CHAPTER 1

INTRODUCTION

1.1 General Introduction

LPG leakages are a mutual hindrance in household and manufacturing nowadays. It is very life threatening if you will not distinguish and modified right away. The idea behind our project is to give a solution by power cut the gas provision as soon as a gas leakage is perceived apart from activating the sounding alarm. In addition to this, the authorized person will receive a message informing him about the leakage with the increase of natural gas productions in the last 10 years: Philippines gas industry has really taken its toll. However, the Bureau of Fire Protection prompted the society to yield preventive and security measures against defective electrical cabling and dissolved petroleum gas leaks regardless of fire alarming incidents in the first half of 2017. The main focus of this paper is to discuss how gas sensors are made using Arduino microcontroller. Arduino is a microcontroller by which many instruments can be made; from these we have made "Gas sensor". In this authentic model a gas sensor model i.e. mq-6 gas sensor is used for sensing LPG gas from environment and allows user to be aware of the leakage of that. For being aware a buzzer is used to be aware of and interrupt the user to the hazards of the consumption of the destruction of gas leaking. This module will effective to detect LPG leakage in domestic purpose, factory, petrol pump etc.

In this we are going to discuss how to implement the LPG gas sensor and alarming system by using Arduino. LPG gas is essential for day to day's life. Without LPG gases the 20th century will have been become the darkest area on earth. At one side it is good to use but at another side it has many harmful sides. When it leaks out and came to contact with flame- able things it can cause burning. This system detects any LPG gas from environment when it came contact within its sensing range. It senses and gives the message of leaking in the LCD display and also gives the alarm to alert people or user of current place. When the LPG controller exceeds the range of the gas sensor module, it can detect the concentration of

Leaking the gas in the air.

Home can provide safety, convenience, and efficiency for people in the 21st century. An intelligent home system is integrated by many function and systems. At present, the gas pipeline plays an increasingly important role in modern life. Natural gas pipeline leak accidents have occurred due to a variety of unexpected natural or man-made factors. These leaks seriously endanger the safety of human life. One of the most important systems is the gas leakage detection function in an intelligent home. The gas leakage event may involve danger for life. There have been many deaths around the world because of gas leakage. The deaths are especially rising as last year more than one hundred people were killed because of gas leakage all over the world. The deaths in developed countries might be less but it is still a worrying factor because in addition to lives, the amount of products that are damaged due to gas leakage are enormous. There are not many buildings that have gas leakage detectors because of their price and installation. Even if there are detectors installed the primitive technology that is used in the devices make them unreliable because of false alarms and those which are free or are reliable are priced at a very high range. As a result, they are often avoided. The gas leakage detection device is fixed on the wall or ceiling. It is not very convenient that uses many gas leakage detection modules in the home. In the paper, we design a gas leakage detection system to detect gas leakage event, and transmit information to users.

1.2 Objective of the Project

As we know the problems occurs in day to day life at home related to the LPG gas, to solve such problems we design the automatic LPG gas booking and leakage detection system.

- We can Detect Gas leakage instantly.
- LPG leakage is detected through the sensor and information is sent to the user by SMS.
- To real time gas monitoring system.
- To provide security for home, hotels, industries, etc.

1.3 Problem Formulation

This is the major problem now a day which causes a very dangerous to the users of LPG. The detection of LPG leakage automatically by gas sensor if it crosses the threshold value.

Here it can be prevented by detecting before it becomes an accident by gas sensor module and providing immediate alert by buzzing the sound and sending the message to the predefined number. To avoid leakage accidents in the industries, homes, hotels, restaurants and in where the lpg gas cylinders are used. It will detect the gas leakage and alerts the users before so immediate precaution can be taken to prevent the accident.

1.4 Existing system

Leakage detection and location is one of the par amount concerns of home owner all over the world. A timely evaluation and response to a gas leakage, allows proper management of the serious condition and an effective risk minimization With the continuing growth of the forces ofsocial production and the gradual awakening of the people'sconsciousness of the importance of home safety, a series ofmeasures have been put forth to ensure person's safety. In home, small negligence may cause heavy economic losses and environmental pollution. Therefore, many companies, including Petro China and Sinopec, are provide large amounts of funds to upgrade existing systems in order to remove the hidden danger condition. However, there are stillsome limitations on real-time monitoring, data transmissionandto find accurate location of a leakage point when an accident happens. Mainly because: most of the current quipment's are based on wired networks, it is undevelopedin technology and hard to be deployed; the technology of dataacquisition in gas leakage condition is also unsophisticated and because of this it is hard to locate the leakage point. These issues can be solved with the help of Wireless Sensor Networks(WSN).

1.5 Methodology

In this project, main aim is to detect gas leakage at gas pipelines through internet connectivityandbymonitoringitdaily.we have designed an Innovative Pipe Line Detecting Robot with Wireless Control and Monitoring System using IOT and Bluetooth Technology. This entire Pipeline detection System is designed using Arduino and AVR Microcontroller. This System is equipped with highly sensitive Sensor LPG Sensor.Weusean LPG gas sensor to sense LPG gas when LPG gas leakage occurs. When LPG gas leakage occurs, a pulse will send to the Arduino board.. When the Arduino board gets a pulse from a LPG, then it displays the readings of that sensors in LCD display and upload those readings in the cloud

using IOT. It activates the buzzer to generate the beep sound, when an LPG gas sensor gives a High pulse to Arduino board. We can access those information at any place all over the world. For this robot we are giving manual moderobot. In manual mode we have to control the robot by using an android application of smart phone with the help of web application. I

Movement of the Robot is controlledby ESP32cam, DC Geared Motor and L293D based Motor driver IC. Wifi camera based Android Application is used to Control the movement of Robot in Forward, Backward, Left and Right Direction. Live video monitoring is also done on web application using ip address of the camera.

CHAPTER 2

BASICS OF IOT

2.1 Definition

Definition the Internet of Things (IOT) is the interconnection of uniquely identifiable embedded computing devices within the existing Internet infrastructure. The "Internet of Things" connects devices and vehicles using electronic sensors and the Internet.

2.2 Introduction

Introduction The Internet of Things (IOT) is the network of physical objects devices, vehicles, buildings and other items embedded with electronics, software, sensors, and network connectivity that enables these objects to collect and exchange data. The IoT allows objects to be sensed and controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer based systems, and resulting in improved efficiency, accuracy and economic benefit, when IoT is augmented with sensors and actuators, the technology becomes an instance of the more generalclass ofcyber physical systems, which also encompasses technologies such as smart grids,smart homes, intelligent transportation and smart cities.

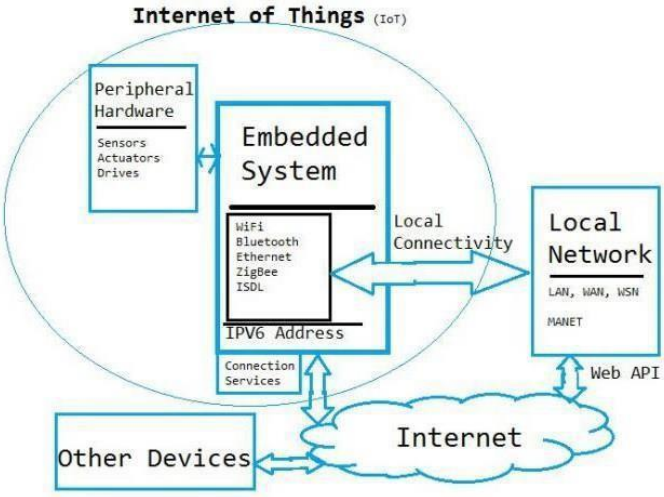


Fig 2.2 : Internet of Things

CHAPTER 3

LITERATURE SURVEY

- **TUWien and ARAS, Baku, Azerbaijan [1]**, This paper gives first an overview on robots in the petroleum industry, focuses on improvements especially in the case of robotic vehicles which move inside a pipeline for inspection reasons, so called in-pipe inspection robots

- **Mohammed Y Aalsalem, Wazir Zada Khan, Wajeb Gharibi1, Muhammad Khurram Khan, Quratulain Arshad [2],** This data is made available real-time through real-time feeds over the internet. This data helps in easily locating the root cause of the emergency condition.

- **Hanan Elazhary[3],** This paper discusses emerging research areas including the IoT and the intersection between the IoT and the prominent areas of research cloud computing and mobile computing.

- **Mohd Zaki Ghazali, Noorhayati Mohamed Noor, Noraziah Ramly, Sulastri Putit [4],** This paper presents the development of a microcontroller based mobile gas sensing robot. The purpose of the robot is to automatically detect gas leakage along a gas transporting pipeline. The developed microcontroller based mobile gas sensor robot is also proposed to reduce the workload of inspection and maintaining gas pipeline. Pipeline gas detection is difficult as it is odourless but very flammable and the pipeline may run thousand kilometres. The combustible property of LPG gas leads to mass destruction of properties and human casualties.

- **Sven Rademacher, Katrin Schmitt, Jürgen Wöllenstein [5],** This paper presents the monitoring and control of gas leakages by using wireless gas sensor network in case of a disaster

- **Amit Shukla , Hamad Karki [6],** This paper is aimed towards fulfilling the dire need of a brief technical survey summarizing all the current applications of robotics in the onshore oil and gas industry. There are five main steps involved in the global business of oil and gas, starting from exploration, drilling, production, refining and to finally transportation to consumer end. Every step involves some degree of automation but robotics inspection of metallic pipelines and tanks, used for transportation and storage of oil and gas, are most critical and popular. Therefore, in the onshore oil and gas facilities most of the robotic solutions are available in the form of In-Pipe Inspection Robots and Tank Inspection Robots.

