AN INTELLIGENT ROVER

(MIC'S ROVER)

A Minor Project Report

Submitted in partial fulfillment of the requirement

for the degree of

Bachelor of Technology

In

Electronics and communication Engineering

July-December 2021

Guided By
Prof. Rasmi pant

Submitted by
chinmay dubey
[0704ME191026]

Department of Electronics and communication

Mahakal Institute of Technology, Ujjain

Affiliated to Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal

PROJECT APPROVAL SHEET

The project entitled “An Intelligent rover” submitted by chinmay dubey as partial fulfillment for the award of **Bachelor of Technology in electronics and communication Engineering** by Rajiv Gandhi Prodyogiki Vishwavidyalaya, Bhopal.

Internal Examiner

Date:

External Examiner

Date:

RECOMMENDATION

The project entitled “Intelligent rover” submitted by chinmay dubey as partial is a satisfactory account of the bonafide work done under our guidance is recommended towards partial fulfillment for the award of the **Bachelor of Technology in Electronics and Communication Engineering** from Mahakal Institute of Technology, Ujjain by Rajiv Gandhi Prodyogiki Vishwavidyalaya, Bhopal.

Project Guide
Prof……
Date:

Project Coordinator
Prof. Rasmi pant
Date:

Endorsed By

Head
Department of Electronics and communication Engineering
Mahakal Institute of Technology, Ujjain

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Chinmay dubey

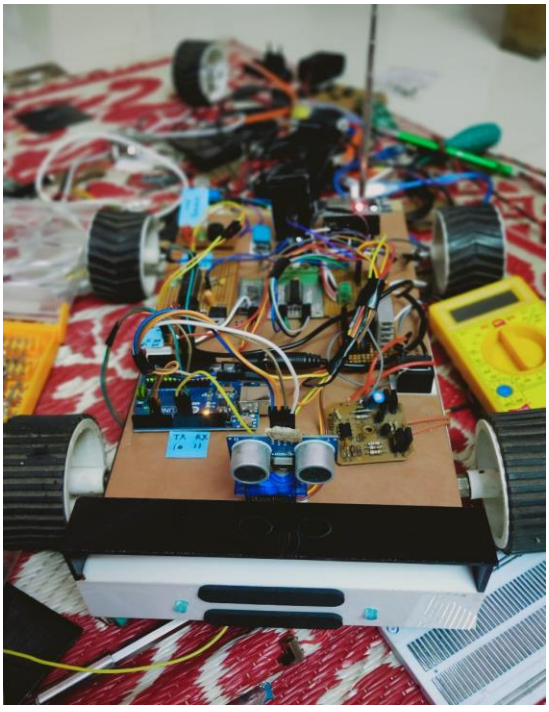
[0704ME191026]

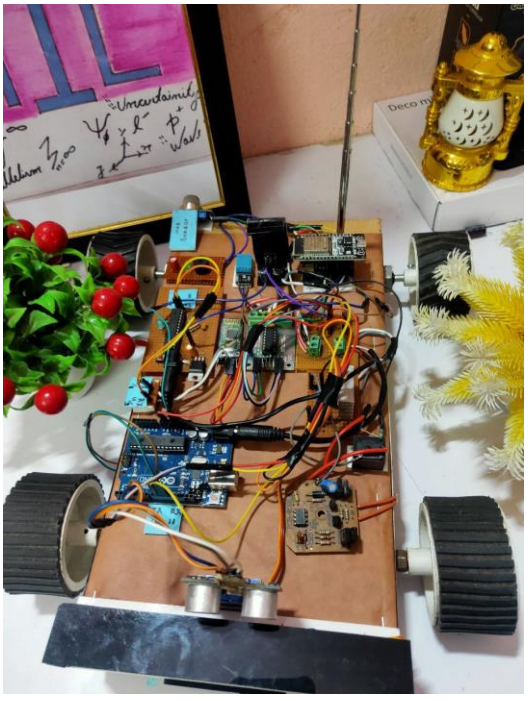
Place: Ujjain

Date:

Abstract

MIC'S rover is a prototype or a small size rover that is made by using Arduino Uno and esp-32 microcontroller board so the core reason of designing this rover is that we can inspect some kind of remote areas where human interference is very tough and close to impossible just by using our smartphone so that it is easy going for normal people who doesn't have technical knowledge, by just using Bluetooth of smartphone .it is a smart rover that can help us to monitor many critical places about where we don't have any information , or we can also use the above model for purposes .





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1. Introduction

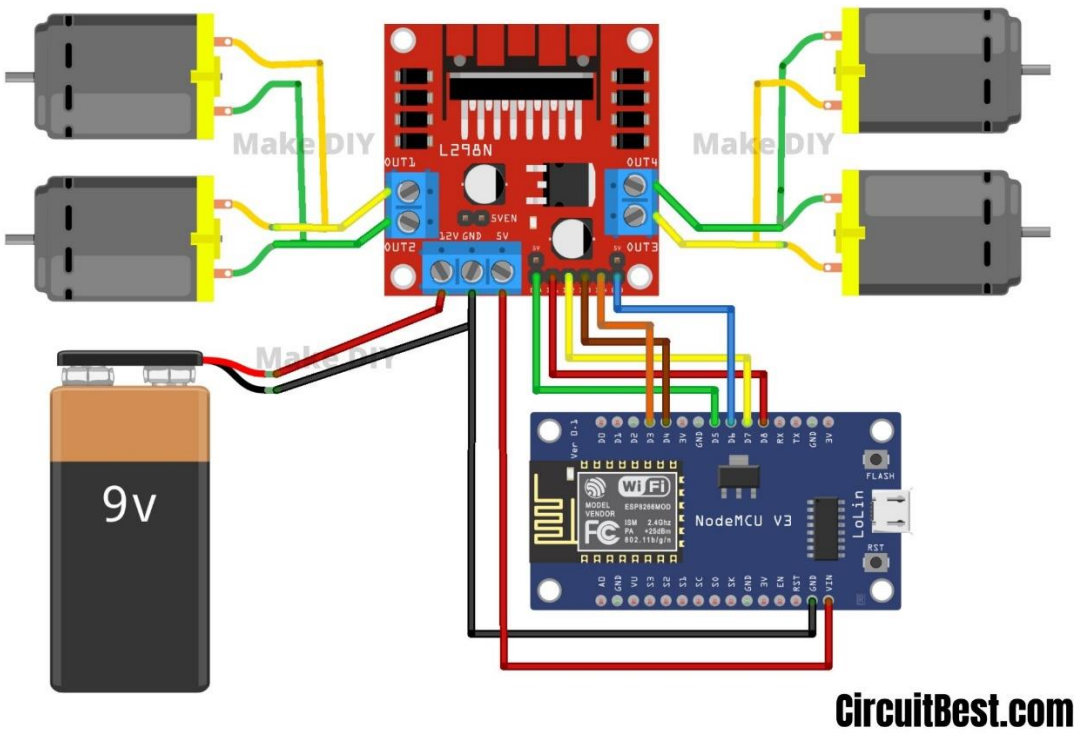
MIC'S rover is a prototype of an actual big scale rover that is used to detect some physical phenomena's like temperature , humidity ,gas, some foreign object like MIC'S rover consist of a radar system that I made using servo motor and ultrasonic sensor so it work's really well in small range so that we can detect some outside entries and the best thing about the radar is that it is connected with Bluetooth module so that with the help of an android app named as zeebolt we can get a 2d plot output of the above radar system ,the rover also consist of a temperature , humidity ,and gas sensor connected by dvdt switch by a Bluetooth module so that we can take output with the help of different android apps .and the rover also consist of infrared sensor module which makes it object obstackling so that it reduce the chances of damages , the rover can be operated by different android apps the controlling of the rover is done by esp 32 that is connected by motor driver IC , lights and horn .

The best thing about this rover is that it is powered with GSM module so at a large distance we can still use it with the help of IOT.

This rover has also a esp 32 based camera module so that we can use it for real time video monitoring. Or the best thing about the rover is that it almost consist many sensor two microcontroller units so that we can easily implement for eduacational purposes

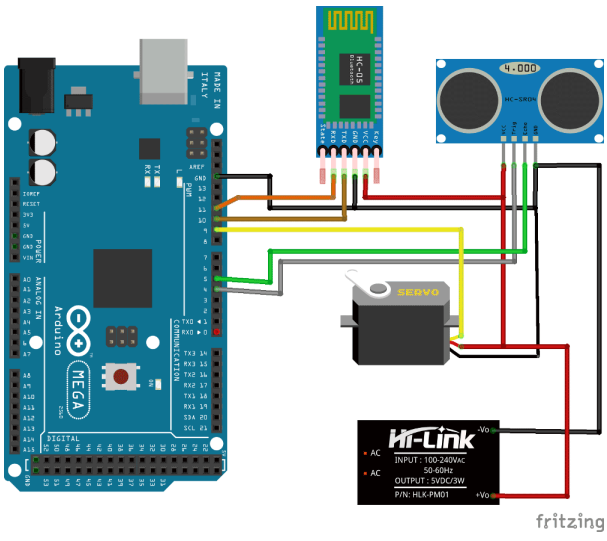
Rover control system

The rover is totally controlled by using esp32 and motor driver IC which is directly connected to 12 volts' battery source, as the esp. 32 board has inbuilt Bluetooth and Wi-Fi so I used its Bluetooth to make it wireless and it can directly be used by smartphone just using an android app called Bluetooth car control.



