AUTOMATIC GAS BOOKING SYSTEM USING IOT

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ABSTRACT

For economic reasons in many countries, the most widely used and well-liked fuel source for cooking is LPG (Liquefied Petroleum Gas). It is also preferred for its convenience on usage among the users. In this paper, we discuss about the smart booking system which will be used for booking the new LPG cylinder by automated process of continuous monitoring the LPG cylinder, measuring the content level of gas in cylinder and displaying the gas content level in LPG gas cylinder (house-hold) on its usage by the customers. The content level of LPG in cylinder is not examined normally and hence in the proposed smart booking system, the content level of LPG in cylinders is displayed. Here, a load sensor is used to measure the level (minimum load) of LPG in cylinder and the sensor output is connected with a Node mcu esp8266. By the use of GSM (Global System for Mobile communications) module, the information regarding to refill the cylinder is passed to the user through SMS (Short Messaging Service), and thereby completing the automatic (smart) booking of cylinder by sending message to the booking number of gas that the user had registered with. By this process, the detection of gas level in LPG cylinder is done continuously and displayed via LCD, thereby indicating the usage of gas by the customer from the date of delivery of cylinder to the customer. When the gas content level in cylinder is below the minimum load (below 20%), then the user mobile is alerted through a proper message as a part of IOT. Hence, automatic (smart) booking of latest LPG is done by sending message to LPG booking office and thereby preventing late booking.

Keywords: Arduino Uno, GSM module, lawful candidate, Liquefied Petroleum Gas, Load Cell Sensor, minimum load, Smart Booking System.

I. INTRODUCTION

The process of booking gas plays a major role in everyone's routine life. Usually what happens is, when the customer gives a call to the LPG gas distributor, either the call will not get connected or the customer's request will not be registered, thus wasting the user's time. On the other hand, if the user did not notice the reduction of gas level in cylinder in-time, then the user would book the cylinder by paying extra money to the third party vendors outside.

In this smart gas booking system, the content level of gas in cylinder is closely monitored from time to time and a proper message is sent to the customer and booking number when the gas is about to get complete thus saving the customer's time during gas booking. Here we have used a load cell sensor to sense the content level of gas in cylinder, which in-turn is controlled by the micro controller based system been built into a device acting as an alarm which provides a visual sign or sound an alarm on completion of the LPG.

The load cell sensor has a quick response time and proper sensitivity at low cost. Through GSM module, proper message will be sent to the customer and booking number of the gas provider on identification of gas content level crossing the minimum load (below 20%) by the load cell sensor, thus notifying the cylinder should be refilled with gas by displaying the gas content level on a LCD (Liquid Crystal Display).

II. ARCHITECTURE

A. LPG Weight Detection System using GSM

LPG weight (gas) detection system using GSM is applicable in houses, restaurants, hotels and also in various industries [2]. Automatic gas booking system is employed to continuously keep track of the load in the LPG gas cylinder. In our home, we repeatedly observe that, when the gas content level in the LPG gas cylinder is found to be nil, then a request is raised for the brand spanking new LPG cylinder at the provider office of the LPG gas cylinder. Due to shortage of LPG gas cylinders at the gas providers, there are delays in providing gas cylinders [3] to the customers which happens repeatedly. The ultimate problem for this is delay in booking at the gas providers.

The utilization of LPG gas within the home or restaurant is for cooking purpose. If the LPG gas within the gas cutter is found to be empty in those places, then at that time, request for brand spanking new gas cylinder is sent to the gas storage department and if there is shortage of gas cylinders within that gas storage department will result in delay in providing LPG gas cylinder to the candidate or customer from the gas store.
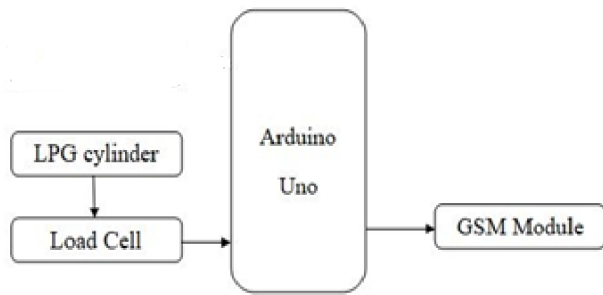
Fig 2.1 Gas Sensor Architecture

