SMART HOME SECURITY

Project Report submitted in partial fulfillment of the requirement for the degree of

BACHELOR OF TECHNOLOGY

IN

ELECTRONICS AND COMMUNICATION ENGINEERING

By

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ABSTRACT

It’s a known fact that LPG leakage during domestic usage is a disaster, especially when we switch on any electric switch or appliances because it may produce a spark which causes sudden loud explosion of the gas filled room. In our nation there is an increase in such accidents and casualties related to it in the recent times. Our main idea is to implement security system for detecting leakage of gas in closed environment using sensors. Once the gas leakage is detected depending on the level of gas immediately the systems will trip of the power supply so as to avoid explosion.CO is a toxic gas that prevents blood from transferring oxygen around the body. CO poisoning can cause dizziness and loss of consciousness; it can also induce comas and cause death. As it has no odor, color or taste, it can be difficult to detect. It is produced by burning fuels, such as petrol, gas and wood, in unventilated conditions where there is not enough oxygen for the carbon to form carbon dioxide. In this project we will try to sense carbon Monoxide gas and LPG gas and take appropriate measures to avoid any potential hazard.

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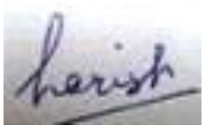
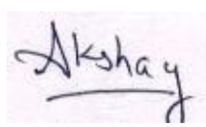
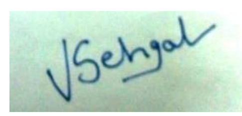
DECLARATION BY THE SCHOLAR

I hereby declare that the work reported in the B-Tech thesis entitled **"SMART HOME SECURITY"** submitted at **Jaypee University of Information Technology , Waknaghat India**, is an authentic record of my work carried out under the supervision of **Mr. Munish Sood** I have not submitted this work elsewhere for any other degree or diploma.

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Date 25/05/2016

SUPERVISOR'S CERTIFICATE

This is to certify that the work reported in the B-Tech. thesis entitled "**Smart Home Security**" , submitted by **Harish Thakur Akshay Sharma Vinay Sehgal** at **Jaypee University of Information Technology, Waknaghat , Solan, H.P.** is a bonafide record of his / her original work carried out under my supervision. This work has not been submitted elsewhere for any other degree or diploma.

Name: Mr. Munish Sood

Jaypee University of Information Technology, Waknaghat, Solan, H.P.

Date: 25/05/2016

ACKNOWLEDGEMENT

It is our foremost duty to express our deep regards & gratitude to our Project Guide **Mr. Munish Sood**, under whose guidance & supervision we are able to work on the project "**Smart Home Security**". Any amount of gratitude towards our family and friends can never be enough for the constant support they have provided us with, we are totally indebted to them. At last it is him, to whom we owe everything, as without God's blessings this endeavors of ours would never have been a success.

LIST OF ACRONYMS & ABBREVIATIONS

CNG	Compressed Natural Gas
LPG	Liquefied Petroleum Gas
CO	Carbon Monoxide
PPM	Parts Per Million
AC	Alternating Current
DC	Direct Current
IDE	Integrated Development Environment
CO_2	Carbon Dioxide
SnO_2	Tin Dioxide
CNS	Central Nervous System
TWA	Time-weighted average
SPST	Single Pole Single Throw
DPST	Double Pole Single Throw
DPDT	Double Pole Double Throw

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CHAPTER-1

INTRODUCTION

In this fast developing society, electronics has come to stay as the most important branch of Engineering. Electronic devices are being used in almost all industries for quality control and automation and they are fast replacing the present vast army of workers engaged in processing and assembling in the factories. These devices supplement the human ability to sense, monitor, calculate, observe, and control. An uncontrolled combination of fuel with oxygen releases heat and any unintended contact with a spark can cause burning. Automatic gas detecting systems are intended to notify the building occupants to evacuate in the event of the gas leakage or other emergency, report the event to an off premises location in order to summon emergency services, and to prepare the structure and associated systems to control the spread of gas and fire. This work is about the design and construction of a gas detector with audible alarm. This gas detector with audible alarm is designed with the intention to ensure that the event of gas is intelligently detected, promptly notified and interactively managed than what is obtainable with conventional ``ring-ring´´ fire alarm systems

1.1 LPG gas

CNG and LPG are very commonly used domestic gases. This project aims on minimizing the accidents caused due to gas leakage in households through the world as they cause fatal accident during the leakage of the gas. As in most cases these gases are odorless making detection in leakage impossible for human olfactory senses, thus this project basically deals with the sensing and alert system. Tin oxide sensors MQ-6 are used for detection of leakage and buzzers for alerting the neighborhood about the leakage and also cutting of the supply from regulator and a power supply with the help of relay takes place. The system during leakage follows a series of steps i.e. the sensor generates a charge which further gives a driving current to the ARDUINO system which is connected to buzzer, relay and exhaust fan which perform their immediate actions of informing the person concerned by, alarm generation and switching off power supply.

1.2 CARBON MONOXIDE

Carbon Monoxide (CO), is often called the “Silent Killer” because of its ability to take lives quickly and quietly when its victims never even knew they were at risk. It is indetectable to humans, being both tasteless and odorless, and in high enough concentrations it can kill within minutes. But CO is not so silent if you read about its victims in the news. It already claims hundreds of lives each year, and survivors of CO poisoning can be left with psychological and neurological symptoms. Sadly, this toxic gas takes lives that could be saved through education, awareness, and simple protection. Read this article to make yourself aware of the risks that CO poses, and how to stay CO safe!

1.2.1 What is CO And Who’s At Risk?

CO is a poisonous gas produced by the incomplete burning of carbon based fuels. When inhaled it deprives the blood stream of oxygen, suffocating its victim. No one is immune to the effects of CO, though children 14 and under are more likely to sustain poisoning than adults at lower levels. CO can cause immediate health problems, and even death, in high concentrations, and some suspect it can also cause long-term health problems in low concentrations if a person experiences regular exposure (such as at home, or in the workplace). Significant exposure to CO can also reduce life expectancy.

Any gas or propane based engine will produce CO, meaning that boaters, truckers, and small aircraft pilots are at risk from CO fumes as soon as they start their vehicle. Homeowners suffer the most from CO poisoning, and are in danger from sources like gas-powered furnaces and water heaters, clogged fireplaces and chimneys, cars running in an attached garage, and burning of fuels indoors (such as a gas or charcoal grill).Travelers staying in hotels are in danger of CO poisoning as well, which can be leaked into a hotel room from nearby faulty heaters and boilers.

