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# Smart LPG Monitoring and Controlling System

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**Received:** 10-01-2017, **Revised:** 21-02-2017, **Accepted:** 13-04-2017, **Published online:** 30-06-2017

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**Abstract---** *LPG cylinders are used all over the world even in villages. Because of its versatile nature it is used as a fuel for domestic, industrial, automobile and other purposes. But they are dangerous and also life threatening. Constant vigilance is required for the LPG cylinder and is done by using Internet of Things (IoT). This design of wireless LPG monitoring and controlling system is developed using Wi-Fi module. The technology incorporates Arduino and Android App development. Through the Android app the user can detect the status of the LPG regulator and switch off the regulator if necessary. The additional advantage of the system is that it automatically switches off the LPG regulator at the time set by the user. This system ensures safety and prevents explosion due to unnecessary open of regulator. The system is real time, economical, commercial and cost efficient.*

**Keywords---** *LPG Monitoring, Regulator, IOT, Controlling, Wi-Fi Module, App.*

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## I. INTRODUCTION

LPG, first introduced in 1910 by Dr. Walter Snelling is a mixture of commercial Propane and commercial Butane having saturated as well as unsaturated Hydrocarbons. Because of the versatile nature of the LPG it is used for many needs such as domestic fuel, industrial fuel, automobile fuel, heating, illumination etc and the demand for LPG is on an exponential raise day by day. The liquefied petroleum gas is finding wide usage in homes, industries and automobiles as fuel because of its desirable properties. But the safety has become a major issue. Now-a-days, big problem in the houses are to monitor the LPG in order to avoid unnecessary leakage that will cause serious threats to life. In fact, the leakage occurs probably when the LPG regulator is switched ON.

The wireless communication is increasing day by day. This has motivated to use mobile phone to remotely control the LPG regulator and to receive feedback about the status of LPG regulator. This paper describes a remote LPG control system which can control the LPG by using android application through android mobile phone and monitor the status of LPG through the application. This system is extremely handy, as no wired connection is required between the switch and the regulator of the LPG. So it can be controlled from any place in this world.

## II. PROBLEM DEFINITION OF CURRENT LPG AUTOMATION SYSTEMS

LPG automation systems face four main challenges; these are high cost of ownership, inflexibility, poor manageability, and difficulty in achieving security. The existing systems uses GSM module for connectivity. And there is no feature for automatic switch OFF of the LPG regulator at the time set by the user.

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### III. PROPOSED METHODOLOGY

This paper proposes an advance and innovative approach for LPG monitoring and controlling. The main objective of this paper is to design and implement an LPG monitoring and controlling system using IOT that is capable of controlling and monitoring the LPG regulator through an easy manageable android app. The proposed system has a great flexibility by using Wi-Fi technology. This will decrease the deployment cost and will increase the ability of upgrading, and system reconfiguration.

