

IoT based Automatic LPG Gas Booking and Leakage Detection

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Abstract – LPG cylinders 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 off regulator-switch using motor. This system has a weighing sensor which measures the weight of the cylinder and regularly updates the user about gas left in the cylinder. Also, the user can set the reference value of cylinder by using a mobile app. We can book a cylinder by using SMS API through IOT. The real-time data is uploaded to the cloud by using Wi-Fi module. By this, the cylinder will be replaced at time.

Key Words: Arduino UNO, Wi-fi module, Load cell, Mobile app, Gas sensor

1. INTRODUCTION

In western Maharashtra, the supply of LPG through pipeline is not possible due to shortage of LPG. This project provides automatic booking of LPG cylinder and overcomes the problem of LPG leakage. So our proposal is to completely automate the process of refill booking without human intervention that accordingly will help consumers against foul play. Our system is also intended to help customers to upgrade their safety standards 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 project 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 the gas system in order to prevent damage or explosion of LPG.

1.1 PROPOSED SYSTEM

In automatic gas cylinder booking, we continuously measure the amount of gas present in the cylinder using a load cell which is interfaced with the Arduino UNO and send the data to the cloud and the user-held application. When the gas level goes

below the set level, then a message will be sent to the gas agency and notification about the same is sent to the user. So, the user gets the cylinder within time.

In the gas leakage detection process, any gas leakage is checked by a gas sensor (MQ-6) which is interfaced with Arduino UNO. When leakage is detected, the motor will be immediately turned off, the gas regulator-switch at the same time it informs the user about the gas leakage by sending SMS, turning on the buzzer.

1.2 OBJECTIVE

To design and acquire a project that will 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. To send and SMS to the user about leakage details.

