A MINI PROJECT ON

"GAS DETECTOR USING ARDUINO UNO R3"

Submitted in partial fulfillment of requirement in

"MECHANICAL MEASUREMENTS AND CONTROLS"

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THIRD YEAR ENGINEERING IN MECHANICAL (SEM V)

GUIDED BY

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DEPARTMENT OF MECHANICAL ENGINEERING

Academic Year 2016-2017

CERTIFICATE

This is to certify that this report entitled

"GAS DETECTOR USING ARDUINO UNO R3"

Submitted by the following students of

"Mechanical Engineering"

Towards the partial fulfillment in the requirements in

"MECHANICAL MEASUREMENTS AND CONTROLS"

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Throughout their tenure of completion of task they have been guided and assessed by me, I am satisfied that their contribution was proportionate, they were satisfactory progressive and their task is up to standard envisaged by University of Mumbai.

HOD MECHANICAL **PROJECT GUIDE**

(Prof. R.K.AGRAWAL) (Prof. NITIN NANDESHWAR)

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"We have taken efforts in this project. However, it would not have been possible without the kind support and help of many individuals and web research. We would like to extend my sincere thanks to all of them.

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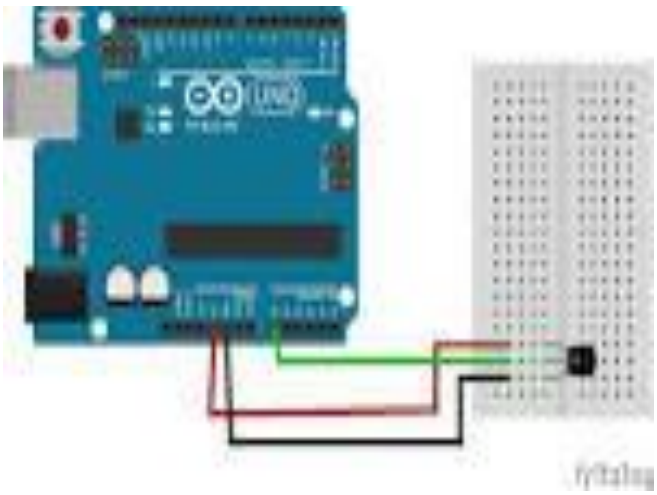
Ours thanks and appreciations also go to my colleague in developing the project and people who have willingly helped me out with their abilities."

INTRODUCTION

Arduino is composed of two major parts: the Arduino board, which is the piece of hardware you work on when you build your objects; and the Arduino IDE, the piece of software you run on your computer. You use the IDE to create a sketch (a little computer program) that you upload to the Arduino board.



Arduino Development Module

The first Arduino was introduced in 2005, aiming to provide an inexpensive and easy way for novices and professionals to create devices that interact with their environment using sensors and actuators. Common examples of such devices intended for beginner hobbyists include simple robots, thermostats, and motion detectors.

Hardware An official Arduino Uno with descriptions of the I/O locations An early Arduino board[8] with anRS-232 serial interface (upper left) and an Atmel ATmega8 microcontroller chip (black, lower right); the 14 digital I/O pins are located at the top and the six analog input pins at the lower right. An Arduino board consists of an Atmel 8-, 16- or 32-bit AVR microcontroller with complementary components that facilitate programming and incorporation into other circuits. An important aspect of the Arduino is its standard connectors, which lets users connect the CPU board to a variety of interchangeable add-on modules known as shields, Some shields communicate with the Arduino board directly over various pins, but many shields are individually addressable via an I^2C serial bus—so many shields can be stacked and used in parallel.

Official Arduinos have used the mega AVR series of chips, specifically the AT mega8 , ATmega168 , ATmega328 , ATmega1280 , and ATmega2560 .A handful of other processors have been used by Arduino compatibles. Most boards include a5 volt linear regulator and a 16 MHz crystal oscillator (or ceramic resonator in some variants), although some designs such as the Lily Pad run at 8 MHz and dispense with the onboard voltage regulator due to specific form- factor restrictions.

