

IOT Based Smart Gas Monitoring System

Anandhakrishnan S, Deepesh Nair, Rakesh K, Sampath K, Gayathri S Nair
¹(EEE, ASIET, INDIA) ²(EEE, ASIET, INDIA) ³(EEE, ASIET, INDIA) ⁴(EEE, ASIET, INDIA)
⁵(Asst.Proffesor,EEE, ASIET, INDIA)

Abstract: Nowadays gas leakage and gas detection is a major problem in our daily lives. Also gas wastage is a major issue that needs to be countered. LPG gas is highly flammable and can inflict damage to life and property. To avoid such situations, a considerable amount of effort has been devoted to the development of reliable techniques for detecting gas leakage. As knowing about the existence of a leak is not always enough to launch a corrective action, some of the leak detection techniques were designed to allow the possibility of locating the leak. Our aim is to reduce the risks in Kitchen using Internet of Things. The main aim is to propose the design and construction of an SMS based Gas Leakage Alert System. Gas sensor are used to detect gas leakages in a kitchen. With the help of an infrared sensor the issue of gas wastage is also monitored. An alarm goes off whenever the sensor doesn't detect any vessel over the burner beyond a particular time period

Keywords: Cloud storage, IOT, Sensors, Android App

I. Introduction

Liquefied petroleum gas (LPG) is currently the most used gas in our home for cooking purposes. LPG gas is a flammable gas, if leaked it can cause major damage to life and property. Therefore it should be used in safe handling manner and additional care has to be taken in order to prevent any leakage possible. The main features of LPG is that being heavier than air, it do not disperse easily and may lead to suffocation when inhaled. The leaked gases when ignited may lead to explosion. The number of deaths due to the explosion of gas cylinders has been increasing in recent years. Now a days people are having very busy schedule and hence sometimes they forget or don't get enough time for booking the gas from the gas agency. So it would be much easier and helpful if there was a provision to book the gas automatically. A major amount of gas is being wasted due to the carelessness of consumer's. Sometimes they forget to turn off the burner which may also could lead to damages. Our proposed topic aims at detection of gas leakage and automatic controlling of gas valve. The smart gas system which provides home safety, detects the leakage of the LPG and alerts the consumer about the leak by a notification through by using android app through Internet Of Things (IOT) and consumer can turn off the gas valve, from anywhere in the world. The additional advantage of the system is that it continuously monitors the level of the LPG present in the cylinder using load sensor and if the gas level reaches below the threshold limit of gas so that the user can replace the old cylinder with new in time and books the cylinder by automatically send a notification to the gas agency. An added feature is that if the users accidentally forget to turn off the gas burner, the system will inform by activating an alarm. so the problem of wastage of the energy is solved

II. Literature Survey

In the proposed system we have designed "IOT based Smart Gas Monitoring System". This proposed system aims to detect the economic fuels like petroleum, liquid petroleum gas, alcohol etc and allows a provision for controlling the gas leakage by closing the valve automatically. The next feature of the topic is to ensure the booking of gas cylinder from gas agency. For both the functioning the sensors detect the leaked gas from the sensor and send it to the internet. by programming on the internet, the sensed signal is directed to the android app by using the android app we give the signal for switching off gas valve from distant place. So it redirects again to the internet and close the gas cylinder valve through IOT. The problem of gas wastage could also be avoided using this system. Sometimes if the burner is left on by mistake, the consumer could be alerted about the problem. If the burner is on and there is no vessel on top of it, an alarm goes off