1.2.2 **How Do I Know If I Am Being Exposed to CO?**

The beginning symptoms of CO poisoning are sometimes compared to the symptoms of food poisoning. Depending on the level of CO, and length of exposure, you may experience any one or more of the following symptoms:

- Headache
- Dizziness
- Weakness and clumsiness
- Nausea and vomiting
- Quick irregular heartbeat
- Chest pain
- Hearing loss
- Blurry vision
- Disorientation or confusion seizures

Level of CO	**Health Effects, and Other Information**
0 PPM	Normal, fresh air.
9 PPM	Maximum recommended indoor CO level .
10-24 PPM	Possible health effects with long-term exposure.

25 PPM	Max TWA Exposure for 8 hour work-day (ACGIH).
50 PPM	Maximum permissible exposure in workplace (OSHA).
100 PPM	Slight headache after 1-2 hours.
200 PPM	Dizziness, nausea, fatigue, headache after 2-3 hours of exposure.
400 PPM	Headache and nausea after 1-2 hours of exposure. Life threatening in 3 hours.
800 PPM	Headache, nausea, and dizziness after 45 minutes; collapse and unconsciousness after 1 hour of exposure. Death within 2-3 hours.
1000 PPM	Loss of consciousness after 1 hour of exposure.
1600 PPM	Headache, nausea, and dizziness after 20 minutes of exposure. Death within 1-2 hours.
3200 PPM	Headache, nausea, and dizziness after 5-10 minutes; collapse and unconsciousness after 30 minutes of exposure. Death within 1 hour.
6400 PPM	Death within 30 minutes.
12,800	Immediate physiological effects, unconsciousness.

PPM	Death within 1-3 minutes of exposure.

In this project on detection of carbon monoxide Above 100 PPM level the system automatically turns on the exhaust fan and an Alarm is Turned on.

CHAPTER-2

COMPONENTS USED

2.1 MQ-6 SEMICONDUCTOR SENSOR FOR LPG

It's a known fact that LPG leakage during domestic usage is a disaster, especially when we switch on any electric switch or appliances because it may produce a spark which causes sudden loud explosion of the gas filled room. In our nation there is an increase in such accidents and casualties related to it in the recent times.

LPG is indispensible part of our life as it is an important source of fuel for cooking and also used in automobiles as an alternative to petrol and diesel. Although it is a clean fuel it poses a threat as it is highly combustible. As the LPG's are available either in pressurized cylinders or as in pipeline supply there is high chance of leakage. So if leakage occurs there is a high chance of an explosion even when any electrical sparks occurs which may result in causalities and loss of property. As more and more households have started using LPG there is an increase in the number of accidents being reported owing to gas leakage. So our work aims at reducing accidents related to gas leakage in household as well as in industries.

MQ-6 Semiconductor Sensor for LPG Sensitive material of MQ-6 gas sensor is SnO2, which with lower conductivity in clean air. When the target combustible gas exist ,The sensor's conductivity is more higher along with the gas concentration rising.MQ-6 gas sensor has high sensitivity to Propane, Butane and LPG, also response to Natural gas .The sensor could be used to detect different combustible gas, especially Methane, it is with low cost and suitable for different application.

2.1.1 Character Configuration:-

* Good sensitivity to Combustible gas in wide range

* High sensitivity to Propane, Butane and LPG

* Long life and low cost

* Simple drive circuit

2.1.2 Application:-

* Domestic gas leakage detector

* Industrial Combustible gas detector

* Portable gas detector

2.1.3 TECHNICAL DATA-

Model No: MQ-6

Sensor Type: Semiconductor

Standard Encapsulation : Bakelite (Black Bakelite)

Detection Gas: Isobutane, Butane, LPG

Concentration: 300-10000ppm(Butane, Propane, LPG)

Loop Voltage Vc: $\leq$ 24V DC

Heater Voltage VH: 5.0V±0.2V AC or DC

Circuit Load Resistance RL: Adjustable

Heater Resistance RH: 31Ω±3Ω（Room Tem.）

Heater consumption PH: $\leq$900mW

Sensing Resistance Rs: 2KΩ-20KΩ(in 2000ppm C3H8)

Sensitivity S: Rs(in air)/Rs(1000ppm C4H10)≥5

Tem. Humidity :20℃±2℃；65%±5%RH

Preheat time : Over 48 hours

2.1.4 SENSITIVITY CHARACTERSTICS-

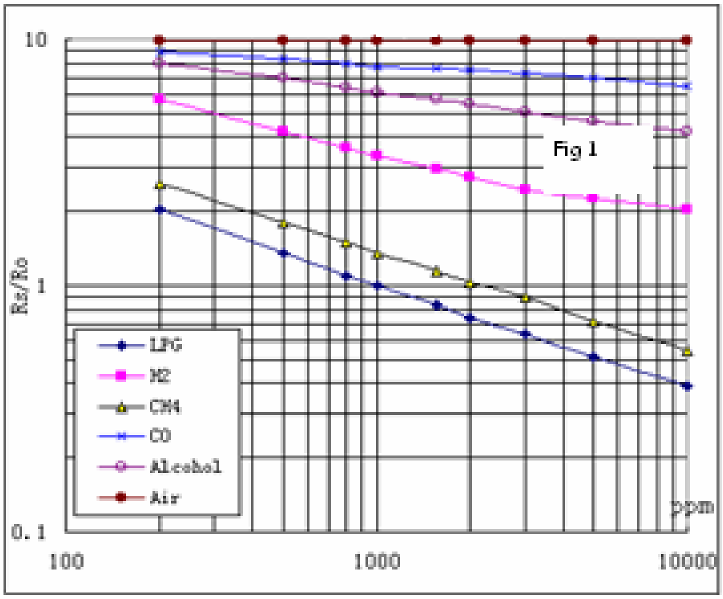

Figure 2. 1:MQ6 sensor sensitivity Characteristics

Fig shows the typical sensitivity characteristics of MQ-6, ordinate means resistance ratio of the sensor (Rs/Ro), abscissa is concentration of gases. Rs means resistance in different gases, Ro means resistance sensor in 1000ppm LPG. All test are under standard test conditions.