CHAPTER 4

4.1 BLOCK DIAGRAM

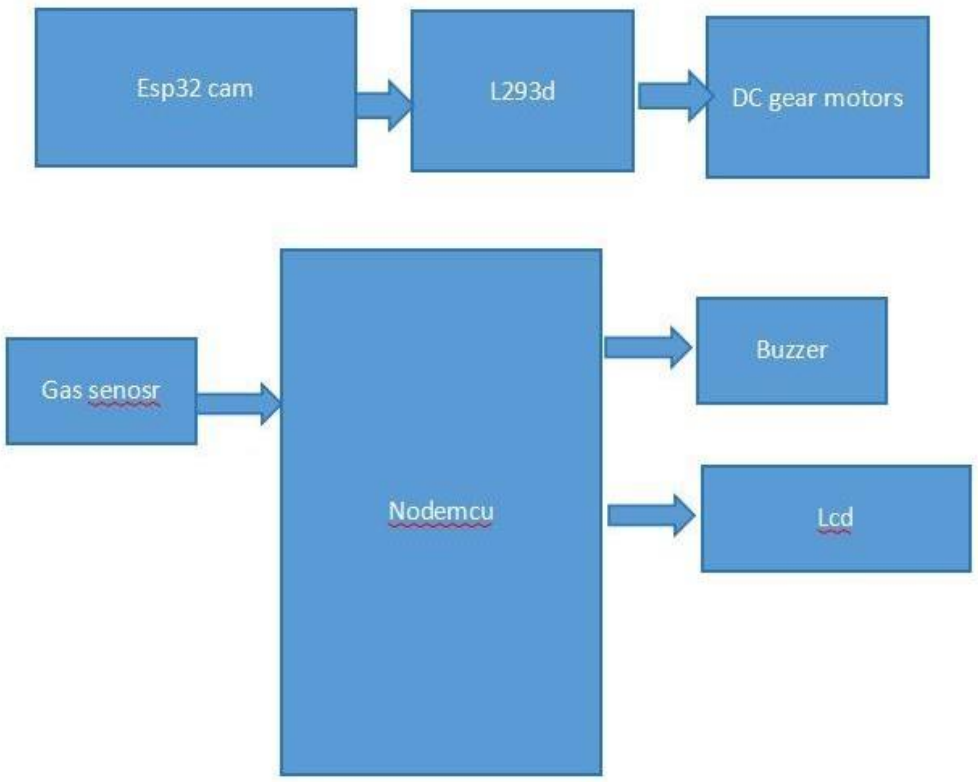


Fig 4.1 : Block Diagram

4.2 System Requirement Specifications :

A system requirement specification (SRS), a requirement specification for software system is a description of the behaviour of a system to be developed and may include a set of use cases that describe interactions that the users will have with the software.

Software requirement specification establishes the basis for agreement between customers and contractors or suppliers (in market-driven projects, these roles may be played by the marketing and development divisions) on what the software product is to do as well as what it is not expected to do. Software requirements specification permits A rigorous assessment of

requirements before design can begin and reduces later redesign. It should also provide a realistic basis for estimating product costs, risks and schedules.

4.3 Hardware Specifications :

- ARDUINO UNO
- ARDUINO BOARD
- Power Supply
- Memory
- 16*2 character LCD display
- MQ2 Gas Sensor
- Buzzer
- ESP8266 WIFI Camera
- Battery
- 7805 voltage regulator IC
- 1N4001-T switching diode
- DC gear Motor
- L293D

4.4 Software Specifications

- Arduino IDE (v1.0.6)
- Programming Language : C

4.5 Hardware Description

4.5.1 ARDUINO UNO :

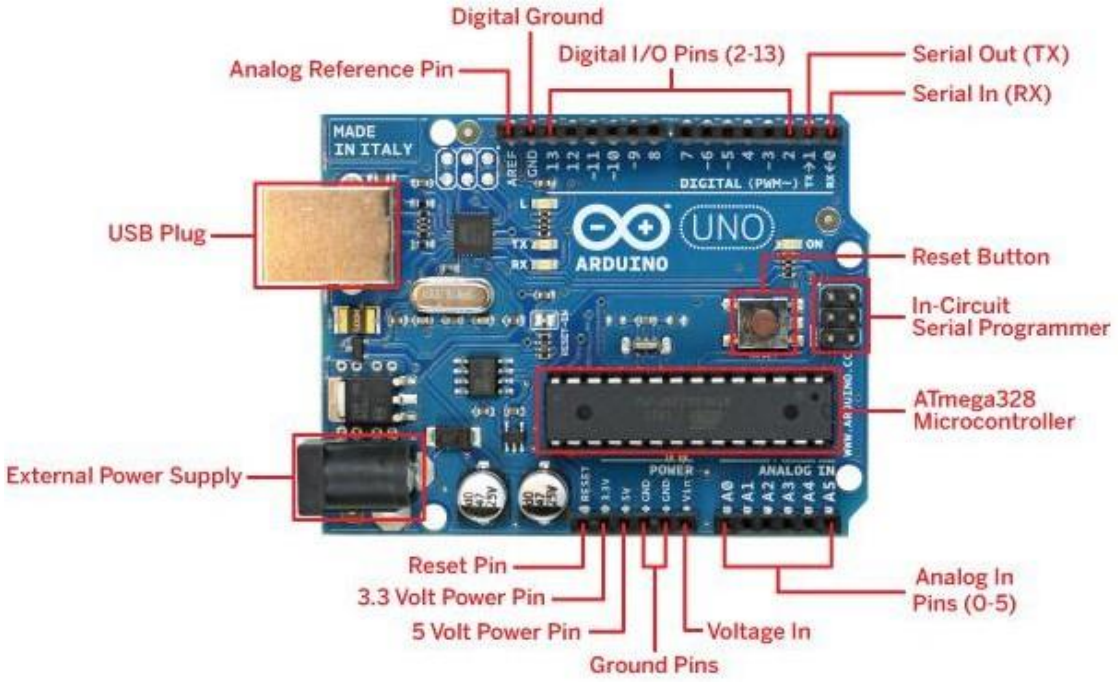


Fig 4.5.1 :ARDUINO UNO

Introduction

The Arduino Uno is a microcontroller board based on the ATmega328. It 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 an AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDIUSB-to-serial driver chip.Instead, it features the Atmega8U2 programmed as a USB-to-serial converter.

"Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform; for a comparison with previous versions.

TECHNICAL SPECIFICATIONS

Microcontroller:	ATmega328
Operating Voltage:	5V
Input Voltage:	7-12V
Input Voltage (limits):	6-20V
Digital I/O Pins:	14 (of which 6 provide PWM output)
Analog Input Pins:	6
DC Current per I/O Pin 40:	mA
DC Current for 3.3V Pin 50	mA
Flash Memory:	32 KB of which 0.5 KB used by boot loader
SRAM:	2 KB
EEPROM:	1 KB
Clock Speed:	16 MHz

4.5.2 ARDUINO BOARD :

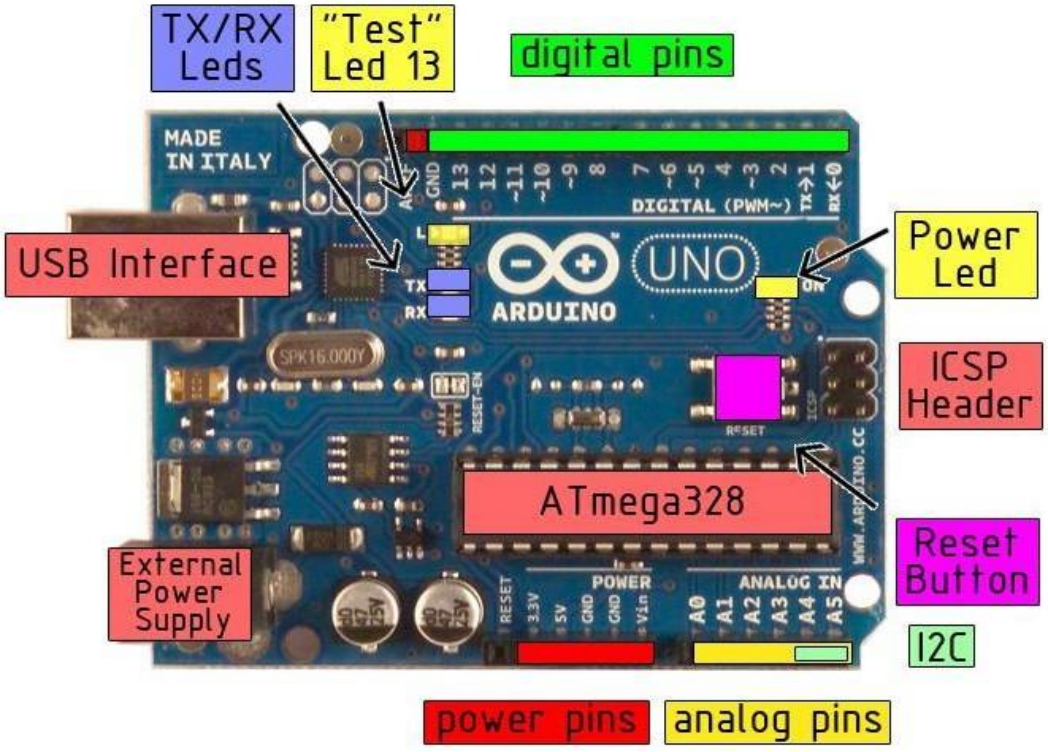


Fig 4.5.2 : ARDUINO BOARD

4.5.3 Power Supply

The Arduino Uno 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 centre-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 of 6 to 20 volts. If supplied with less than 7V, however, the 5Vpin may supply less than five volts and the board may be unstable. If using more than 12V, the voltageRegulator 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 Arduino board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.
- **5V**. The regulated power supply used to power the microcontroller and other components on the board. This can come either from VIN via an on-board regulator, or be supplied by USB or another regulated 5V supply.
- **3V3.**A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.
- **GND**. Ground pins.

4.5.4 Memory

The Atmega328 has 32 KB of flash memory for storing code (of which 0,5 KB is used for the boot loader); It has also 2 KB of SRAM and 1 KB of EEPROM (which can be read and written with the EEPROM library).

INPUT AND OUTPUT

Each of the 14 digital pins on the Uno can be used as an input or output, using pin Mode (), digital Write (), and digital Read () functions. They operate at 5 volts. Each pin can provide or receive a maximum of 40mA and has an internal pull-up resistor (disconnected by default) of 20-50K ohms'. 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.
- **PWM:** 3, 5, 6, 9, 10, and 11. Provide 8-bit PWM output with the analog Write() function.
- **SPI:** 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). These pins support SPI communication, which, although provided by the underlying hardware, is not currently included in the Arduino language.
- **LED: 13.**There is a built-in LED connected to digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off.The Uno has 6 analog inputs, each of which provide10 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 analog Reference() function. Additionally, some pins have specialized functionality:
- **I2C:** 4 (SDA) and 5 (SCL). Support I2C (TWI) communication using the Wire library.
  There are a couple of other pins on the board:
- **AREF**. Reference voltage for the analog inputs. Used with analog Reference ().