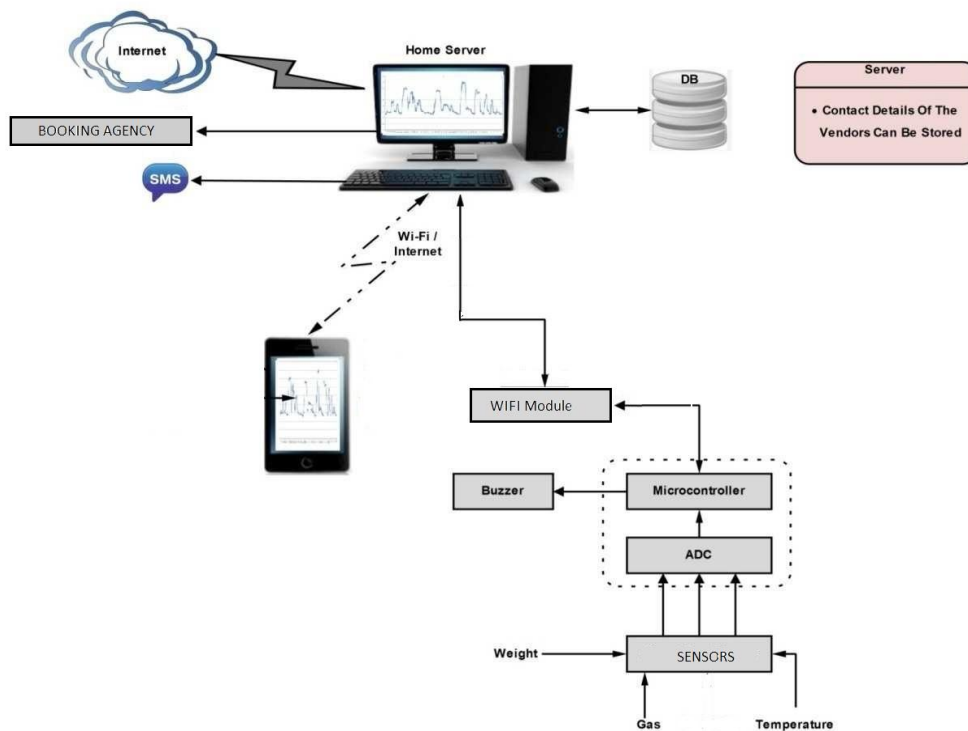


Fig 1: Conceptual System

III. Internet Of Things (IOT)

The ability of various things to be connected to each other through the Internet or It is network of physical devices (vehicles,building) connected to embedded device (software,sensor) through internet.IOT allows the object to sensor collect remotely across network of infrastructure. IOT contains various domains , protocols , application.The interconnection of these embedded devices is expected to usher in automation in nearly all fields, while also enabling advanced applications like a smart grid and expanding to the areas such as smart cities. At the same time, IOT is strongly tied to the big data era due to the enormous data that the “Things” can generate. For the interconnection of these devices, different wired or wireless standards exist. IOT provide various residential and enterprises solution through latest technology .It broadly covers M2M communication, smart grids, smart building, smart cities and many more application. Using IOT in smart cities/smart buildings can certainly provide reliable and efficient solutions as it will allow the user to interact with the entities.

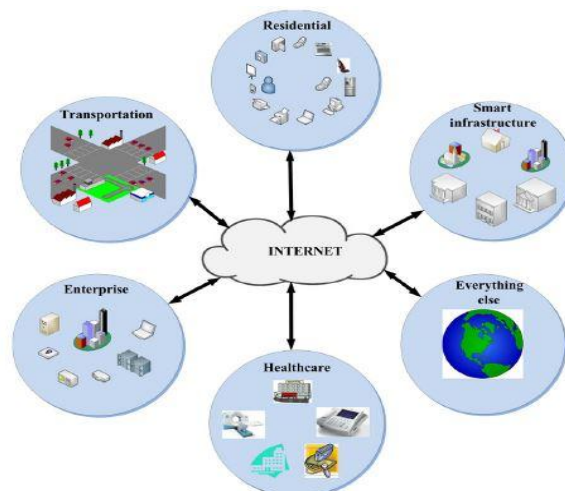


Fig:2 Basic IOT diagram

IV. Methodology

The proposed system consist of atmega328 and it is interfaced to sensors like MQ2 sensor, load cell, infrared sensors etc. which are the input of the system. Here the wifi-module is interfaced to these which give the ability to communicate with each other.

