causing fire and blast dangers, breaks can murder vegetation, including enormous trees, and may discharge ground-breaking ozone depleting substances to the climate. Bhopal gas tragedy was an example of gas leakage accident in India [1] [3]. This was world's worst gas leakage industrial accident. There are many examples of life accidents due to leakage of gases; recently.

- A woman in her late 40's suffered grievous burns due to a gas leak while cooking at her home near Madhavaram, Tamilnadu. India.

- A woman was grievously injured in fire incident after a gas leak at her home in Tadeplli of Guntur district, Andhra Pradesh India.

- Nine individuals including four youngsters were egregiously harmed when a fire brought about by LPG spillage triggered a cylinder blast at a house in Peenya, Bengaluru, India.

The existing system provides an alarm system primarily to detect a gas leak in domestic and commercial premises. The fundamental target of this framework is to screen the spillage of melted oil gas (LPG) so as to stay away from genuine fire mishaps and encourage security measures [1]. The framework recognizes LPG spills from the gas sensor and illuminates the purchaser regarding the

gas spill by sending an instant message. Be that as it may, it won't turn off the handle of the gas cylinder naturally [2].

Here, System is being employed to detect the excess of gas in the marked environment to prevent fire accidents and ensure the safety of the home. This gas recognition and alert system won't just caution the spillage however will likewise precisely kill the handle of the gas chamber to hold onto any spillage of gas [1] [5]. Also, this framework educates the concerned individual by messaging and dropping a message on their portable. This gives a bigger level of wellbeing to any gas arrangement in any conditions. This framework is a conservative adaptation for the assistance of security as it includes numerous smaller than expected highlights of uber noteworthiness and holds a USP of programmed gas closing element, in the event of nonappearance of any human assistance in the zone of spillage this component is of incredible criticalness [4].

A number of research papers have been published on gas leak detection techniques, in which gas sensors are used for detection of leakage and also providing an alert to users by SMS using GSM. This paper uses the concept of Internet of Things (IOT) to alert the users. An IOT is a new concept in clouding which consists of an interconnection of household appliances, physical devices, and other devices which are embedded with software, electronics, actuators, sensors, and a network connectivity with the help of which these devices can exchange data and connect.

II. OBJECTIVES

General Objectives of our new system are:

- To layout and acquire a project "LPG Leakage Detector using Arduino with SMS Alert and Sound Alarm", the specific objective is to perceive gas outflow like Methane leak, Butane leak, and LPG leak, Methane outflow or any such petroleum centered on gaseous substance that can be discovered using MQ-6 device.

- To layout and set up an SMS centered Alert method send SMS alert missives to restrict mobile number enter inside the Arduino program.

- To layout and acquire a project that will fabricate a sound alarm during gas outflow and rest the alarm once gas outflow is regulated.

- Show status in an LCD using a 16×2 LCD component and to rest the gas supply using Solenoid controller.

- Shut down the main power supply and makes exhaust fans to pull out all leaked gases.

III. METHODOLOGY

A. System Methodology

The V-model technique was used to acquire the project. This technique is very easy to apprehend and utilize. The

simplicity of this technique also makes it simpler to accomplish. The V-Model is dependent on the relationship of a testing stage for each similar or corresponding improvement level. This means that for every single segment in the improvement drive, there is a directly correlated testing phase. This is a highly-restricted model and the next stage starts only after the end of the previous phase.

B. Requirement Analysis

a) *MQ-6 Sensors:* The MQ6 (LPG Gas Sensor) a simple to-utilize condensed oil gas (LPG) sensor. It very well may be utilized in gas spillage identifying gear in shopper and industry applications, this sensor is appropriate for distinguishing LPG, iso-butane, propane, LNG.

b) *Liquid crystal display (LCD):* It is connected to the Arduino board by connecting its data pins to pins 2 to 5 of the Arduino board. The 12 and 13 pins of the Arduino are connected to the E and RS pins of the LCD respectively. The RW pin of the LCD is grounded. LCD pops up with a display, says 'Gas detected Alert ON'.

Fig 1.   LCD Display

c) *Stepper Motor:* This motor is utilized into achieving the interesting errand of this ready framework that is, in the fitting situation the ARDUINO educates the engine to start pivoting by a point of 90° and mood killer the handle of the controller.

d) *Exhaust Fan:* In the event of overabundance of gas being spilled as of now the odds of deformed expands moderately to battle this, an exhaust fan is utilized to clear the spot.

e) *Buzzer (AUDIO INDICATION):* At the point when the buzzer gets the necessary voltage, which really is observed and trained by ARDUINO it starts to buzz and alarms the nearby.

f) *Arduino IDE:* Arduino is combination of a physical programmable circuit board and a piece of software. To write and upload computer code to a physical board this IDE (Integrated Development Environment) is used that runs on computer.