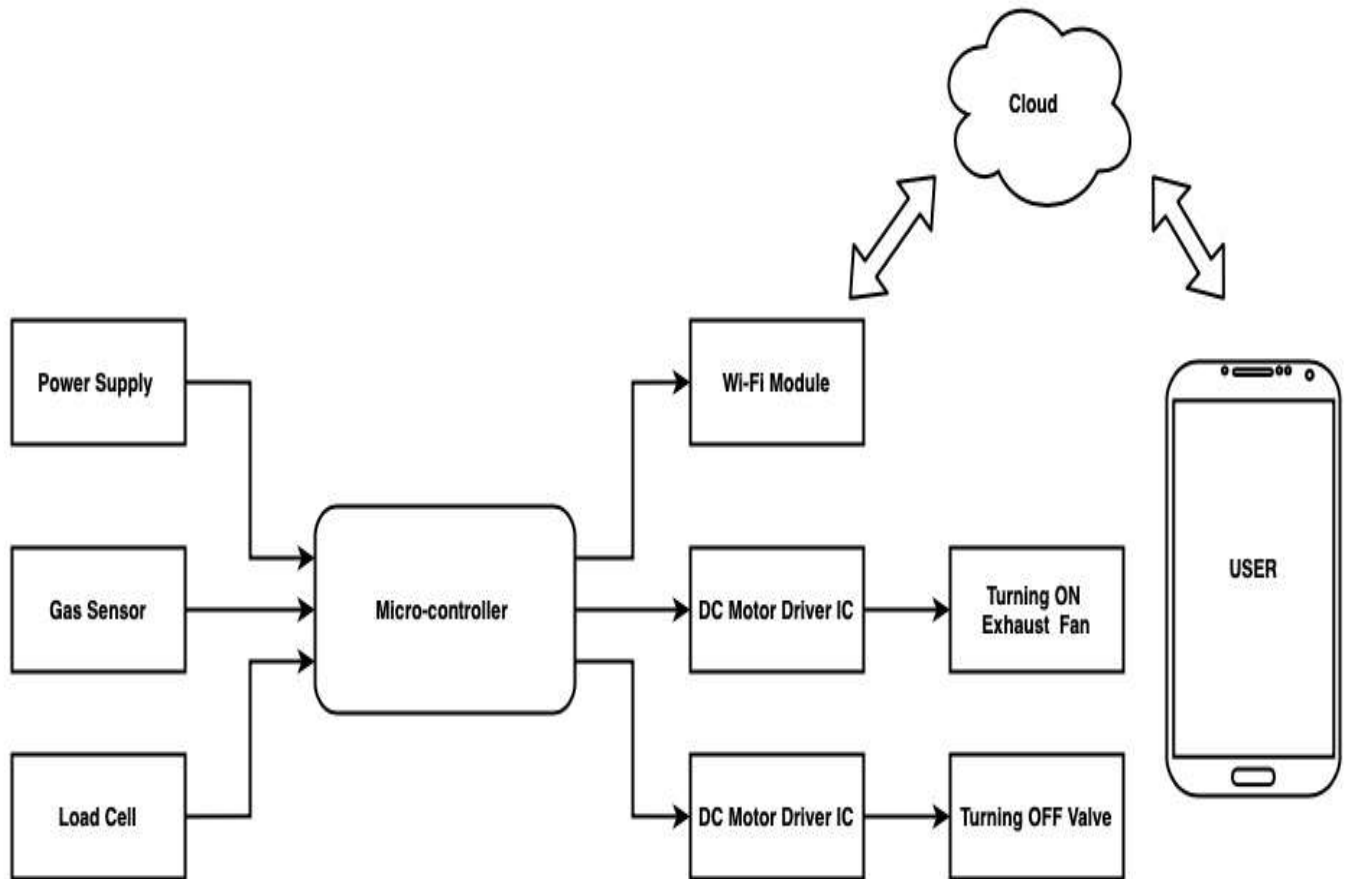
2. RELATED WORK

The gas booking/order is being done with the help of IOT and that the continuous weight measurement is done using a load cell which internally works on the principle of piezo electric sensor is interfaced with a Microcontroller, i.e. when a gas container is placed on the load cell it measures the weight and sends an electric pulse to the microcontroller which will compare the pulse with an ideal value in form of digital (the electric pulse is converted into an equivalent digital value). If the compared output is high then it sends a pulse (high) to the IoT which will update it to the internet but doesn't place an order, but if the compared output is low then it sends a pulse (low) to the IoT which will update it to the internet and even place a gas refill order. For ease of user, there is even a Radio Frequency (100m) module which has its Tx encoder kit to the main board & its Rx decoder for a sub-board, so the need of providing it with these is that when a gas order is being placed it notifies the consumer with a siren alarm. When it comes to the security of the kit as well as the gas container, we have an MQ-2 (gas sensor), LM 35 (temperature sensor), which will detect the surrounding environment for any chance of error. Whenever any change is subjected in any of the sensors (load cell, LM35, MQ-2) a siren (60db) is triggered.

3. DESCRIPTION OF BLOCK DIAGRAM

The block diagram of automatic LPG cylinder booking and leakage detection is shown below. The main components of the system are Arduino UNO, Load cell, Wi-Fi Module, Gas Leakage sensor and motors.

3.1. BLOCK DIAGRAM



Features:

- 1) Input voltage : 7-12V
- 2) 14 Digital I/O pins (6 PWM outputs)
- 3) 6 Analog inputs
- 4) 32k flash memory
- 5) 16Mhz clock speed

The above figure shows that main block diagram of our project. The Arduino Uno is used as main controller. The Gas sensor is used to detect the leakage of LPG gas. The two motor are used to switch off the regulator and to switch on the exhaust fan used to release the leaked LPG gas outside of house. The wi-Fi is used to store the booking history as well as the app data that is used for booking of gas.

3.2 COMPONENT OF SYSTEM

3.2.1 Arduino UNO

The Arduino UNO is a microcontroller board based on the ATmega328. IT uses an ATmega16u2b 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 board. A program written with IDE for Arduino is called a sketch.

3.1.2 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 degree and consumes less than 150mA at 5V.

Features:

- 1) High sensitivity to LPG, Isobutane, Propane
- 2) Small sensitivity to Alcohol, Smoke
- 3) Detection range: 100-10000 ppm
- 4) Fast response time : <10s

3.1.3 DC MOTOR

DC motor in simple words is a device that converts direct current (electrical energy) into mechanical energy.

Features:

- 1) Working voltage: 3-12V
- 2) No load speed: 200rpm
- 3) NO load current: 125mA
- 4) Torque: 500gf.cm

3.1.4 MOTOR DRIVER IC (I293D)

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 and 11 will rotate it in clockwise and anticlockwise directions, respectively.

3.1.5 LOAD CELL

A load cell is a transducer that can translate pressure into an electrical signal. Mostly strain gauge type load cell is used. In strain gauge load cell, the force is being sensed by the deformation of a strain gauge on the element

Features:

- 1) Capacity: 3-200Kg
- 2) Material: Aluminium-alloy or Steel alloy

3.1.6 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.

3.1.7 IOT (INTERNET OF THINGS)

The IOT is a system of interrelated computing devices, mechanical and digital machines provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human interaction.

3.1.8 Wi-Fi MODULE (ESP8266)

Espressif's ESP8266EX delivers highly integrated Wi-Fi SoC solution to meet users continuous demands for efficient power usage, compact design and reliable performance in the IOT industry. With the complete and self-contained Wi-Fi networking capabilities, ESP8266EX can perform either as a standalone application or as the slave to a host MCU. When ESP8266EX hosts the application, it promptly boots up from the flash. The integrated highspeed cache helps to increase the system performance and optimize the system memory.

