



# Automatic gas booking and leakage detection using embedded system with safety guards

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**Abstract**—Gas leakage is a major problem with industrial sector, residential premises etc. One of the preventive methods to stop accident associated with the gas leakage is to install a gas leakage detection kit at vulnerable places. The aim of this project is to present such a design that can automatically detect, alert and control gas leakage. The device is intended for use in household safety where appliances and heaters that use natural gas & LPG may be a source of risk. The system can also be used for other application in the industry or plant that depends on LPG & natural gas in their operation This project is used to monitor continuous weight of the LPG cylinder. In our country many times that people don't know exactly the status of cylinder and there is a delay in informing gas agency. To avoid such situations we have implemented the project called "Automatic Gas Booking Using Embedded System with Safety Guards". In this project we have used load cell as a weight sensor. This sensor will be placed below the LPG cylinder. MQ6 as a LPG leakage sensor which will detect the leakage of LPG and provides security to people.

**Key words**—Arduino-UNO, GSM, Load Cell, Leakage Detector.

## I.Introduction

There are approximately 30Crore LPG users in our country. The main objective of our project is to continuously measures the weight of the cylinder by load cell and when the weight of the cylinder goes below the set value it sends message to the gas agency for the booking and another message to the owner. It also reduces the human efforts also became easy for illiterate person. When the temperature of the room goes above 50C it turns ON the buzzer and sends message "Your kitchen temperature is very high than normal" to the owner. The main purpose of our project is to avoid accidents due to leakage of LPG as safety is an important part. This system is also detects LPG gases such as butane and propane. The range of MQ6 sensor is from 200-10000 ppm. When the level of butane goes above 600 ppm which is considered as dangerous for human the system sends a message "LPG leakage is detected in your kitchen" to the owner.

## II.LITERATURE REVIEW

### LITERATURE SURVEY:

Safety plays a major role in today's world and it is necessary that good safety systems are to be

implemented in places of education and work. This work modifies the existing safety model used in homes. The main objective of the work is design in microcontroller detecting and alerting system. The gases like LPG and propane were sensed and displayed each and every second in the LCD display. If these gases exceed the normal level then an alert message (SMS) is sent to the authorized person. The advantage of this automated detection and alerting system over the manual method is that it offers quick response time and accurate detection of an emergency and in turn leading faster diffusion of the critical situation.

### 2.1. Related Work

Home automation or smart homes (also known as domotic) can be described as introduction of technology within the home environment to provide convenience, comfort, security and energy efficiency to its occupants. With the introduction of Iot, the research and implementation of home automation are getting more popular. Various wireless technologies that can support some form of remote data transfer, sensing and control such as bluetooth, wifi, Rfid and cellular network have been utilised to embed various levels of intelligence in the home. The studies have presented bluetooth based home automation system using android smart phones without the internet controllability. The devices are physically connected to bluetooth sub controller which is then accessed and controlled by smart phone using built in Bluetooth connectivity. Researchers have also attempted to provide a network interoperability and remote access to control devices and appliances at home using home gateways. Lately few researchers have also presented the use of Web services, simple object access protocol (SOAP) and representational state transfer as an interoperable application layer to remotely access home automation system.

### 2.2. Existing System

#### 2.2.1. Scope

When things like household appliances are connected to a network, they can work together in cooperation to provide the ideal service as a whole, not as a collection of independently working devices. This is useful for many of the real-world applications and services, and one would for example apply it to build a smart residence; windows can be closed automatically when the air conditioner is turned on, or can be opened for oxygen when the gas oven is turned on. The idea of IoT is especially valuable for persons with disabilities, as IoT technologies can

support human activities at larger scale like building or society, as the devices can mutually cooperate to act as a total system. So far, much work has been done on realizing the IoT.

#### 2.2.2. uID-CoAP architecture

There is a existing system which introduces the uID-CoAP architecture, a new IoT framework that aims to provide a solution and a new way to let the existing embedded systems be integrated into the IoT network.