2.1.5 STRUCTURE AND CONFIGRATION -

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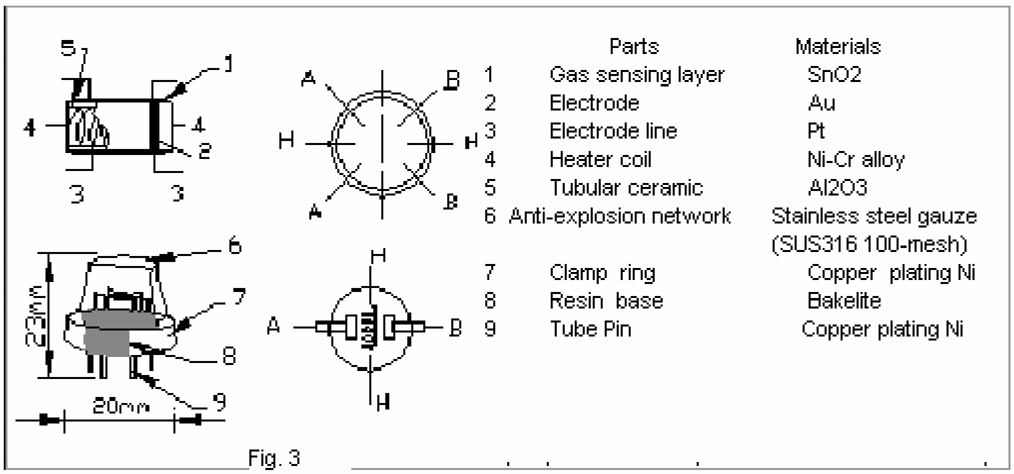

Figure 2. 2: Structure of MQ-6 Gas sensor

2.2 MQ-7 Semiconductor Sensor for Carbon Monoxide

Carbon monoxide (CO) is a colorless, odorless, tasteless, nonirritating, but significantly toxic gas. It is a product of combustion of organic matter in presence of insufficient oxygen supply. Symptoms of mild poisoning include headaches, vertigo and flu like effects, whereas larger exposures can lead to significant toxicity of the central nervous system (CNS), heart, and even death. Carbon monoxide (CO) is one of the leading causes of accidental poisonings. Experts agree that it is difficult to estimate the incidence of CO poisoning cases, because the symptoms resemble many other common ailments. This is more so in India, where there is improper reporting of morbidity and mortality attributable to suspected CO poisoning. High index of suspicion, clustering of such cases in winter months, and a careful history taking, help in making the diagnosis.

Sensitive material of MQ-7 gas sensor is SnO_2, which with lower conductivity in clean air. It make detection by method of cycle high and low temperature, and detect CO when low temperature (heated by 1.5V). The sensor's conductivity is more higher along with the gas concentration rising. When high temperature (heated by 5.0V), it cleans the other gases adsorbed under low temperature.MQ-7 gas sensor has high sensitivity to Carbon Monoxide. The sensor could be used to detect different gases contains CO, it is with low cost and suitable for different application

2.2.1Character Configuration

*Good sensitivity to Combustible gas in wide range

* High sensitivity to Natural gas

* Long life and low cost

* Simple drive circuit

2.2.2Application

* Domestic gas leakage detector

* Industrial CO detector

* Portable gas detector

2.2.3 TECHNICAL DATA-

Model No: MQ-7

Sensor Type: Semiconductor

Standard Encapsulation: Plastic

Detection Gas :Carbon Monoxide

Concentration: 10-10000ppm CO

Loop Voltage V_c : ≤10V DC

Heater Voltage V_H: 5.0V±0.2V AC or DC（High）1.5V±0.1V AC or DC（Low）

Heater Time T_L: 60±1S（High）90±1S（Low）

Load Resistance R_L: Adjustable

Heater Resistance R_H: 31Ω±3Ω（Room Tem.）

Heater consumption P_H: ≤350mW

Sensing Resistance Rs: 2KΩ-20KΩ(in 100 ppm CO)

Sensitivity S: Rs(in air)/Rs(100ppm CO)≥5

Tem. Humidity:20℃±2℃；65%±5%RH

Preheat time : Over 48 hours

2.2.4 SENSITIVITY CHARACTERSTICS-

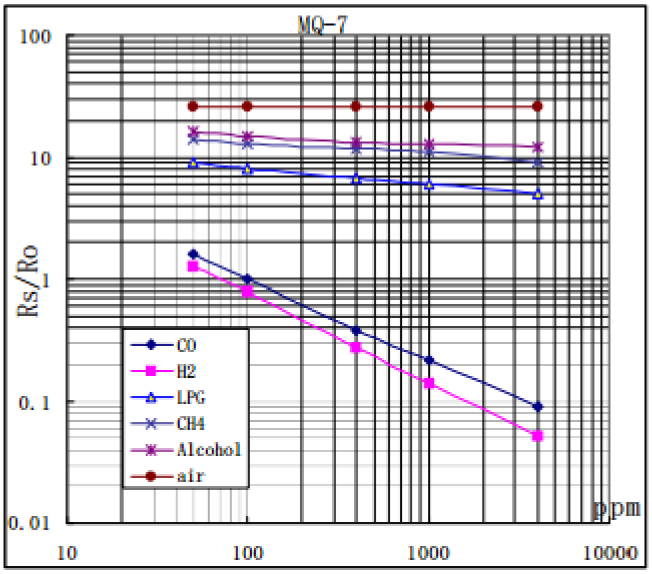

Figure 2. 3: Sensitivity Characterstics of MQ-7 Gas Sensor

Figure shows the typical sensitivity characteristics of MQ-7, ordinate means resistance ratio of the sensor **(**Rs/Ro**),** abscissa is concentration of gases. Rs means in different gases, Ro means resistance of sensor in 1000ppm Hydrogen. All test are under standard test conditions.

2.2.5 STRUCTURE AND CONFIGURATION-

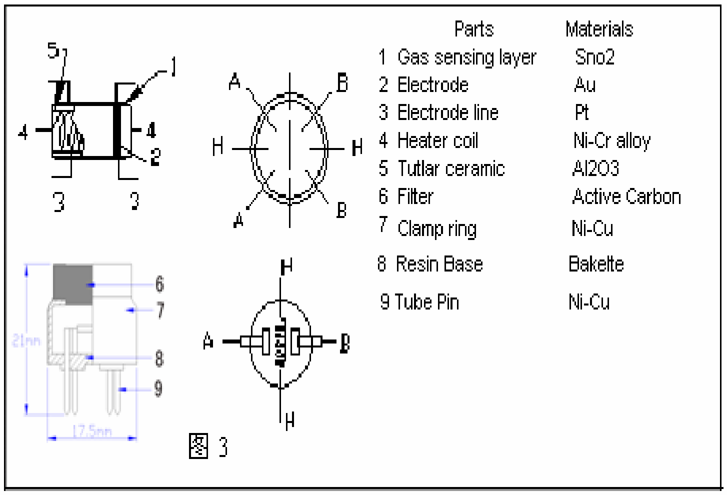

Figure 2. 4: Structure of MQ-7 Gas sensor

2.3 ARDUINO UNO

The Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, 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.