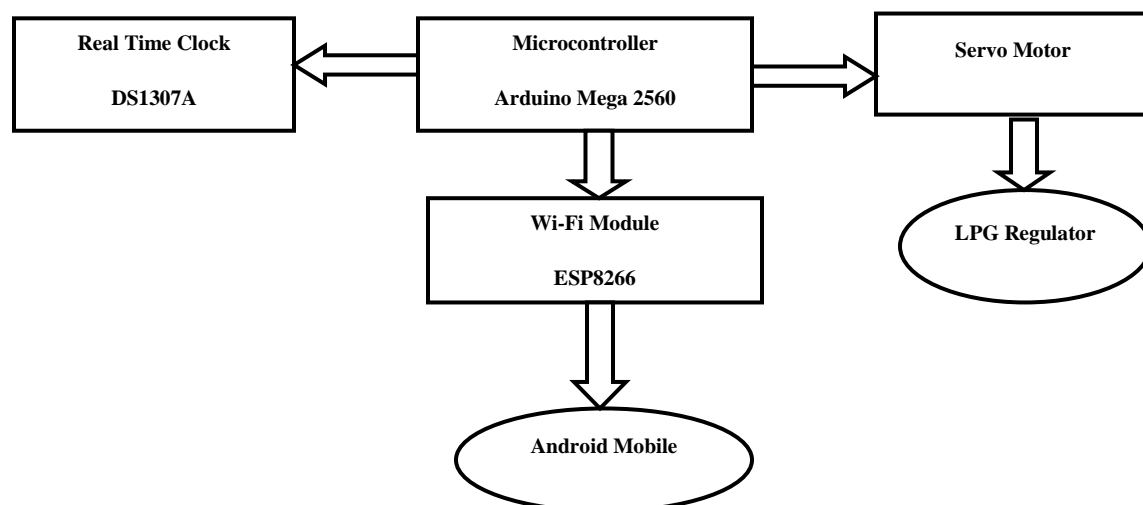
### IV. SYSTEM ARCHITECTURE

The system has two parts namely hardware and software. The hardware architecture consists of a stand-alone embedded system that is based on 8-bit Microcontroller (ATMega2560), Wi-Fi Module (ESP8266), servo motor and a Real Time Clock Circuit (DS1307). The software part consists of programming in arduino and an android based application. The Wi-Fi modem provides the communication media between the user and the system by means of app. The app consists of commands to be executed. The format of command is predefined. The command is sent to the Wi-Fi module via the internet by clicking the buttons in the app. Once the Wi-Fi module receives the command, the commands sent will be extracted and executed by the microcontroller. The system will interpret the commands by checking the status and turn the LPG Regulator ON/OFF accordingly via the servo motor. For additional home security and safety, the system consists of a RTC circuit which aids in switching OFF of the LPG regulator during night time (around 10 PM) and the status is updated in the app through the Wi-Fi module. The detailed description about the hardware and software is as follows:

#### A. Hardware Used

The hardware architecture of the system containing various components is represented in the block diagram and each component in the architecture is explained as follows:

#### Block Diagram



### ***Wi-Fi Module***

The communication link needs more security. The Wi-Fi protocols provide more security for secure connection. An Android application has two methods to create a link. The first one is using IP address of the Wi-Fi module directly coded into the app for initial testing. The second one is, it allow users to search for the device, which becomes a final decision. Then user can select the device from a list, for making connection. The basic steps for connecting to Wi-Fi module were the same for both versions of the application. Once got IP address of the destination then user can create socket with Wi-Fi module.

### ***Arduino Mega 2560 Microcontroller***

This is the main module of the whole system. On receiving the commands, the system checks the status of the regulator and then regulator is switched on or off accordingly. In case of automatic operation, the microcontroller is connected to an RTC circuit that aids in switching off of the LPG regulator when it is not in use at night times around 10 PM and it will update the app.

### ***Servo Motor***

To perform the switching operation of the LPG Regulator in accordance with the commands given by the microcontroller, a servo motor is used. The shaft of the servo motor can be positioned at specific position using control signal. The motor shaft will hold at this position as long as the control signal does not change.

### ***RTC Circuit***

The Microcontroller is interfaced to an RTC (Real Time Clock) circuit to make the system as real time system. If the regulator needs to be switched off automatically at the time scheduled by the user, then an RTC circuit is interfaced to track time.

## ***B. Software Engaged***

### ***Arduino***

The open-source Arduino environment allows user to write code and upload it to the I/O board. The environment is written in Java. The Arduino development environment contains a text editor for writing code, message area, text console, and toolbar with buttons for common functions, and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them. Arduino programs are written in C or C++.

Arduino features, capable of compiling and uploading programs to the Board with a single click. Software written using Arduino is called sketches. These sketches are written in the text editor. Sketches are saved with the file extension '.ino'. It has features for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino environment including complete error messages and other information. The bottom right-hand corner of the window displays the current board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor. As the Arduino platform uses Atmel microcontrollers, Atmel's

development environment, AVR Studio or the newer Atmel Studio, may also be used to develop software for the Arduino.

### ***App Inventor***

App Inventor for Android is an open-source web application originally provided by Google, and now maintained by the Massachusetts Institute of Technology (MIT). It allows creating software applications for the Android operating system (OS). It uses a graphical interface, which allows users to drag-and drop visual objects to create an application that can run on Android devices. Here we are making an android application for LPG automation, which will control the LPG Regulator just by one click. The application consists of password protected security feature.

## **V. CONCLUSION**

This paper gives a detailed description of smart LPG monitoring and controlling system, which is very useful, economical, real time and also commercial. It provides simple and easy way to control the LPG by using an android application. The main advantage of the system is the automatic switch OFF the LPG regulator. Also the safety and security system can be easily installed in the house and used. It informs the user even if the user is not in the house.

## **VI. FUTURE WORK**

Using this system as framework, the system can be expanded to other areas where LPG or pressurised gas cylinders are involved such as automobiles, welding and coating industries, power plants, hotels, etc. This kind of a system with respective changes can be implemented for monitoring other equipments and instruments also.

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