According to [6], Arduino is an open-source electronics platform. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. You can

tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing [2].

g) *GSM Modem:* This is one of the significant blocks in our project. GSM modem is utilized for sending SMS with the goal that client can get remote sign. GSM modem is utilized to send SMS to client about the circumstance of gas cylinder like threshold is crossed or gas level is 20%, gas level is beneath 5%. Microcontroller speaks with GSM modem and sends orders to GSM modem. Accordingly, a text SMS is sent to the proprietor of the gas cylinder.

C. Validation Phases

The unusual Validation Stages in a V-Model are explained in detail below.

a) *Unit Testing:* Unit tests intended in the module model are accomplished on the code during this validation phase. Unit testing is the assessment of code level and it helps eradicate bugs at an early stage, though all deficient cannot be exposed by unit testing.

b) *Integration Testing:* Integration testing is connected with the architectural design stage. Integration tests are accomplished to test the existence and transmission of the internal components within the system [2].

IV. WORKING

The Arduino is a propelled adaptation and it is most appropriate for cutting edge shut circle control applications, for example, industrial drives and servo engine control; digital power; solar converters and inverters; power line communications and transportation. Here it is employed for:

- Observing and checking the surpassing edge esteem through a gas sensor which is prefixed. As the limit esteems cross, the program is executed and Arduino teaches the signal to ring and caution the nearby.

- Along with this, Arduino also sends an email/SMS/ call to the worried about the leakage of gas and a text message is dropped on the cell phone of the destitute, these all undertakings are started and are done under control of Arduino.

- Arduino also powers the stepper motor to begin rotating.