Features:

- 1) 802.11 b/g/n support
- 2) 802.11n support (2.4 GHz), up to 72.2 Mbps
- 3) Defragmentation
- 4) 2x virtual Wi-Fi interface
- 5) Automatic beacon monitoring
- 6) Support infrastructure BSS station mode/ Soft AP mode / Promiscuous mode
- 7) Antenna diversity

4. SOFTWARE REQUIRMENT

4.1 DIP TRACE

It is an EDA/CAD software for creating schematic diagram and printed circuit board the developers provide a multi-lingual interface and tutorials. Dip-Trace has 4 modules: schematic capture editor, PCB layout editor with built-in shape-based auto router and 3D-preview & export, component editor, and patter editor.

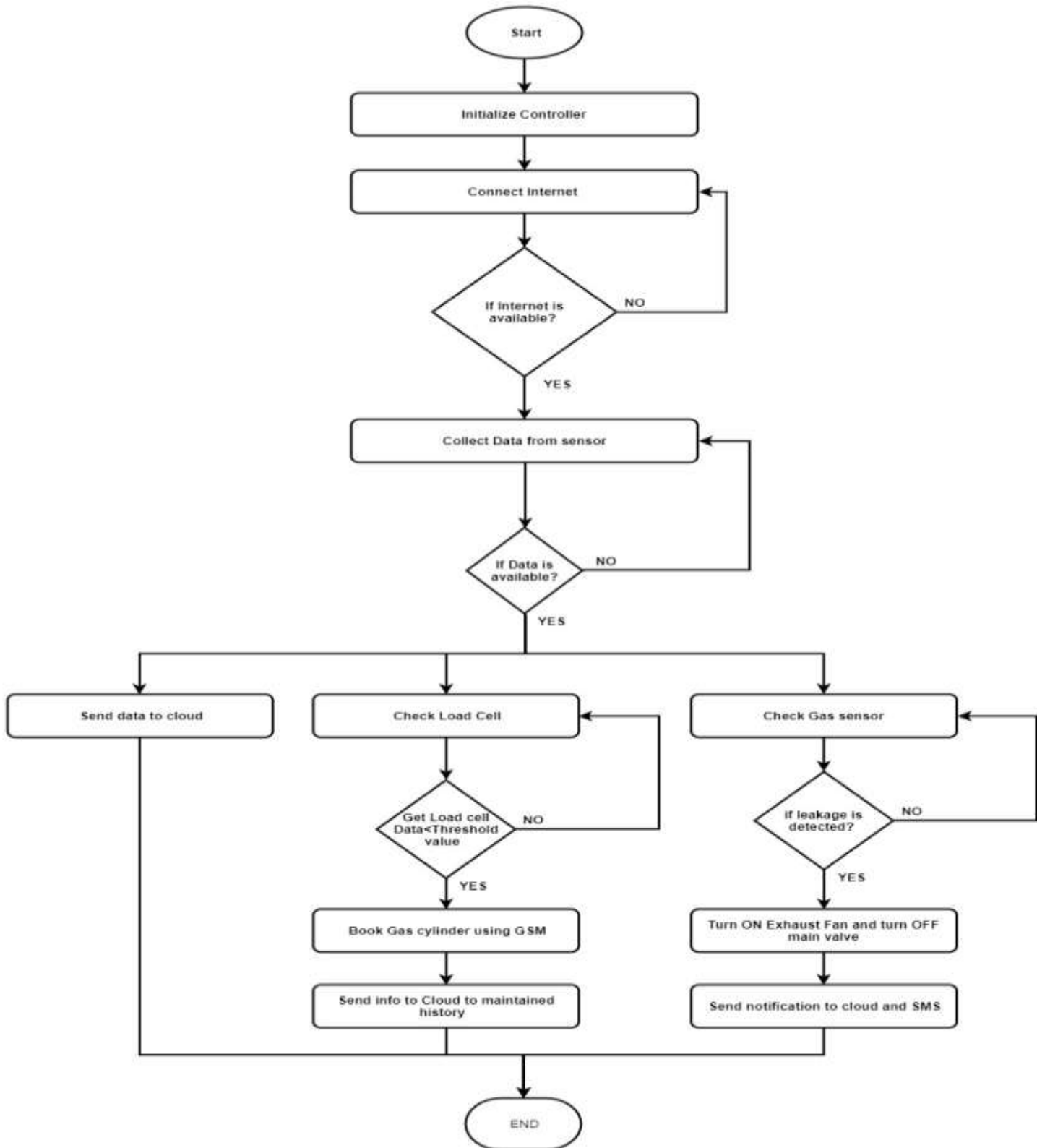
4.2 EMBEDDED C

It is a set of language extensions for the c programming language by the C standards committee to address commonality issues that exist between C extensions for different embedded systems.