· 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.

COMMUNICATIONS

The Arduino Uno has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega328 provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An ATmega8U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The '8U2 firmware uses the standard USBCOM drivers, and no external driver is needed. However, on Windows, an *.inf file is required..

The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino 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 for serial communication on any of the Uno's digital pins. The ATmega328 also support I2C (TWI) and SPI communication.

PROGRAMMING

The Arduino Uno can be programmed with the Arduino software (download). Select "Arduino Uno w/ATmega328" from the Tools > Board menu (according to the microcontroller on your board).

The ATmega328 on the Arduino Uno provides pre burned 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).
You can also bypass the boot loader and program the microcontroller through the ICSP (In-Circuit Serial Programming) header.

The ATmega8U2 firmware source code is available. The ATmega8U2 is loaded with a DFU boot loader, which can be activated by connecting the solder jumper on the back of the board (near the map of Italy) and then resetting the 8U2. You can then use Atmel's FLIP software (Windows) or the DFU programmer (Mac OS X and Linux) to load a new firmware. Or you can use the ISP header with an external programmer (overwriting the DFU boot loader).

4.5.5 16*2 character LCD display

The LCD (**Liquid Crystal Display**) is a type of display that uses the liquid crystals for itsoperation. Here, we will accept the serial input from thecomputer and upload the sketch to theArduino. The characters will bedisplayed on the LCD.The library is based on a compatible chipset called **Hitachi HD44780**. It isfound on most of the LCDs that are based on text. It works with either an8-bit mode or 4-bit mode. Here, the bit mode signifies the data lines inaddition to the enable, RS , and R/W control lines (optional).

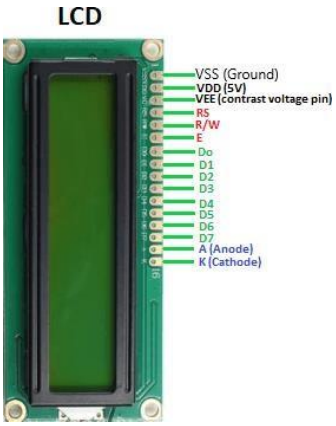


Fig 4.5.5 : 16*2 LCD display

4.5.6 MQ2 Gas Sensor

Fig 4.6.6 : MQ2 Gas Sensor

MQ2 is a semiconductor type gas sensor which detects the gas leakage. The sensitive material of MQ-2 is tin dioxide (SnO2). It has very low conductivity in clean air. MQ-2 gas sensor has high sensitivity to LPG, concentration level of it is from 400 – 1000ppm and it also detects the following flammable gases:

1. Propane
2. Hydrogen
3. Methane
4. Butane.

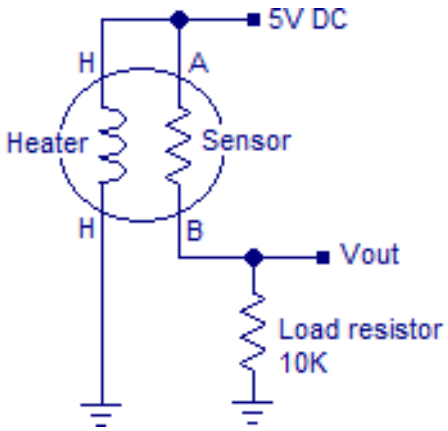
Different concentration level for different gases :

400-1000ppm – LPG and Propane
300-5000ppm - Butane
5000-2000ppm- Methane
300-5000ppm-H2
100-2000ppm -Alcohol

Featuresof MQ2 Gas Sensor :

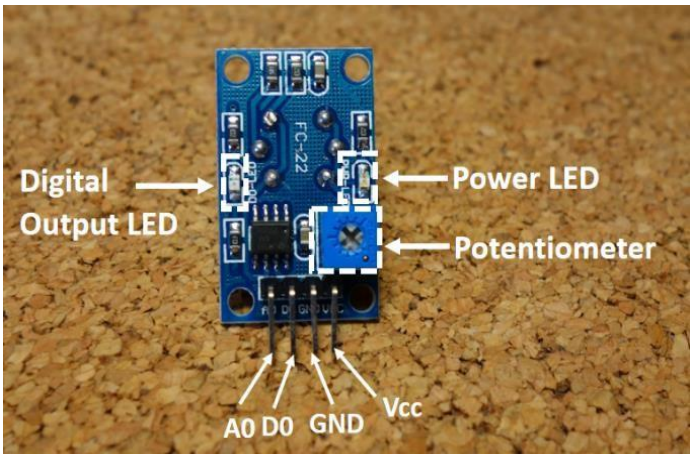
1. Wide detecting scope
2. High sensitivity to combustible gas in wide range
3. Fast response
4. Stable and long life
5. Simple drive circuit
6. Low cost and compact size.

The gas sensor senses the analog value according to the concentration of the gas level in the environment. The concentration range of MQ2 gas sensor is 400-1000ppm for LPG and use value of Load resistance (RL) about 20 KO (10KO to47KO). When accurately measuring, the proper alarm point for the gas detector should be determined after considering the temperature and humidity influence. The voltage that the sensor outputs changes accordingly to the smoke/gas level that exists in the atmosphere. The sensor outputs a voltage that is proportional to the concentration of smoke/gas. The resistance of the sensor is different depending on the type of the gas.



MQ2 sensor senses the flammable gases by the increase in temperature when they are oxidized by the heating element. Consider the figure given above. If there is any flammable gas present in the sample, the oxidization of the same gas results in increased temperature and the resistance of the sensor resistor will drop. That means more current will flow through the load resistor and so the voltage across it will shoot up.

MQ2 Gas Sensor Pin Description:

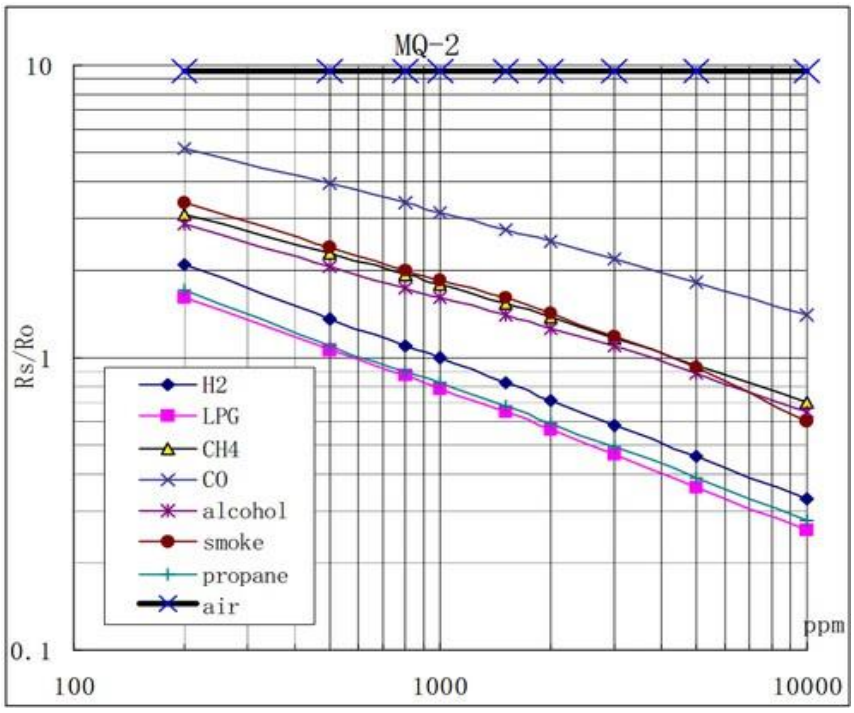


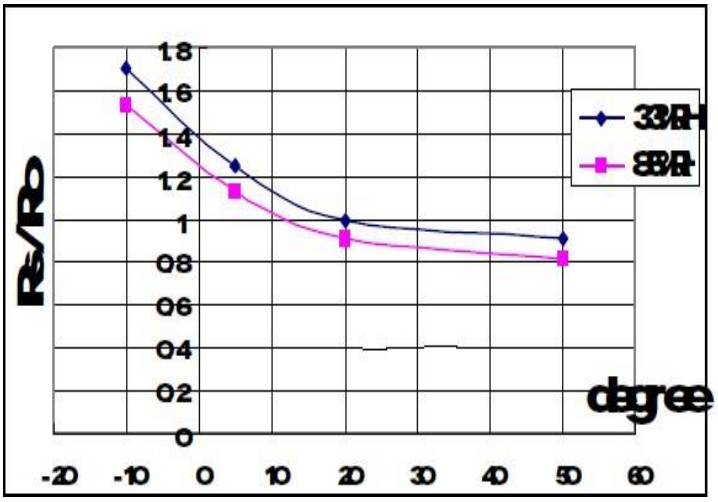
1. DO (digital pin)
2. AO (analog pin)
3. VCC (5V)
4. GROUND

Standard Working Condition:

Symbol	Parameter Name	Technical Condition	Remarks
V_C	Circuit voltage	5V±0.1	AC or DC
V_H	Heating voltage	5V±0.1	AC or DC
R_L	Load resistance	adjustable	
R_H	Heater resistance	33Kohm±5%	Room temperature
P_H	Heating consumption	Less than 800mW	

Sensitive characteristics of MQ-2 Gas Sensor :





shows the typical dependence of the MQ-2 on temperature and humidity.
Ro: sensor resistance at 1000ppm of H_2 in air at 33%RH and 20 degree.
Rs: sensor resistance at 1000ppm of H_2 at different temperatures and humidities.

SENSITIVITY ADJUSTMENT:

Resistance value of MQ-2 is difference to various kinds and various concentration gases. So, when using these components, sensitivity adjustment is very necessary. Recommended that you calibrate the detects for 1000ppm liquefied petroleum gas<LPG>, or 1000ppm iso-butane concentration in air and use value of load resistance that about 20Kilo ohms.

When accurately measuring the proper alarm point for the gas detector should be determined after considering the temperature and humidity influence.

Application of MQ2 Gas Sensor:

- Domestic gas leakage detector.
- Industrial combustible gas leakage detector.
- Portable gas leakage detector.

