

BLUETOOTH CONTROL ROBOT



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DISSERTATION

A thesis submitted in partial fulfillment of the requirement
for the degree of BS Electronics

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

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ABSTRACT

A robot is an electromechanical reprogrammable and multifunctional machine that is guided by a computer programming. The point of my task is identified with versatile remote bluetooth control robot movement that is controlled, and by the Bluetooth device of android device using android app. This day and age life is so occupied and this association of machines and people are moving far away from pen and mouse and become progressively perfect with the physical world with progression of time hold between the machine and human's are being diminished by the assistance of new advancement the activities of robots are accurate as well as without rest they can work 24 hours continuously. There are several circumstances where human work is not important. The conditions are to obtain secrete information of enemies, dispose of the disposal of hazards, like radioactive substances, in hostage situations and other work like underwater remote locations etc. My project is simple remote car with Android application. The controlling of this is through any smart device with Android. Android is used to control the device with the assistance of an application.

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Chapter 1

Introduction

Bluetooth control car is controlled by using Android mobile phone instead of any other method like buttons, gesture etc. Here only needs to touch button in android phone to control the car in forward, backward, left and right directions. So here android phone is used as transmitting device and Bluetooth module placed in car is used as receiver. Android phone will transmit command using its in-built Bluetooth to car so that it can move in the required direction like moving forward, reverse, turning left, turning right and stop.

1.1 What is a robot?

Robot is the electromechanical device that is controlled by the programming language to perform different tasks. These are design to reduce the human efforts and time to improve the productivity.

1.2 Bluetooth controlling of Car

Now a days smart phones have become more powerful with large storage capacity, advance entertainment and more specialized strategies of bluetooth is regularly used to transfer information between two devices.

It is developed in 1994 by Vendor Erickson. The car is connected through Android application with an android device and send commands to module and by programming it manipulate the motion of car.

1.3 Statement of purpose

Foremost goal of this work is to transfer of data by using wireless network between a Smartphone and the robot. The purpose is to make simpler robotic hardware architecture. This easy structure can assist the student to built their personal robotic car with low price and give them a platform in different guides

1.4 Basic components of this project

- 9 Volt power supply
- DC motors
- AC motor driver L293D
- Arduino

- Bluetooth module HC-05

In the working of car we use these components as basic building blocks of robot. The bluetooth application directly send signals to the bluetooth module and then, it send the data to Arduino from here it send instructions to the DC motor driver and then to the DC motors, then rotation is done according to the instructions.

1.4.1 Arduino

1.4.1.1 What is arduino

Arduino is a suitable board for primary starting with electronic programming. It is the excellent platform for both hardware and software, it is simple to apply for beginners in addition to for enhances users. Arduino is able to examine inputs, and also use in the working small sensors.

1.4.1.2 Arduino working in project

The commands that are received by the Bluetooth module are attached to the Arduino and through Arduino it controls the DC motors that control the rotation.

1.4.2.1 HC-05 module of bluetooth:

It is utilized to send data or information from the Android application to the robot wirelessly. It has two modes slaver and master. Default communication is slave in HC-05, baud rate is 9600. It has 6 pins.

1.4.2.2 Working of Bluetooth module in project:

In project its working is to receive the instructions from the Arduino and through Arduino it controls the rotation of car through DC motors.

1.4.3 L293D motor driver:

L293D composed of 2 H-bridge motor that has IC on one motor driver. Motor driver act as little amplifier due to the fact that they take a not high current control signals and give us a amplified high signal or cutting edge output and is use to force the motor.

1.4.3.1 Working in project:

It receives instructions from the application and through Arduino it controls the rotation of car through DC motors.

1.4.4 DC motors:

Dc motors is electrical machine that convert electrical energy to mechanical power. It produce rotary motion its speed can be vary according to the strength of current apply to it. It operates on direct current.

1.4.4.1DC motors working in project.

Dc motors are attached with the motor driver and can convert the electrical energy into the mechanical work

1.4.5 Power Supply 9 volts:

Battery of 9 volts is used to supply the power to the circuit. Because either we use bluetooth module for the connectivity but this component will not operate until the certain amount of the power is supplied to it.

