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Smart gas assistant for a perfect kitchen

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***Abstract* — Technology is developing at a faster phase influencing ourselves and our environment so as to make a comfort and an easy living. Nowadays Liquified Petroleum Gas (LPG) stored in cylinder is being used widely for the purpose of household cooking. People find it difficult to identify the amount of gas remaining and identify gas leakage. This paper proposes a smart way of measuring the amount of LPG available in the cylinder, Automatic booking of cylinder, Cylinder valve control, Automatic opening of emergency windows to provide ventilation and sending the house owner an alert notification through mobile application along with an alarm and buzzer to notify the neighbours so as to avoid major accidents and save our lives.**

Keywords—Arudino, Wi-Fi and GSM Module, Internet of Things, Online Tool, Mobile Application.

I. INTRODUCTION

Dr. Walter Snelling identified that gasoline at its liquid state had a large volume of LPG along with propane, butane, and other hydrocarbons way back in 1910. He also identified that LPG could be used as a source of lighting, fuel, and cooking. LPG technology was awarded a U.S. patented. The demand for LPG is on an exponential raise day by day. The major reason of choosing LPG as a preferred source among the available sources is that it has a high calorific value produces very less smoke and environment friendly.

Major amount of LPG is consumed for domestic application where no proper facilities are made to keep the LPG cylinders under prescribed conditions and environments. Even using the same pipeline over years without proper maintenance will result in leakage of gases which may result in mishaps. When a hazard happens due to pressure the cylinder bursts out adding up to the destruction. The explosion results in a pressure wave and a large fireball. to a radius of 500 meters causing death or fire burns to person within the radius. Various attempts to handle this problem are made by authors. A mobile app, alarm and buzzer are used to notify the user and neighbours. Emergency ventilations and gas valves controlled by a stepper motor is added to the system. Arduino with Wi-Fi and GSM facility are used, for further access of information and analytics the data are stored in cloud. to create these components, incorporating the applicable criteria that follow.

Figure 1. shown below depicts the model of Arduino attached with GSM and Wi-Fi module for effective communication of data to the fire station and alert the user indicating an emergency.

Fig.1 Arduino interfaced with GSM / Wi-Fi

II. LITERATURE SURVEY

[1]A.S .Falohun, A.O.Oke, B.M.Abolaji ,O.E.Oladejo proposed the dangerous gas detection using an integrated circuit and MQ -9 .This system mainly aimed at detecting the leakage and sounding an alert ,so that we can safeguard building from danger .[2] Hina Ruqsar, R.chandana, R.Nandini, Dr.T.P.Surekha, proposed the internet of things based real time gas leakage monitoring and controlling .This system aimed at monitoring the gas leakage with the help of electronic sensor and feed the data over internet .[3] Gaurav V.Tawale-patil, Klyani.H.kulkrani,Pooja .U.Kuwad, Pooja.R.Pawar proposed the smart kitchen using IoT. In this system, it senses whether there is a gas in the cylinder is about to get over and then immediately inform the owner and books the cylinder. [4] Poojadahiya, Neha, Dr.SRN.Reddy proposed internet based home alert system using Wi-Fi and current technologies. The main objective of the paper is it can detect the theft, fire ,leakage of gas or smoke and sense an auto generated e-mail remotely to intimate thee owner using Wi-Fi and cloud technologies .[5] Prof .M.Amsaveni, A.Anurupa, R.S.Anupreetha, C.Malarvizhi,N. Gunasekaran proposed the GSM based LPG leakage detection and controlling system .The main aim of this project is that it automatically detect control gas leakage and alerts the user by sending SMS with help of GSM module .[6] S.T.Apeh, K.V.Erameh, U.Iruansi proposed the design and development of kitchen gas leakage detection and automatic gas shut off system .This system detects gas leakage and alerts the user through alarm and whenever there is a fire outbreak it shuts off the supply valve .so that the gas flow stops .[7]Amita Thakare,Pooja R.Gandhe proposed a review paper on kitchen monitoring system using embedded web server .the LPG gas level can be monitored continuously and it is sent as an alert information to the owner via IoT network instantly.[8]Prof.Trupti K. Walbe, Rajashree R.Shinde proposed GSM based digital fuel meter and fuel theft detection using PIC microcontroller. In this system we display the fuel availability and when fuel gets theft it alerts through text message or buzzer.

III. EXISTING METHODOLOGY

In all the existing approaches, various gas detection techniques and gas sensors are used for detection of gases, but the way of handling the dangerous gases that are identified are not implemented clearly. Major reason for firing is due to the usage of electrical appliance in the presence of combustible gases. Some papers suggested the idea of using ventilation/exhaust fans. When the fan runs continuously, heat is generation which may cause combustion of gases leading to accidents.