4.5.7 Buzzer-

Anarduino buzzer is also called a piezo buzzer. It is basically a tiny speaker that you can connect directly to an Arduino. You can make it sound a tone at a frequency you set. The buzzer produces sound based on reverse of the piezoelectric effect. Piezo electricity is an effect where certain crystals will change shape when you apply electricity to them. By applying an electric signal at

the right frequency, the crystal can make sound. The buzzer produces the same noisy sound irrespective of the voltage variation applied to it. It consists of piezo crystals between two conductors. When a potential is applied a cross these crystals, they push on one conductor and pull on the other. This, push and pull action, results in a sound wave. Most buzzers produce sound in the range of 2 to 4 kHz.

Fig 4.5.7 : Buzzer-

4.5.8 ESP8266 WIFI Camera

ArduCAM now released a world smallest low cost ESP8266 WIFI IOT camera kit based on ArduCAM-Mini-2MP-V2 and ArduCAM-ESP8266-Nano module. User can implement a 2MP WIFI camera using HTTP or Websocketprotocol on ESP8266, and the camera can be acted as an AP and mobile phone/PC can connect to the camera directly or acted as a Station which connected to the home router. The kit can capture 2MP full resolution JPEG still image, even stream low resolution at fairly frame rate video over network or directly save to local SD/TF card. The kit is suitable for portable application, it can be powered from micro-USB or using battery and has build in lithium battery charging circuits. The kit can also be used separately, it is almost identical to standard alone ArduCAM-Mini-2MP camera and ESP8266-12F module.

Fig 4.5.8 : ESP8266 WIFI Camera

Features :

- 2MP image sensor OV2640, support JPEG
- Standard FOV 60°stock lens
- I2C interface for the sensor configuration
- SPI interface for camera commands and data stream
- Onboard ES8266-12F module
- Build in Lithium battery recharging 3.7V/500mA max
- Build in SD/TF card socket
- Build in micro USB-Serial convertor
- Compatible with Arduino IDE
- Small form of factor

Specification :

- Maximum resolution: 2MP
- Field of view: 60°
- Compression: JPEG/MJPEG
- Interface: SPI and I2C
- WIFI mode: *802.11* b/g/n software AP or Station mode
- Power consumption: 180mA @ 3.7V full running
- Mechanical size: 34mm(L) x 24mm(W) x 23(D)

4.5.9 Battery

In this model 9 volt battery is used. 9V Batteries: 9V Batteries are used for provide power supply to Arduino, NodeMcu and L298N motor driven shield.

Fig 4.5.9 : 9V Battery

4.5.10 7805 voltage regulator IC

7805 Voltage Regulator, a member of the 78xx series of fixed linear voltage regulators used to maintain such fluctuations, is a popular voltage regulator integrated circuit (IC). The xx in 78xx indicates the output voltage it provides.

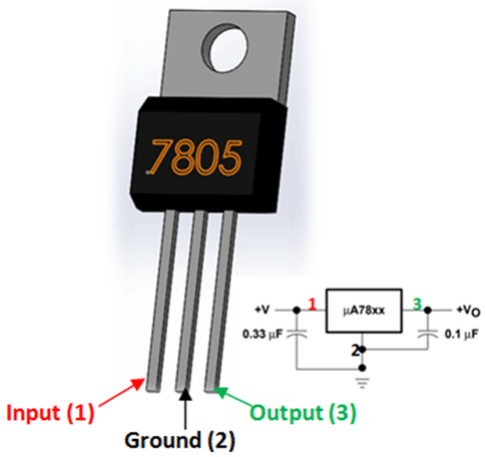


Fig 4.5.10 7805 voltage regulator IC

4.5.11 1N4001-T switching diode

The 1N4001-T is a Rectifier Diode with moulded plastic case. The rectifier diode has high current capability and low forward voltage drop.

Fig 4.5.11 : 1N4001-T switching diode

4.5.12 DC gear Motor

Geared DC motors can be defined as an extension of DC motor which already had its Insight details demystified here. A geared DC Motor has a gear assembly attached to the motor. The speed of motor is counted in terms of rotations of the shaft per minute and is termed as RPM .The gear assembly helps in increasing the torque and reducing the speed. Using the correct combination of gears in a gear motor, its speed can be reduced to any desirable figure. This concept where gears reduce the speed of the vehicle but increase its torque is known as gear reduction. This Insight will explore all the minor and major details that make the gear head and hence the working of geared DC motor.

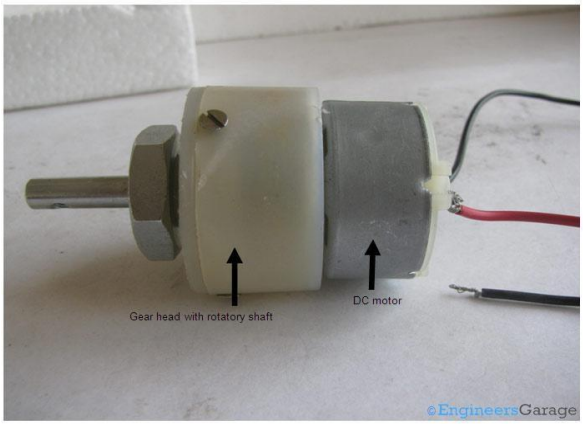


Fig : 4.5.12 DC gear Motor

4.5.13 L293D

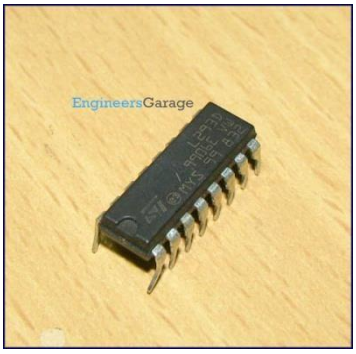


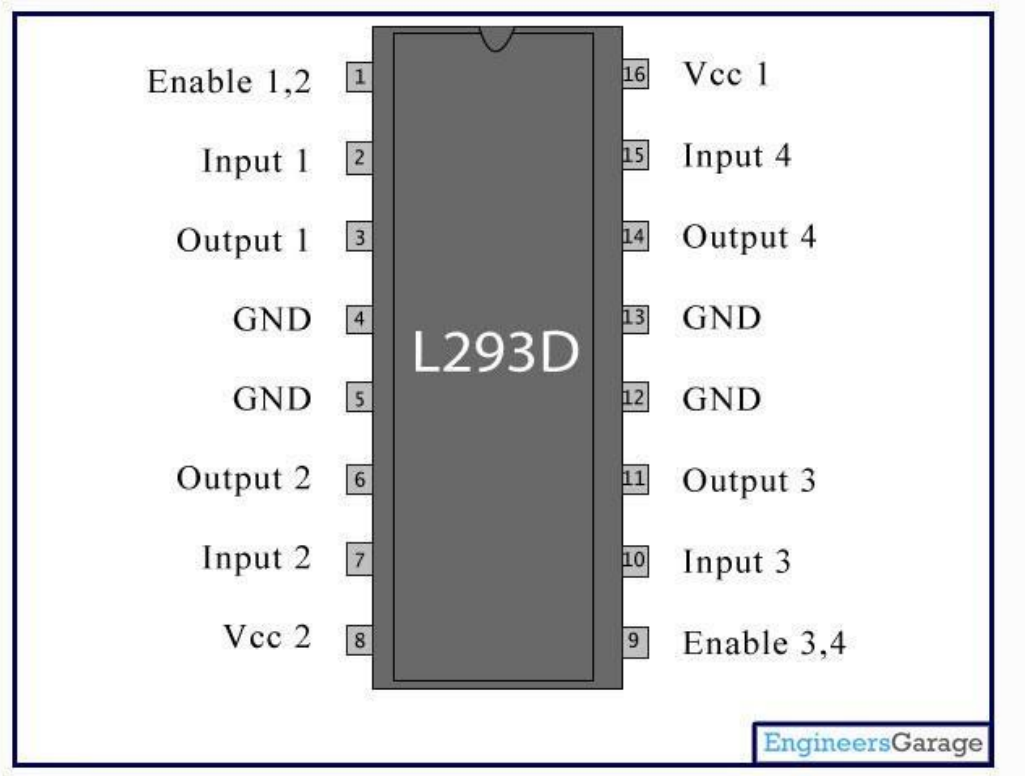
Fig 4.5.13 : L293D

L293D is a dual H-bridge motor driver integrated circuit (IC). Motor drivers act as current amplifiers since they take a low-current control signal and provide a higher-current signal. This higher current signal is used to drive the motors.

L293D contains two inbuilt H-bridge driver circuits. In its common mode of operation, two DC motors can be driven simultaneously, both in forward and reverse direction. The motor operations of two motors can be controlled by input logic at pins 2 & 7 and 10 & 15. Input logic 00 or 11 will stop the corresponding motor. Logic 01 and 10 will rotate it in clockwise and anticlockwise directions, respectively.

Enable pins 1 and 9 (corresponding to the two motors) must be high for motors to start operating. When an enable input is high, the associated driver gets enabled. As a result, the outputs become active and work in phase with their inputs. Similarly, when the enable input is low, that driver is disabled, and their outputs are off and in the high-impedance state.

Pin Diagram:



Pin Description:

Pin No	Function	Name
1	Enable pin for Motor 1; active high	Enable 1,2
2	Input 1 for Motor 1	Input 1
3	Output 1 for Motor 1	Output 1
4	Ground (0V)	Ground
5	Ground (0V)	Ground
6	Output 2 for Motor 1	Output 2
7	Input 2 for Motor 1	Input 2
8	Supply voltage for Motors; 9-12V (up to 36V)	Vcc_2
9	Enable pin for Motor 2; active high	Enable 3,4
10	Input 1 for Motor 1	Input 3
11	Output 1 for Motor 1	Output 3
12	Ground (0V)	Ground
13	Ground (0V)	Ground
14	Output 2 for Motor 1	Output 4
15	Input2 for Motor 1	Input 4
16	Supply voltage; 5V (up to 36V)	Vcc_1

4.6 Software Description :

Software tools that are used in the project

1) Arduino IDE (v1.0.6)

4.6.1 Arduino IDE (v1.0.6):

Fig 4.6.1 : Arduino IDE Lookout

The Arduino integrated development environment (IDE) is a cross-platform application written in Java, and derives from the IDE for the Processing programming language and the Wiring projects. It is designed to introduce programming to artists and other newcomers unfamiliar with software development. It includes a code editor with features such as syntax highlighting, brace matching, and automatic indentation, and is also capable of compiling and uploading programs to the board with a single click. A program or code written for Arduino is called a "sketch".