Chapter 2

Arduino

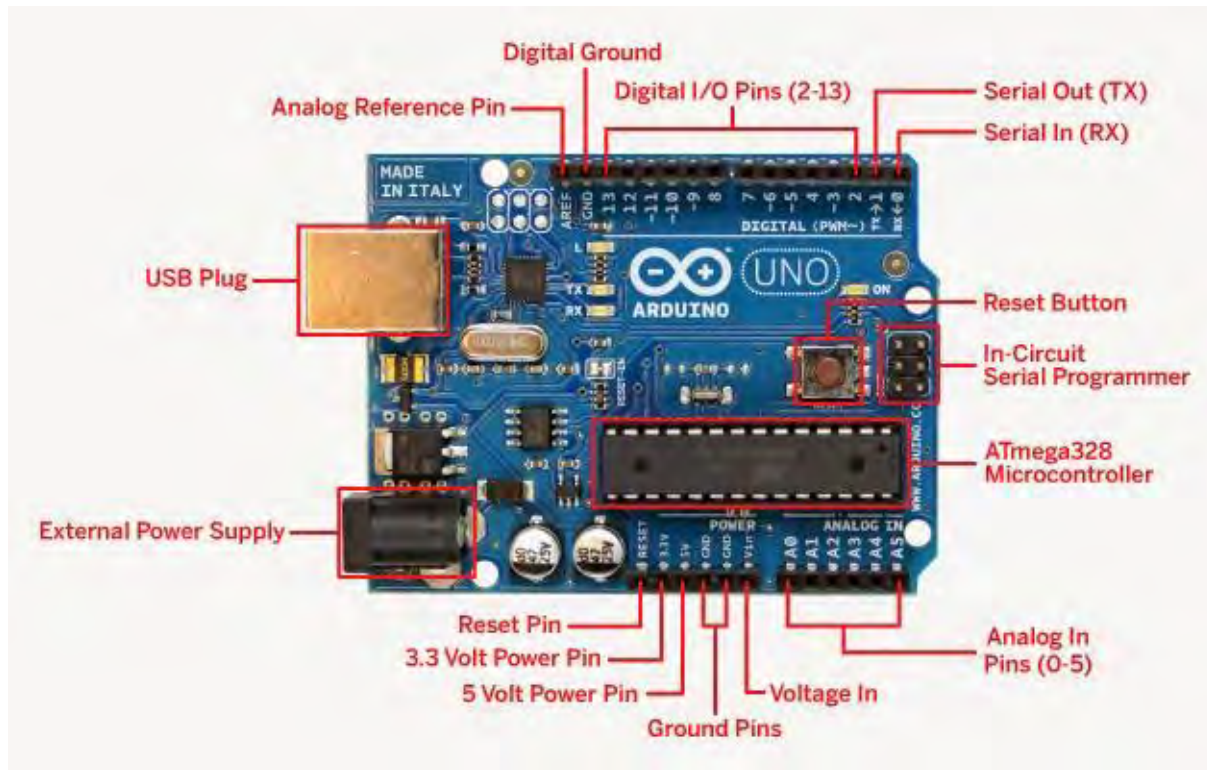
2.1 Introduction:

Arduino boards are commonly used in electronic experiments they are easy to handle with both hardware and software. It receives input signals and generates output accordingly. It mainly depends upon the programming of Arduino. Arduino has different pins for output and input. Some components also attach with it like USB port, ICSP header power jack and microcontroller etc. It has total 14 pins except with input receiver and ground.

2.2 Main components that are attached with the arduino:

- Two microcontrollers
 1. ATmega328
 2. ATmega1642

Oscillator, 14 total pins, 6 input (analog) pins, Power pins (GND, VIN& reset), USB port, Power jack, ISCP header, Flash memory (32k) and Input voltage 7-12v.



2.3 Technical specifications:

- The voltage that is related to input and also for input is 7-20 volts.
- Amount of current that it gives at output is 50milliampere at 3.3 volt pin.
- It has SRAM of 2 kilobytes.
- It has flash memory of 32 kilobytes.
- It has 1kilobytes of EEPROM.
- Its clock speed is of 16 mega hertz.
- Its width is 53.4 millimeters.
- Its length is 68.8 millimeters.
- Its weight is 25 grams.