IV. PROPOSED METHODOLOGY

This paper takes care of automatic LPG Gas Cylinder booking system and effective handling of leakage. Pressure sensor is used to find out the volume of gas present inside the cylinder. If the volume of gas is below 25%, an alert notification is sent to the user via a mobile app powered by Wi-Fi facility and if the gas level present inside goes below 10%, an automatic booking of LPG gas is done from a registered mobile number. Using MQ05 (LPG Gas sensor) we are detecting the amount of gas present in the environment. If the volume of gas present is greater than the threshold value three immediate responses has to take place, First one is that using a stepper motor we are controlling the cylinder valve and an emergency exhaust window so that excess gases may flow out reducing the amount of gas present in the environment. The second part that gets into action is a buzzer so as to alert the neighbours and the third one is that an alert notification is sent to the user via mobile application so that the user can be aware of the situation. The amount of gas present is checked upon frequently and if the value of the gas is found to be continuously increasing even after various efforts, a notification is sent to the nearby fire station and the power of the house is set to shut down so as to avoid any disasters or fire accidents.

The purpose of sending the user information about the volume of gas present in the cylinder is to guide him for limited usage of LPG gas until the fresh cylinder reaches our home. An Automatic booking from a registered number is done using a GSM module.

The figure 2 shown below explains about the working of various modules such as Wi-Fi, GSM and stepper motor drivers for controlling the servo operated gas valve and exhaust window. A LCD display is attached to the system so that the user can be aware of the percentage of LPG gas present in the atmosphere.

A. Block Diagram

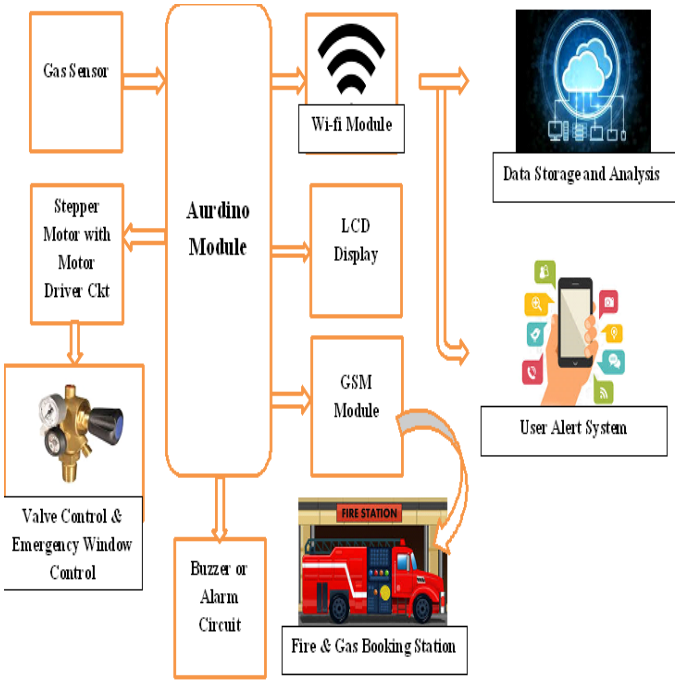

Fig.2 Block Diagram of Gas Alert System

This project mainly consist of six modules as follows

1. User Interface

User interface is everything that the user can see and interact with. In this module the android enabled phone makes control of the home automation system. Android provides a variety of pre-build UI components such as structured layout objects and UI controls that allows you to build the graphical user interface for your app. Android also provides other UI modules for special interfaces such as dialogs, notifications, and menus. The interface should allow user to view device status and to control device.

2. Wi-Fi Router Configuration

The Wi-Fi unit provides the medium for communication. It can be also configured to make security services. The Wi-Fi should be configured with a certain address and user commands will be directing through Wi-Fi unit.

3. Arduino

Arduino is an open-source platform. 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.

4. MQ-5 Sensor

They are used in gas leakage detecting equipment in family and industry, are suitable for detecting of LPG, iso-butane, propane, LNG, avoid the noise of alcohol and cooking fumes and cigarette smoke. The enveloped MQ-5 has 6 pin, 4 of them are used to fetch signals, and other 2 are used for providing heating current. This is the latest and most favorable senor to use for this project.

5. Stepper Motor

A stepper motor is a motor controlled by a series of electromagnetic coils. This design allows for very precise control of the motor: by proper pulsing, it can be turned in very accurate steps of set degree increments (for example, two-degree increments, half-degree increments, etc.). This motor will be perfect for controlling the regulator. We will use a Bipolar Stepper motor as it will allow us to rotate the regulator in both directions.

6. GSM Module

GSM is a mobile communication modem and is used to send and receive voice calls as well as messages. In our project they are used for sending messages

Arduino module acts as a brain of the system. It controls various activities taking place in the system. The gas sensor used here is MQ5, It takes care of identifying LPG gas presence in the environment. The stepper motor along with the motor driver takes care of controlling the cylinder valve by rotating at equal degree of intervals and takes care that the emergency exhaust windows open in a sequence. The Wi-Fi Facility is added to the system so that data can be stored in the cloud to identify the reason behind by using various data handling and analysis. Using the same Wi-Fi data is sent to the user through mobile application. GSM Module is used in case of automatic booking of LPG and sending an alert to the nearby fire station so that they can come to the spot and immediately take care of the situation. LCD is also used so that the user in the kitchen will also be able to get to know the values of gas present.