#### Technology Used:

The system is proposed of an Android Smartphone users mobile app will be developed in android. MySQL will be used for maintaining database.

## III.DESIGN AND IMPLEMENTATION

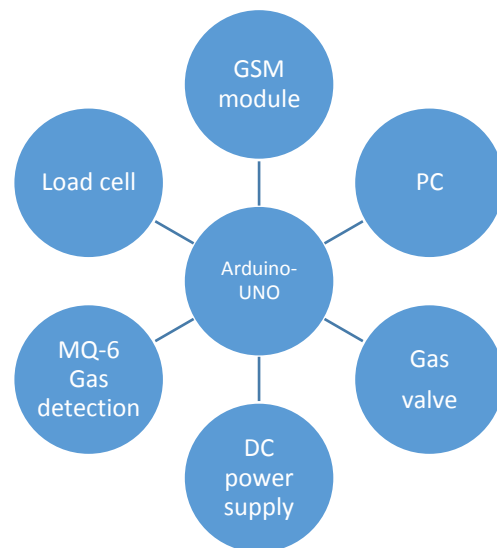


FIG 3.1 BLOCK DIAGRAM OF PROPOSED SYSTEM

This method consists of weight measurement module, microcontroller gas leakage detection system, GSM module and alert system. Which are used for automatic booking real time LPG measurement monitoring system and LPG leakage. The main basic Arduino-UNO microcontroller requires the power supply ranging can be either from an ac to dc adapter or battery. The Main platform we are using to build the project is Arduino-UNO Microcontroller which gives us the flexibility to write the code more effectively in convenient way. It also provides us features like Inexpensive, Cross platform,

Simpler and clear programming environment, Open source and extensible software easy for beginners. Microcontroller simply connect it to a computer with a USB cable or power it with a AC to-DC adapter or battery to get started. The another main component we are using in our project is use of Load cell. A load cell is a transducer that is used to convert a applied load (force) into electrical signal, which is used to measure weight of a LPG gas cylinder. In this project, Gas Sensor is use to detect the leakage of the LPG Gas (Methane & Propane) which converts one signal into other form of signal. The LM35 series IC (temperature IC) output which is linearly proportional to the Centigrade temperature. LCD (Liquid Crystal Display) is used to show the output results of Different sensor values. We are using GSM Modem for alert the user by sending SMS (Short Message Service) about Gas Leakage and LPG cylinder booking. GSM uses of time division multiple access (TDMA) and is the most widely used of the technologies (TDMA, GSM, and CDMA). This system continuously measures the weight of the cylinder and once it reaches minimum threshold it will automatically sends message to the authorized LPG Agent so that they can deliver the LPG cylinder in time.

### 3.1. Microcontroller (AT MEGA 328)



FIG.3.2 MICROCONTROLLER ATMEGA328.

The **Arduino-Uno** is a micro controller board based on the ATmega328. Arduino is an open-source, prototyping platform and its simplicity makes it ideal for hobbyists to use as well as professionals.

The Arduino Uno has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Arduino Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega832 microcontroller chip programmed as a USB-to-serial converter.

### 3.2. MQ-6 Sensor

Gas sensor is a device which is used to sense gas leakage of its surroundings. The MQ6 gas sensor is highly sensitive to petroleum based gases and less sensitive to alcohol is carbon dioxide .MQ6 sensor works on basis of combustion process, and output is given in variable voltage form. It is analog so we have to convert it from A to D because AtMega328 is digital. So it is connected to port A.

### 3.3. GSM Module

GSM/GPRS TTL modems SIM900 quad-band GSM/GPRS device, works on frequency 850 MHZ,900HZ,800MHZ & 1900HZ. It is very compact in size & easy to use as plug in GSM Modem. The modem is designed with 3V3 and 5V DC TTL interfacing circuitry, which allows user to directly interface with 5V microcontrollers as well as 3V3 microcontrollers.