2.4 How power is supplied to arduino:

Power can be supply to the arduino through external power supply by USB connection. AC to DC adopter is used for non universal serial port connection.

Following pins supply power to arduino

- V_{in}

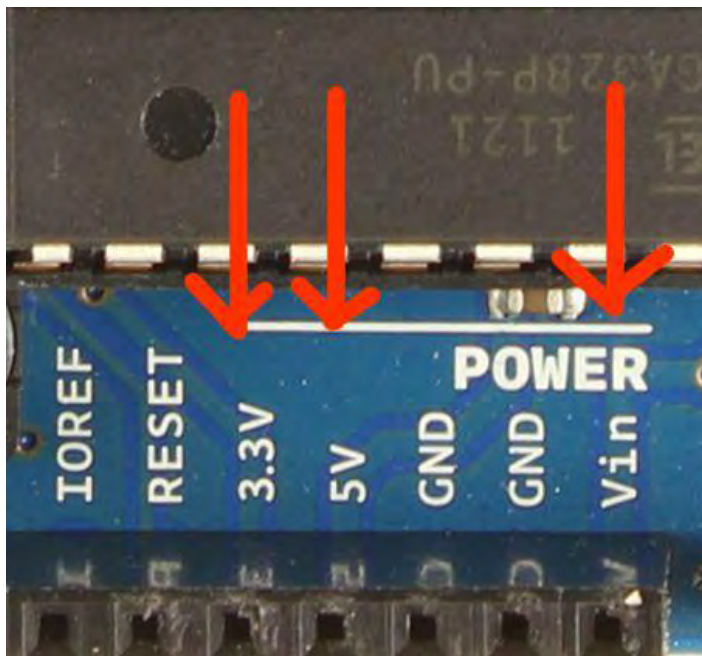
The entered voltage deliver to board for the outside deliver of energy

- 5_{volts}

It gives outside energy of 5volts from the arduino and apply voltage via 5 volt instead of 3.3 can damage device.

- 3.3_{volts}

50 miliampere is generated by 3.3 volts and drawn by regulator board.



2.5 Output relates pins and input related pins configurations:

- Arduino pins are as a matter of course arranged as sources of info, so they cannot be used as with pinMode() when you are utilizing them as information sources. Pins designed in this state are called as high-impedance state.
- Pins designed as yield with pinMode() are known as a low-impedance state. This implies they can give some measure of current to different circuits. This is sufficient current light up the LED, or run numerous sensors however this current isn't sufficient to run transfers, solenoids, or engines.

- Attempt to generate high current from the output pins to run the device that work on high current, it can harm the output transistors in the stick, or may harm the whole ATmega chip.

PinMode()function Syntax:

```
Void setup(){
pinMode (pin,mode);
}
```

1. Pin: the number of the pin whose mode you want to set.
2. Mode: input, output

- Digital write() function:

The digital write function is usually used to write a high or low value to a digital pin. If the pin been configured as output with pinMode() and its voltage will be set to the corresponding values of 5V for high, 0V for low.

- DigitalWrite() function syntax:

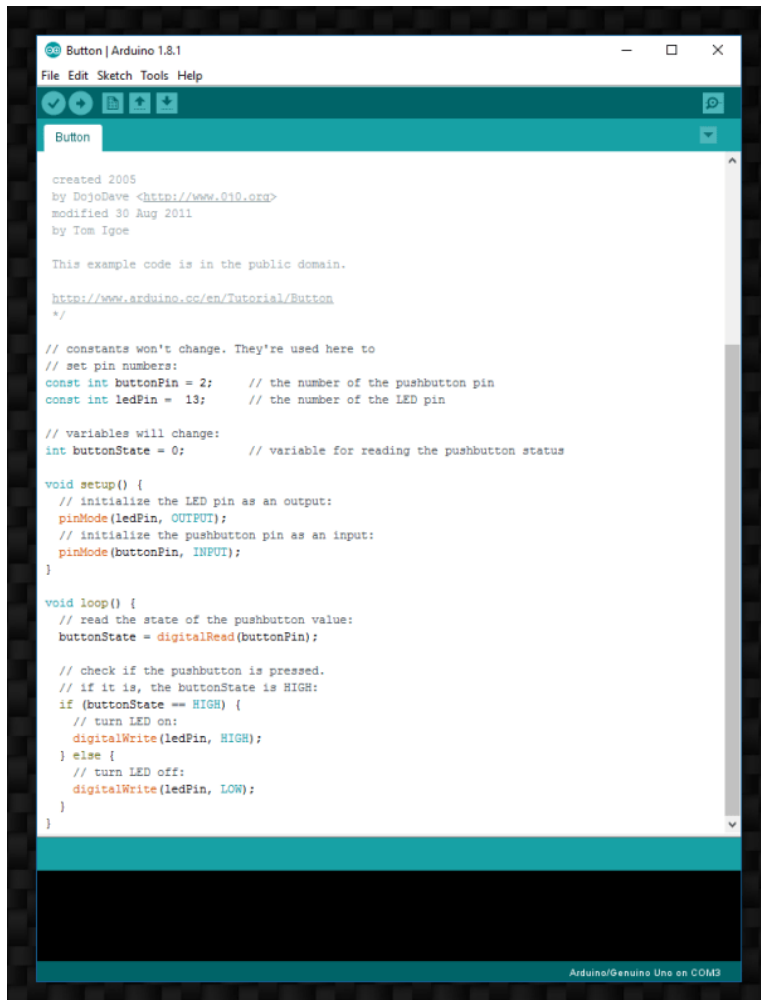
```
Void loop(){
Digitalwrite (pin, value);
}
```

Pin: the number of pins you want to set up.

Values: high/low.

2.6 Coding of the arduino:

Coding of the arduino is closely related to the programming of c language. Arduino programs are written on IDE. First of set the circuit after it we should transfer the program to the arduino. These arrangements of directions make the sketch to the arduino that what functions it will going to perform. The product that makes Arduino portrayals is known as the IDE represents Integrated Development Environment.



```
Button | Arduino 1.8.1
File Edit Sketch Tools Help

Button

created 2005
by DojoDave <http://www.010.org>
modified 30 Aug 2011
by Tom Igoe

This example code is in the public domain.

http://www.arduino.cc/en/Tutorial/Button
*/

// constants won't change. They're used here to
// set pin numbers:
const int buttonPin = 2;    // the number of the pushbutton pin
const int ledPin = 13;     // the number of the LED pin

// variables will change:
int buttonState = 0;       // variable for reading the pushbutton status

void setup() {
  // initialize the LED pin as an output:
  pinMode(ledPin, OUTPUT);
  // initialize the pushbutton pin as an input:
  pinMode(buttonPin, INPUT);
}

void loop() {
  // read the state of the pushbutton value:
  buttonState = digitalRead(buttonPin);

  // check if the pushbutton is pressed.
  // if it is, the buttonState is HIGH:
  if (buttonState == HIGH) {
    // turn LED on:
    digitalWrite(ledPin, HIGH);
  } else {
    // turn LED off:
    digitalWrite(ledPin, LOW);
  }
}

Arduino/Genuino Uno on COM3
```

Arduino sketch has two main parts of the program:

1. **Void set up ()** – in this we have to set some instructions that would not again needed to write.
2. **Void loop ()** – Contain the set of instructions that will be repeated over and over in the void loop until the board is turned off.

2.7 Connection of arduino with I293d:

1. 5 volts of motor driver is connected to 5 volts.
2. Ground of the motor driver is connected ground of arduino.
3. Pin 1 of the motor driver is connected with arduino pin that is D8
4. Pin 2 of motor driver is connected with arduino pin that is D9.
5. Pin 3 of motor driver is connected with arduino pin that is D10.
6. Pin 4 of motor driver is connected with arduino pin that is D11.