To avoid all such situations we are implementing a smart booking system show in fig. 2.1 which is LPG weight detection and gas booking system which includes LPG cylinder connected with the load cell that monitors the load of the cylinder on its daily usage and if it is found that the gas weight of the cylinder falls below the minimum load then proper information regarding minimum load is sent to the lawful customer through GSM module with the help of Arduino Uno controller which properly ensures the timely action to be taken for booking.

B. Smart Booking System

Literally we are quite engaged in our routine work and it is not an easy task to keep track of the level (load) of LPG gas cylinder all time. If LPG gas level gets drained without any proper information regarding the reduction point to the user, then it will create a difficult and unbalance able situation in our lifestyle. In this smart booking system, the load of the cylinder is monitored or sensed using load sensor. It can track the LPG gas emptiness all the time and if the LPG gas level in the cylinder is extremely on the brink of empty level, then it will alert the lawful customer by sending a proper SMS [4] stating the reduction in gas minimum load limit and also to the LPG agency for ordering LPG cylinder. According to the present government regulation, there is an intense demand for LPG gas cylinders, but due to the shortage in production of LPG gas cylinders, once a replacement cylinder is booked we would need to wait for few days to get the delivery.

To avoid all these issues, the logic of our smart booking system is that, to continuously monitor the extent of LPG gas level that is present within the cylinder using the load cell. If the gas level is found to reach below the edge limit of gas around 20% (minimum load), then the smart booking system automatically books the cylinder by employing a GSM module and on order, the old empty cylinder is replaced by the new one in time and thus avoiding the inconvenience in regular activities of the candidate.

C. Load Cell Sensor

The environmental specifications of a load cell [5] as shown in Fig. 2.3 along with its physical and electrical specifications, helps to work with numerous applications for its specifications which is appropriately common in them. It includes FSO (Full Scale Output) an electronic output which is

measured in mv/V at full scale. The utmost variation from the drawn line in straight between the load at capacity which is rated and no load is represented by the combined error percentage of the complete scale output. It is also used to measure during times when loads get decreases and increases.
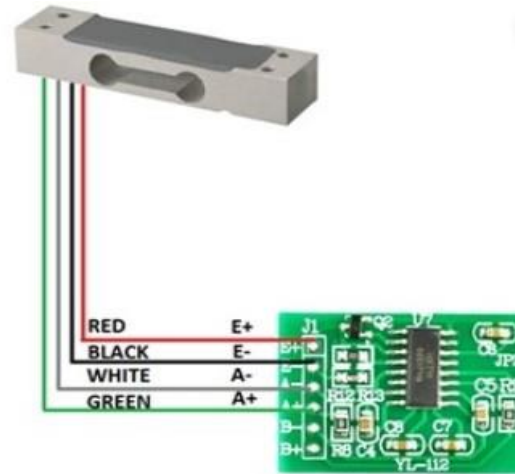

Fig 2.3 Load cell Sensor

Various properties of the load cell sensor are:

i) Hysteresis: For equivalent applied loads, it measures the difference between output signals of the load cell in maximum values. By decreasing load from rated outputs, the primary measurements are often arrived and therefore the second by increasing the load from zero.

ii) Zero Balance (also known as Offset): With a rated excitation and under no load, allows reading output of load cell. Under zero load, the variation in output between a real load cell and a true zero measurement is calculated and is expressed in percentage (%) of the full scale output.

iii) Repeatability: Total variation between the output measurements under identical conditions for repeated loads and measured in proportion of the rated output.

iv) Compensated Temperate Range: Measured in °F or °C. Within the defined limits of temperature range over, the load cell is compensated thus guaranteeing zero balance and rated efficiency in output.