An Arduino's microcontroller is also pre-programmed with a boot loader that simplifies uploading of programs to the on-chip flash memory, compared with other devices that typically need an external programmer . This makes using an Arduino more straightforward by allowing the use of an ordinary computer as the programmer. Currently, optiboot boot loader is the default bootloader installed on Arduino UNO.

Topic: GAS LEAKAGE DETECTOR USING ARDUINO

COMPONENTS REQUIRED :

- ARDUINO PRO MINI
- LPG GAS SENSOR MODULE
- BUZZER
- BC 547 TRANSISTOR
- 16X2 LCD
- DC POWER SUPPLY
- I K RESISTOR
- DC MOTOR(200 RPM)
- CONNECTING WIRES

INTRODUCTION:

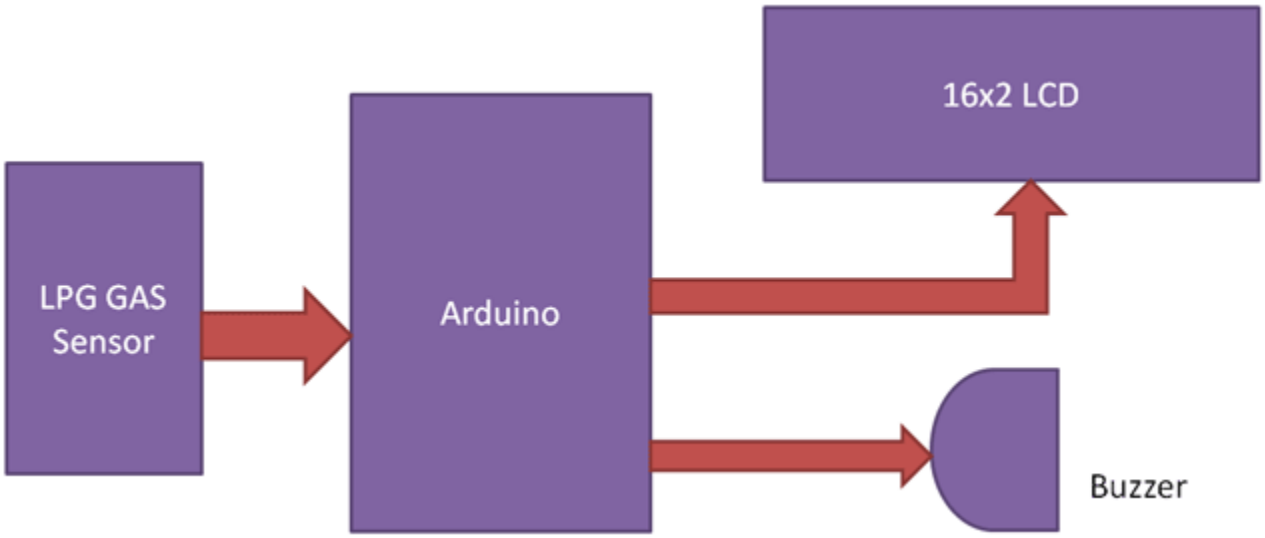
While LPG is an essential need of every household, its leakage could lead to a disaster. To alert on LPG leakage and prevent any mishappening there are various products to detect the leakage. Here we have developed an Arduino based LPG gas detector alarm. If gas leakage occurs, this system detects it and makes an alert by buzing the buzzer attached with the circuit. This system is easy to build and anyone who have some knowledge of electronics and programing, can build it.

As shown in the schematic diagram above, it contains Arduino board, LPG GAS Sensor Module, buzzer and 16x2 LCD module.Arduino controls the whole processof this system like reading LPG Gas sensor module output, sending message to LCD and activating buzzer. We can set sensitivity of this sensor module by inbuilt potentiometer placed on it.