7. Terminals of motor driver are connected with arduino terminals.

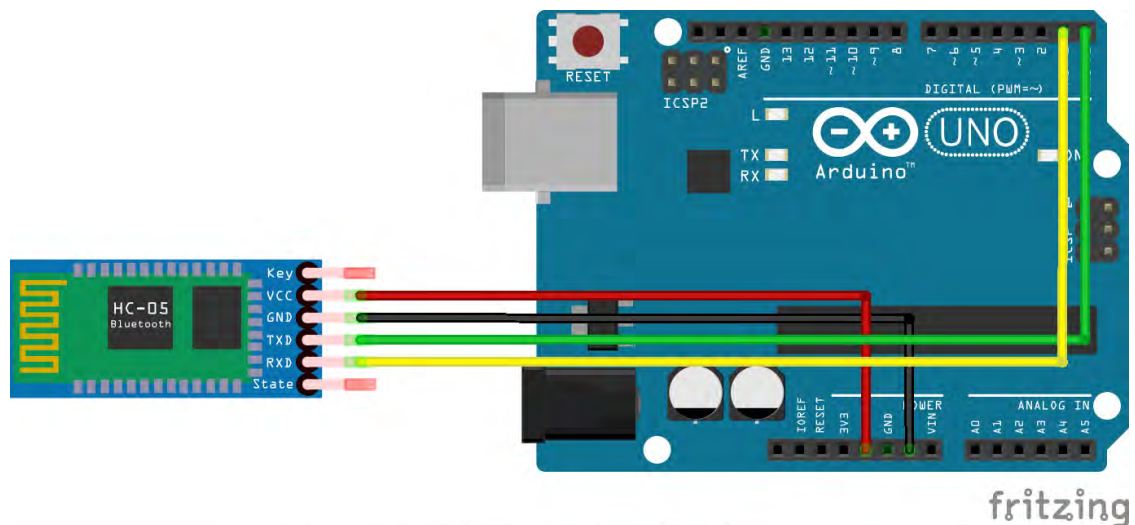
8. V_{SS} Power terminal of motor driver is connected with 9 volts of arduino

2.8 Correspondence of arduino with bluetooth that is utilized in undertaking:

Bluetooth is one of the well known remote correspondence innovations. It is well known on the grounds that low power utilization, minimal effort and a light in weight yet its range is restricted.

Arduino pins connections with Bluetooth Pins

- RX(Pin0) with TX
- TX(Pin 1) with RX
- 5V with VCC
- GND with GND



Code for Controlling 1 DC Motor:

```
//Arduino Bluetooth Controlled Car//
```

```
#include <AFMotor.h>

//initial motors pin
//AF_DCMotor motor1(1);
//AF_DCMotor motor2(2);
AF_DCMotor motor3(3);
AF_DCMotor motor4(4);

char command;

void setup()
{
  Serial.begin(9600); //Set the baud rate to your Bluetooth module.
}

void loop(){
  if(Serial.available() > 0){
    command = Serial.read();

    Stop(); //initialize with motors stoped

    //Change pin mode only if new command is different from previous.

    //Serial.println(command);

    switch(command)
    {
```

```
case 'F':
    forward();
    break;
case 'B':
    back();
    break;
case 'L':
    left();
    break;
case 'R':
    right();
    break;
}
}
}

void forward()
{
    // motor1.setSpeed(255); //Define maximum velocity
    // motor1.run(FORWARD); //rotate the motor clockwise
    // motor2.setSpeed(255); //Define maximum velocity
    // motor2.run(FORWARD); //rotate the motor clockwise
    motor3.setSpeed(255); //Define maximum velocity
    motor3.run(FORWARD); //rotate the motor clockwise
    motor4.setSpeed(255); //Define maximum velocity
```

```
    motor4.run(FORWARD); //rotate the motor clockwise
}

void back()
{
    // motor1.setSpeed(255); //Define maximum velocity
    // motor1.run(BACKWARD); //rotate the motor anti-clockwise
    // motor2.setSpeed(255); //Define maximum velocity
    // motor2.run(BACKWARD); //rotate the motor anti-clockwise
    motor3.setSpeed(255); //Define maximum velocity
    motor3.run(BACKWARD); //rotate the motor anti-clockwise
    motor4.setSpeed(255); //Define maximum velocity
    motor4.run(BACKWARD); //rotate the motor anti-clockwise
}

void left()
{
    // motor1.setSpeed(255); //Define maximum velocity
    // motor1.run(BACKWARD); //rotate the motor anti-clockwise
    // motor2.setSpeed(255); //Define maximum velocity
    // motor2.run(BACKWARD); //rotate the motor anti-clockwise
    motor3.setSpeed(255); //Define maximum velocity
    motor3.run(FORWARD); //rotate the motor clockwise
    motor4.setSpeed(255); //Define maximum velocity
    motor4.run(FORWARD); //rotate the motor clockwise
```

```
}

void right()
{
// motor1.setSpeed(255); //Define maximum velocity
// motor1.run(FORWARD); //rotate the motor clockwise
// motor2.setSpeed(255); //Define maximum velocity
// motor2.run(FORWARD); //rotate the motor clockwise
motor3.setSpeed(255); //Define maximum velocity
motor3.run(BACKWARD); //rotate the motor anti-clockwise
motor4.setSpeed(255); //Define maximum velocity
motor4.run(BACKWARD); //rotate the motor anti-clockwise
}

void Stop()
{
// motor1.setSpeed(0); //Define minimum velocity
// motor1.run(RELEASE); //stop the motor when release the button
// motor2.setSpeed(0); //Define minimum velocity
// motor2.run(RELEASE); //rotate the motor clockwise
motor3.setSpeed(0); //Define minimum velocity
motor3.run(RELEASE); //stop the motor when release the button
motor4.setSpeed(0); //Define minimum velocity
motor4.run(RELEASE); //stop the motor when release the button
}
```