- LCD, exhaust fan, and relay all begin to come in action in accordance to Arduino.
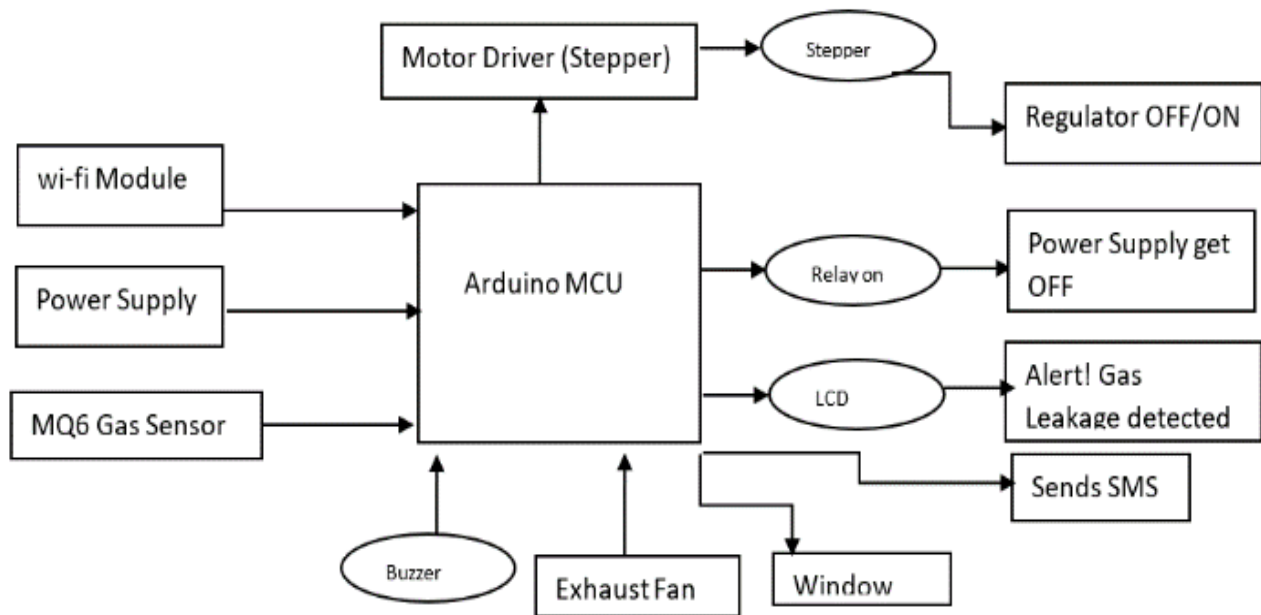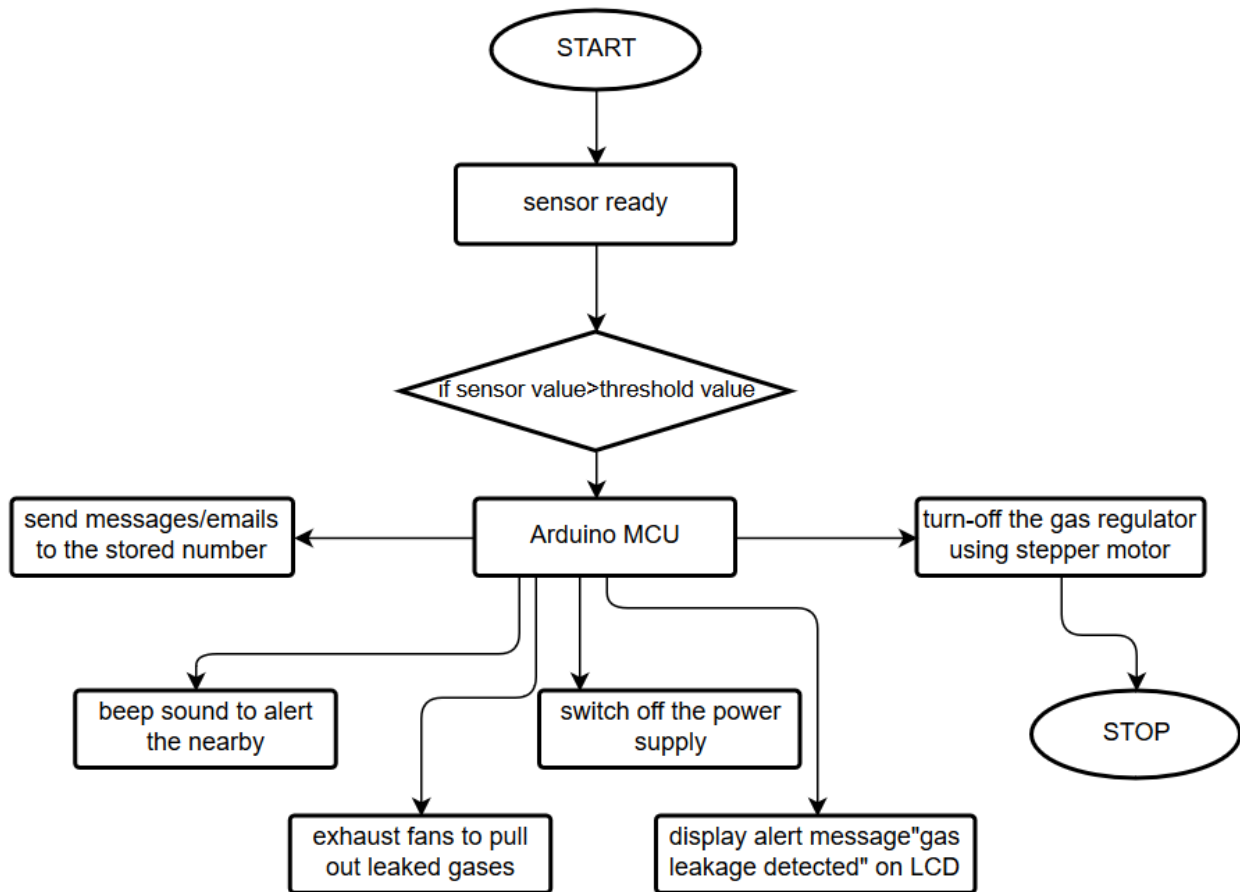

Fig 2.   Block diagram of the system

Fig 3.   Flowchart

V.   RESULT

In order to determine the result of the project, safety matches or lighters are used to obtain leaked gases around the gas sensor. If the gas sensor senses a value greater than a threshold the microcontroller present in the Arduino will perform the following programmed tasks:

1. The regulator knob is turned off immediately after there is a sensing of gas leakage.

2. Within a few seconds (say 5 seconds) the main power supply is cut off by the relay.

3. In order to alert nearby individuals and users, a message is displayed on the LCD screen and a buzzer is made to beep.

4. Wi-Fi module will send alert message.

5. The message will be triggered to open kitchen room window and the exhaust fan will fan on all enclosed gas from the environment.

When reset button of Arduino pressed, the system will get refreshed. It is multiple operational projects and combines many features in all together at one place.

VI.   CONCLUSION

The research and development would hit new dimensions in case of introduction of any impurity detection sensors of new gas detectable sensors. This gas system is successfully able to perform all the stated functions and has shown to be a great tool from a gas safety point of view.

VII. FUTURE WORK

Based on the conclusion of the research, the proponents formulated several recommendations for the study. The group would like to recommend to the future researchers that they continue to develop this prototype device to find a way to include the manipulation of LPG tank hand wheel and anything that will help to the proposed project but not recommended for LPG stores.

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