Fig 3.3 GSM SIM900A Module

### 3.4. Load Cell

A load cell is described as a “weight measurement device necessary for electronics scale

display weights in digits.” Load cell is an idle transducer/sensor which converts applied force into electrical signals. Load cell works on fluid pressure, elasticity and magneto static effect or piezoelectric effect.

### 3.5.PC Monitor

A personal computer (PC) is a multi-purpose computer whose size, capabilities, and price make it feasible for individual use. PCs are intended to be operated directly by an end user, rather than by a computer expert or technician. Computer time-sharing models that were typically used with larger, more expensive minicomputer and main frame systems, to enable them be used by many people at the same time, are not used with PCs.

### 3.6. Gas valve

A valve is a device that regulates, directs or controls the flow of a fluid (gases, liquids, fluidized solids, or slurries) by opening, closing, or partially obstructing various passageways. Valves are technically fittings, but are usually discussed as a separate category. In an open valve, fluid flows in a direction from higher pressure to lower pressure. The word is derived from the Latin *valva*, the moving part of a door, in turn from *volvere*, to turn, roll.

### 3.7. Power supply

power-supply modules are designed and rated to operate with their inputs connected to lines delivering 105 to 125 Vac. Most 115-Vac power systems maintain line voltage within that range. However, line voltage for heavily loaded systems can drop below 105 V, and line voltage for lightly loaded systems or for systems close to utility substations may rise appreciably above 125 V. When connected to a low-voltage line, a regulated power supply may not produce rated dc output voltage. And power supplies tend to overheat when subjected to high line voltage.

## IV. RESULT AND CONCLUSION

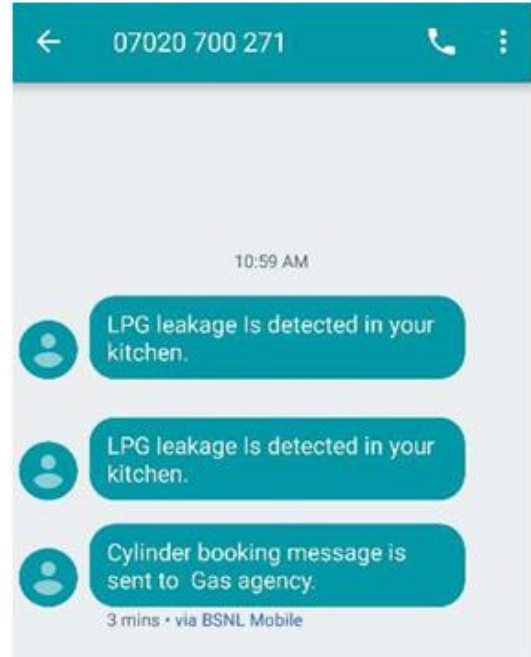


FIG 4.1 :SMS'S SENT TO THE USER MOBILE

In this paper we have used automatic gas booking with alert system without human intervention. Our system helps customers to upgrade their safety and protect life and property from reputed accidents. The main objective of our system is to measure the gas present in cylinder when the weight of cylinder is below the fixed load by using weight sensor. The gas agency gets the order of new cylinder and owner received the messages regarding the status. Thus the system developed by us will somehow help the LPG Gas consumer to lead a safety life and comfortable life.

The above figure represents SMS messages on user mobile phone, send by GSM module for different kinds of reaction of our project. The message “**CYLINDER BOOKING MESSAGE IS SENT TO GAS AGENCY**” is sent to the user when the LPG gas reaches to minimum threshold level. So the user comes to know Cylinder booking is done.



FIG 4.2. FINAL DESIGN OF THE PROJECT

### V. FUTURE SCOPE

Voice feedback system can be included in GSM based LPG weight and LPG leakage detection system. User will get intimation through pre-recorded voice messages like the weight of gas Cylinder is ABC kg.

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