Automatic LPG cylinder booking and leakage detection using Arduino UNO

Sarika K Shinde, Priya R Khore, Ashwini T Hirave, Prof. Vipul R Kaushik, Prof. Sudhir N Divekar, Dr. Vijay N Patil

Department of Electronics and Telecommunication, H.S.B.P.V.T.'s Parikrama Group of Institutions, COE, Kashti, Maharashtra, India

ABSTRACT

Nowadays People are busy in their life so they do not have enough time for their security and safety that's why we are working on this issue regarding home security. In kitchen, Hotels, and industry while using LPG Cylinder there are many problems occurs such as the time required for booking of LPG Cylinder it also creates the problem with gas leakage. Our designed system can help for monitor and detect gas leakage by using the sensor as soon as gas leakage is detected an alert message sent to user and it also stops the gas supply by automatically switching off the regulator with the help of motor and immediately turns on the exhaust fan and turn on buzzer which can help near people.

Keywords : Arduino uno, GSM, Load cell, Smoke detector

I. INTRODUCTION

In India, the supply of LPG through pipelines is not possible due to a short-age of LPG. As technology being improved many gas agencies or distributors have implemented IVRS these days although due to daily busy schedules, the customer finds very difficult to book new cylinder, and also it is very dangerous when an LPG gas leakage occurs in any domestic usage, chemical industry or in any other applications. This project provides an automatic booking of LPG cylinder and to overcome the problem of LPG leakage. In the present time, everyone is busy in their daily life and it is difficult to know the status of the gas cylinder. Further, it will register your booking through GSM technology by sending SMS to the distributor company and also send an alert to the user at the same time[1][2][3]. It will be helpful for those aged people who live alone and are dependent on others, by making them independent and secure them from any kitchen hazardous So, our proposal is to completely automate the process of refill booking without human intervention that accordingly will help consumer against foul play. Our system is also intended to help consumers to upgrade their safety standards, act in accordance with statutory requirements on environmental commitments and most importantly the basic function being prevented by accidents and protect life and property from disasters. The primary objective of our paper is to measure the gas present in the cylinder when the weight of the cylinder reached below the fixed load, using the pervasive sensors. The gas retailer gets the order for a new cylinder and the house owner receives the message about the same and the details about the booking proceedings. And the secondary objective is to provide any malfunction in a gas system in order to prevent damage or explosion of LPG.

II. LITERATURE REVIEW

LPG, first produced in 1910 by Dr. Walter Snelling is a mixture of Commercial Propane and Commercial Butane having saturated as well as unsaturated hydrocarbons. Because of the versatile nature of LPG it is used for many needs such as domestic fuel, industrial fuel, automobile fuel, heating, illumination, etc and the demand for LPG is on an exponential raise day by day Before the development of electronic household gas detectors in the 1980s and 90s, gas presence was detected with a chemically infused paper that changed its colour when exposed to the gas [4][5][6].

Manohar Raju and N. Sushma Rani, 2008; they introduce an Android-based automatic gas detection and indication robot. They proposed prototype depicts a mini mobile robot which is capable to detect gas leakage in hazardous places. Whenever there is an occurrence of gas leakage in a particular place the robot immediately read and sends the data to android mobile through wireless communication [7][8][9].

Mahalingam introduces Gas leakage is a major concern with residential, commercial premises and gas-powered transportation vehicles. One of the preventive measures to avoid the dan-ger associated with gas leakage is to install a gas leakage detector at vulnerable locations. The objective of this work is to present the design of a cost-effective automatic alarming system, which can detect liquefied petroleum gas leakage in various premises. In particular, the alarming system designed has a high sensitivity for primary butane, which is also individually sold bottled as a fuel for cooking and camping. The proposed system is designed to meet UK occupational health and safety standards. Test results are demonstrated for a USB powered gas leakage detection system and it gives early warning signals under less severe conditions and activates a high-pitched alarm in case of emergency [10][11][12].
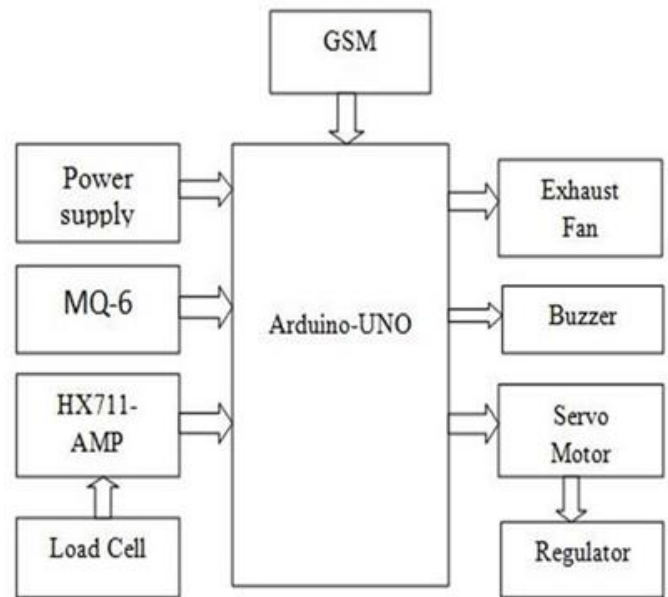
III. BLOCK DIAGRAM

Fig.1 Block diagram of Automatic LPG booking and Leakage detection using Arduino uno

Fig.2 Arduion UNO Board

IV. IMPLEMENTATION

In this project, we have proposed a system in which LPG cylinder is under a monitoring for automatic booking the cylinder and protection from gas Leakage.