Arduino programs are written in C or C++. The Arduino IDE comes with a software library called "Wiring" from the original Wiring project, which makes many common input/output operations much easier. The users need only to define two functions to make an executable cyclic executive program:

- setup(): a function run once at the start of a program that can initialize settings
- loop(): a function called repeatedly until the board powers off

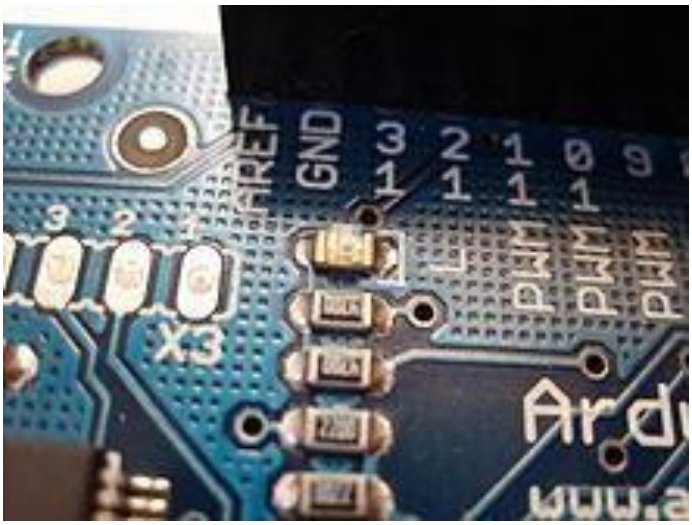
A typical first program for a microcontroller simply blinks an LED on and off. In the Arduino environment, the user might write a program like this.

A typical first program for a microcontroller simply blinks an LED on and off. In the Arduino environment, the user might write a program like this:

```
#define LED_PIN 13

void setup() {
pinMode(LED_PIN, OUTPUT);       // Enable pin 13 for digital output
}

void loop() {
digitalWrite(LED_PIN, HIGH);    // Turn on the LED
delay(1000);                    // Wait one second (1000 milliseconds)
digitalWrite(LED_PIN, LOW);     // Turn off the LED
delay(1000);                    // Wait one second
}
```



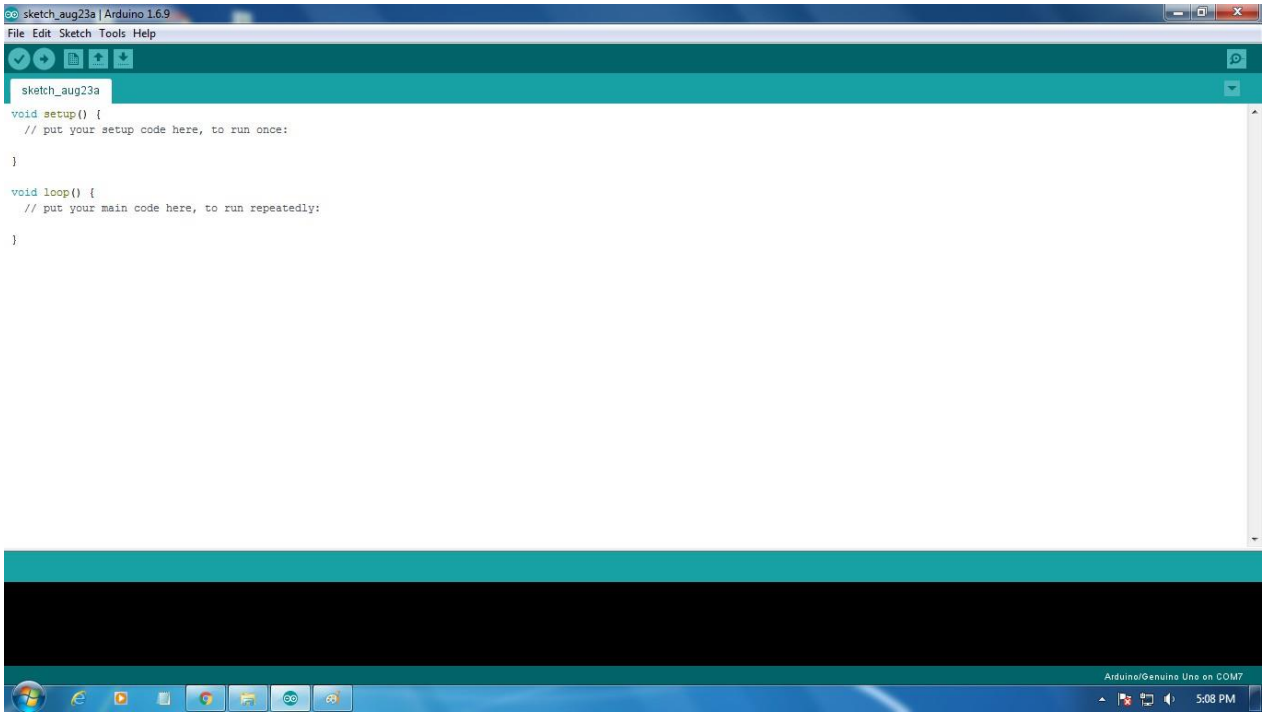
It is a feature of most Arduino boards that they have an LED and load resistor connected between pin 13 and ground; a convenient feature for many simple tests. The previous code would not be seen by a standard C++ compiler as a valid program, so when the user clicks the "Upload

to I/O board" button in the IDE, a copy of the code is written to a temporary file with an extra include header at the top and a very simple main() function at the bottom, to make it a valid C++ program.

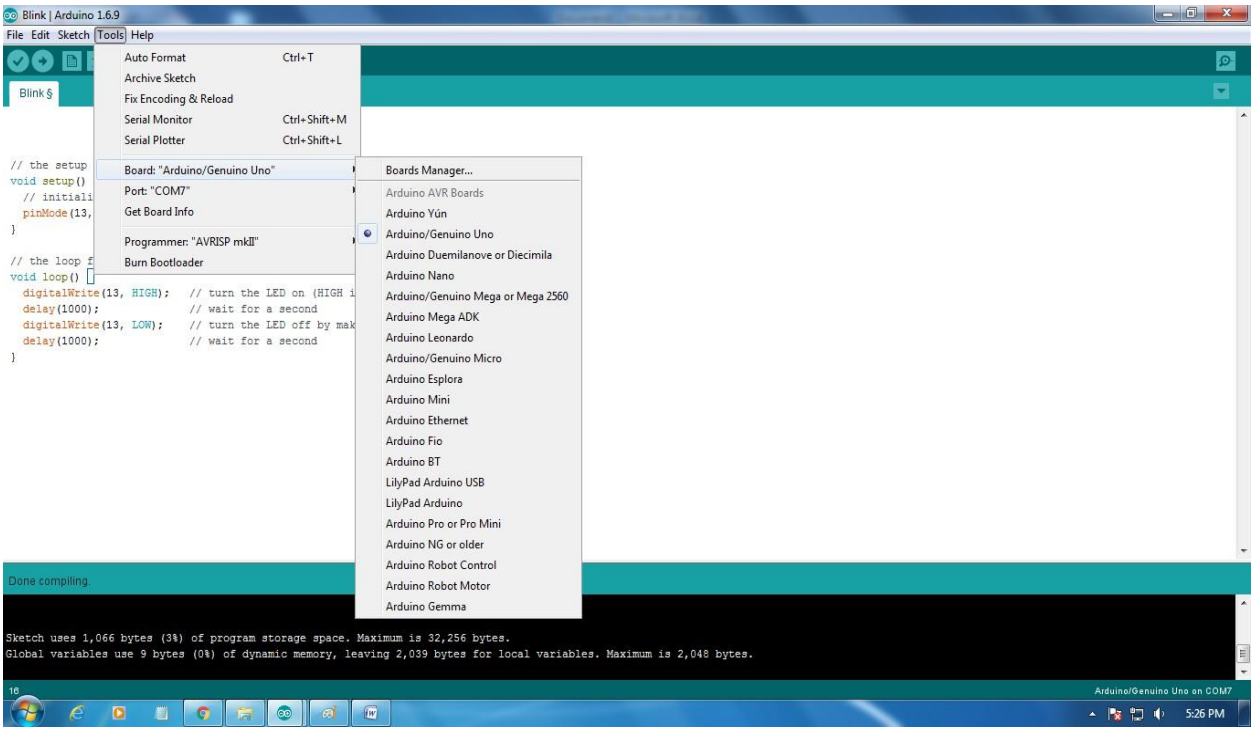
The Arduino IDE uses the GNU tool chain and AVR Libc to compile programs, and uses avrdude to upload programs to the board.

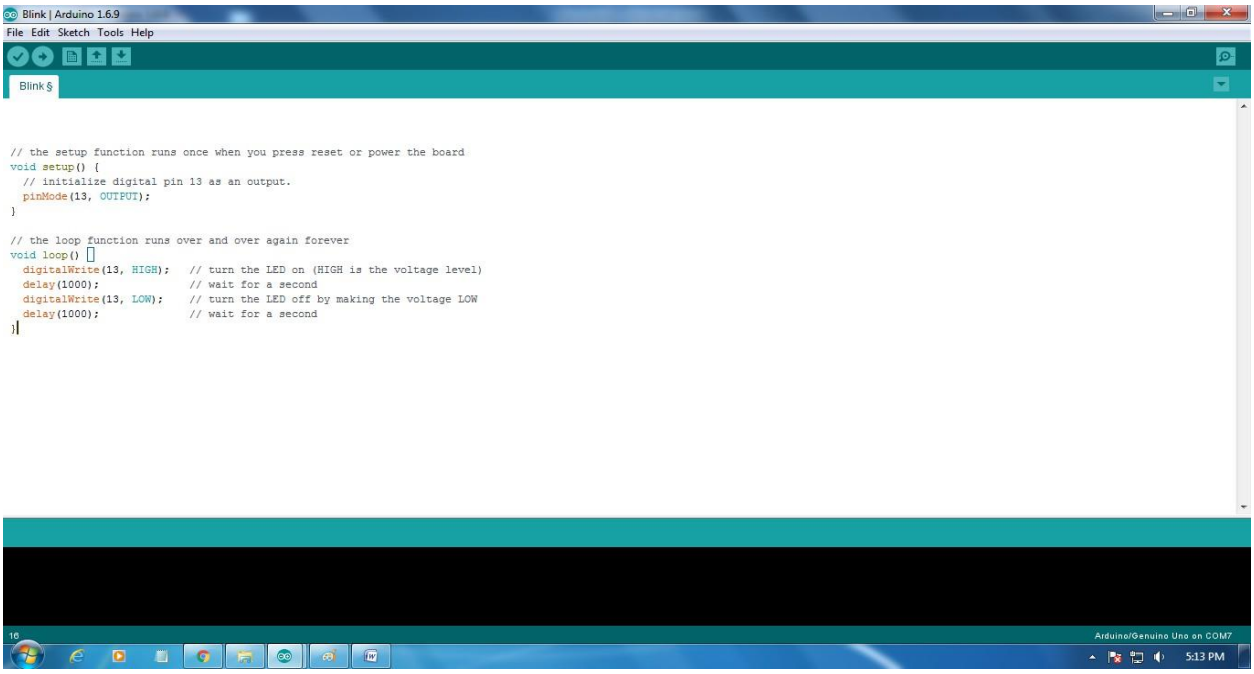
As the Arduino platform uses Atmel microcontrollers, Atmel's development environment, AVR Studio or the newer Atmel Studio, may also be used to develop software for the Arduino.