2.3.1 **Technical specifications-**

Microcontroller	ATmega328P
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limit)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
PWM Digital I/O Pins	6
Analog Input Pins	6
DC Current per I/O Pin	20 Ma
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328P) of which 0.5 KB used by boot loader
SRAM	2 KB (ATmega328P)
EEPROM	1 KB (ATmega328P)

Clock Speed	16 MHz
Length	68.6 mm
Width	53.4 mm
Weight	25 g

2.3.2 Programming-

The Uno can be programmed with the Arduino Software (IDE). Select "Arduino/Genuino Uno" from the Tools > Board menu (according to the microcontroller on your board).The ATmega328 on the Uno comes preprogrammed with a boot loader that allows you to upload new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol (reference, C header files). We can also bypass the boot loader and program the microcontroller through the ICSP (In-Circuit Serial Programming) header using Arduino ISP.

2.3.3 Power-

The Uno board can be powered via the USB connection or with an external power supply. The power source is selected automatically. External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the GND and Vin pin headers of the POWER connector.

The board can operate on an external supply from 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may become unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

The power pins are as follows:

Vin. The input voltage to the Uno board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). We can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.

5V: This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (7 - 12V), the USB connector (5V), or the VIN pin of the board (7-12V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage your board.

3V3: A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.

GND: Ground pins.

IOREF: This pin on the Uno board provides the voltage reference with which the microcontroller operates. A properly configured shield can read the IOREF pin voltage and select the appropriate power source or enable voltage translators on the outputs to work with the 5V or 3.3V.

Memory:

The ATmega328 has 32 KB (with 0.5 KB occupied by the boot loader). It also has 2 KB of SRAM and 1 KB of EEPROM (which can be read and written with the EEPROM library).

2.3.4 PIN MAPPING**:ATmega328P-**

Each of the 14 digital pins on the Uno can be used as an input or output, using pinMode(), digitalWrite(), and digitalRead() functions. They operate at 5 volts. Each pin can provide or receive 20 mA as recommended operating condition and has an internal pull-up resistor (disconnected by default) of 20-50k ohm. A maximum of 40mA is the value that must not be exceeded on any I/O pin to avoid permanent damage to the microcontroller.

In addition, some pins have specialized functions:

Serial: 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the ATmega8U2 USB-to-TTL Serial chip.

External Interrupts: 2 and 3. These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value. See the attachInterrupt() function for details.

PWM: 3, 5, 6, 9, 10, and 11. Provide 8-bit PWM output with the analogWrite() function.

SPI: 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). These pins support SPI communication using the SPI library.

LED: 13. There is a built-in LED driven by digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off.

TWI: A4 or SDA pin and A5 or SCL pin. Support TWI communication using the Wire library.

The Uno has 6 analog inputs, labeled A0 through A5, each of which provide 10 bits of resolution (i.e. 1024 different values). By default they measure from ground to 5 volts, though is it possible to change the upper end of their range using the AREF pin and the analogReference()function.

There are a couple of other pins on the board:

AREF. Reference voltage for the analog inputs. Used with analogReference().

Reset. Bring this line LOW to reset the microcontroller. Typically used to add a reset button to shields which block the one on the board.

2.3.5 Communication:

The Uno has a number of facilities for communicating with a computer, another Uno board, or other microcontrollers. The ATmega328 provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An ATmega16U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The 16U2 firmware uses the standard USB COM drivers, and no external driver is needed. However, on Windows, a .inf file is required. The Arduino Software (IDE) includes a serial monitor which allows simple textual data to be sent to and from the board. The RX and TX LEDs on the board will flash when data is being transmitted via the USB-to-serial chip and USB connection to the computer (but not for serial communication on pins 0 and 1).

A Software Serial library allows serial communication on any of the Uno's digital pins.

The ATmega328 also supports I2C (TWI) and SPI communication. The Arduino Software (IDE) includes a Wire library to simplify use of the I2C bus. For SPI communication, use the SPI library. Automatic (Software) Reset Rather than requiring a physical press of the reset button before an upload, the Uno board is designed in a way that allows it to be reset by software running on a connected computer. One of the hardware flow control lines (DTR) of the ATmega8U2/16U2 is connected to the reset line of the ATmega328 via a 100 nanofarad capacitor. When this line is asserted (taken low), the reset line drops long enough to reset the chip. The Arduino Software (IDE) uses this capability to allow us to upload code by simply pressing the upload button in the interface toolbar. This means that the boot loader can have a shorter timeout, as the lowering of DTR can be well-coordinated with the start of the upload.

This setup has other implications. When the Uno is connected to either a computer running Mac OS X or Linux, it resets each time a connection is made to it from software (via USB).

2.4.Relay

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers: they repeated the signal coming in from one circuit and re-transmitted it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations.

A type of relay that can handle the high power required to directly control an electric motor or other loads is called a contactor. Solid-state relays control power circuits with no moving parts, instead using a semiconductor device to perform switching. Relays with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload or faults; in modern electric power systems these functions are performed by digital instruments still called "protective relays".

2.4.1 TYPES OF RELAY

2.4.1.1.Latching relay-

A latching relay maintains either contact position indefinitely without power applied to the coil. The advantage is that one coil consumes power only for an instant while the relay is being switched, and the relay contacts retain this setting across a power outage. A latching relay allows remote control of building lighting without the hum that may be produced from a continuously (AC) energized coil.

In one mechanism, two opposing coils with an over-center spring or permanent magnet hold the contacts in position after the coil is de-energized. A pulse to one coil turns the relay on and a pulse to the opposite coil turns the relay off. This type is widely used where control is from simple switches or single-ended outputs of a control system, and such relays are found in avionics and numerous industrial applications.

Another latching type has a remanent core that retains the contacts in the operated position by the remanent magnetism in the core. This type requires a current pulse of opposite polarity to release the contacts. A variation uses a permanent magnet that produces part of the force required to close the contact; the coil supplies sufficient force to move the contact open or closed by aiding or opposing the field of the permanent magnet.[10] A polarity controlled relay needs changeover switches or an H bridge drive circuit to control it. The relay may be less expensive than other types, but this is partly offset by the increased costs in the external circuit.

In another type, a ratchet relay has a ratchet mechanism that holds the contacts closed after the coil is momentarily energized. A second impulse, in the same or a separate coil, releases the contacts.[10] This type may be found in certain cars, for headlamp dipping and other functions where alternating operation on each switch actuation is needed.

2.4.1.2.Reed relay-

A reed relay is a reed switch enclosed in a solenoid. The switch has a set of contacts inside an evacuated or inert gas-filled glass tube which protects the contacts against atmospheric corrosion; the contacts are made of magnetic material that makes them move under the influence of the field of the enclosing solenoid or an external magnet.

Reed relays can switch faster than larger relays and require very little power from the control circuit. However, they have relatively low switching current and voltage ratings. Though rare, the reeds can become magnetized over time, which makes them stick 'on' even when no current is present; changing the orientation of the reeds with respect to the solenoid's magnetic field can resolve this problem.