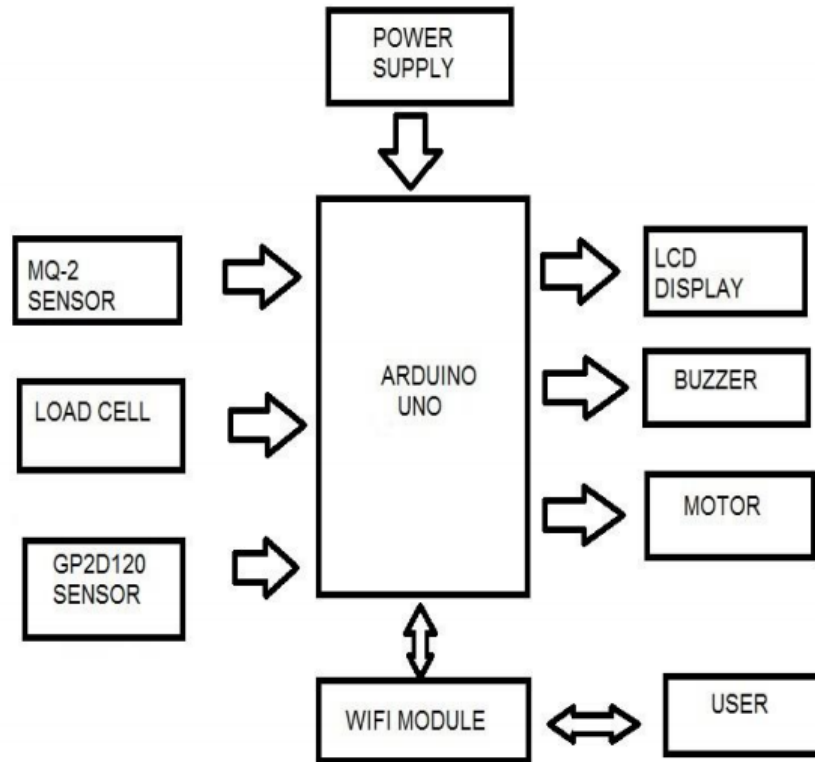


Fig 3:Block diagram of the system

The proposed method takes an automatic control action upon detection of gas. The regulator valve (motor) would be switched off which completely stops the flow of gas leakage. Initially if there is a gas leakage then the electronic sensor i.e. the gas sensor that obeys the principle of LPG sensor senses any gas leakage from storage, if any leakage sensed then the output of this sensor goes high. This high signal is monitored by the microcontroller and it will identify the gas leakage. If there is a leakage, the consumer is informed through internet in his device and a signal is sent back to the microcontroller to turn off the valve. In this system, a sensor (load cell) is used to monitor the weight of the gas cylinder, if it goes below a critical value the sensor senses this condition and sends a notification via internet to gas agency for booking a LPG. The object detection sensor is used to detect the presence of any vessel over the burner. If a vessel is not detected over a predetermined time, then an alarm goes off and the consumer is alerted.

V. Component Descriptions

MQ2 SENSOR:

A gas detector is a device that detects the presence of gases in an area, often as part of a safety system. Gas Sensor (MQ2) module is useful for gas leakage detection (in home and industry). It is suitable for detecting H₂, LPG, CH₄, CO, Alcohol, Smoke or Propane. Due to its high sensitivity and fast response time, measurements can be taken as soon as possible. The sensitivity of the sensor can be adjusted by using the potentiometer.



Fig 4: MQ2 sensor

LOAD CELL:

A load cell is a transducer that is used to create an electrical signal whose magnitude is directly proportional to the force being measured. Strain gauge load cells are the most common in industry. These load cells are particularly stiff, have very good resonance values, and tend to have long life cycles in application. Strain gauge load cells work on the principle that the strain gauge (a planar resistor) deforms/stretches/contracts when the material of the load cells deforms appropriately. These values are extremely small and are relational to the stress and/or strain that the material load cell is undergoing at the time. The change in resistance of the strain gauge provides an electrical value change that is calibrated to the load placed on the load cell.



Fig 5: Load cell

INFRARED SENSOR:

An infrared sensor is an electronic device that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measure only infrared radiation, rather than emitting it that is called as passive IR sensor. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations. These types of radiations are invisible to our eyes that can be detected by an infrared sensor. The emitter is simply an IR LED (light emitting diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, the resistances and these output voltages, change in proportion to the magnitude of the IR light received.



Fig 6: Infrared sensor

MICROCONTROLLER-ATMEGA328:

The high-performance Atmel 8-bit AVR RISC-based microcontroller combines 32KB ISP flash memory with read-while-write capabilities, 1KB EEPROM, 2KB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel

10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts.

ATmega328- FEATURES

- Flash (kBytes):32 kBytes
- Pin Count:32
- Max. Operating Freq. (MHz):20 MHz
- CPU:8bit AVR
- Max I/O Pins:23
- Ext Interrupts:24
- Power up timer and oscillator start up timer



Fig 7:Atmega328

WIFI MODULE (ESP 8266):

The ESP8266 WiFi Module is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much WiFi ability as a WiFi Shield offers. The ESP8266 module is an extremely cost effective board with a huge, and ever growing, community.