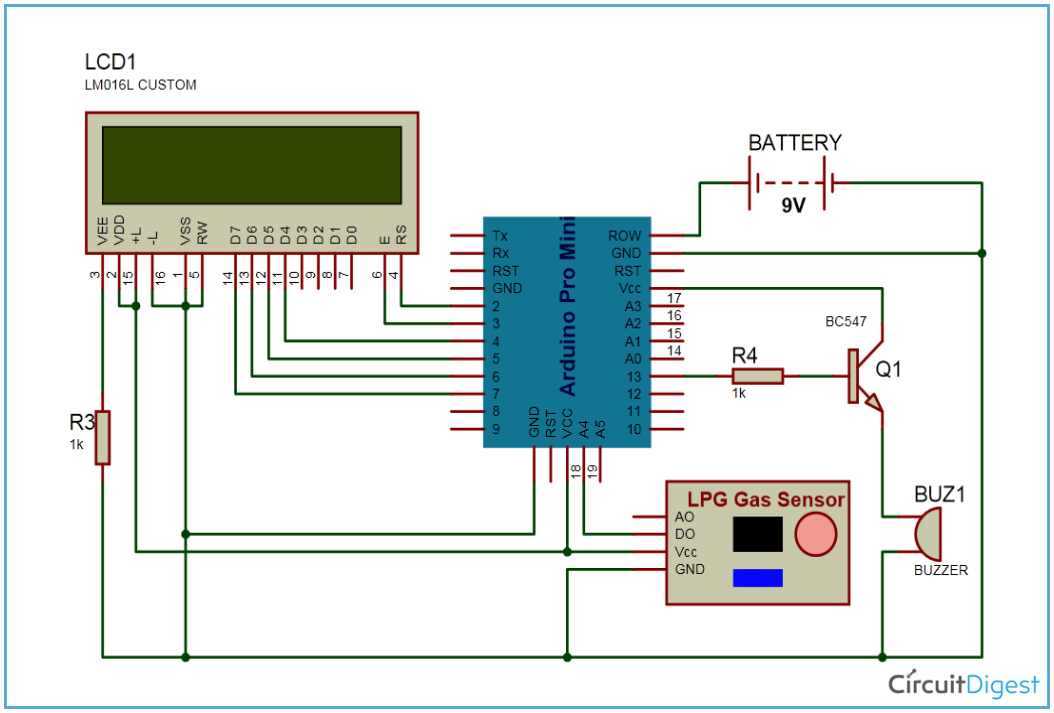
LPG gas sensor module's DO pin is directly connected to pin 18 (A4) of Arduino and Vcc and GND are connected to Vcc and GND of arduino. LPG gas sensor module consist a MQ3 sensor which detects LPG gas. This MQ3 sensor has a heater inside which needs some heater supply to heat up and it may takes up to 15 minute to get ready for detecting LPG gas.

And a comparator circuit is used for converting Analog output of MQ3 in digital. A 16x2 LCD is connected with arduino in 4-bit mode. Control pin RS, RW and En are directly connected to arduino pin 2, GND and 3. And data pin D0-D7 are connected to 4, 5, 6, 7 of arduino. A buzzer is connected with arduino pin number 13 through a NPN BC547 transistor having a 1 k resistor at its base

BLOCK DIAGRAM:



CIRCUIT DIAGRAM:



PROGRAM:

```
#include <LiquidCrystal.h>
LiquidCrystal lcd(3, 2, 4, 5, 6, 7);

#define lpg_sensor 18
#define buzzer 13

void setup()
{
  pinMode(lpg_sensor, INPUT);
  pinMode(buzzer, OUTPUT);
  lcd.begin(16, 2);
  lcd.print("LPG Gas Detector");
  lcd.setCursor(0,1);
  lcd.print("Circuit Digest");
  delay(2000);
}

void loop()
{
  if(digitalRead(lpg_sensor))
  {
    digitalWrite(buzzer, HIGH);
    lcd.clear();
    lcd.print("LPG Gas Leakage");
    lcd.setCursor(0, 1);
    lcd.print("     Alert     ");
    delay(400);
    digitalWrite(buzzer, LOW);
    delay(500);
  }

  else
  {
    digitalWrite(buzzer, LOW);
    lcd.clear();
    lcd.print("  No LPG Gas ");
    lcd.setCursor(0,1);
    lcd.print("   Leakage   ");
    delay(1000);
  }
}
```

WORKING:

