Automatic LPG Cylinder Booking and Leakage Detection using Arduino UNO

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Abstract:
LPG cylinders have become an integral part of every home. Our kitchens are occupied with LPG cylinders which help us make delicious food. But it can be dangerous and life threatening. Therefore, it requires constant vigilance to reduce the danger. The aim of this project is to design a safety-oriented system which will alert the user about any threat in the kitchen through mobile and also capable of performing required action immediately. 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 motor. It ensures safety from any gas leakage accident like suffocation and explosion. As an additional advantage, this system has a weighing sensor which can measure the weight of the cylinder and regularly update user about gas left in the cylinder. This system will also help customers to know whether they are being cheated by gas agency by providing less amount of LPG. 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 user at the same time. 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.

Keywords: Arduino, Load cell, LPG booking, GSM module, Gas leakage, MQ-6 sensor, BO motor.

I. INTRODUCTION

In India, the supply of LPG through pipelines is not possible due to shortage of LPG. As technology being improved many gas agencies or distributors have implemented IVRS these days although due to daily busy schedules, customer finds very difficult to book new cylinder, and also it is very dangerous when a LPG gas leakage occurs in any domestic usage, chemical industry or in any other applications. This project provides automatic booking of LPG cylinder and to overcome the problem of LPG leakage. 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 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 gas system in order to prevent damage or explosion of LPG.

## II. PROPOSED APPROACH

A. Automatic LPG cylinder booking
B. Gas leakage detection
A. In automatic gas cylinder booking we continuously measure the amount of gas present in the cylinder using load cell which is interfaced with Arduino UNO and displaying weight of cylinder on LCD display. When gas level goes below the set level then message will be send to the gas agency and notification about same is given to the user using GSM module. So, user get cylinder within time.
B. In gas leakage detection process, any gas leakage is checked by gas sensor (MQ-6) which is interfaced with Arduino UNO. When leakage is detected BO (battery operated)motor will be immediately turn off the gas regulator-switch at the same time it informs the user about the gas leakage by sending the SMS, turning on the buzzer and also displaying message on LCD.

II. DESCRIPTION
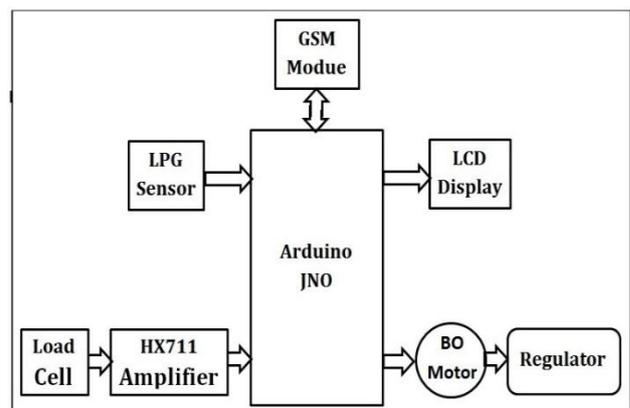
Fig 1: Block diagram representation of the system

Arduino UNO: The Arduino UNO is a microcontroller board based on the ATmega328.It uses an ATmega16U2 faster transfer rates and more memory.
Arduino can be used to develop stand-alone interactive objects or can be connected to software on your computer. It uses Arduino IDE (Integrated Development Environment)

software which allows you to write programs and upload them to your board. A program written with the IDE for Arduino is called a sketch.

Features: a) Input voltage: 7-12V
   b) 14 Digital I/O Pins (6 PWM outputs)
   c) 6 Analog Inputs
   d) 32k Flash Memory
   e) 16Mhz Clock Speed

Load cell (YZC-1B): A load cell is a transducer that can translate pressure (force) into an electrical signal. Mostly strain gauge type load cell is used. In a strain gauge load cell, the force is being sensed by the deformation of a strain gauges on the element.

Features: a) Capacity: 3-200kg
   b) Material: Aluminium-alloy or alloy steel
   c) Type: Parallel beam type

HX711 Amplifier: The HX711 load cell amplifier is used to get measurable data out from a load cell and strain gauge. The HX711 Load Cell Amplifier accepts five wires from the load cell. These pins are labelled with colours: RED, BLK, WHT, GRN, and YLW. Where red, black, green and white wires come from the strain gauge on the load cell and yellow is an optional ground wire. The four wires coming out from the load cell are usually: VCC is red, Ground is black. Output signal is white, green or yellow. Once the load cell is hooked up to the amplifier, you can hook up VDD, VCC, DAT, CLK, and GND to a microcontroller.

GSM Module (SIM900A): GSM module is used to establish communication between a controller and a GSM-GPRS system. It requires a SIM card just like mobile phones to activate communication with the network. Also, they have IMEI number similar to mobile phones for their identification.

Features: a) Dual-Band 900/1800 MHz
   b) Control via AT commands
   c) Operation temperature: -40° C to $+85^o$ C
   d) Supply voltage range: 3.2V to 4.8V
   e) Low power consumption:1.0mA

LPG Sensor (MQ-6): The MQ-6 is a semiconductor gas sensor that detects the presence of LPG, Isobutane, and Propane gas. The sensor can operate at temperatures from -10 to 50°C and consumes less than 150 mA at 5V.