PROCEDURE FOR THE ARDUINO SOFTWARE:



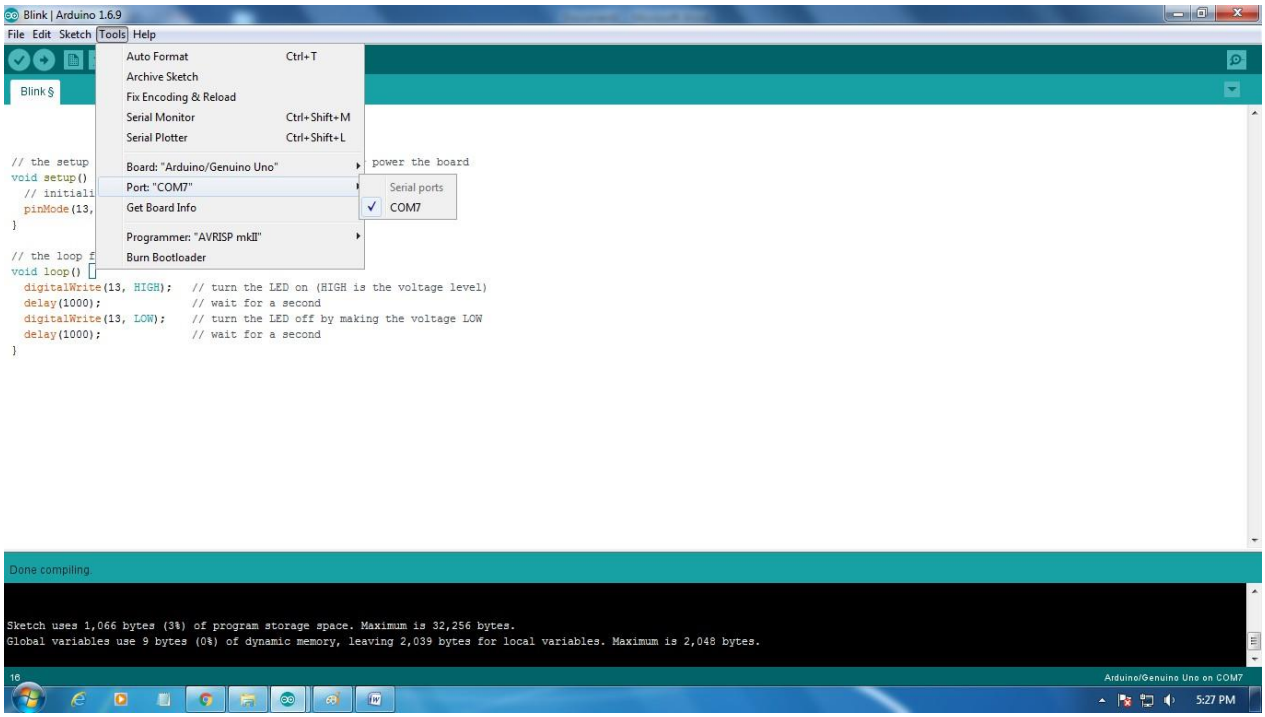
Open the arduino software. Select new file.



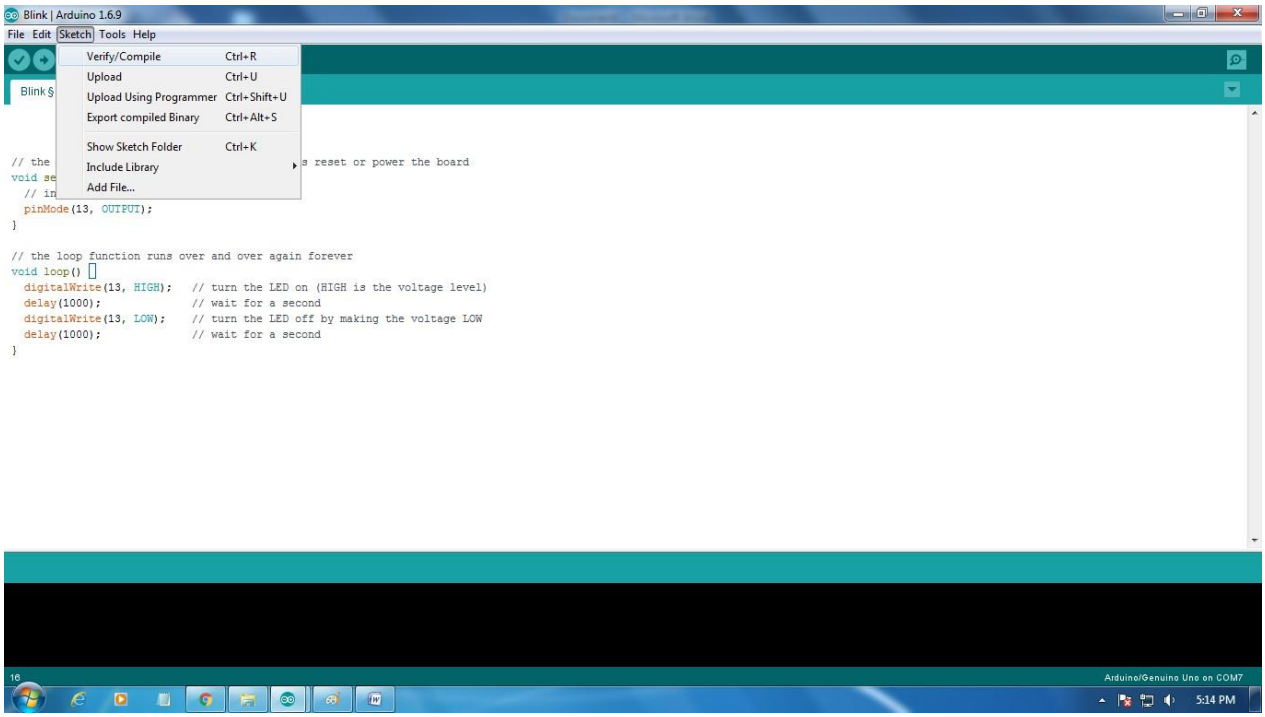


Write the program code.

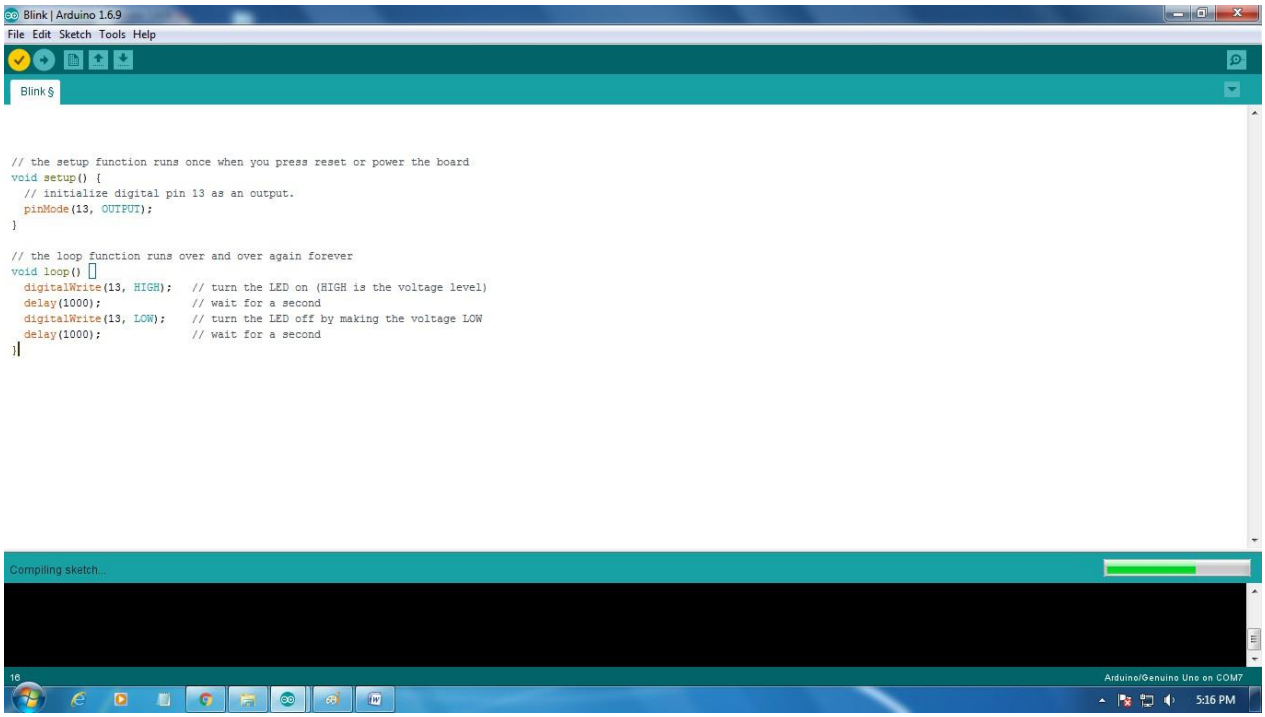
Select the appropriate arduino boards. by browsing TOOLS -boards.