4.1 Load cell

The load cell is used to Weight measurement of the patient. The load cell is a transducer that measures force as an electrical signal. The load cell uses a strain gauge to detect the measurement. The electrical signal

generated by a transducer is proportional to the weight of the cylinder.

4.2 Arduino UNO

It is the Heart of our system, The high-performance Microchip 8-bit AVR RISC-based microcontroller

4.3 Gas detector

Fig. 3 Load cell

combines 32KB ISP flash memory with read-while-write capabilities, 1KB EEPROM, 2KB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6- channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts.

CPU type: 8-bit AVR
Performance: 20 MIPS at 20 MHZ
Flash memory: 32KB
SRAM: 2KB
EEPROM: 1KB
Pin count: 28 or 32 pin: PDIP:- 28pin, MLF:- 32pin

The sensor has a high resistance and in the presence of gas, the sensor conductivity increases. The sensor has a simple drive circuit shown in Figure. The sensor

is driven from a 5V supply. A voltage (heating voltage) is applied between Pin 2 and 5 with a resistance of 26 3 to heat the sensor to the working temperature. When Tin Oxide is pre- heat in the presence of oxygen, oxygen is adsorbed on the crystal surface with negative charges.

Fig.4 Gas Sensor

4.4 GSM Module

GSM is a mobile communication modem; it stands for global system for mobile communication (GSM). The idea of GSM was developed at Bell Laboratories in 1970. It is a widely used mobile communication system in the world. GSM is an open and digital cellular technology used for transmitting mobile voice and data services operates at the 850MHz, 900MHz, 1800MHz and 1900MHz frequency band.

- ✓ The threshold value gets a fix into the microcontroller by programming.
- ✓ GSM modem is used to send and receive the message.
- ✓ The message will be sent from user to gas refill officer and notification will get from the gas refill officer to user.
- ✓ When a gas leak is detected by the LPG sensor.
- ✓ LPG sensor will send the signal to the controller and motor get started to turn off the regulator switch.
- ✓ The controller also starts the buzzer and turn ON Exhaust Fan.

Fig.5 GSM Module

4.5 Servo Motor

The servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity, and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use servo motor.

Fig. 6 Servo Motor

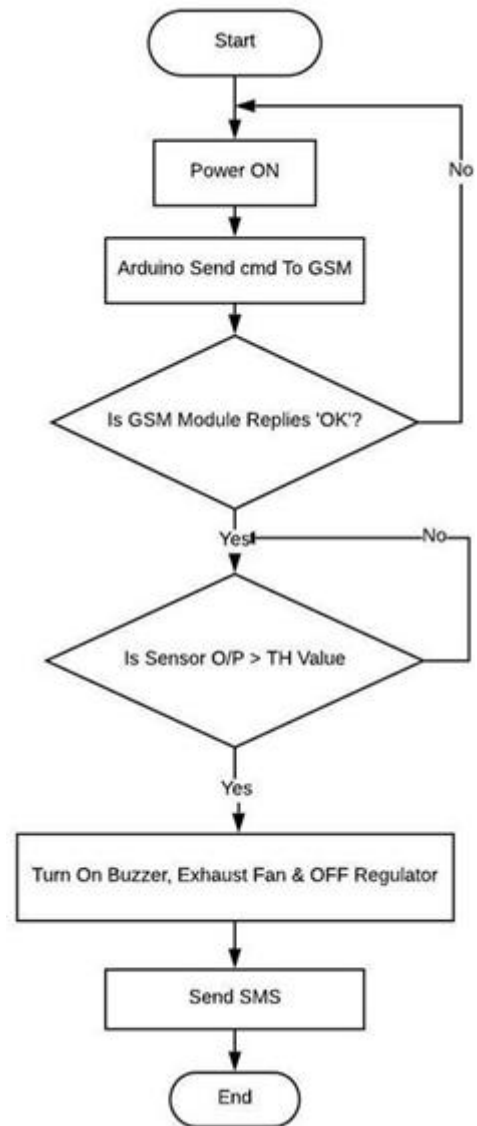## V. SIMULATION AND RESULTS

Software Design

Flowchart

Fig.7 Flowchart

A Algorithm

1. Load cell i.e. pressure sensor is used to check the weight of the cylinder.
2. If the cylinder weight is below the pre-defined threshold value then automatically send SMS to the pre-defined number i.e. to gas agency.