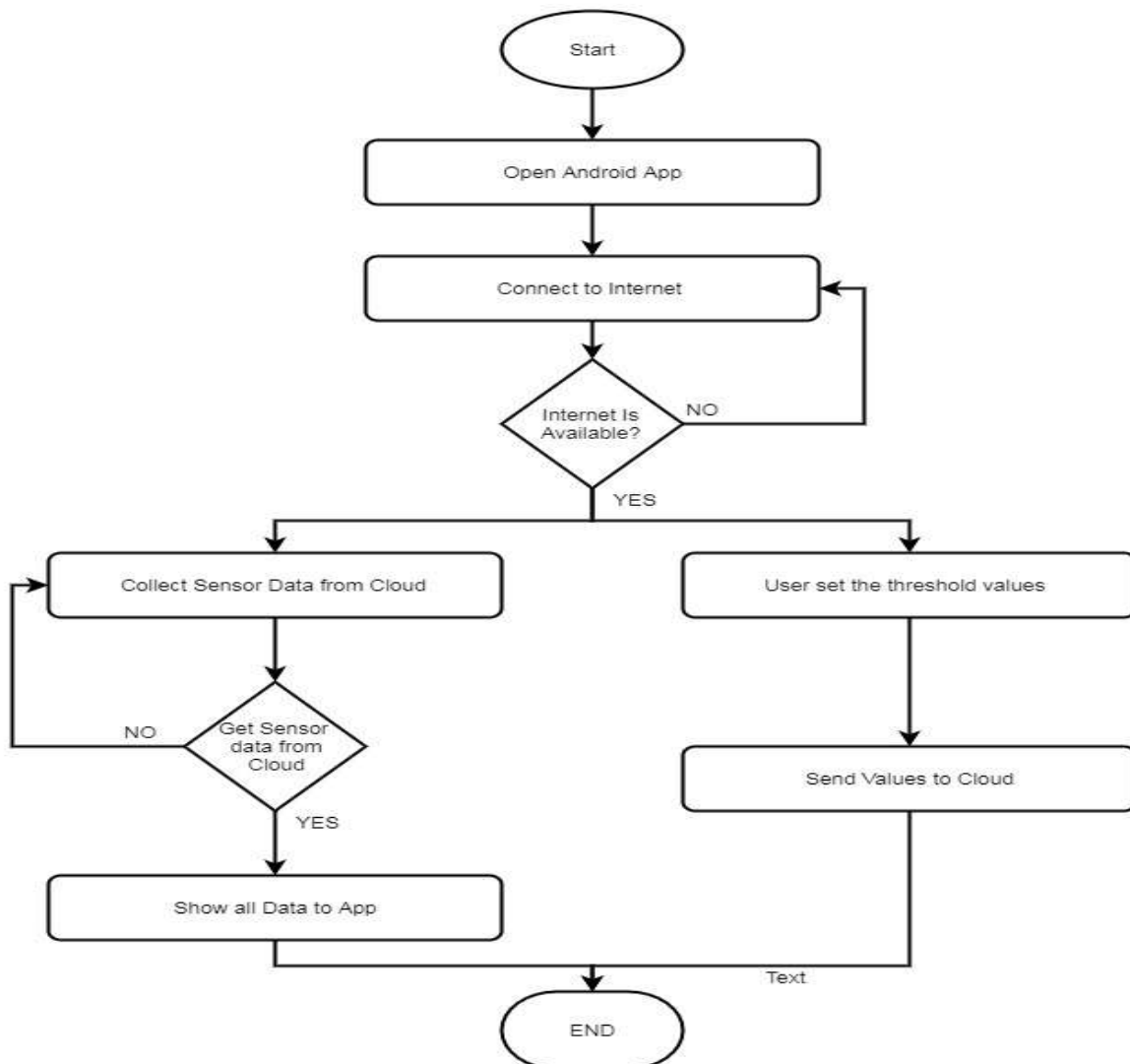
It includes a number of features not available in normal C, such as Fixed-point arithmetic, named address spaces and basic I/O hardware addressing. Embedded C uses most of the syntax and semantics of standard C, e.g. main() function, functions, array and strings, structure and union, bit operations, Marcos.

5. FLOW-CHART

5.1 FOR HRDWARE



5.2 FOR USER



6. ADVANTAGES

- 1) The main advantage is automatic booking of LPG cylinder by sending a SMS to the Distributor company and also alert the user.
- 2) It ensures the security from the gas leakage and hazards.
- 3) It is very less time consuming and cylinder replaced in time.
- 4) Easy to implement.

7. FUTUER-SCOPE

- 1) When there is a leakage in gas cylinder the main supply in home is automatically cut off by using home automation.
- 2) Automatic payment should be paid after cylinder booking from user bank account.

8. CONCLUSION

By implementing this project we have minimize the risk of hazards of LPG gas leakage. We have implemented the automatic system which ensure the safety of customer. Also we have minimized the cylinder replacing time

9. REFERENCES

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