Radar using servo motor and ultrasonic sensor

In this project, we have designed Arduino RADAR Model using Ultrasonic Sensor for Detection & Ranging. RADAR is an object detection system that uses radio waves to identify the range, altitude, direction, and speed of the objects. The radar antenna transmits radio wave pulses that bounce off any object in its path. The object returns a portion of the wave received by the receiver which is in line of sight with the transmitter. This Arduino RADAR project aims to achieve a radar system prototype based on an Arduino board, capable of detecting stationary and moving objects. And the best thing is that it is programmed with Bluetooth module so that we can take output on smartphone.



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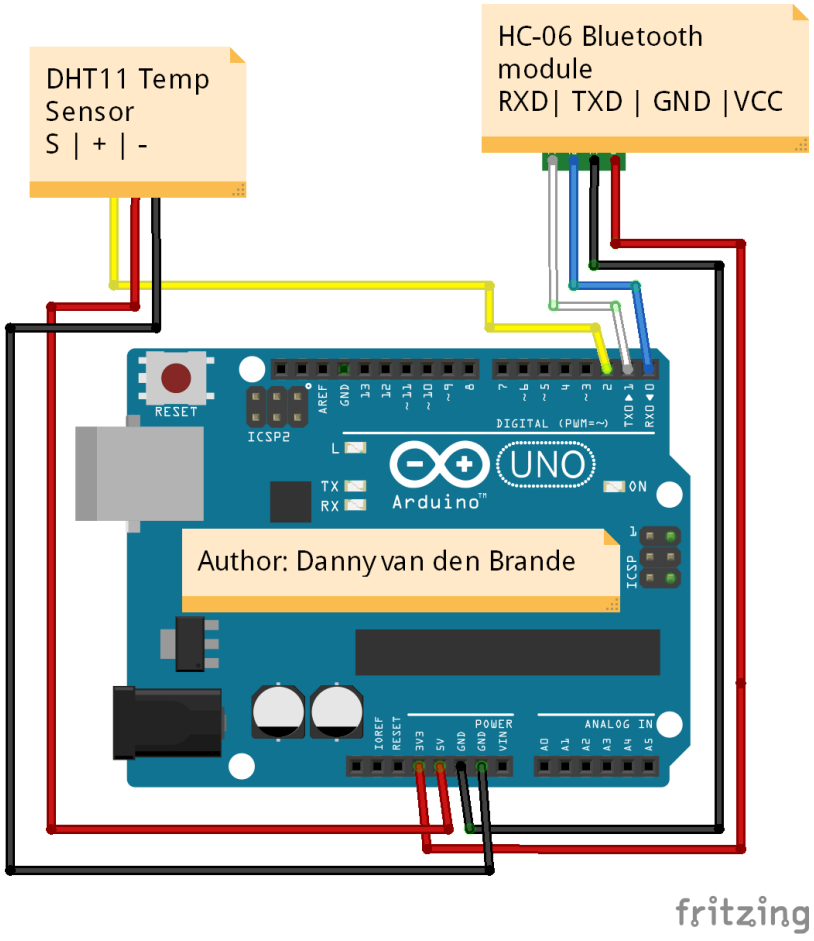
Temperature and humidity sensing unit

The DHT-22 (also named as AM2302) is a digital-output, relative humidity, and temperature sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and sends a digital signal on the data pin.

. The room temperature and humidity will be printed to the serial monitor that is our in our phone as I used Bluetooth module as a switch between both radar and temp. sensor.



Gas and fire sensing unit

MQ2 gas sensor is an electronic sensor used for sensing the concentration of gases in the air such as LPG, propane, methane, hydrogen, alcohol, smoke and carbon monoxide.

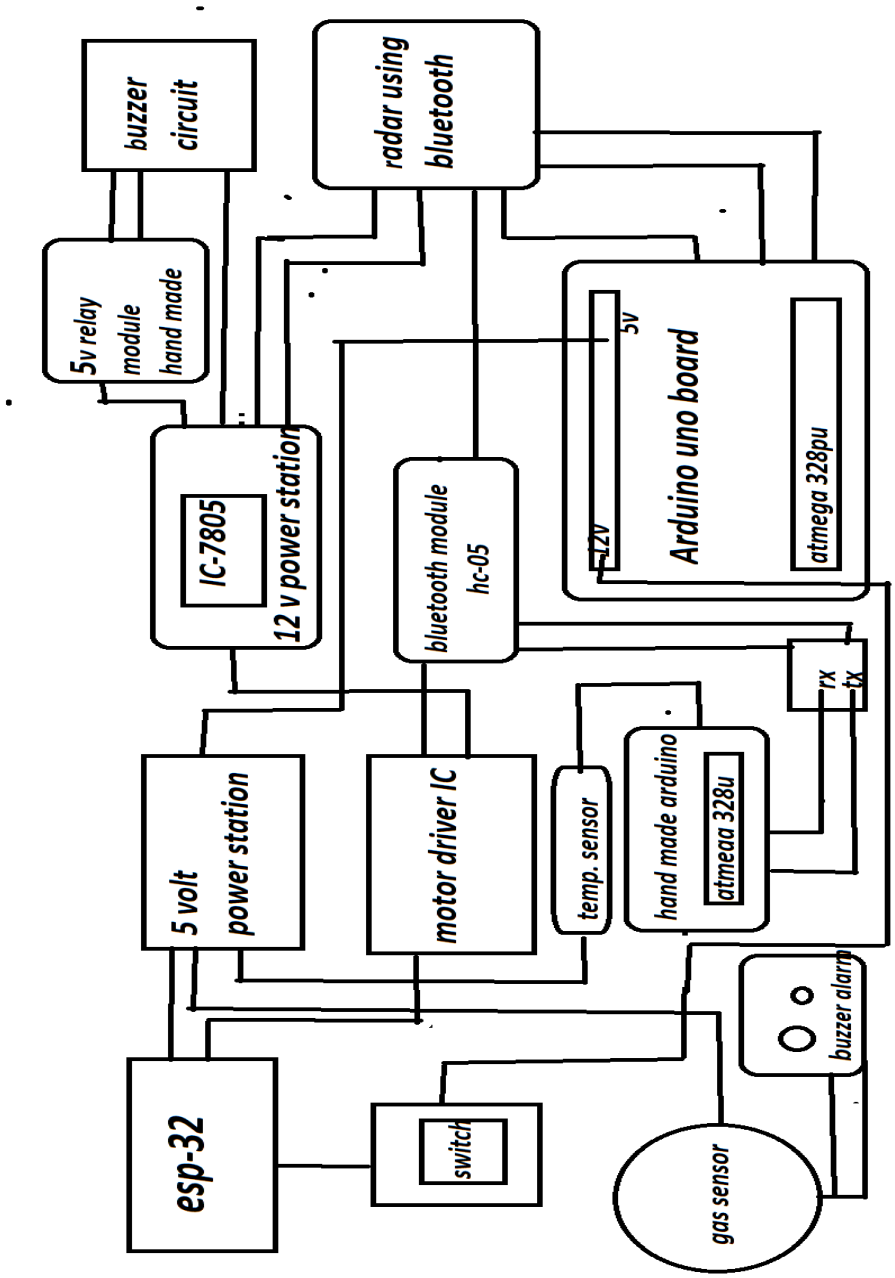
MQ2 gas sensor is also known as chemiresistor. It contains a sensing material whose resistance changes when it comes in contact with the gas. This change in the value of resistance is used for the detection of gas.

MQ2 Gas Sensor

MQ2 is a metal oxide semiconductor type gas sensor. Concentrations of gas in the gas is measured using a voltage divider network present in the sensor. This sensor works on 5V DC voltage. It can detect gases in the concentration of range 200 to 10000ppm.

Chapter - 2

Hardware model



Ultrasonic sensor and

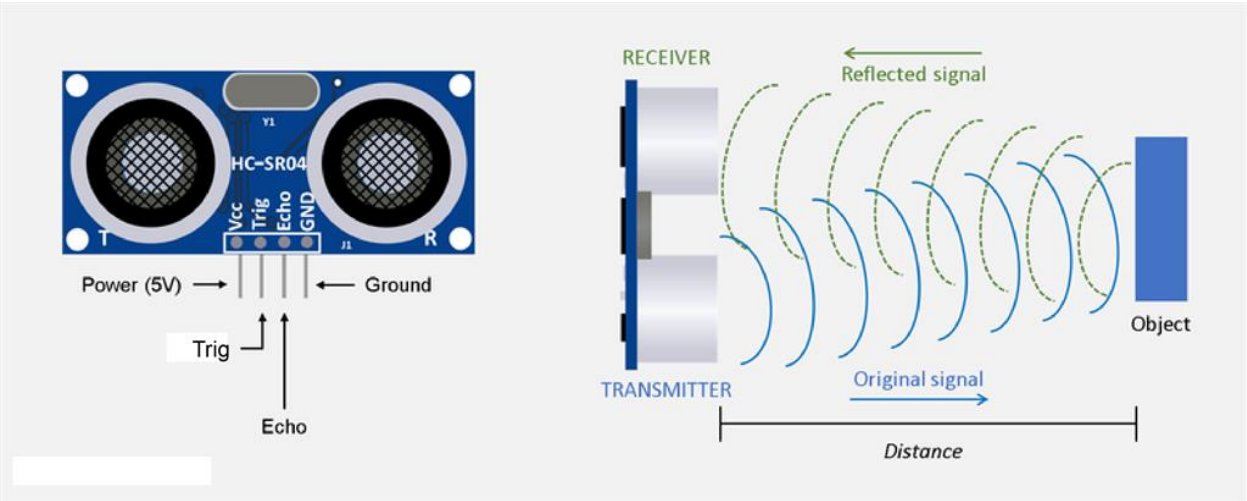
it’s working principal

An ultrasonic sensor is an electronic device that measures the distance of a target object by emitting ultrasonic sound waves, and converts the reflected sound into an electrical signal. Ultrasonic waves travel faster than the speed of audible sound (i.e. the sound that humans can hear). Ultrasonic sensors have two main components: the transmitter (which emits the sound using piezoelectric crystals) and the receiver (which encounters the sound after it has travelled to and from the target).