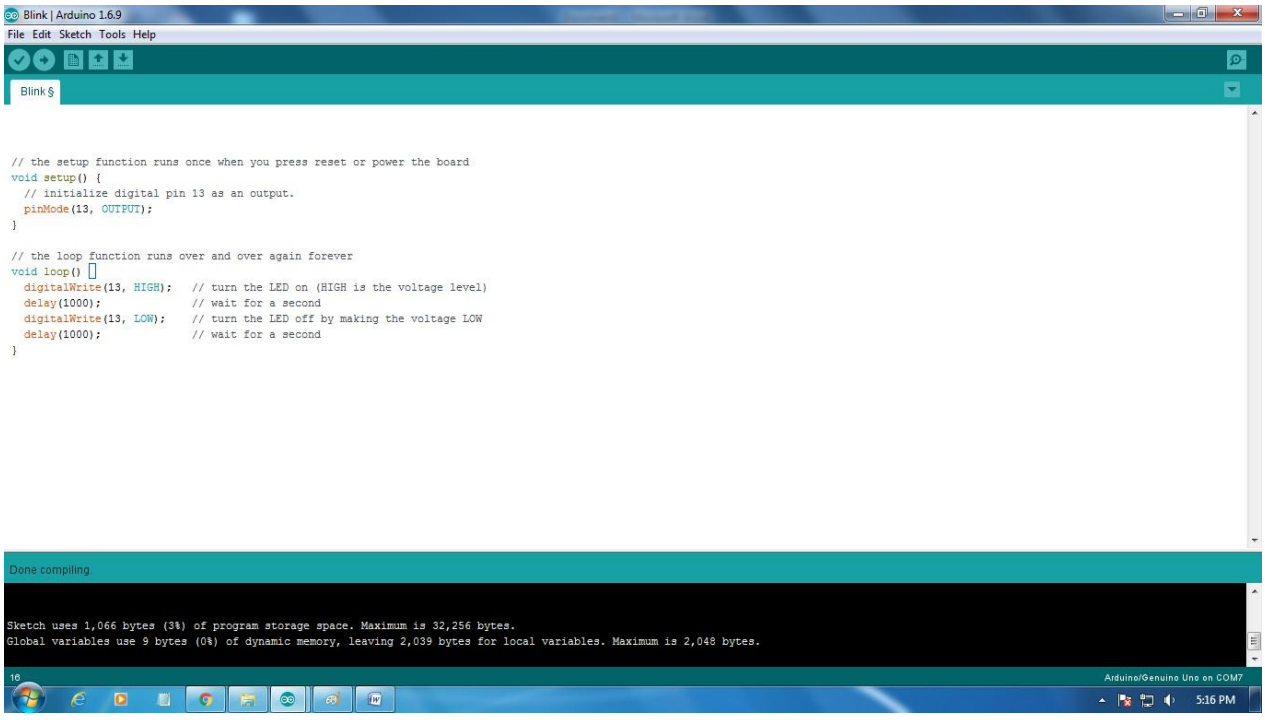
Select the appropriate COM port by browsing Tools - Serial port -COM port.



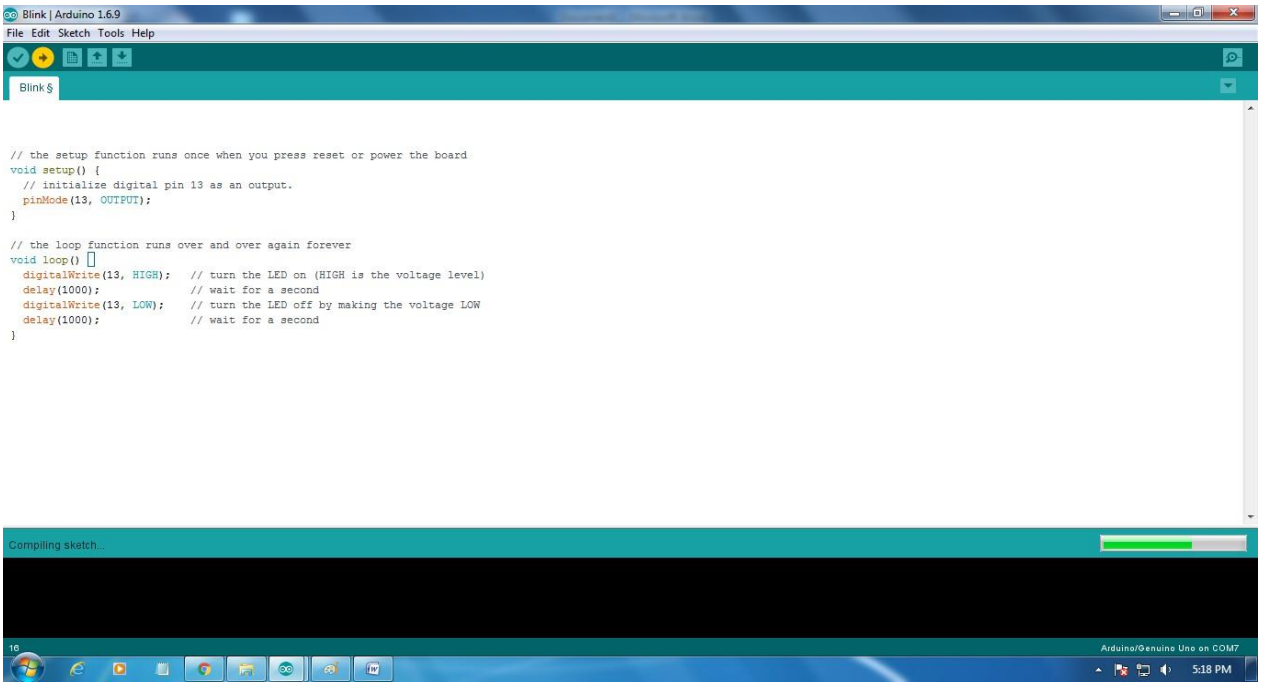
Verify or compile the program code. From sketch verify/compile or “CTRL+R” short cut command.



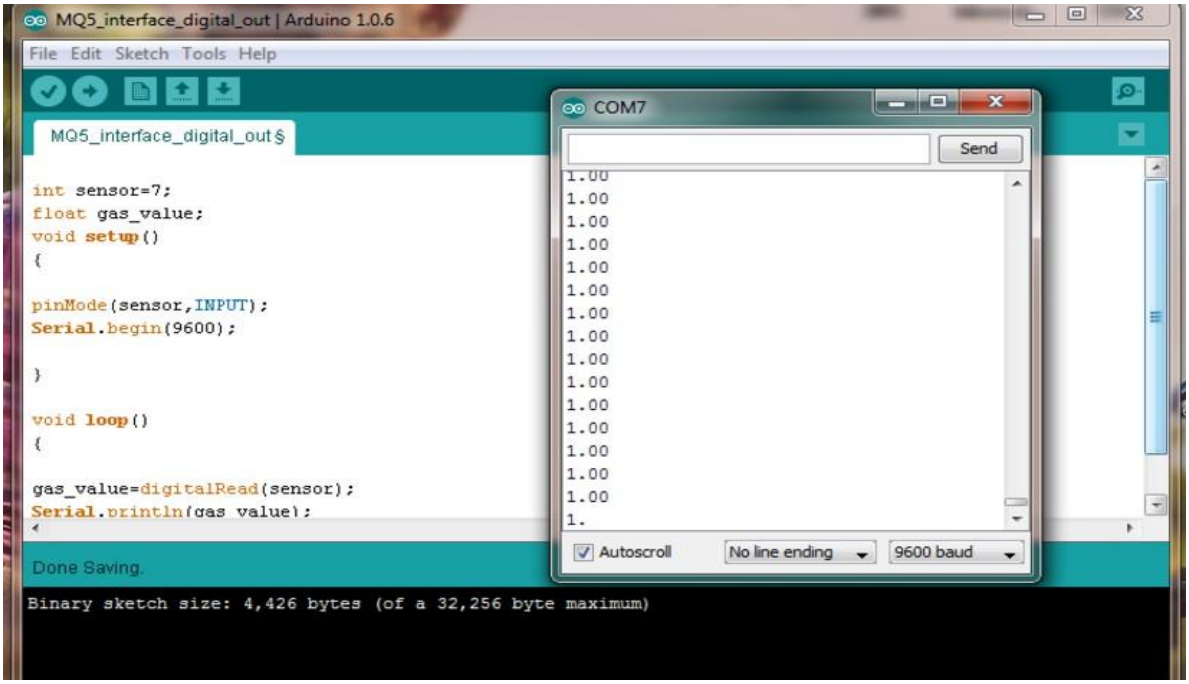
Compiling process.



It displays any syntax errors after done compiling. If so check the code once again and correct it.



Now for dumping into the processor, connect the Arduino kit using USB cable and go for upload. From sketch, upload. Or "CTRL+U".Wait for complete uploading process until it display done uploading.



Can view the results in the serial monitor by browsing from TOOLS-Serial Monitor – "CTRL+SHIFT+M".