D. Arduino Uno

In this smart booking system, Arduino Uno shown in Fig. 2.4 plays the role of a controller. Arduino Uno is a well-designed open source platform and its prototype supports user friendly software and ease of use hardware. Arduino Uno board [6] will be able to read inputs such as light sensor or Twitter message and switch to a power output to trigger and publish a motor online.
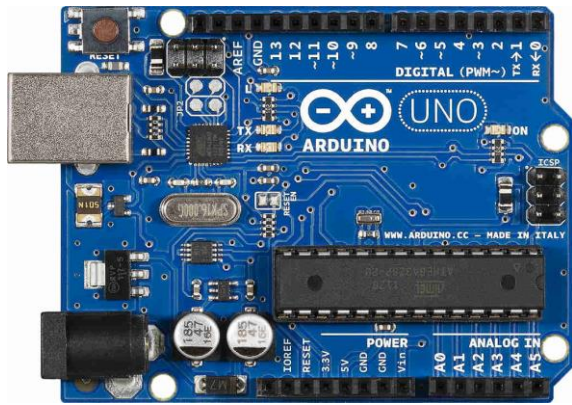
Fig 2.4 Controller-Arduino Uno

The Arduino Uno controller is one of the user friendly software for beginners. Arduino provides the quality and versatile board which is programmed to be reusable and can be connected with systems without the need for printed circuit board thus simplifying the method of creating an impact environment for users.

Various advantages in using this controller are,

- provides simple programming environment
- supports open source extensible applications
- Inexpensive
- supports cross-platform.
- flexible enough for advanced users and runs on platforms such as ios, windows and linux.

E. GSM System

The GSM system [7] as shown in Fig. 2.5 is a circuit which is used to provide communication between a computing device and a GSMA. The computing device could be a mobile device and GSMA could be a GPRS (General Packet Radio Service) system. The GSM module may be like a chip as well. MCU Telecommunications Standards Institute (ETSI) developed GSM (Global System for Mobile communications) as a well-known standard module.

Fig 2.5 GSM Module

Second Generation wireless cellular networks (2G networks) with GSM became the standards for mobile communications in global and is widely been working over various regions of 219 countries and has a market share of about 90%. To report about the various protocols used by the mobile phones, GSM was developed.

The mobile data service that has faster response to CDPD (Cellular Digital Packet Data) and works with packet oriented cellular technologies is GPRS. It is been made standard by the ETSI (European Telecommunications Standards Institute) and is used on the GSM of 2G/3G cellular communication networks.

III. EXISTING SYSTEM

Basic principle behind the system is concentration in the variation of gas level in LPG gas cylinder. The changes are monitored frequently and if it is detected it informs the user by emitting an audio visual alarm when it exceeds a particular threshold level [8]. When the detection occurs, it also sends another warning message to the receiver module via a Radio Frequency (RF) network. These receiver modules should be at a certain range in order to communicate with main device. So the receiver module should be at a distance within the house from the location of the gas outlet to detect the alarm square measure.

The Gas sensor detects the concentration of gas in pressure and sends the signal to the micro controller. The micro controller reads the voltage from the detector and the instructions will be executed to calculate the concentration shift present in the gas cylinder. For many types of gases, the Gas sensor is extremely sensitive but the types of gas cannot be detected using the Gas sensor unfortunately. The Gas sensing factor present in the sensor has similar sensitivity to most gases like CH4 and LPG [9].

The Alarm system cannot be noticed when the user is not at the home. So the low Gas level warning will not reach the user. With the absence of information about gas level reduction, the user cannot make decisions. It will end up in emergency cylinder booking after the cylinder gets empty. When the user is informed with the successful alarm, the user has to book the cylinder by calling the gas distributor. Sometimes the call cannot be connected or recorded. So these things are some of the disadvantages faced in the existing system.