In order to calculate the distance between the sensor and the object, the sensor measures the time it takes between the emission of the sound by the transmitter to its contact with the receiver. The formula for this calculation is **D = ½ T x C** (where D is the distance, T is the time, and C is the speed of sound ~ 343 meters/second). For example, if a scientist set up an ultrasonic sensor aimed at a box and it took 0.025 seconds for the sound to bounce back, the distance between the ultrasonic sensor and the box would be:

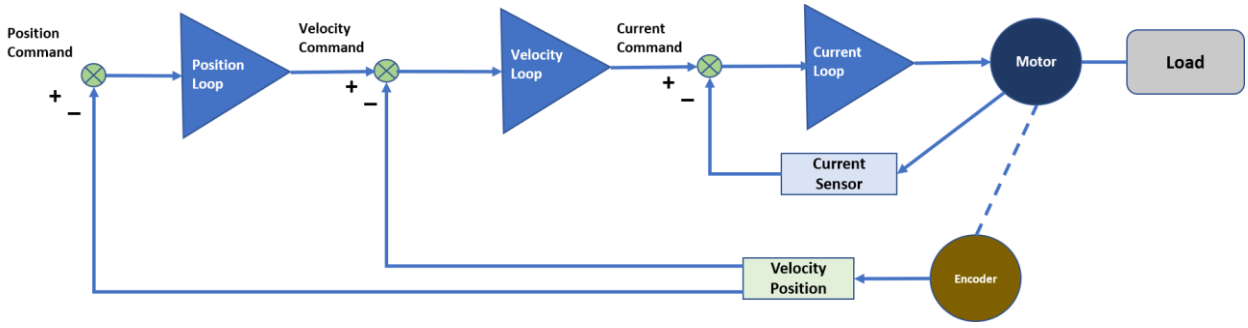
D = 0.5 x 0.025 x 343

or about 4.2875 meters.



Servo motor and its working principal

A servo motor is an electromechanical device that produces torque and velocity based on the supplied current and voltage. A servo motor works as part of a closed loop system providing torque and velocity as commanded from a servo controller utilizing a feedback device to close the loop. The feedback device supplies information such as current, velocity, or position to the servo controller, which adjusts the motor action depending on the commanded parameters.

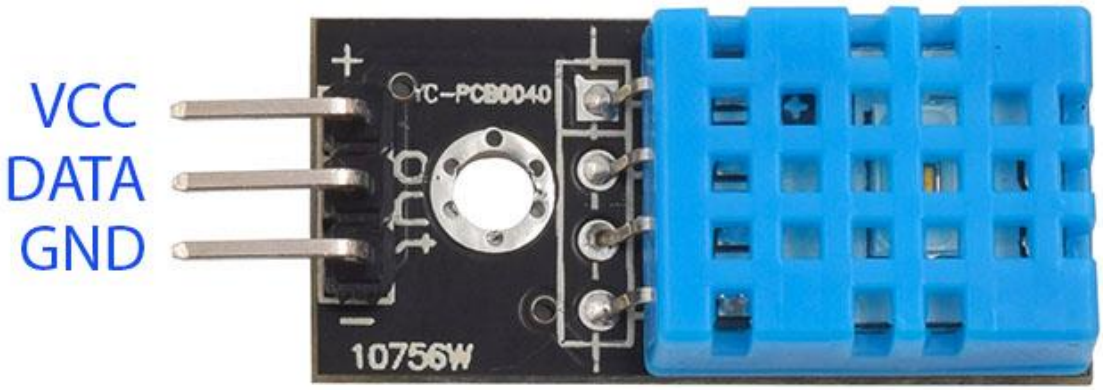


Temperature and humidity sensor and its working

A temperature sensor is a device which can be a Thermocouple or RTD (Resistive Temperature Detector) that provides temperature measurement in a readable form through an electrical signal.

To detect humidity, the DHT11 measures the electrical resistance between two electrodes. The electrodes are on the surface of the component which is a moisture holding substrate. As the substrate absorbs water, ions that increase the conductivity between the two electrodes are released. This change in resistance is proportional to the relative humidity. The resistance between electrodes will decrease with higher relative humidity and increase with lower relative humidity.

To measure air temperature, the device uses a surface mounted (SMT) NTC temperature sensor, or a thermistor. Thermistors are variable resistors that change resistance based on the temperature. This thermistor's resistance will decrease when the temperature increases.



Motor driver IC and it’s working

A motor driver IC is an integrated circuit chip which is usually used to control motors in autonomous robots. Motor driver ICs act as an interface between microprocessors in robots and the motors in the robot. The most commonly used motor driver IC’s are from the L293 series such as L293D, L293NE, etc. These ICs are designed to control 2 DC motors simultaneously. L293D consist of two H-bridge. H-bridge is the simplest circuit for controlling a low current rated motor. For this tutorial we will be referring the motor driver IC as L293D only. L293D has 16 pins, they are comprised as follows:

Enable

2

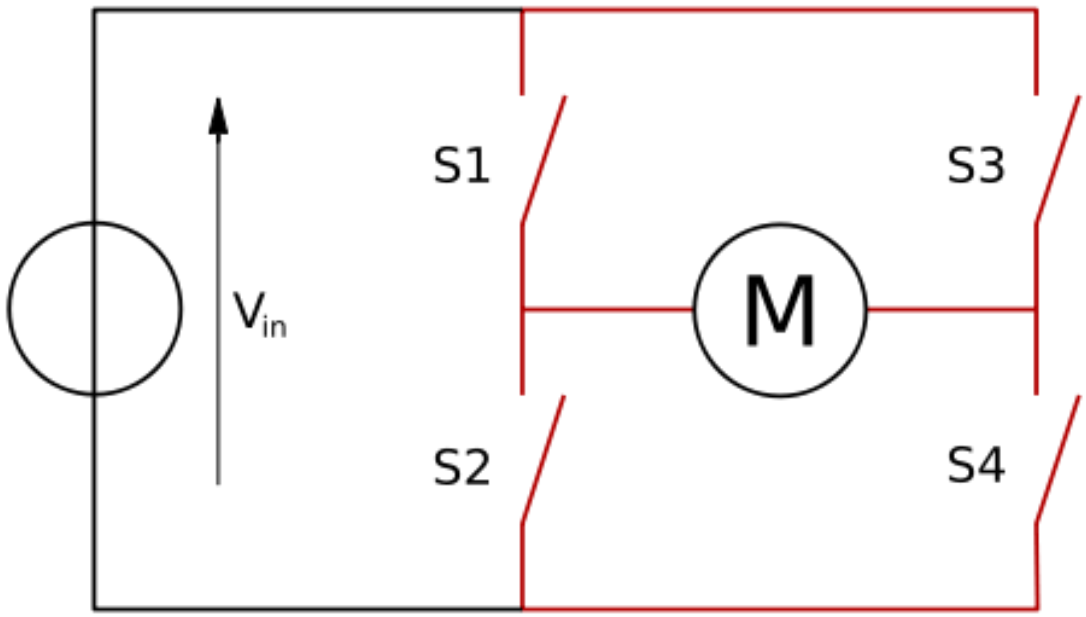
Voltage Pins 2

L293D and Its Working

The L293D is a 16 pin IC, with eight pins, on each side, dedicated to the controlling of a motor. There are 2 INPUT pins, 2 OUTPUT pins and 1 ENABLE pin for each motor. L293D consist of two H-bridge. H-bridge is the simplest circuit for controlling a low current rated motor.
The Theory for working of a H-bridge is given below.

Working of A H-bridge

H-bridge is given this name because it can be modelled as four switches on the corners of ‘H’. The basic diagram of H-bridge is given below:



In the given diagram, the arrow on the left points to the higher potential side of the input voltage of the circuit. Now if the switches S1 & S4 are kept in a closed position while the switches S2 & S3 are kept in a open position meaning that the circuit gets shorted across the switches S1 & S4. This creates a path for the current to flow, starting from the V input to switch S1 to the motor, then to switch S4 and then the exiting from the circuit. This flow of the current would make the motor turn in one direction. The direction of motion of the motor can be clockwise or anti-clockwise, this is because the rotation of the motor depends upon the connection of the terminals of the motor with the switches.