Sealed contacts with mercury-wetted contacts have longer operating lives and less contact chatter than any other kind of relay.

2.4.1.3.Mercury wetted relay-

A mercury-wetted reed relay is a form of reed relay in which the contacts are wetted with mercury. Such relays are used to switch low-voltage signals (one volt or less) where the mercury reduces the contact resistance and associated voltage drop, for low-current signals where surface contamination may make for a poor contact, or for high-speed applications where the mercury eliminates contact bounce. Mercury wetted relays are position-sensitive and must be mounted vertically to work properly. Because of the toxicity and expense of liquid mercury, these relays are now rarely used.

The mercury-wetted relay has one particular advantage, in that the contact closure appears to be virtually instantaneous, as the mercury globules on each contact coalesce. The current rise time through the contacts is generally considered to be a few picoseconds, however in a practical circuit it will be limited by the inductance of the contacts and wiring. It was quite common, before the restrictions on the use of mercury, to use a mercury-wetted relay in the laboratory as a convenient means of generating fast rise time pulses, however although the rise time may be picoseconds, the exact timing of the event is, like all other types of relay, subject to considerable jitter, possibly milliseconds, due to mechanical imperfections.

2.4.1.4.Machne tool relay-

A machine tool relay is a type standardized for industrial control of machine tools, transfer machines, and other sequential control. They are characterized by a large number of contacts (sometimes extendable in the field) which are easily converted from normally open to normally closed status, easily replaceable coils, and a form factor that allows compactly installing many relays in a control panel. Although such relays once were the backbone of automation in such industries as automobile assembly, the programmable logic controller (PLC) mostly displaced the machine tool relay from sequential control applications.

A relay allows circuits to be switched by electrical equipment: for example, a timer circuit with a relay could switch power at a preset time. For many years relays were the standard method of controlling industrial electronic systems. A number of relays could be used together to carry out complex functions (relay logic). The principle of relay logic is based on relays which energize and de-energize associated contacts. Relay logic is the predecessor of ladder logic, which is commonly used in programmable logic controllers.

2.4.1.5.Tme delay relay-

Timing relays are arranged for an intentional delay in operating their contacts. A very short (a fraction of a second) delay would use a copper disk between the armature and moving blade assembly. Current flowing in the disk maintains magnetic field for a short time, lengthening release time. For a slightly longer (up to a minute) delay, a dashpot is used. A dashpot is a piston filled with fluid that is allowed to escape slowly; both air-filled and oil-filled dashpots are used. The time period can be varied by increasing or decreasing the flow rate. For longer time periods, a mechanical clockwork timer is installed. Relays may be arranged for a fixed timing period, or may be field adjustable, or remotely set from a control panel. Modern microprocessor-based timing relays provide precision timing over a great range.

Some relays are constructed with a kind of "shock absorber" mechanism attached to the armature which prevents immediate, full motion when the coil is either energized or de-energized. This addition gives the relay the property of time-delay actuation. Time-delay relays can be constructed to delay armature motion on coil energization, de-energization, or both.

Time-delay relay contacts must be specified not only as either normally open or normally closed, but whether the delay operates in the direction of closing or in the direction of opening. The following is a description of the four basic types of time-delay relay contacts.

First we have the normally open, timed-closed (NOTC) contact. This type of contact is normally open when the coil is unpowered (de-energized). The contact is closed by the application of power to the relay coil, but only after the coil has been continuously powered for the specified amount of time. In other words, the direction of the contact's motion (either to close or to open) is identical to a regular NO contact, but there is a delay in closing direction. Because the delay occurs in the direction of coil energization, this type of contact is alternatively known as a normally open, on-delay:

2.4.1.6 Pole and throw-

Since relays are switches, the terminology applied to switches is also applied to relays; a relay switches one or more poles, each of whose contacts can be thrown by energizing the coil.

Normally open (NO) contacts connect the circuit when the relay is activated; the circuit is disconnected when the relay is inactive. It is also called a "Form A" contact or "make" contact. NO contacts may also be distinguished as "early-make" or "NOEM", which means that the contacts close before the button or switch is fully engaged.

Normally closed (NC) contacts disconnect the circuit when the relay is activated; the circuit is connected when the relay is inactive. It is also called a "Form B" contact or "break" contact. NC contacts may also be distinguished as "late-break" or "NCLB", which means that the contacts stay closed until the button or switch is fully disengaged.

Change-over (CO), or double-throw (DT), contacts control two circuits: one normally open contact and one normally closed contact with a common terminal. It is also called a "Form C" contact or "transfer" contact ("break before make"). If this type of contact has a "make before break" action, then it is called a "Form D" contact.

The following designations are commonly encountered:

SPST – Single Pole Single Throw. These have two terminals which can be connected or disconnected. Including two for the coil, such a relay has four terminals in total. It is ambiguous whether the pole is normally open or normally closed. The terminology "SPNO" and "SPNC" is sometimes used to resolve the ambiguity.

SPDT – Single Pole Double Throw. A common terminal connects to either of two others. Including two for the coil, such a relay has five terminals in total.

DPST – Double Pole Single Throw. These have two pairs of terminals. Equivalent to two SPST switches or relays actuated by a single coil. Including two for the coil, such a relay has six terminals in total. The poles may be Form A or Form B (or one of each).

DPDT – Double Pole Double Throw. These have two rows of change-over terminals. Equivalent to two SPDT switches or relays actuated by a single coil. Such a relay has eight terminals, including the coil.

The "S" or "D" may be replaced with a number, indicating multiple switches connected to a single actuator. For example, 4PDT indicates a four pole double throw relay that has 12 switch terminals.

2.4.2 APPLICATIONS

Relays are used wherever it is necessary to control a high power or high voltage circuit with a low power circuit, especially when galvanic isolation is desirable. The first application of relays was in long telegraph lines, where the weak signal received at an intermediate station could control a contact, regenerating the signal for further transmission. High-voltage or high-current devices can be controlled with small, low voltage wiring and pilots switches. Operators can be isolated from the high voltage circuit. Low power devices such as microprocessors can drive relays to control electrical loads beyond their direct drive capability. In an automobile, a starter relay allows the high current of the cranking motor to be controlled with small wiring and contacts in the ignition key.

Electromechanical switching systems including Strowger and Crossbar telephone exchanges made extensive use of relays in ancillary control circuits. The Relay Automatic Telephone Company also manufactured telephone exchanges based solely on relay switching techniques designed by Gotthilf Ansgarius Betulander.

The use of relays for the logical control of complex switching systems like telephone exchanges was studied by Claude Shannon, who formalized the application of Boolean algebra to relay circuit design in A Symbolic Analysis of Relay and Switching Circuits. Relays can perform the basic operations of Boolean combinatorial logic. For example, the Boolean AND function is realized by connecting normally open relay contacts in series, the OR function by connecting normally open contacts in parallel. Inversion of a logical input can be done with a normally closed contact. Relays were used for control of automated systems for machine tools and production lines. The Ladder programming language is often used for designing relay logic networks.