IV. PROPOSED SYSTEM

Automatic Gas Detection System is designed using Wi-Fi module with various features to serve with many other applications as one system especially for LPG consumers. Wi-Fi module itself enables the system to store and process the data to detect the weight loss and also serves additional purpose like

tracking the weight lively through the internet with the help of an APP Interface.
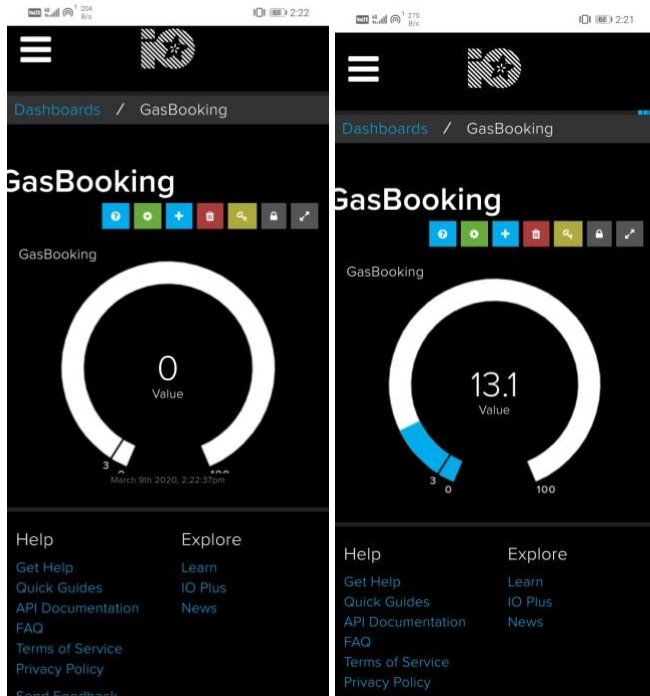

Fig 4.1 App Interface

Wi-Fi module is integrated with instructions using the Arduino Uno software which are to be executed to make further functions. The Wi-Fi module interacts with GSM module to send a message when the weight of an object falls below the fixed size (minimum load).
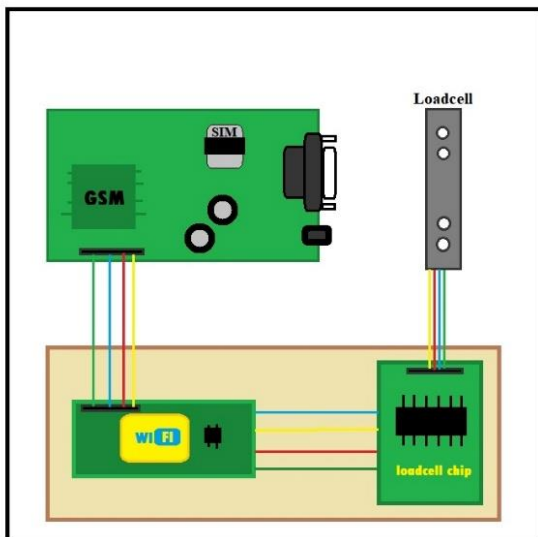

Fig 4.2 Gas Detection System Design

The Load cell sensor is the important device which calculates the weight of an object periodically by measuring the resistance created in a device. These resistances are triggered due to the weight of an object which is observed by the mechanism

named spring of the load cell sensor. The load cell sensor keeps on monitoring the gas level and sends signals to the Wi-Fi module.