B. FlowChart

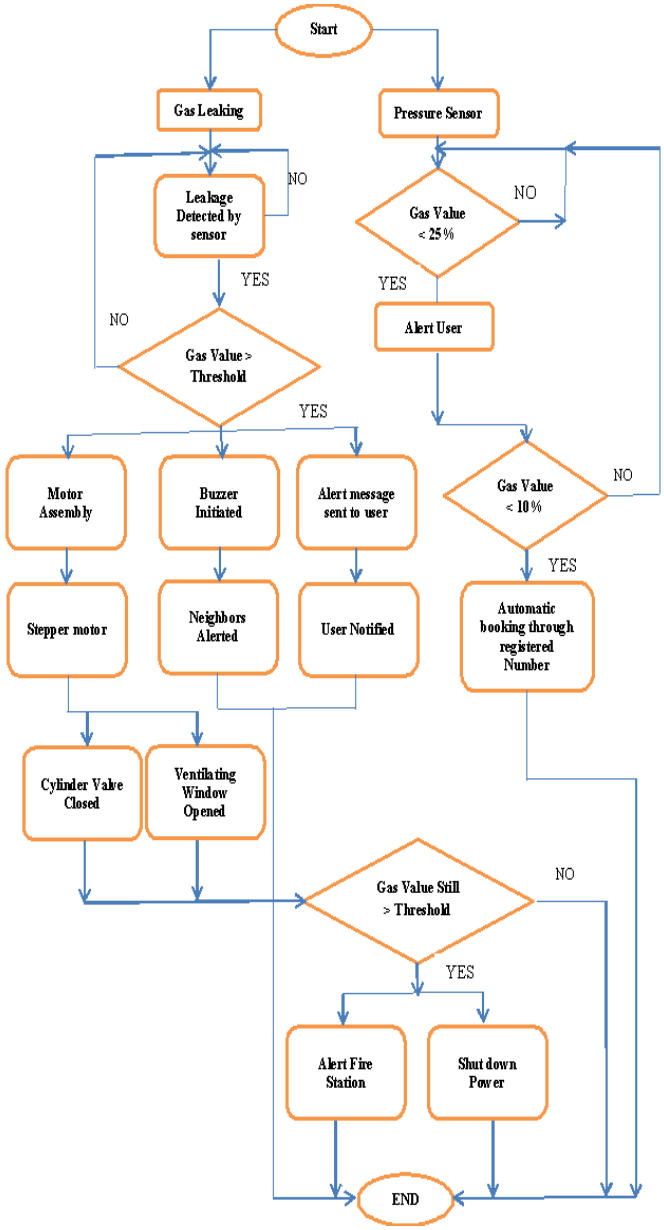

Fig.3 Flow Chart of Gas Alert System

Figure 3 depicts the exact flow that takes place in the system. The system flow starts at the initial condition where the level of gas present in the atmosphere is calculated to a last step where an alert notification is sent to a near-by fire station for rescues purpose. Figure 4 shows the connections involved in the gas alert system.

V. CONNECTION DIAGRAM

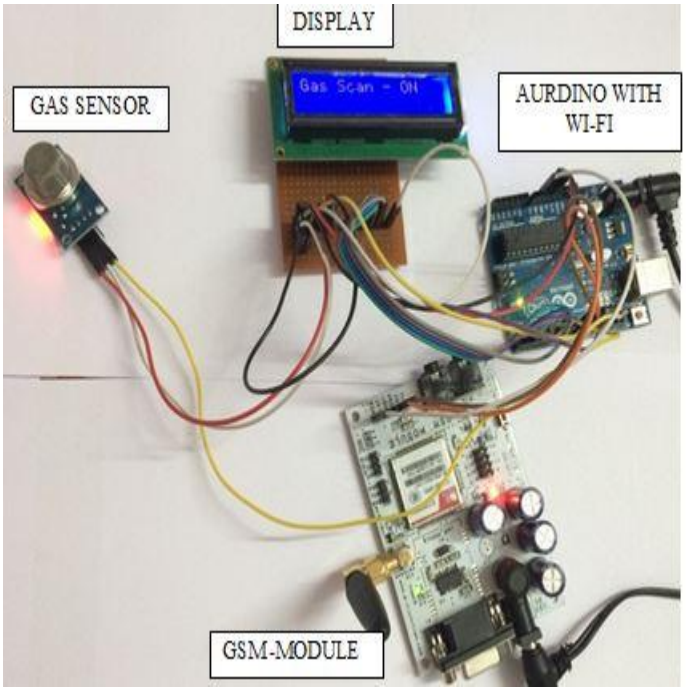

Fig.4. Flow Chart of Gas Alert System

VI. CONCLUSION AND FUTURE WORK

The method of detecting the leakage of LPG and methods adapted for controlling its leakage by controlling the regulator and implementing various control actions is found to be effective. We all use LPG cylinders in our homes but we have no satisfactory safety measures. Using the Internet-of-Things is a novel way to ensure that this project will have future scope and is scalable because it could be merged with other home-automation systems. The future scope is that this can be implemented in industries and mining areas that are much prone to hazardous gases.

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