For simplicity, lets assume that in this condition the motor rotates in a clockwise direction.

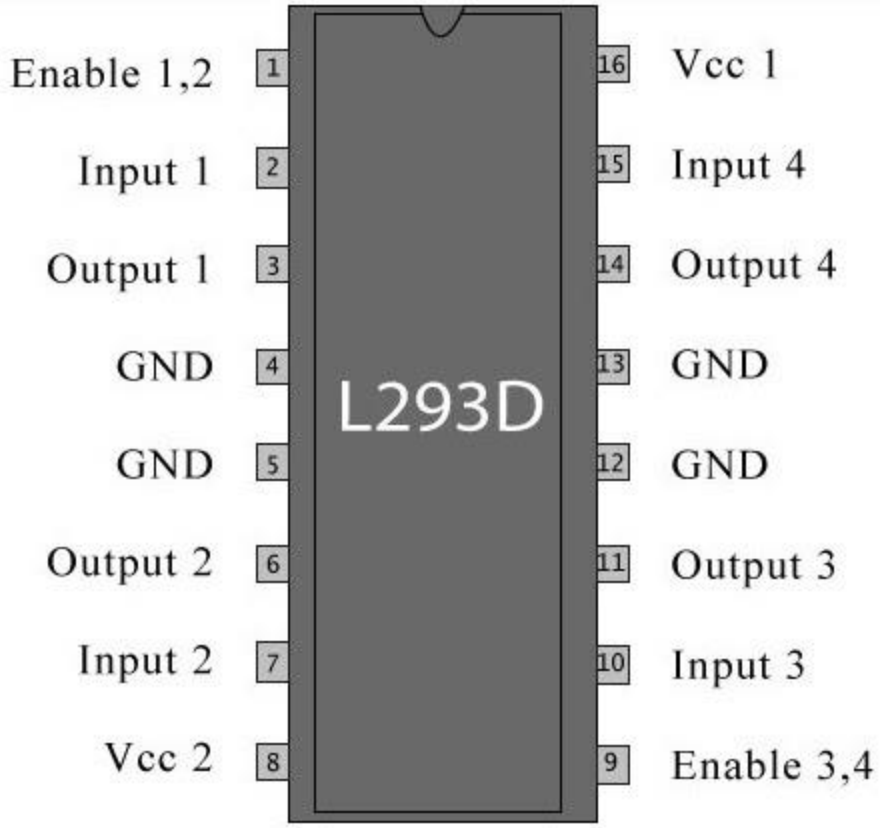
Now, when S3 and S2 are closed then and S1 and S4 are kept open then the current flows from the other direction and the motor will now definitely rotates in counter-clockwise direction

When S1 and S3 are closed and S2 and S4 are open then the ‘STALL’ condition will occur(The motor will break).

Stall Condition:

When the motor is applied positive voltage on both sides then the voltage from both the sides brings the motor shaft to a halt

L293D Pin Diagram :



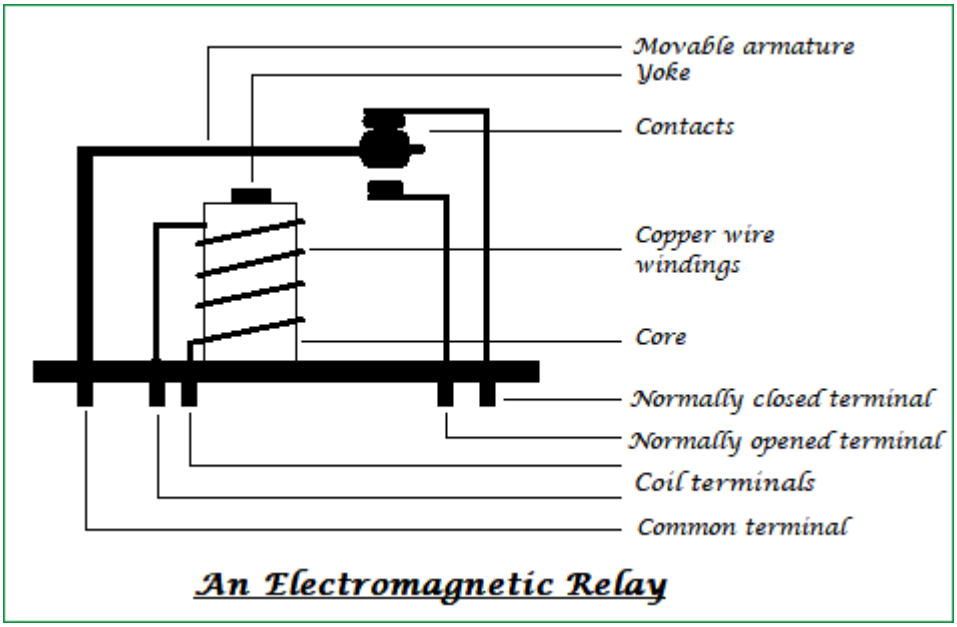
RELAY and it’s working

What is Relay?

A Relay is an electromechanical device that can be used to make or break an electrical connection. It consists of a flexible moving mechanical part which can be controlled electronically through an electromagnet, basically, a relay is just like a mechanical switch but you can control it with an electronic signal instead of manually turning it on or off. Again this **working principle of relay** fits only for the electromechanical relay.

Construction of Relay and its operation:

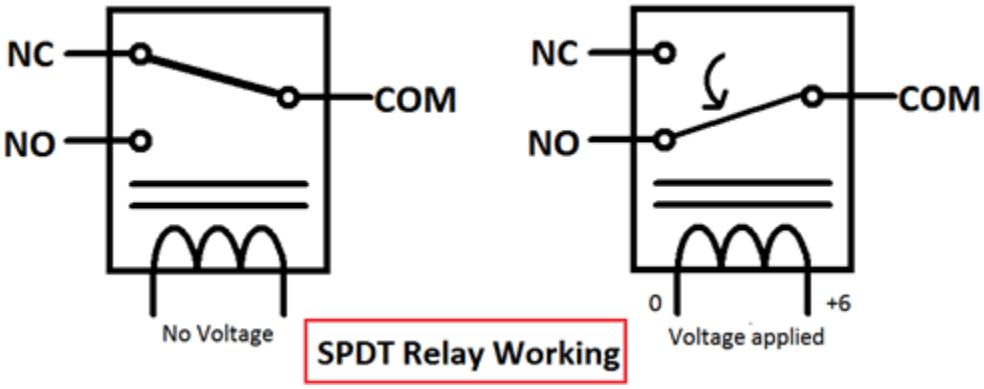
The following figure shows how a Relay looks internally and how it can be constructed,



An Electromagnetic Relay

On a casing, a core with copper windings (forms a coil) winded on it is placed. A movable armature consists of a spring support or stand like structure connected to one end, and a metal contact connected to another side, all these arrangements are placed over the core such that, when the coil is energized, it attracts the armature. The movable armature is generally considered as a common terminal which is to be connected to the external circuitry. The relay also has two pins namely ***normally closed and normally opened (NC and NO),*** the normally closed pin is connected to the armature or the common terminal whereas the normally opened pin is left free (when the coil is not energized). When the coil is energized the armature moves and is get connected to the normally opened contact till there exists flow of current through the coil. When it is de-energized it goes to its initial position.

The general **circuit representation of the relay** is as shown in the figure below

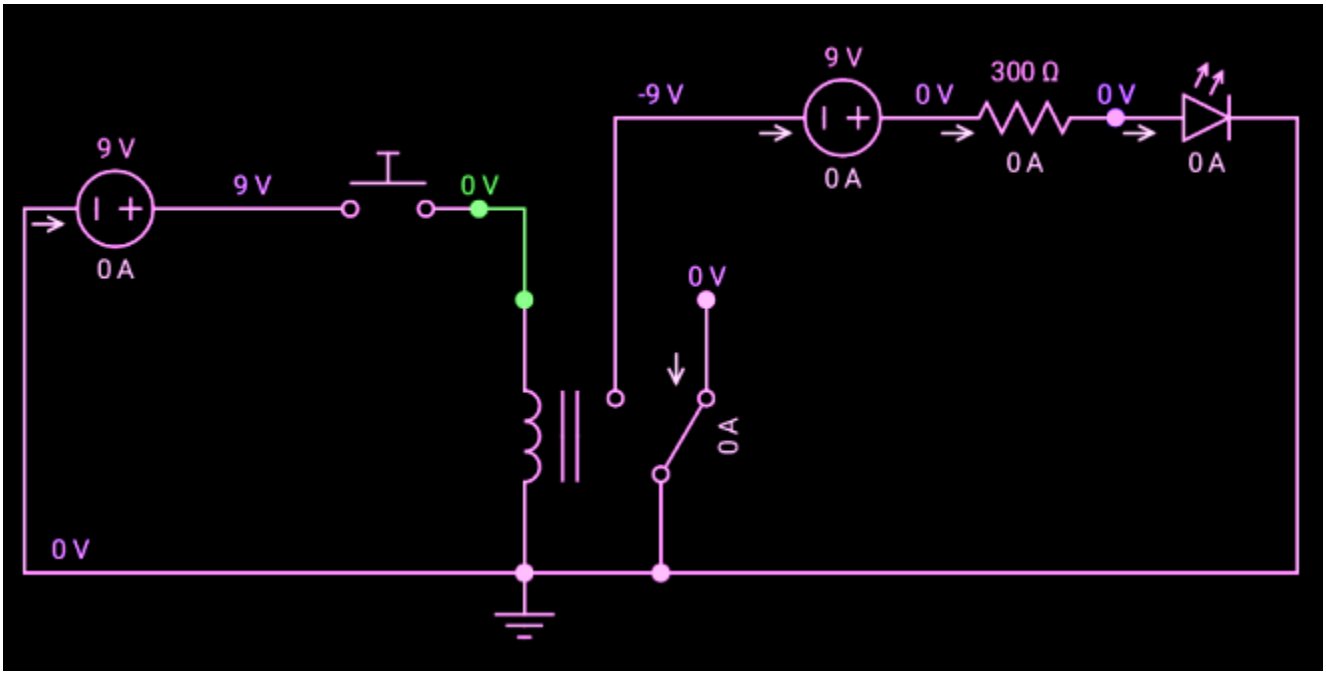


Relay Working Principle

Now let's understand how a relay works in a normally closed condition and normally open condition.