The GSM module connected to the Wi-Fi module enables the system to achieve information sharing like sending critical gas level message to the user's mobile phone by SMS which is implemented as (Fig 4.3a. ID-1) and another message to the provider (Fig 4.3b. ID-2) to book the gas automatically. The sample messages triggered from the GSM module are shown in Fig 4.3a. ID-1 (message passed to the user unit) and Fig 4.3b. ID-2 (message sent to the provider to book a new cylinder)
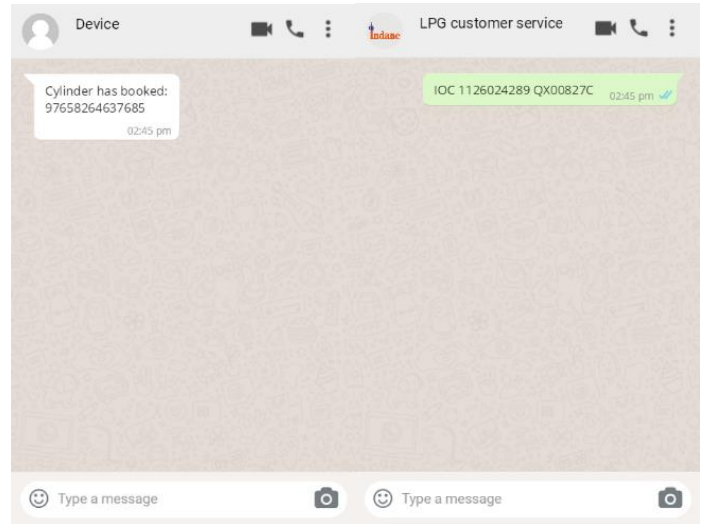

Fig. 4.3a. ID-1   **Fig. 4.3b. ID-2**

The booking confirmation message as shown in Fig 4.4, will be sent by the provider to the user after successful gas booking.
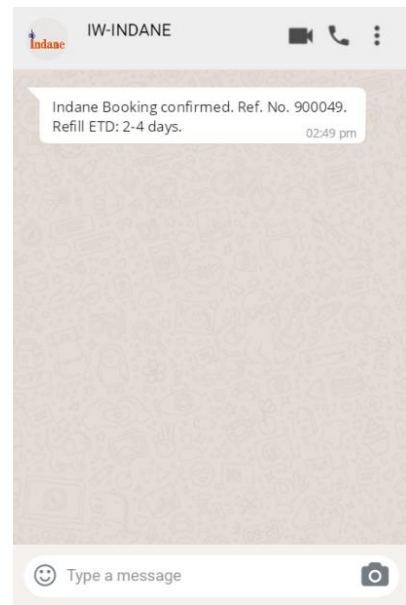

Fig 4.4 Booking Confirmation Message

The overall design structure of automatic gas booking system is shown in Fig 4.5 as gas detection proposed architecture.
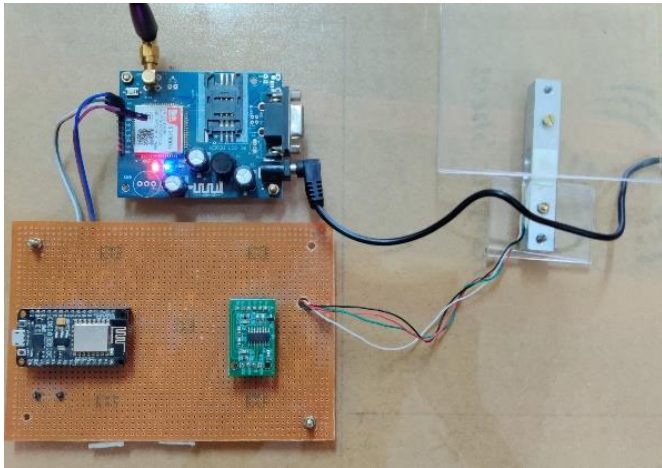

Fig 4.5 Gas Detection Proposed Architecture

When the volume of the gas is below the minimum load (below 20%), the devised system provides booking of new LPG cylinder at the LPG gas provider and thereby informing the user before the situation.

V. CONCLUSION

This paper is aimed to spot effective strategies for the implementation of Automatic Gas Booking system. The load of LPG cylinder is determined by the load cell sensor. The loads are going to be observed by the load cell sensor. While load cell observes the low weight and it sends an invitation to the microcontroller. Microcontroller will automatically send a message to the authority through GSM thus serving as an effective and efficient time managing gas booking system for the user.

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