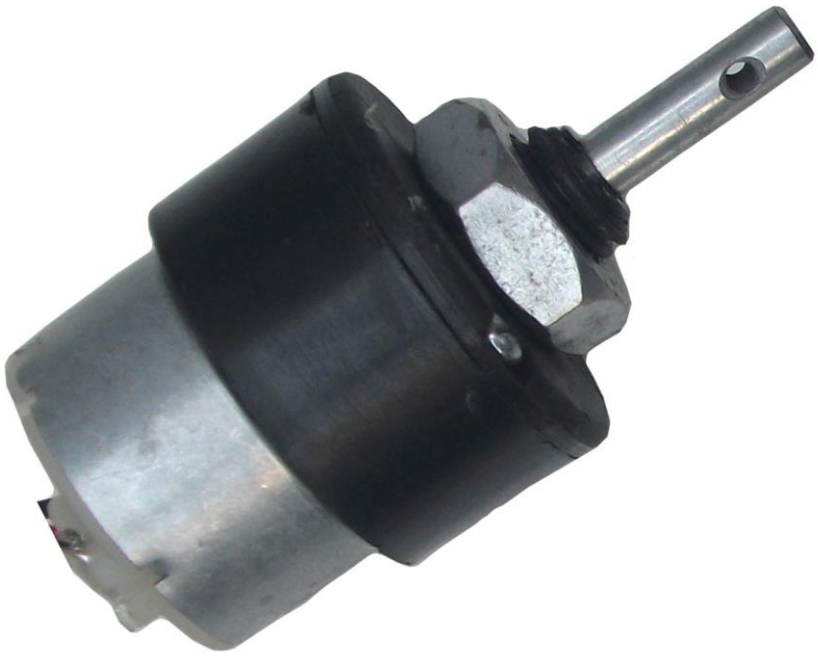
Pin details of the gas sensor module are shown in Fig. 2. An MQ-6 gas sensor is used in the gas sensor module. As per its datasheet, it has high sensitivity to propane, butane, isobutene, LPG and natural gas. The sensor can also be used to detect combustible gases, especially methane. This circuit has been tested with LPG gas and was found to work very fine. Whenever there is LPG con-centration of 1000 ppm (parts per million) in the area, the OUT pin of the sensor module goes high. This signal drives timer IC 555, which is wired as an astable multivibrator. The multivibrator basically works as a tone generator. Output pin 3 of IC 555 is connected to LED1 and speaker-driver transistor SL100 through current-limiting resis-tors R5 and R4, respectively. LED1 glows and the alarm sounds to alert the user of gas leakage. The pitch of the tone can be changed by varying preset VR1. Use a suitable heat-sink for transistor SL100.

ADVANTAGES:

- Circuit has high sensitivity to propane,butane,lpg and natural gas.
- The sensor can also be useful to detect combustible gases,especially methane
- The circuit has been tested with lpg gas and found to be worked very fine.
- Main components used are:
- 1:MQ-6 LPG gas sensor.
- 2:SL 100 transistor.

APPLICATION:

- Used in automobiles for engine emission control.
- Electrochemical detectors are used in refineries,gas turbines,chemical plants etc.
- Ultrasonic gas detectors use acoustic sensor to detect changes in the background noise of its environment.
- They are also gound in off shore and on shore gas platforms.