Relay in NORMALLY CLOSED condition:

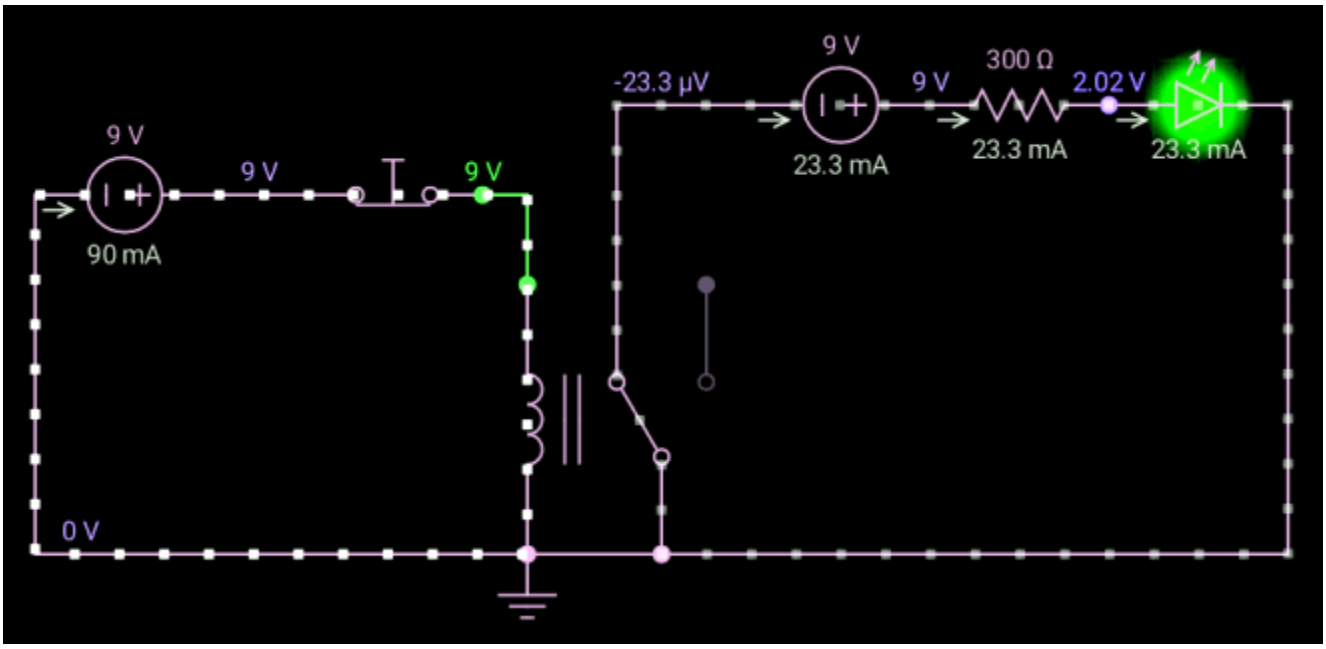
When no voltage is applied to the core, it cannot generate any magnetic field and it doesn't act as a magnet. Therefore, it cannot attract the movable armature. Thus, the initial position itself is the armature connected in normally closed position (NC).



Relay in NORMALLY OPENED condition:

When sufficient voltage is applied to the core it starts to create a magnetic field around it and acts as a magnet. Since the movable armature is placed within its range, it gets attracted to that magnetic field created by the core, thus the position of the armature is being altered. It is now connected to the

normally opened pin of the relay and external circuit connected to it function in a different manner.



Note: The functionality of the external circuit depends upon the connection made to the relay pins.

So finally, we can say that when a coil is energized the armature is attracted and the switching action can be seen, if the coil is de-energized it loses its magnetic property and the armature goes back to its initial position.

7805 IC and its working

Definition: Voltage regulator like IC7805 belongs to the 78xx series ICs. In the 78xx series, xx represents the fixed output voltage value and 7805 is a fixed linear voltage regulator. Batteries provide a voltage of 1.2V, 3.7V, 9V, and 12V. This voltage is good for the circuits which voltage requirements are in that range. The regulated power supply in this regulator is +5V DC.

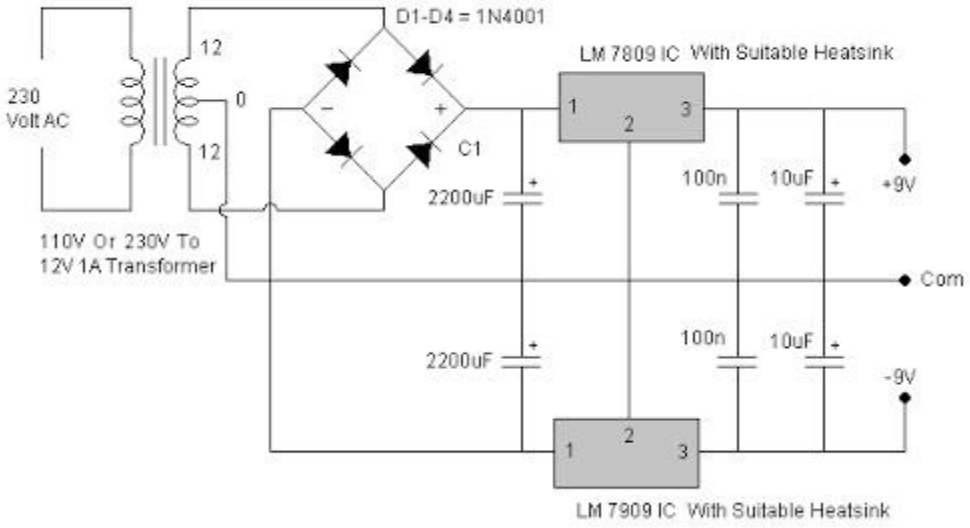
The 7805 voltage regulator is a three-terminal voltage regulator IC. In various applications, a 7805 voltage regulator with a fixed output voltage is used. The availability of this is through various packages like SOT-223, TO-263, TO-220, and TO-3. Among this, TO-220 is the most used one. There are many important features in the 7805 IC.

Minimum external components are enough for functioning

- 1.5 A of current can be delivered in this 7805 IC
- It has internal current limiting features
- It also consists of thermal shutdown features.

7805 Voltage Regulator Working

This is the circuit diagram of producing a regulated output of 5V from the AC mains supply. This circuit uses the following components.



7805 Voltage Regulator Circuit Working

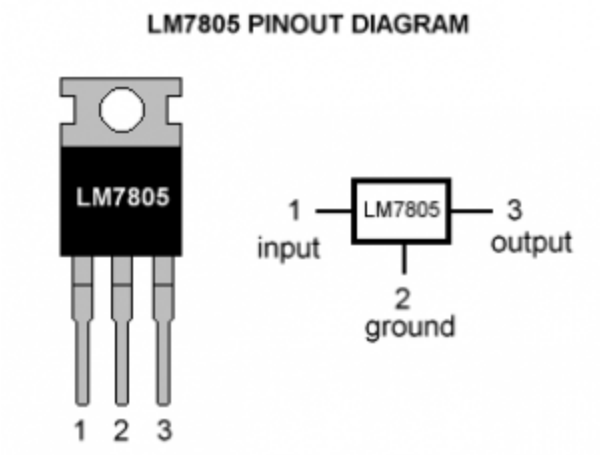
- 230V – 12V step down transformer
- 1A fuse
- 7805 voltage regulator IC
- Capacitors

- IN4007 diode
- Bridge rectifier

When AC power supply is given from mains, first it is converted into unregulated DC, and finally, constant regulated DC can be generated like the output from this circuit. Mainly the circuit is designed with a bridge rectifier which is made up of diodes, transformer, capacitors, and linear 7805 voltage regulator.

It takes place in two steps, on the first step AC power supply is converted into unregulated DC and in the second step, this unregulated DC is converted into regulated DC. We will see the process now. The primary step down transformer is connected to the mains supply. The secondary of a step-down transformer is connected with a bridge rectifier, here it is a combination of 4IN 4001 diodes.