1. Arduino IDE Software

Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board. An integrated development
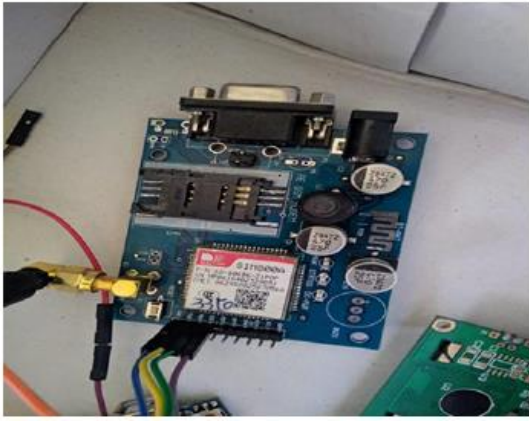
environment (IDE) is a software application that provides comprehensive facilities to computer programmers for software development. An IDE normally consists of a source code editor, build automation tools, and a debugger. Most modern IDEs have intelligent code completion.

2. Proteus

The Proteus Design Suite is a proprietary software tool suite used primarily for electronic design automation. The software is used mainly by electronic design engineers and technicians to create schematics and electronic prints for manufacturing printed circuit boards. It was developed in Yorkshire, England by Labcenter Electronics Ltd and is avail-able in English, French, Spanish and Chinese languages.

Simulated Results

Fig. 8 Simulation Result 1

As shown in Figure 8, in the simulation process we have interface Gas sensor ,LCD display, GSM module and motor with Arduino-UNO .This system will detect leakage of LPG and send an alert message to the user, at the same time it will switch off the gas supply of LPG by switching regulator-switch using BO (battery operated) motor.

Fig. 9 Simulation Result 2

As shown in Figure 16, in the simulation process we have interface load cell, with Arduino-UNO. This system will measure the weight of LPG cylinder when the weight of the cylinder goes below the threshold value it sends a message to the gas agency for booking purpose.

E. Implemented Results

Fig 10 Implemented Proposed Project

VI. CONCLUSION

By designing this project, we can help the people to provide safety and security by monitoring the gas leakage and providing automatic gas cylinder booking. It is very useful for all industrial, hospitals purpose as well as Home automation purpose. The programming used for this system is simple which is C language and can be easily understood by everyone.

VII. REFERENCES

[1]. Mahalingam, R. T. Naayagi, N. E. Mastorakis, "Design and Implementa-tion of an Economic Gas Leakage Detector", (2012).

[2]. Kaushik Vipul R. et al., "IOT based energy meter billing and monitoring system -A case study," International Research Journal of Advanced Engineering and Science, Volume 2, Issue 4, pp. 64-68, 2017.

[3]. V. N. Patil et al., "Criminal Identification Using Arm7," International Research Journal of Engineering and Technology, Vol: 04, Issue: 3, pp.677- 680, Mar -2017.

[4]. Ch. Manohar Raju and N. Sushma Rani "An Android Based Automatic Gas Detection and Indication Robot,(2008).

[5]. Vipul R. Kaushik et al., "IOT based Vehicle Tracking & Vehicular Emergency System-A Case Study and Review", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol. 6, Issue 10, pp. 8001-12, October 2017.

[6]. V. N. Patil et al., "Voice over Internet Protocol Technology for Automation," Wulfenia Journal Klagenfurt , Austria, Vol 24, No. 3, pp. 321-330, Mar 2017.

[7]. Hitendra Rawat, Ashish Kushwah, Khyati Asthana, Akanksha Shivhare "LPG Gas Leakage Detection Control System (2014).

[8]. V. N. Patil et al. "Digital Static Timing Path Analyzer for DSCH Program," International Research Journal of Engineering and Technology, Vol: 04, Issue: 3, pp.674- 677. | Mar -2017

[9]. S.N.Divekar and S.N.Pawar. Article: PIC Microcontroller and PC based Multi Sensors Artificial Intelligent Technique for Gas Identification. International Journal of Computer Applications 121(14):34-38, July 2015.

[10]. Kaushik Vipul R., Tanaji Dabade, Vijay N. Patil "IOT based air and sound pollution monitoring system- a review" JETIR June 2019, Volume 6, Issue 6, pp 543-548

[11]. R.Naresh Naik , P.Siva Nagendra Reddy ,S.Nanda Kishore , K.Tharun Kumar Reddy "Arduino Based LPG gas Monitoring Automatic Cylinder booking with Alert System", (2016).

[12]. Kaushik Vipul R., Tanaji Dabade, Vijay N. Patil "Process of Biometric Authentication and Its Application-A Review" JETIR April 2019, Volume 6, Issue 4, pp 1021-1025