Early electro-mechanical computers such as the ARRA, Harvard Mark II, Zuse Z2, and Zuse Z3 used relays for logic and working registers. However, electronic devices proved faster and easier to use.

Because relays are much more resistant than semiconductors to nuclear radiation, they are widely used in safety-critical logic, such as the control panels of radioactive waste-handling machinery. Electromechanical protective relays are used to detect overload and other faults on electrical lines by opening and closing circuit breakers.

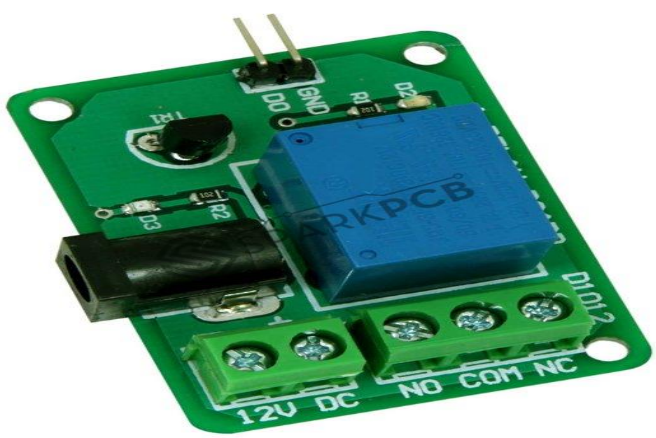

Figure 2. 5: 12 V SPDT RELAY

CHAPTER-3

WORKING

3.1 BLOCK DIAGRAM

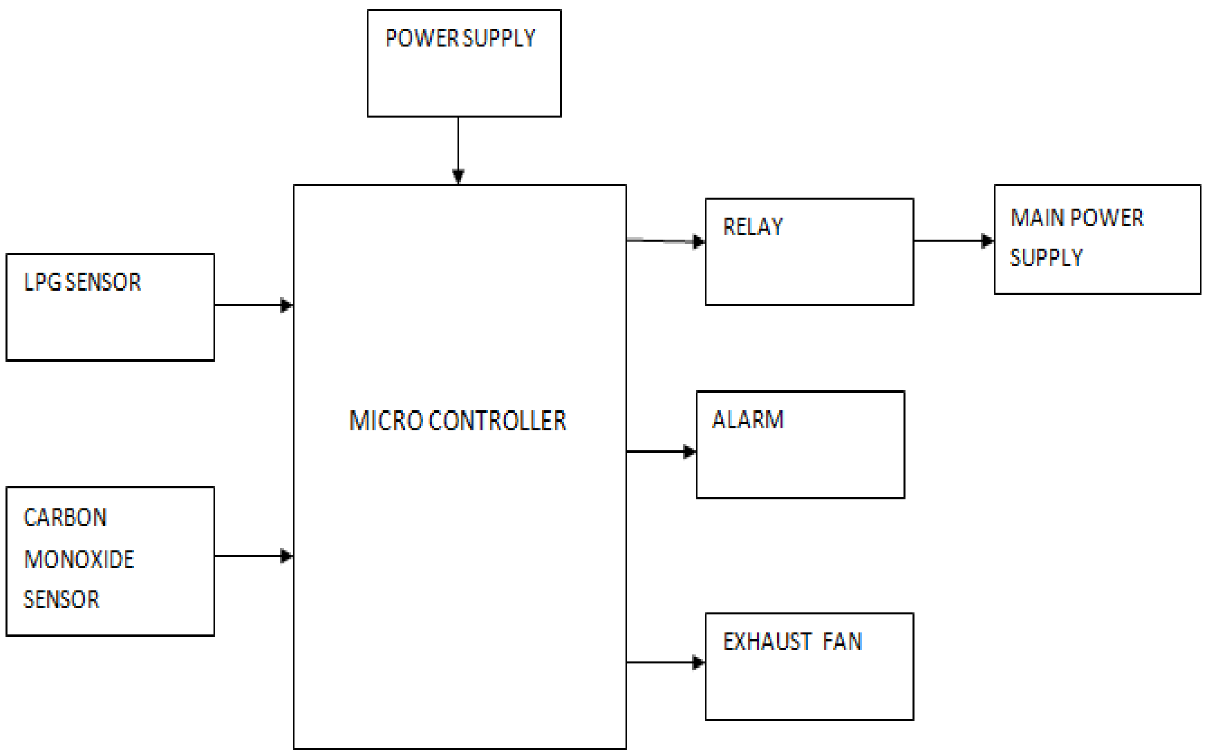

Figure 3. 1 : Block Diagram

3.2 FLOW DIAGRAM

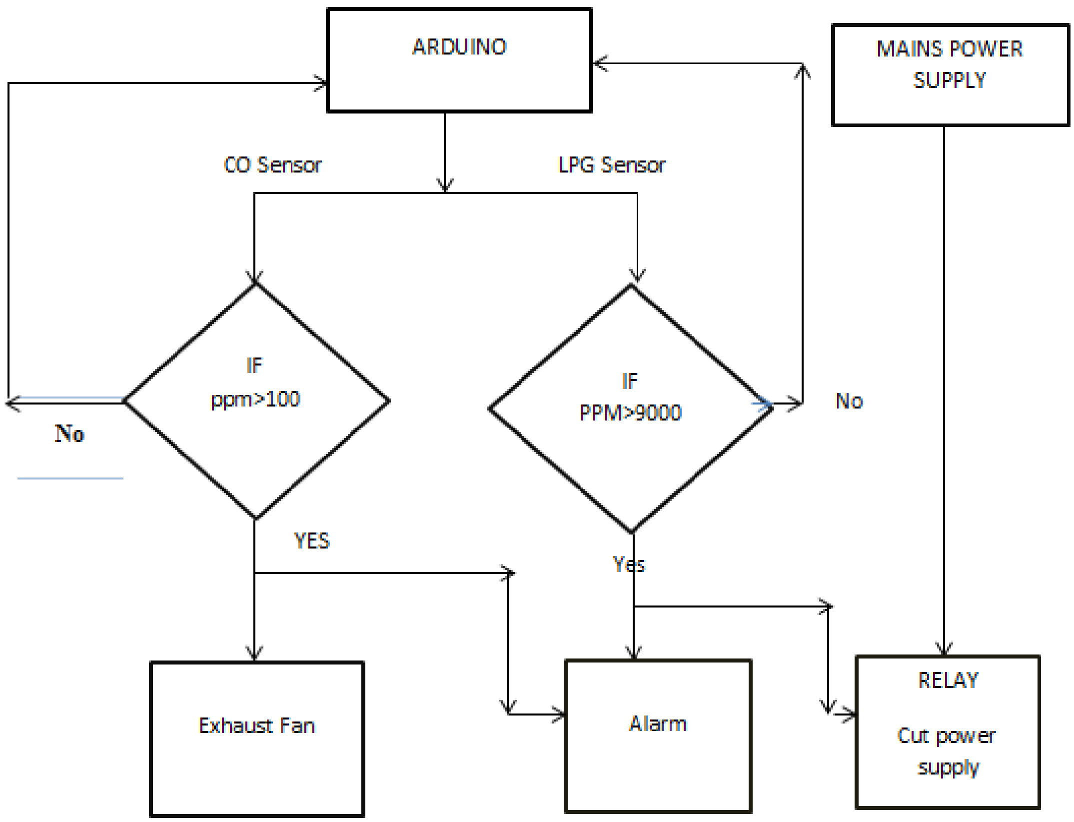

Figure 3. 2:FLOW DIAGRAM OF THE CIRCUIT

3.3 Circuit Diagram

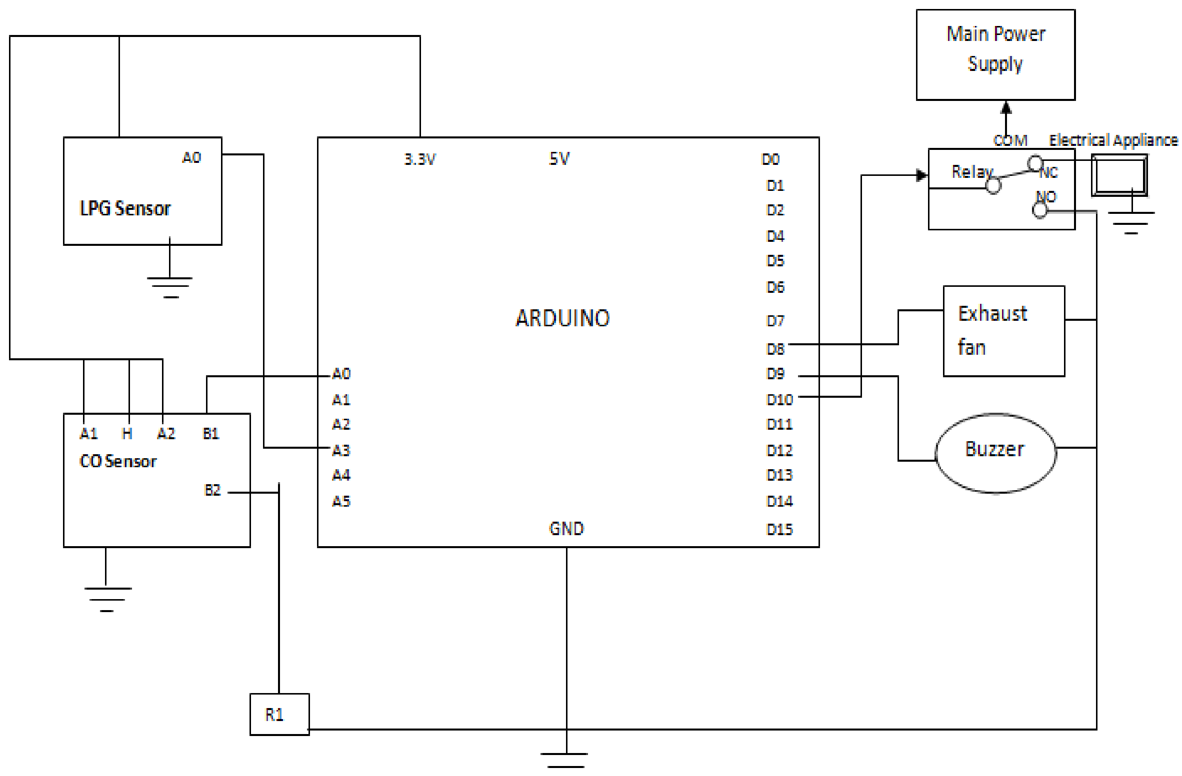

Figure 3. 3:Circuit Diagram

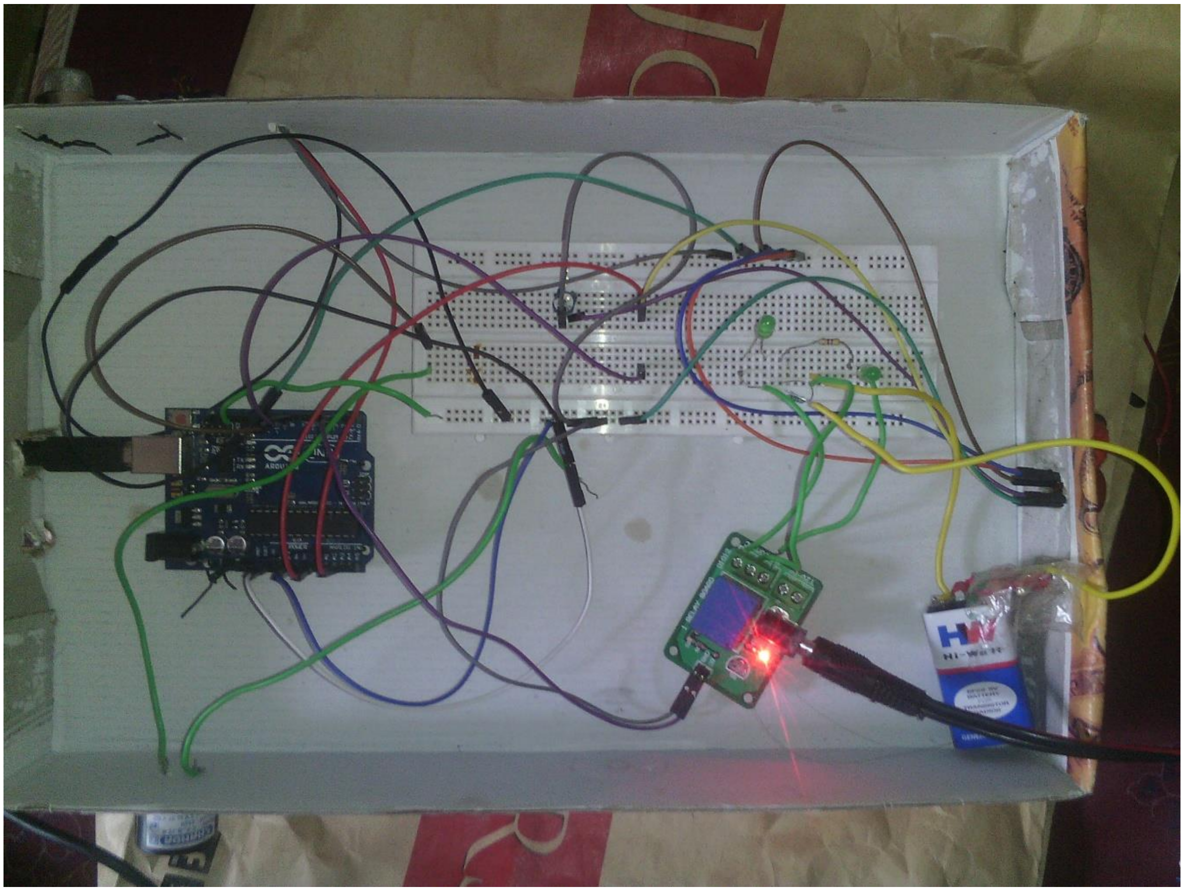

Figure 3. 4: Implemented Circiut

3.4 Calculation of threshold value

3.4.1 LPG Sensor

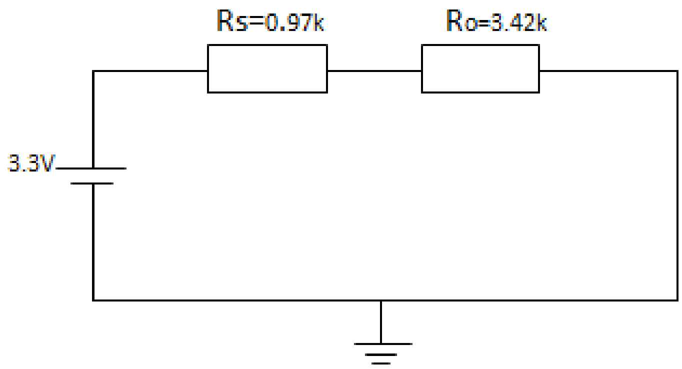

Figure 3. 5: LPG Sensor Resistance Circuit

Rs=0.96 K ,Ro=3.42K

Rs/Ro=0.3 =9,000 PPM(from sensitivity characteristics)

Using Kirchoff Voltage Law

3.3V=(.968+3.421)I

I=3.3/4.38=0.753mA

Vo=3.42*10^3*0.753

=2.57V

R=x/1024*3.3=797.4

3.4.1 CO Sensor

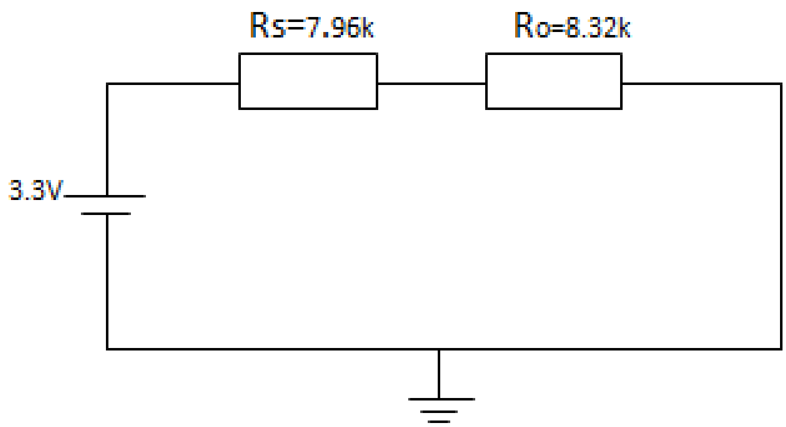

Figure 3. 6： CO Sensor Resistance Circuit