In between the bridge rectifier and the transformer, a 1A fuse is placed. It is used for current limitation i.e to limit current to 1A drawn the circuit. the rectified DC which is given by the bridge rectifier is smoothened by the capacitor. So the output is unregulated DC about 12 V DC. Then the voltage regulator IC receives this unregulated Dc as input and this regulator converts the unregulated DC to regulated DC about 5V and finally, output terminals receive this regulated DC.



Infrared sensor module and its working

IR Sensor Working Principle

There are different types of infrared transmitters depending on their wavelengths, output power and response time. An IR sensor consists of an IR LED and an IR Photodiode, together they are called as PhotoCoupler or OptoCoupler.

IR Transmitter or IR LED

Infrared Transmitter is a light emitting diode (LED) which emits infrared radiations called as IR LED's. Even though an IR LED looks like a normal LED, the radiation emitted by it is invisible to the human eye.

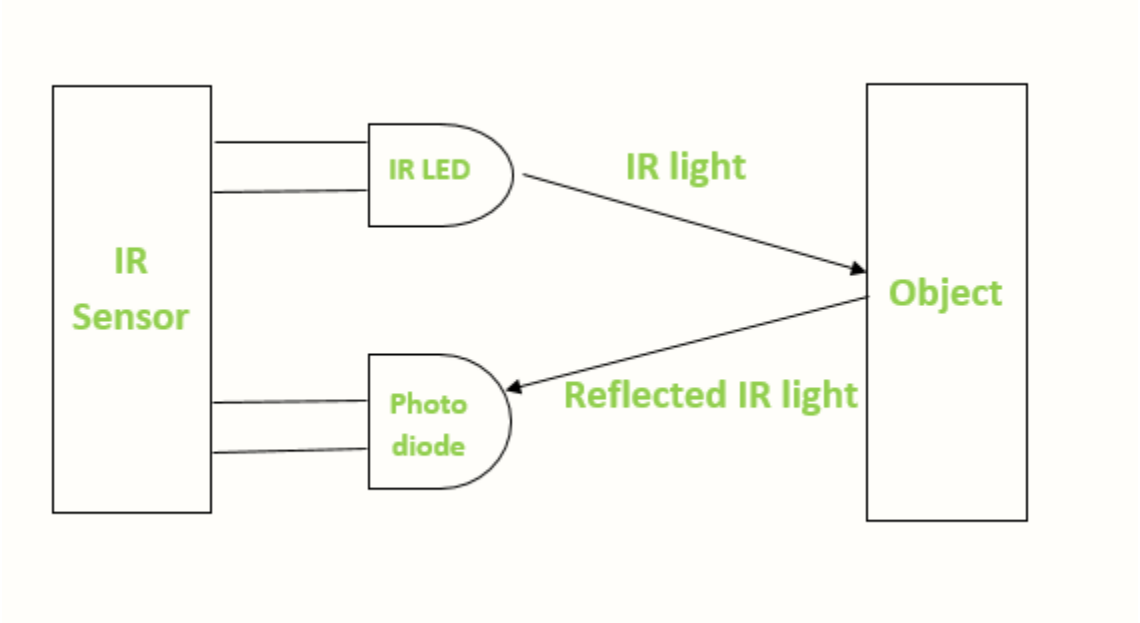
The picture of an Infrared LED is shown below.

IR Receiver or Photodiode

Infrared receivers or infrared sensors detect the radiation from an IR transmitter. IR receivers come in the form of photodiodes and phototransistors. Infrared Photodiodes are different from normal photo diodes as they detect only infrared radiation. Below image shows the picture of an IR receiver or a photodiode,

Different types of IR receivers exist based on the wavelength, voltage, package, etc. When used in an infrared transmitter – receiver combination, the wavelength of the receiver should match with that of the transmitter.

The emitter is an IR LED and the detector is an IR photodiode. The IR photodiode is sensitive to the IR light emitted by an IR LED. The photo-diode's resistance and output voltage change in proportion to the IR light received. This is the underlying working principle of the IR sensor.



When the IR transmitter emits radiation, it reaches the object and some of the radiation reflects back to the IR receiver. Based on the intensity of the reception by the IR receiver, the output of the **sensor** defines.

Arduino Uno

Arduino UNO is a low-cost, flexible, and easy-to-use programmable open-source microcontroller board that can be integrated into a variety of electronic projects. This board can be interfaced with other Arduino boards, Arduino shields, Raspberry Pi boards and can control relays, LEDs, servos, and motors as an output.

Arduino UNO features AVR microcontroller Atmega328, 6 analogue input pins, and 14 digital I/O pins out of which 6 are used as PWM output.

Arduino UNO

This board contains a USB interface i.e. USB cable is used to connect the board with the computer and Arduino IDE (Integrated Development Environment) software is used to program the board.

The unit comes with 32KB flash memory that is used to store the number of instructions while the SRAM is 2KB and EEPROM is 1KB.

The operating voltage of the unit is 5V which projects the microcontroller on the board and its associated circuitry operates at 5V while the input voltage ranges between 6V to 20V and the recommended input voltage ranges from 7V to 12V.

Arduino UNO Components

The Arduino UNO board contains the following components and specifications:

ATmega328: This is the brain of the board in which the program is stored.

Ground Pin: there are several ground pins incorporated on the board.

PWM: the board contains 6 PWM pins. PWM stands for Pulse Width Modulation, using this process we can control the speed of the servo motor, DC motor, and brightness of the LED.

Digital I/O Pins: there are 14 digital (0-13) I/O pins available on the board that can be connected with external electronic components.

Analogue Pins: there are 6 analogue pins integrated on the board. These pins can read the analogue sensor and can convert it into a digital signal.

AREF: It is an Analog Reference Pin used to set an external reference voltage.

Reset Button: This button will reset the code loaded into the board. This button is useful when the board hangs up, pressing this button will take the entire board into an initial state.

USB Interface: This interface is used to connect the board with the computer and to upload the Arduino sketches (Arduino Program is called a Sketch)

DC Power Jack: This is used to power up the board with a power supply.

Power LED: This is a power LED that lights up when the board is connected with the power source.

Micro SD Card: The UNO board supports a micro SD card that allows the board to store more information.

3.3V: This pin is used to supply 3.3V power to your projects.

5V: This pin is used to supply 5V power to your projects.

VIN: It is the input voltage applied to the UNO board.

Voltage Regulator: The voltage regulator controls the voltage that goes into the board.

SPI: The SPI stands for Serial Peripheral Interface. Four Pins 10(SS), 11(MOSI), 12(MISO), 13(SCK) are used for this communication.

TX/RX: Pins TX and RX are used for serial communication. The TX is a transmit pin used to transmit the serial data while RX is a receive pin used to receive serial data.

ESP- 32

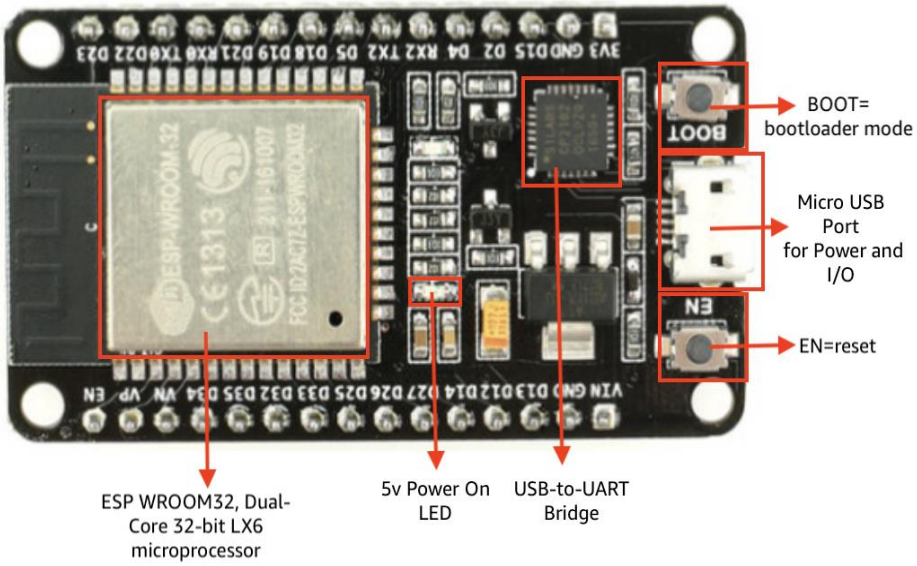
ESP32 is a low-cost, low-power Microcontroller with an integrated Wi-Fi and Bluetooth. It is the successor to the ESP8266 which is also a low-cost Wi-Fi microchip albeit with limited vastly limited functionality.

It is an integrated antenna and RF balloon, power amplifier, low-noise amplifiers, filters, and power management module. The entire solution takes up the least amount of printed circuit board area. This board is used with 2.4 GHz dual-mode Wi-Fi and Bluetooth chips by TSMC 40nm low power technology, power and RF properties best, which is safe, reliable, and scale-able to a variety of applications.