CHAPTER 5

OUTCOMES OF THE PROJECT

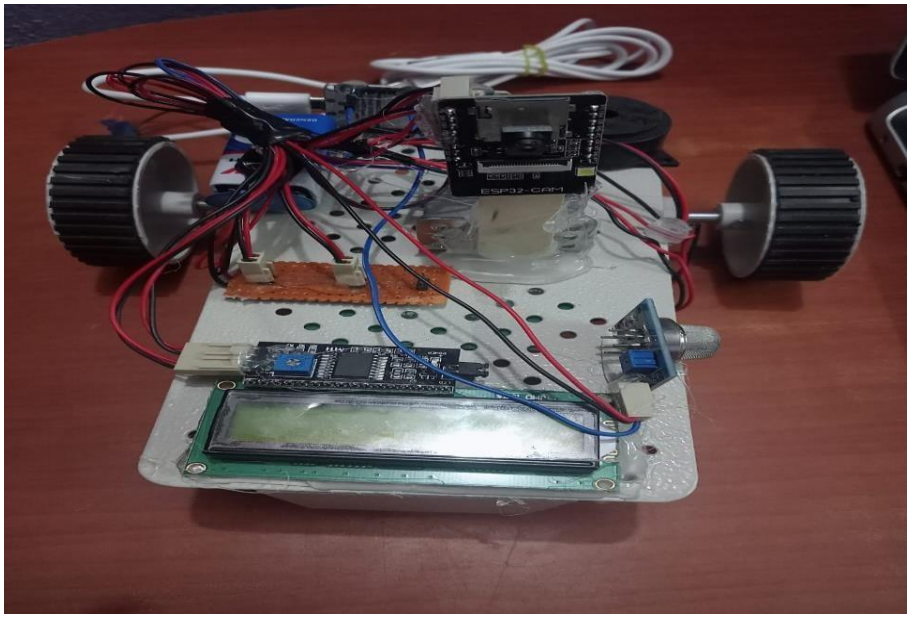


Fig : 5.1

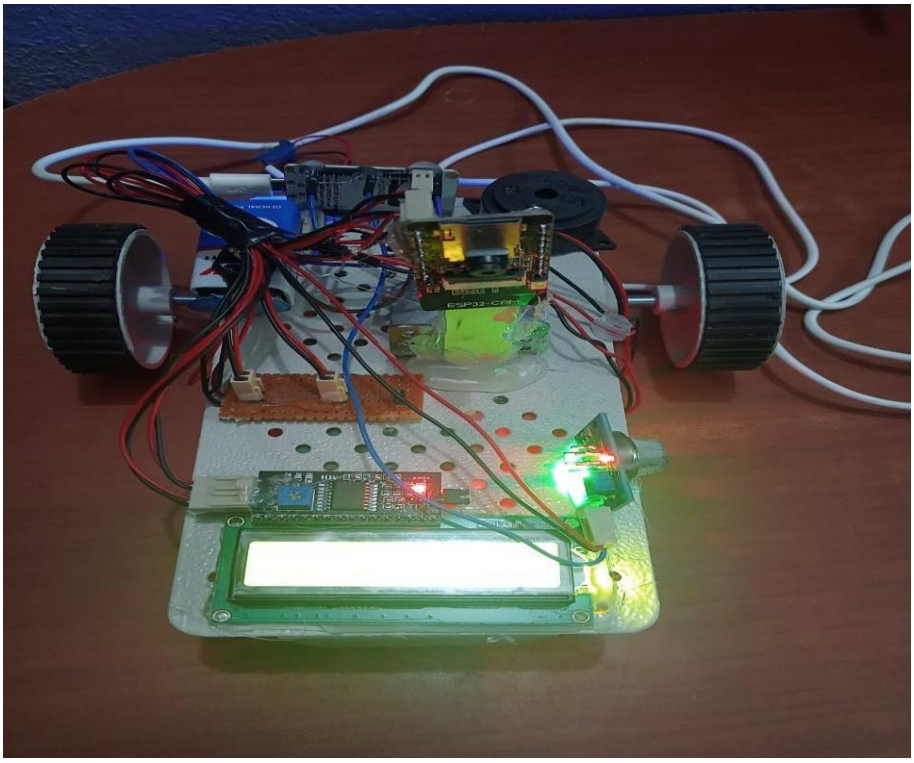


Fig : 5.2

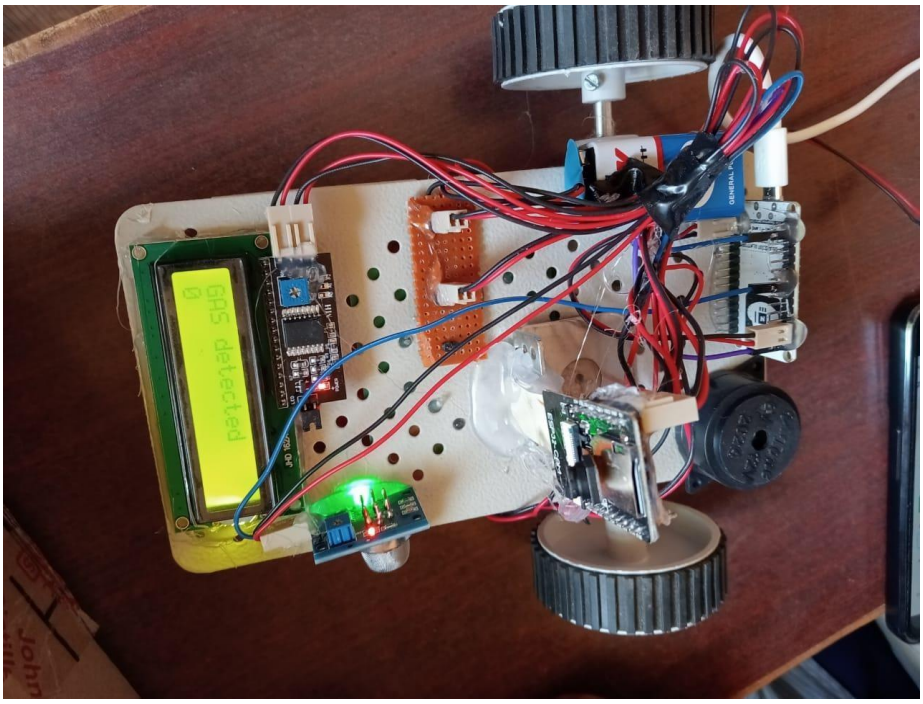

GAS detected

Fig : 5.3

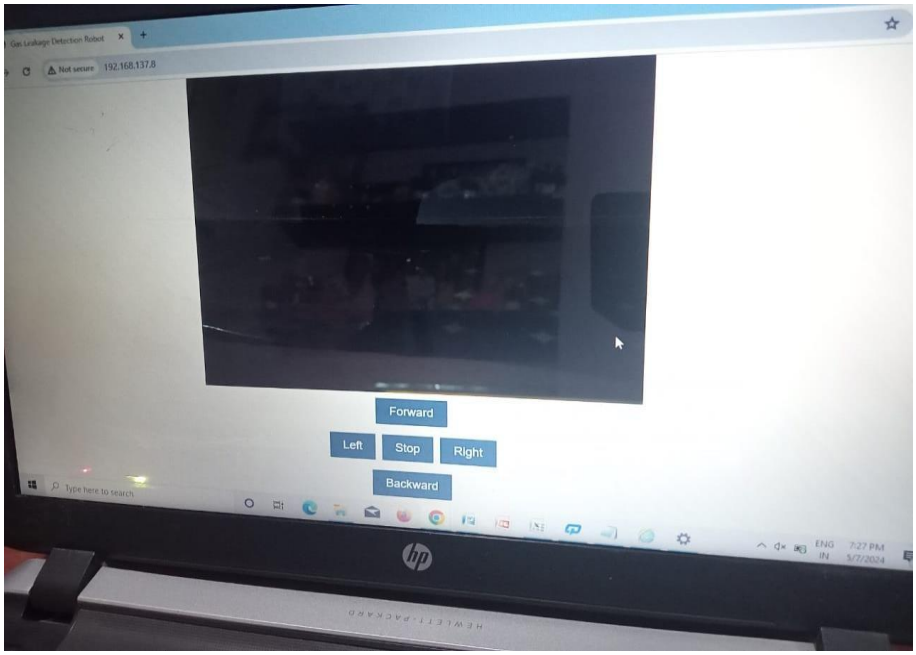

Not secure
192.168.137.8
Forward
Left
Stop
Right
Backward

Fig: 5.4

CHAPTER 6

ADVANTAGES AND DISADVANTAGES

6.1 ADVANTAGES

- **Early Detection**

  The robot can detect gas leaks early, even in hard-to-reach or hazardous environments, helping to prevent potential accidents or damage.

- **Remote Monitoring**

  With IoT capabilities, the robot can send real-time data about gas levels to a centralized system. This allows for remote monitoring of gas pipe networks without the need for human intervention at the site.

- **Environmental Impact**

  Early detection and prevention of gas leaks can help reduce the environmental impact of such incidents by minimizing the release of harmful gases into the atmosphere.

- **Scalability**

  The IoT nature of the project allows for scalability, meaning you can deploy multiple robots to cover larger areas or networks without significantly increasing operational complexit.

6.2 DISADVANTAGES

- **Initial Investment and Cost**

  Developing and deploying the IoT gas pipe leakage detector insect robot project involves upfront costs for equipment, development, testing, and implementation. The initial investment may be prohibitive for some organizations or stakeholders, especially smaller entities or municipalities.

- **Maintenance Requirements**

  Like any mechanical system, the robot requires regular maintenance to ensure optimal performance.

- **False Alarms**

  Gas sensors may be susceptible to false alarms caused by environmental factors such as humidity, temperature fluctuations, or other gases present in the atmosphere. False alarms can lead to unnecessary interventions and reduce the credibility of the detection system.

- **Limited Sensing Range**

  The range of gas sensors used in the robot may be limited, affecting the coverage area and detection capabilities of the system. Multiple robots or additional infrastructure may be required to monitor large or expansive pipe networks effectively.

CHAPTER 7

APPLICATIONS

- **Oil & Gas Industry**

  In oil refineries, gas processing plants, and natural gas distribution networks, the robot can be deployed to detect leaks in pipelines, storage tanks, and equipment, enhancing safety and minimizing environmental risks.

- **Utilities**

  Gas distribution companies can use the robot to monitor and maintain their infrastructure, including underground pipelines and distribution networks, ensuring the reliable supply of natural gas to residential, commercial, and industrial customers.

- **Emergency Response**

  During emergency situations such as natural disasters, industrial accidents, or terrorist threats, the robot can assist emergency responders in assessing and mitigating gas-related hazards, improving overall disaster response capabilities.

- **Smart Cities**

  Municipalities and urban planners can utilize the robot to monitor gas pipelines, water distribution systems, and other critical infrastructure components, enhancing the resilience and sustainability of smart city initiatives.

CHAPTER 8

CONCLUSION

Project uses arduino controller at the gas sensor to sense the leakage of the gas, detects it and send the information to the users by SMS. GSM module is used as the communication purpose for sending the information to predefined number which can alert to prevent the accident. Gas sensor is used to detect the gas leakage. Exhaust fan is used to spread the compressed gas out into the air. Buzzer is used to buzzing the sound which can also alert the people nearby.

CHAPTER 9

FUTURE SCOPE

Wi-Fi module can be used for large scale areas like industries to monitor leak of gas in each room from the control room. This paper mainly aims to implement gas leakage detection technology with cloud. We can use temperature sensor, Multi Language Display, audio o/p to make it user friendly. However, this application can also be developed in future by integrating more number ofequipments to measure various parameters, for instance, a humidity sensor or an optical sensor to determine the humidity.

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