200 RPM Side Shaft Gear DC Motor for Arduino/Raspberry-Pi/Robotics

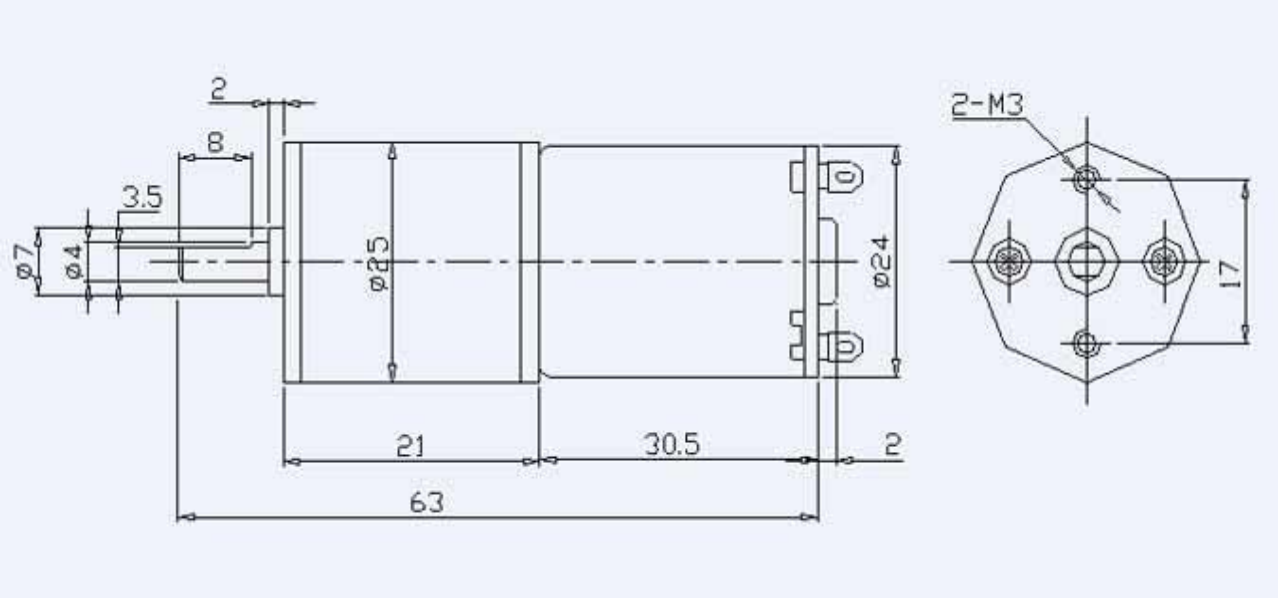
Features of 200 RPM Side Shaft Gear DC Motor:

- 6mm shaft diameter with internal hole.
- 125gm weight.
- Same size motor available in various rpm.
- No-load current = 60 mA(Max), Load current = 300 mA(Max).

Application of 200 RPM Side Shaft Gear DC Motor:

These are used in Robot, Pan/ Tilt camera auto shutter welding machines water meter IC Card, grill, oven, cleaning machine, garbage disposers household appliances, Slot machines, Money detector, atomic actuator, coffee machine, Towel disposal, lighting , Coin refund devices, Peristaltic pump.

DC Motor: High Torque Mini 12V DC Gear Motor, 200 rpm for Hobby Projects
(Part# MT-200)



Motor Spec (Model# 25GA370D12, i = 1:25.5)

1. Voltage: 12.0VDC
2. Output Speed: 200 +/- 10% RPM
3. No-Load output current: =< 50 mA
4. Rotation Output: CW / CCW
5. Noise: No Gear Noise
6. Stall output: : Slip Gear, Broken Gear is no allowed
7. Output shaft of the axial clearance: =< 0.1 ~ 0.3mm, Horizontal clearance requirement =< 0.05

Electrical Specification

1. No-Load Speed: 5700 RPM
2. No-Load Current: =< 30mA
3. Rotation: CW
4. Motor#: 370

DC MOTORS:

Almost every mechanical movement that we see around us is accomplished by an electric motor. Electric machines are a means of converting energy. Motors take electrical energy and produce mechanical energy. Electric motors are used to power hundreds of devices we use in everyday life. Motors come in various sizes. Huge motors that can take loads of 1000's of Horsepower are typically used in the industry. Some examples of large motor applications include elevators, electric trains, hoists, and heavy metal rolling mills. Examples of small motor applications include motors used in automobiles, robots, hand power tools and food blenders.
Micro-machines are electric machines with parts the size of red blood cells, and find many applications in medicine.

Electric motors are broadly classified into two different categories: DC (Direct Current) and AC (Alternating Current). Within these categories are numerous types, each offering unique abilities that suit them well for specific applications. In most cases, regardless of type, electric motors consist of a stator (stationary field) and a rotor (the rotating field or armature) and operate through the interaction of magnetic flux and electric current to produce rotational speed and torque. DC motors are distinguished by their ability to operate from direct current.
There are different kinds of D.C. motors, but they all work on the same principles. In this chapter, we will study their basic principle of operation and their characteristics. It's important to understand motor characteristics so we can choose the right one for our application