Some specs of esp-32

ESP WROOM32, Dual-Core 32-bit LX6 microprocessor

- ROM: 448 KB, SRAM: 520 KB, Support up to: 16MB flash
- Built-in CP21XX USB-to-UART(serial) Bridge
- Wi-Fi: 802.11b/g/n/e/i
- Bluetooth: v4.2 BR/EDR and BLE
- 2 × 8-bit DACs
    - [D26][D25]
- 9 × touch sensors Note: Touch sensor 1 is [D0]. However, it's not available as a pin in this particular ESP32 development board (version with 30 GPIOs). GPIO 0 is available on the version with 36 pins.
    - [D13][D12][D14][D24][D33][32]
    - [D15][D2][D4]
- Internal Temperature Sensor



Esp -32 camera module

ESP32CAM is a development board for image recognition. It features an ESP32(4M Flash + 520K RAM) chip and 2-Megapixel camera(OV2640). It also supports image transmission via Wi-Fi and debugging through USB Type-C port.

The hardware comes preloaded software, programmed by ESP-IDF. It is an application to run Wi-Fi camera. The output image is size 600*800, since it’s 2-Maga camera, you sure can optimize the software to output the maximum size of photos

Chapter - 3

2. Problem Domain

There is some critical places where human's interference may be dangerous or it is also a possibility that we are not able to reach at that place like the curiosity and perseverance rover is designed to inspect the surface of mars they both searching for ancient life on mars and we are operating both of them from earth. and consider the area where we want to monitor the diffusion of gas like (currently the png that is piped natural gas is heavily commercialized it is widespread in almost every city so the time of festivals like Diwali there is the greater risk of blasting so a small amount of diffusion can cost even a life and at that place a continuous human interference is very crucial so we need an intelligent system that can save us .

3. Solution Domain

So here I'm gonna make a small size rover that can solve many real world problems and anyone can use it can save a life of humans by doing really risky jobs and we can also modify it as per our needs like we can take it for security purposes because it has real time camera monitoring system , or it can help us in monitoring foreign object at a small scale , and also one of the most interesting problem that is by just a simple manipulations in the circuit we can use it as a budget friendly movable timeless camera system which can help so many photography enthusiasts who can't afford the expensive systems .

5. Application Domain

Apart from the rover use the best application of this model is that we can use this rover for educational purposes like to teach college students about different sensors, Arduino, esp 32 and also about the functioning and biasing of different electronic components because it has very fine and easy circuit. by the different processes that is used in this rover we can make even more simple small scale rover that can perform specific actions like a small rover with a GSM module can be useful for

making IOT based small vehicles like a online marketing companies is using a smart drone technique for delivering the goods so we can implement this on a small scale for different purposes.

6. Expected Outcome

- MIC'S rover can help us to understand remote areas where human's interference is difficult and close to impossible.
- It will help in designing small scale rovers for specific purposes in very cheap price.
- It is going to educate students with very minimalistic level of difficulties and practically.

Name of Guide: Prof. Rasmi pant

Sign of Guide with Date:

Coding model

Rover control using esp. – 32

```
//ESP32 Bluetooh car
//By Technical_Tamizha
//Circuit Diagram for this project is in my Youtube
channel
//Channel Link :
https://www.youtube.com/channel/UC1VT8SUJ7yvIkE4eCzXVSN
A


#include "BluetoothSerial.h"

BluetoothSerial SerialBT;

char receivedChar;// received value will be stored as
CHAR in this variable

const int MR1 = 12; //ESP32 pins (MR=Right Motor)
(ML=Left Motor) (1=Forward) (2=Backward)
const int MR2 = 14;
const int ML1 = 27;
const int ML2 = 26;

void setup() {
  Serial.begin(115200);
  SerialBT.begin("ESP32_Technical_Tamizha"); //You can
change your Bluetooth device name
  pinMode(MR1, OUTPUT);
  pinMode(MR2, OUTPUT);
  pinMode(ML1, OUTPUT);
  pinMode(ML2, OUTPUT);
}

void Forward(){
        //RIGHT MOTOR
      digitalWrite(MR1,HIGH);//MOVE FRONT
```

```
      digitalWrite(MR2,LOW); //MOVE BACK
      //LEFT MOTOR
      digitalWrite(ML1,LOW);//MOVE BACK
      digitalWrite(ML2,HIGH);//MOVE FRONT
}
void Backward(){
      digitalWrite(MR1,LOW);
      digitalWrite(MR2,HIGH);
      digitalWrite(ML1,HIGH);
      digitalWrite(ML2,LOW);
}
void Left(){
      digitalWrite(MR1,HIGH);
      digitalWrite(MR2,LOW);
      digitalWrite(ML1,HIGH);
      digitalWrite(ML2,LOW);
}
void Right(){
      digitalWrite(MR1,LOW);
      digitalWrite(MR2,HIGH);
      digitalWrite(ML1,LOW);
      digitalWrite(ML2,HIGH);
}
void Stop(){
      digitalWrite(MR1,LOW);
      digitalWrite(MR2,LOW);
      digitalWrite(ML1,LOW);
      digitalWrite(ML2,LOW);
}
void loop() {
    receivedChar =(char)SerialBT.read();

  if (Serial.available()) {
    SerialBT.write(Serial.read());

  }
  if (SerialBT.available()) {

    Serial.print ("Received:");//print on serial
monitor
```

```
    Serial.println(receivedChar);//print on serial
monitor

    if(receivedChar == 'F')
    {
      Forward();

    }
    if(receivedChar == 'B')
    {

      Backward();
    }
     if(receivedChar == 'L')
    {

      Left();
    }
    if(receivedChar == 'R')
    {

      Right();
    }
    if(receivedChar == 'S')
    {
      Stop();
```

Radar system using Bluetooth

```
#include <Servo.h>
#include <SoftwareSerial.h>
//__End of including headers__//

//**Defining pins for US sensor**//
#define trigPin 4
#define echoPin 5
///__End of defaniton__//

SoftwareSerial Blueboy(10, 11); //Naming our Bluetooth
module as Blueboy and defiing the RX and TX pins as 10
and 11
Servo servo;  //Initializing a servo object called
servo

//**Global variabel declarations**//
int BluetoothData;
int posc = 0;
int flag=10;
//__End of global variable declartion__//


void setup() //Runce only once
{
  servo.attach(9); //Servo is connected to pin 9
  pinMode(trigPin, OUTPUT); //trigpin of US sensor is
output
  pinMode(echoPin, INPUT);  //echopin of US sensor is
Input
  Serial.begin(38400); //Serial monitor is started at
38400 baud rate for debugging
  Blueboy.begin(9600); //Bluetooth module works at 9600
baudrate
  Blueboy.println("Blueboy is active"); //Conformation
from Bluetooth
}

void loop()  //The infinite loop
```

```
{

//**Program to start or stop the Survilance devide**//
   if (Blueboy.available())
{
Serial.println("Incoming");   //for debugging
BluetoothData=Blueboy.read(); //read data from
bluetooth
Serial.println(BluetoothData); //for debugging

   if (BluetoothData == 'p') //if the mobile app has
sent a 'p'
   {
   flag=0; //play the device in auto mode
   }
   if (BluetoothData == 's') //if the mobile app has
sent a 's'
   {
   flag=1; //stop the device and enter manual mode
   }
Serial.println(flag); //for debugging
}

if (flag==0)
servofun(); //Servo sweeps on own
if (flag==1)
manualservo(); //Manual sweeping

}
//_End of loop program__//



//**Function for servo to sweep**//
void servofun()
{
  Serial.println("Sweeping"); //for debugging
  for(posc = 10;posc <= 170;posc++)   // Using 10 to
170 degree is safe than 0 to 180 because some servo
might not be operational at extreme angels
```

```
  {
    servo.write(posc); // set the position of servo
motor
    delay(50);
  us();    //measure the distance of objects sing the
US sensor
  }

  for(posc = 170;posc >= 10;posc--)
  {
    servo.write(posc);
    delay(50);
    us();    //measure the distance of objects sing the
US sensor
  }
  Serial.println ("Scan Complete"); //for debugging
  flag=0;
}
//**End of Servo sweeping function**//



//**Function to control Servo manually**//
void manualservo()
{
us();

// Get value from user and control the servo
   if (Blueboy.available())
{
BluetoothData=Blueboy.read();
Serial.println(BluetoothData);
  servo.write(BluetoothData);
  Serial.println("Written");
   if (BluetoothData == 'p')
   {
   flag=0;
   }
}
}
```

```
//__End of manual control function__//



//**Function to measure the distance**//
void us()
{
 int duration, distance;
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(1000);
  digitalWrite(trigPin, LOW);
  duration = pulseIn(echoPin, HIGH);
  distance = (duration/2) / 29.1; // Calculates the
distance from the sensor
  if (distance<200 && distance >0)
Blueboy.write(distance);
}
```

Temperature sensing unit code

```
//chinmay



#include <SoftwareSerial.h>
SoftwareSerial bt(8, 9); // RX, TX
#include "dht.h"
#define dataPin 3

dht DHT;

int temp;
int hum;

void setup() {

 Serial.begin(9600);
 bt.begin(9600);
 Serial.println("Ready");

}

void loop(){
```

```
  int readData = DHT.read11(dataPin);

  hum = DHT.humidity;
  temp = DHT.temperature;

 bt.print(temp);
 bt.print(";");
 bt.print(hum);
 bt.println(";");

  delay(10000);
}
```