Arduino commands used:

- `command = Serial.read()`
- `Serial.println(command);`
- `switch(command)`

CHAPTER 3

Bluetooth module HC-05:

3.1 Introduction:

This device transfer or gets data remotely. HC-05 Bluetooth Module use Bluetooth SPP (Serial Port Protocol) module. It is the way through which sequential data makes a smooth connection with the device. HC-05 Bluetooth module has excellent modes which may be master and slave mode

Specifications of bluetooth module:

- input voltage DC 5V
- communication method: Serial communication
- master and slave mode can be switched as needed



3.2 Pin description:

- V_{cc} its connection is with 5 volts.
- GND its connection is with GND .
- TXD $UART_TXD$ is sending signal or information sending pin it is connected with other device with RXD pin.
- RXD $UART_RXD$ is the receiving signals pin or receiving information pin that is connected with other device TXD .
- KEY is the mode that is related with the communication.
- If the input information pin is on the module is AT mode.



3.3 Sub components:

Blue board of module on this all the sub-components soldered.

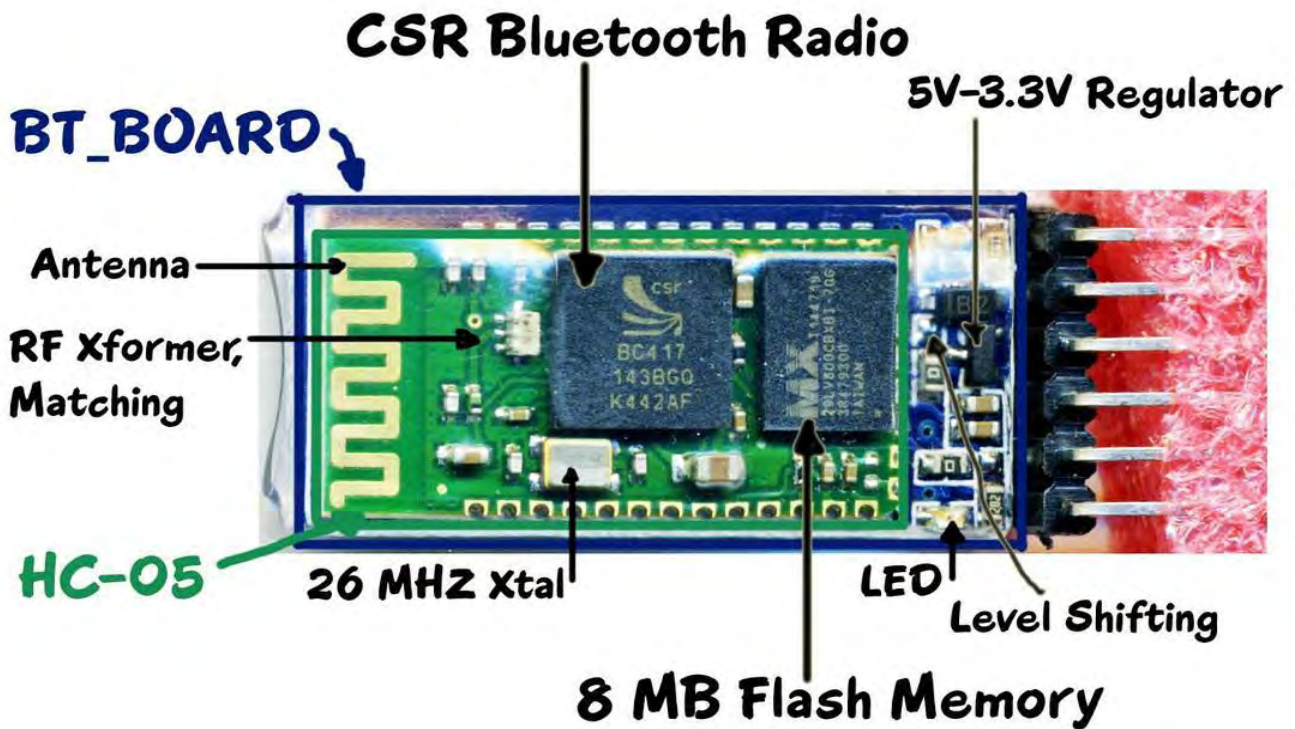
- Power pins.
- Memory chip.
- Antenna.
- Radio chip Bluetooth.
- Voltage regulator (5 to 3.3 volts).
- 6 MHz crystal.