Features: a) High Sensitivity to LPG,
      iso-butane, propane.
   b) Small sensitivity to alcohol, smoke
   c) Detection Range: 100 - 10,000 ppm
   d) Fast Response Time: <10s

BO motor: BO(Battery Operated) light weight DC geared motor which gives good torque and rpm at lower voltages. It can do reverse and forward directions.

Features: a) Working voltage: 3-12V
   b) No load speed: 200rpm
   c) No load current: 125mA
   d) Torque: 500gf.cm

Motor Driver IC (L293D): L293D is a dual H-bridge motor driver integrated circuit (IC). Motor drivers act as current amplifiers since they take a low-current control signal and provide a higher-current signal. Input logic 00 or 11 will stop the corresponding motor. Logic 01 and 10 will rotate it in

clockwise and anticlockwise directions, respectively. Enable pins 1 and 9 (corresponding to the two motors) must be high for motors to start operating.

LCD display: Here we use a 16×2 LCD display for displaying the status of the cylinder i.e. leakage of gas if occurred and weight of the cylinder continuously.

Buzzer : Buzzer is use to indicate that gas leakage has occurred.
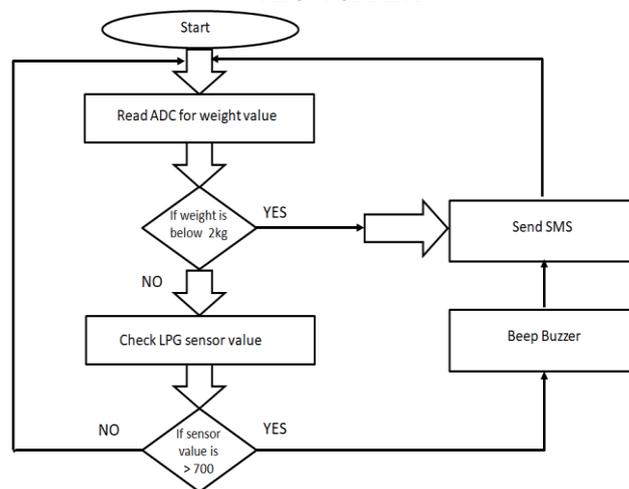
V. FLOWCHART

Fig 2: Flowchart of Proposed system

Our project works on this above flowchart, when we do our project 'ON' Arduino UNO checks the load of cylinder. If it Is less than 2kg then arduino UNO triggers GSM module that it has to book or register the cylinder then sends to massage one to user and one to the company. Also arduino UNO checks the LPG Gas is been leakage or not with the help of LPG sensor (MQ6), If leakage is found again it will send message to the user and company and beeps the alarm & Also it will perform the action it will turn 'OFF' the regulator with the help of BO motor.
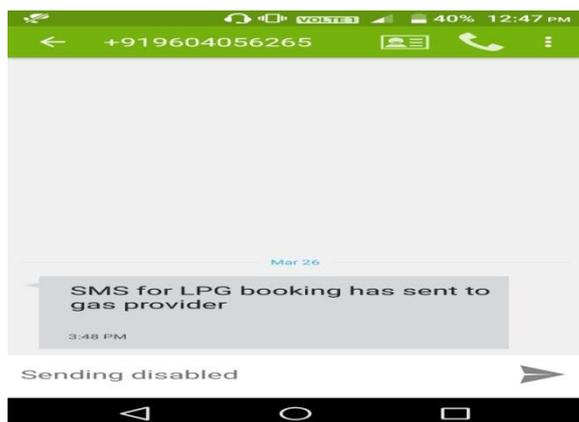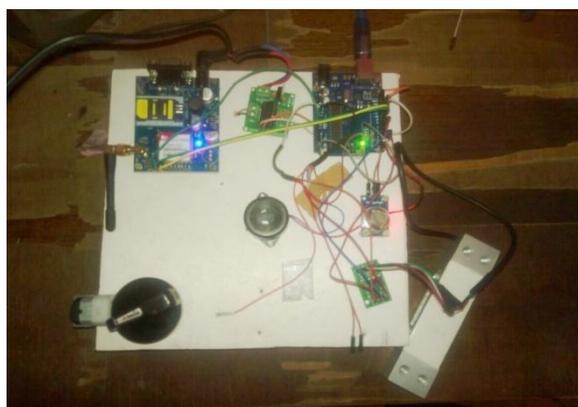
VI.   OUTPUT

Fig 3: Output of serial monitor on Arduino IDE

This is the output of project parameters (for motor, buzzer and message) shown on serial monitor of Arduino IDE.

Fig 4: SMS send to User

Fig 5: Design of Project

VII. CONCLUSION

From the above output we are able to monitor LPG cylinder and do automatic booking of it. Also we are able to Sense the LPG gas If any Major leakage found.

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