Rs=7.96K , Ro=8.32K

Rs/Ro=9.96/8.32=0.956

=100 PPM (From sensitivity characteristics)

3.3V =(7.96+8.32)I

I=3.3/16.28*10^3=0.203mA

I=203uA

V_{sensor}=0.203*8.32

=1.689

x/1024*3.3=1.689

x=524

3.5 Code

```
int BuzzerPin = 9;

int FanPin = 8;

int Relay = 10;

int COPin = A0;

int PROPPin = A3;

int value_CO=0;

int value_PROP=0;

void setup()

{

  Serial.begin(9600);

  pinMode(COPin, INPUT);

  pinMode(PROPPin, INPUT);

  pinMode(BuzzerPin, OUTPUT);

  pinMode(FanPin, OUTPUT);

  pinMode(Relay, OUTPUT);

}

void loop()

{

 value_CO = analogRead(COPin);
```

```
 value_PROP = analogRead(PROPPin);
 Serial.println(value_PROP);
 if( value_CO > 524)
 {
    digitalWrite(FanPin, HIGH);
   for(int fadeValue = 0 ; fadeValue <= 255; fadeValue +=5) {
    analogWrite(BuzzerPin, fadeValue);
    delay(30);
  }
  for(int fadeValue = 255 ; fadeValue >= 0; fadeValue -=5)
  {
    analogWrite(BuzzerPin, fadeValue);
    delay(30);
  }
  }
else
{
  digitalWrite(FanPin, LOW);
  analogWrite(BuzzerPin, 0);
  }
   if( value_PROP > 800)
```

```
{
   digitalWrite(Relay, LOW);
   delay(2000);

 int fadeValue = 255;
   analogWrite(BuzzerPin, fadeValue);
   delay(55);
  fadeValue = 0;
   analogWrite(BuzzerPin, fadeValue);
   delay(55);
 }
else
{
   digitalWrite(Relay, HIGH);
   analogWrite(BuzzerPin,0);
 }
}
```

CHAPTER -4

APPLICATIONS & FUTURE USE

4.1 APPLICATIONS

This system can be used in a lot of ways as it has a wide range of applications:

•Every industry can use this system for leakage detection.It can be used for leakage in households.

• As system is automatic it does not requires any user command.

• Gas leakage in LPG fired appliances like ovens etc.

4.2 ADVANTAGES

•Loss of life and property is reduced.

•It can also be used for CNG leakage detection.

•It also detects smoke.

•The sensor has excellent sensitivity.

4.3 DISADVANTAGES

•Since electronic components are used regular check-up of system is required.

•Error can occur in case of higher concentration of CO_2, CO.

4.4 FUTURE SCOPE

Wide range of application and installation of this system can lead to the safe household. Reducing the frequency and number of accidents which take place. Also the system can be refined for much better calibration and more precise and long life services. And we are working to make it fit for use both economically and in terms of performance.

4.5 CONCLUSION

The system is unlike other detecting systems which require human interface for execution. It is a automatic system which can comes in action as soon as the gas leakage takes place in the household. Also few drawback of other systems are used as stepping stones in making it more precise and flawless. There can be more possibilities and places of improvement and the system is still going through quality control.

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