3.4 Benefits of HC-05

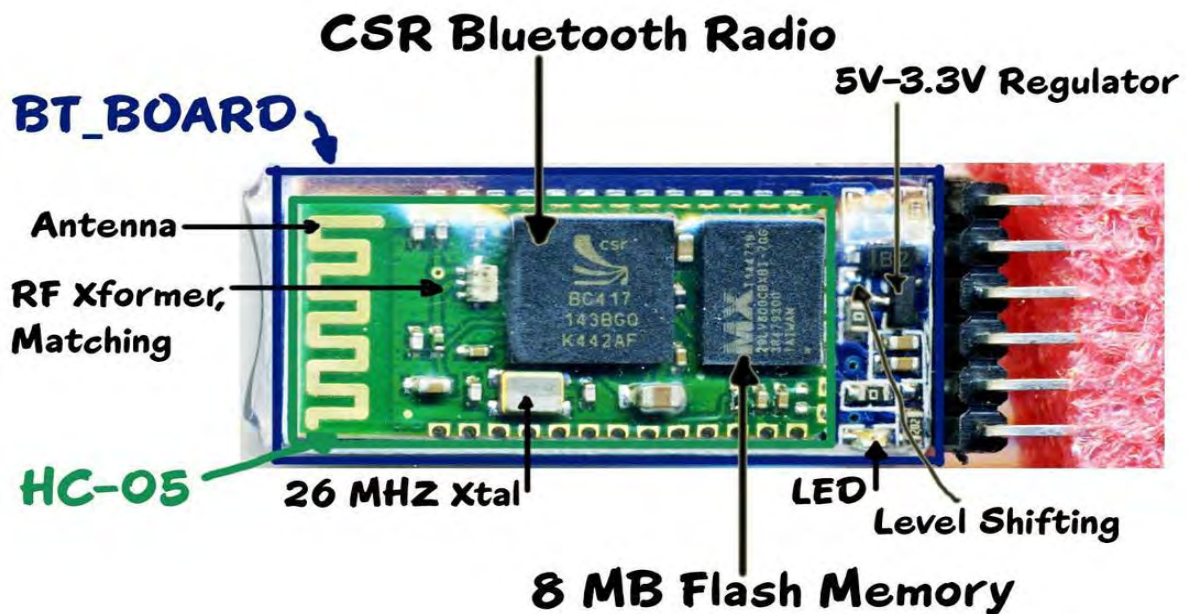
It is cost effective due to low cost packages. It is not temperature sensitive. It operates on only with the power supply without it cannot perform its functions.

Default settings HC-05.

- Default password or code is 1234
- Default mode of communication is slave mode
- Default mode is data mode
- Default baud rate 9600
- Command mode baud rate 38400



Bluetooth module figure 2



3.5 bluetooth module connection with Arduino:

The hardware connection of pins of HC-05 with Arduino Uno

- V_{cc} Is connected with arduino 5 volts.
- GND Is connected with GND of the arduino.
- TXD $UART_TXD$ Sending signal or information sending pin it is connected with arduino with RXD pin.
- RXD $UART_RXD$ Is the receiving signals pin or receiving information pin that is connected with Arduino TXD .
- KEY Is the mode that is related with the communication?
- If the input information pin is on the module is *AT mode*.