Ultrasonic sensor using Arduino

```
//chinmay


#include <LiquidCrystal.h>
 #define trigPin 2
 #define echoPin 4
 // initialize the library with the numbers of the interface pins
 LiquidCrystal lcd(12, 11, 10, 9, 8, 7);
 int counter = 0;
 int currentState = 0;
 int previousState = 0;

 void setup() {
 pinMode(trigPin, OUTPUT);
 pinMode(echoPin, INPUT);
 lcd.begin(16, 2);
 lcd.setCursor(4, 0);
 lcd.print("counter");
 }

 void loop() {
 long duration, distance;
 digitalWrite(trigPin, LOW);
```

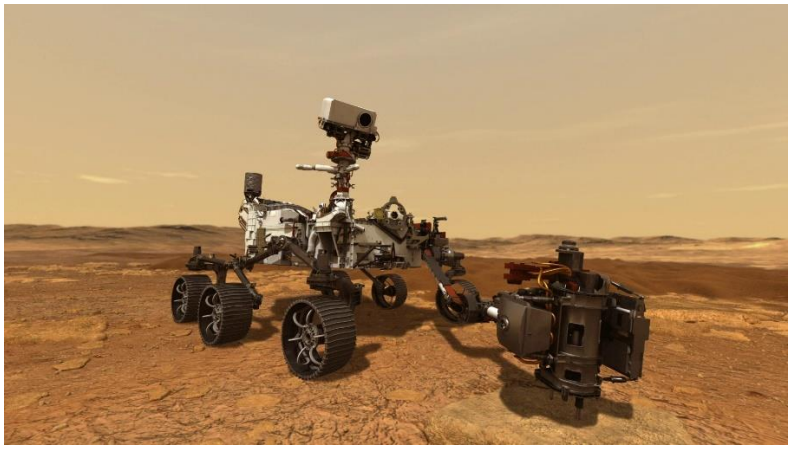
```
delayMicroseconds(2);
digitalWrite(trigPin, HIGH);
delayMicroseconds(10);
digitalWrite(trigPin, LOW);
duration = pulseIn(echoPin, HIGH);
distance = (duration/2) / 29.1;
if (distance <= 10){
currentState = 1;
}
else {
currentState = 0;
}
delay(200);
if(currentState != previousState){
if(currentState == 1){
counter = counter + 1;
lcd.setCursor(4,1);
lcd.print(counter);
  }
 }
}
```

Existing systems

There are some of exiting rover that is made by different space agencies like curiosity and perseverance are some of the best examples of it that is made by NASA and my project is some kind of DIY of actual rovers.

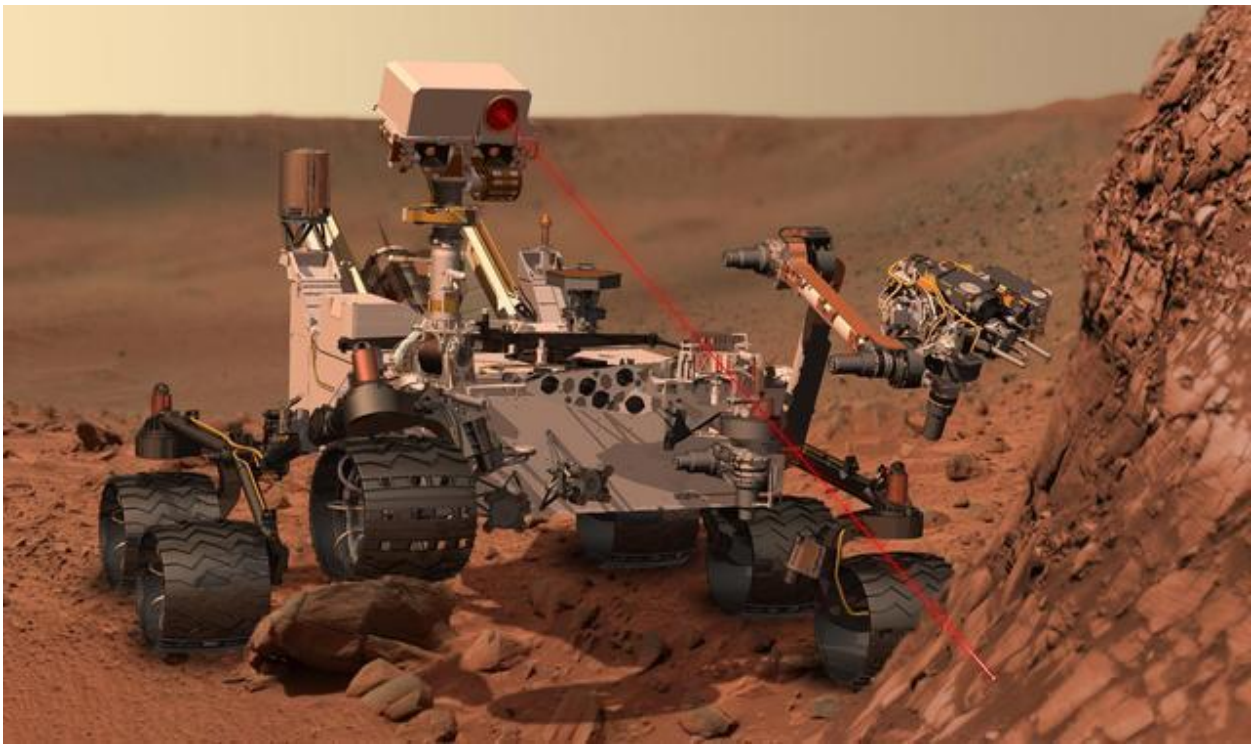
Perseverance rover - On Feb. 18, NASA's Perseverance rover officially aced its journey to Mars and survived a harrowing landing to arrive safely on the surface of the red planet. The next-gen rover and its companion, an experimental helicopter called Ingenuity, have opened a new era in planetary exploration.

Ingenuity is a tech demonstration, the first vehicle to achieve powered, controlled flight on another planet. Perseverance has a bigger, bolder mission, one that could forever change our understanding of the cosmos. It's hunting for signs of past life on Mars.



Curiosity rover - The Mars Science Laboratory and its rover centerpiece, Curiosity, is the most ambitious Mars mission yet flown by NASA. The rover landed on Mars in 2012 with a primary mission to find out if Mars is, or was, suitable for life. Another objective is to learn more about the Red Planet's environment.

In March 2018, it celebrated 2,000 sols (Mars days) on the planet, making its way from Gale Crater to Aeolis Mons (colloquially called Mount Sharp), where it has looked at geological information embedded in the mountain's layers. Along the way, it also has found extensive evidence of past water and geological change



Literature review

By rajan chinnaswami on Arduino based car model – https://www.researchgate.net/publication/283333434_A_Review_Comparative_Analysis_of_Arduino_Micro_Controllers_in_Robotic_Car

Robotics brings together several very different engineering areas and skills. There are various types of robot such as humanoid robot, mobile robots, remotely operated vehicles, modern autonomous robots etc. This survey paper advocates the operation of a robotic car (remotely operated vehicle) that is controlled by a mobile phone (communicate on a large scale over a large distance even from different cities). The person makes a call to the mobile phone placed in the car. In the case of a call, if any one of the button is pressed, a tone equivalent to the button pressed is heard at the other end of the call. This tone is known as DTMF (Dual Tone Multiple Frequency). The car recognizes this DTMF tone with the help of the phone stacked in the car. The received tone is processed by the Arduino microcontroller. The microcontroller is programmed to acquire a decision for any given input and outputs its decision to motor drivers in order to drive the motors in the forward direction or backward direction or left or right direction. The mobile phone that makes a call to cell phone stacked in the car act as a remote

By shubham sen gupta on Arduino base surveillance rover - https://www.researchgate.net/publication/34

4296653_Arduino_based_Surveillance_and_Bomb_Diffusion_Robot_with_Rocker_Bogie_Mechanism_and_Two-way_Talk_Feature_using_Hand_Gesture_control_Robotic_ARM

In present day scenario of military and defence system of India, there is a lack of some technologies as we are still behind in the race of defence as compared to the world's most powerful countries. We know that the bomb detection is basically carried out by using a human bomb squad or dogs which carries the involvement of living beings and their loss can be very costly in order to just stop this mishap we have designed a robot that could actually defuse the bomb from a distance wirelessly as this robot will have a mechanical arm for itself which will be used for bomb diffusion using hand gesture control and will have a clipper to clip the wires as well as it is loaded with a Wi-Fi camera which is self-capable of capturing, live streaming and recording, at day as well as at night and can capture at 360 degrees in horizontal plane and 120 degrees on vertical plane which will be used for surveillance and identification purposes. Also, this robot can be used as a medium of two-way communication over Wi-Fi on both the ends of the enemy as well as the military personnel's on a remote location from where the robot is being operated for getting onto a conclusion with them which will be mounted over the rover and will be controlled remotely and suited for different terrains and staircases as it uses rocker-bogie mechanism which we designed using microcontroller Arduino Uno.

REFRENCES

[1] various tech channels on YouTube.

[2] Sensors and transducers…second edition.” D.Patranbis.

[3] Atmel Atmega 328p/328u datasheet.

[4] ESP – 32 dev board datasheet

[5] Arduino programming book. Author, Brian W. Evans.

[6] quora for random questions

[7] Element 14 community website