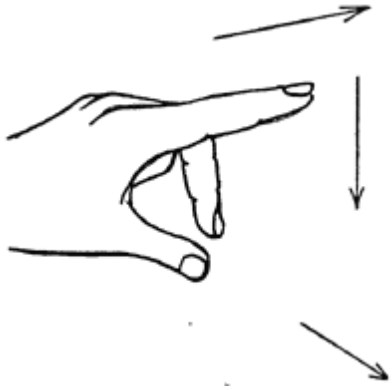
DC Motor Basic Principles:

1: Energy Conversion

If electrical energy is supplied to a conductor lying perpendicular to a magnetic field, the interaction of current flowing in the conductor and the magnetic field will produce mechanical force (and therefore, mechanical energy).

2: Value of Mechanical Force

There are two conditions which are necessary to produce a force on the conductor. The conductor must be carrying current, and must be within a magnetic field. When these two conditions exist, a force will be applied to the conductor, which will attempt to move the conductor in a direction perpendicular to the magnetic field. This is the basic theory by which all DC motors operate.The force exerted upon the conductor can be expressed as follows.
$F = B\ i\ l$ Newton (1) where B is the density of the magnetic field, l is the length of conductor, and i the value of current flowing in the conductor. The direction of motion can be found using Fleming's Left Hand Rule.

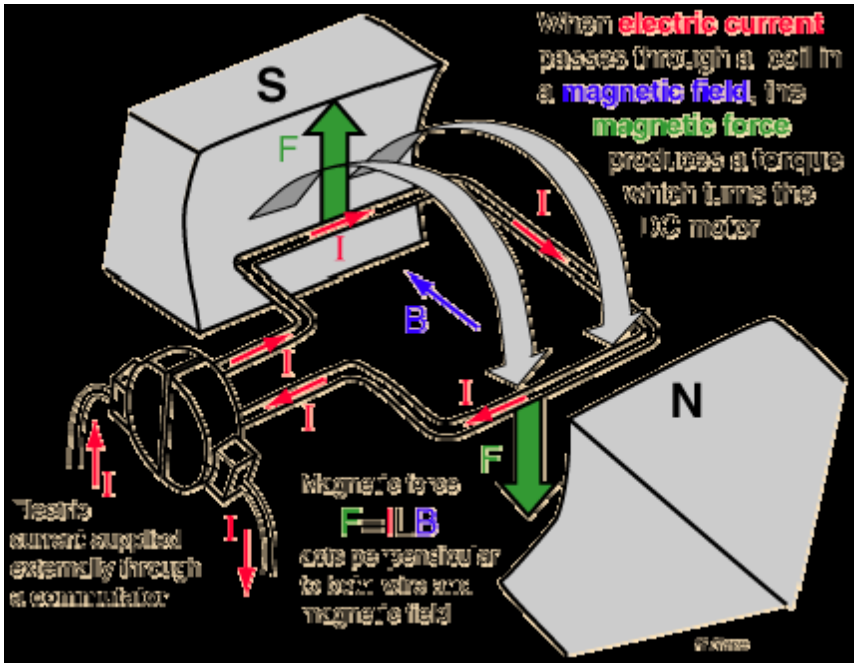


Fleming's ***Left Hand Rule***

The first finger points in the direction of the magnetic field (first - field), which goes from the North pole to the South pole. The second finger points in the direction of the current in the wire (second - current). The thumb then points in the direction the wire is thrust or pushed while in the magnetic field.

3: Principle of operation:

Consider a coil in a magnetic field of flux density **B** (figure 4). When the two ends of the coil are connected across a DC voltage source, current I flows through it. A force is exerted on the coil as a result of the interaction of magnetic field and electric current. The force on the two sides of the coil is such that the coil starts to move in the direction of force.



Torque production in a DC motor

In an actual DC motor, several such coils are wound on the rotor, all of which experience force, resulting in rotation. The greater the current in the wire, or the greater the magnetic field, the faster the wire moves because of the greater force created.

At the same time this torque is being produced, the conductors are moving in a magnetic field. At different positions, the flux linked with it changes, which causes an *emf* to be induced . This voltage is in opposition to the voltage that causes current flow through the conductor and is referred to as a *counter-voltage* or *back emf*.

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