Fig 8:WIFI Module

ARDUINO:

Arduino is a computer hardware and software company, project, and user community that designs and manufactures microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical world. Arduino programs may be written in any programming language with a compiler that produces binary machine code. Atmel provides a development environment for their microcontrollers, AVR Studio and the newer Atmel Studio, which can be used for programming Arduino. The Arduino project provides the Arduino integrated development environment (IDE), which is a cross-platform application written in the programming language Java. A program written with the IDE for Arduino is called a "sketch". Sketches are saved on the development computer as files with the file extension .ino. The Arduino IDE supports the languages C and C++ using special rules to organize code.

PROTEUS DESIGN SUITE:

The Proteus Design Suite is an Electronic Design Automation (EDA) tool including schematic capture, simulation and PCB Layout modules. The software runs on the Windows operating system and is available in English, French, Spanish and Chinese languages. The Proteus Design Suite is a Windows application for schematic capture, simulation, and PCB layout design. All PCB Design products include an auto router and basic mixed mode SPICE simulation capabilities. Schematic capture in the Proteus Design Suite is used for both the simulation of designs and as the design phase of a PCB layout project. It is therefore a core component and is included with all product configurations. The micro-controller simulation in Proteus works by applying either a hex file or a debug file to the microcontroller part on the schematic. It is then co-simulated along with any analog and digital electronics connected to it. This enables it's used in a broad spectrum of project prototyping in areas such as motor control, temperature control and user interface design.

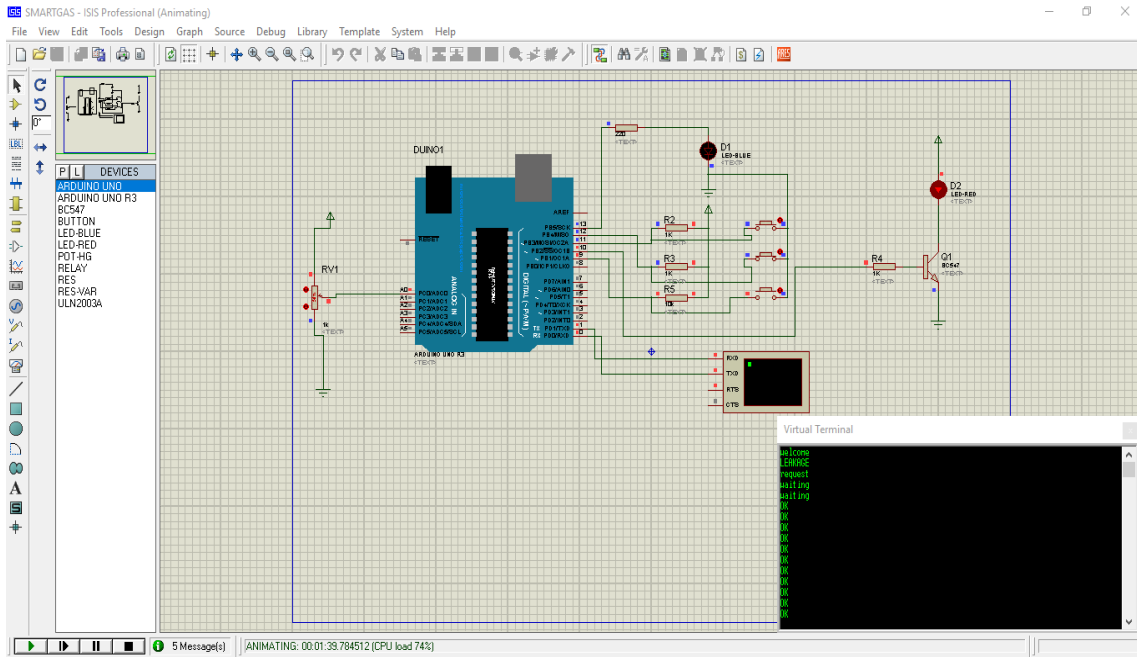


Fig 9:Simulation

VI. Conclusion

In our modern scenario the usage of LPG has increased in a greater manner. As a result of this , the damages caused by the leakage of gas is increasing day by day. So as to eradicate this problems we are introducing highly advanced system known as Internet Of Things(IOT) . It is used in wide range of applications in present day society and introducing a vast scope to the future. Our proposed system is more effective and ecofriendly due to the reason of detecting the leakage of gas and controlling the gas valve. So it is mainly designed for the safety of people and property. Using IOT ,it also allows us to book the gas from the gas agency ,when the weight of the gas cylinder reduces below a threshold value .Thus people could easily use their time effectively. It also uses to alert the consumers about the wastage of gas while removing the utensils from the burner by using an object detection sensor.

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