3.6 Pair HC-05 and Smartphone:

It is use for creating communication between two Bluetooth devices. 1st we have to pair HC-05 module to Smartphone.

1. Go to the settings click the settings and pair your android device
2. Set the code 0000 or 1234.

3.7 Modes of HC-05:

Modes of communication are two Data mode and command mode

Working of HC-05:

It has two working modes one is the data mode. The setting can be changed according to the need from AT mode command in the settings. It transfer and get back the information or signals from other bluetooth holding device. And both of the two modes can be utilized. When the power or energy is supplied to it ,it will go to the command mode when it get power it will find the new bluetooth device that is near to it then it will ask for the password that is 1234 and start working on the commands that are given to it

Chapter 4

Dc Motor driver L293D

4.1 Introduction:

L293D is an ordinary Motor driver which permits DC motor to transport in any direction. L293D can control two dc motors movement simultaneously in any direction. It means that you can control two DC motor with a single L293D IC. Here is H Bridge in one L293D that manage the rotation of DC motors independently. H-bridge is truly a circuit that creates voltage and that voltage can drift everywhere. It's far very a good deal used in robotic utility for controlling DC motors because of its size.

4.2 Working of motor driver L293D:

In L293d there are 4 pins 2 on left and a pair of one right on left face there's 2,7 pin and on right side there may be 15,10 pin. Left hand side pins that are related to input will manage the movement of left aspect and right aspect will manage the motion of opposite to left side. The logic that is related to the input 0 and 1 apply on all the pins through which the motors can be control may be take care of the motion of the robot. Likewise the motion of the other is to pivot the robot in the clockwise way the pins that are related with the input will apply of logic opposite to the above logic. Pin one and nine should be enabling may excessive for starting up operation of the motors. When an allow input is high, the related driver gets enabled. As a result, the output will be energetic and running of the output and input would be in-section. Similarly the driver input will disable the inputs must not be enable and their outputs may be not in the on state and could be within the state of impedance that will be high.

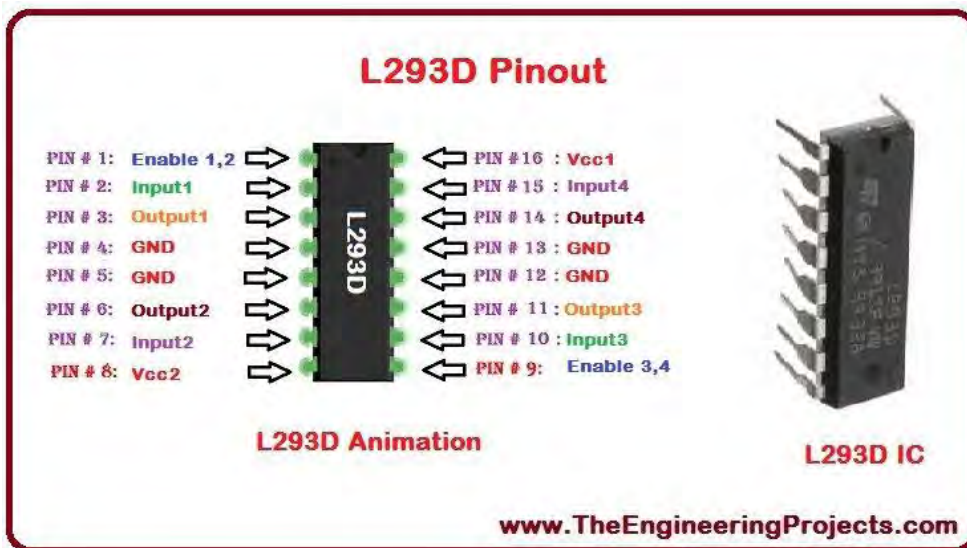


Figure of motor driver 1

4.3 pattern of pins arrangement:

- L-293D has total 16 pins all has different functions.
- All of these sixteen pins has their serial numbers .

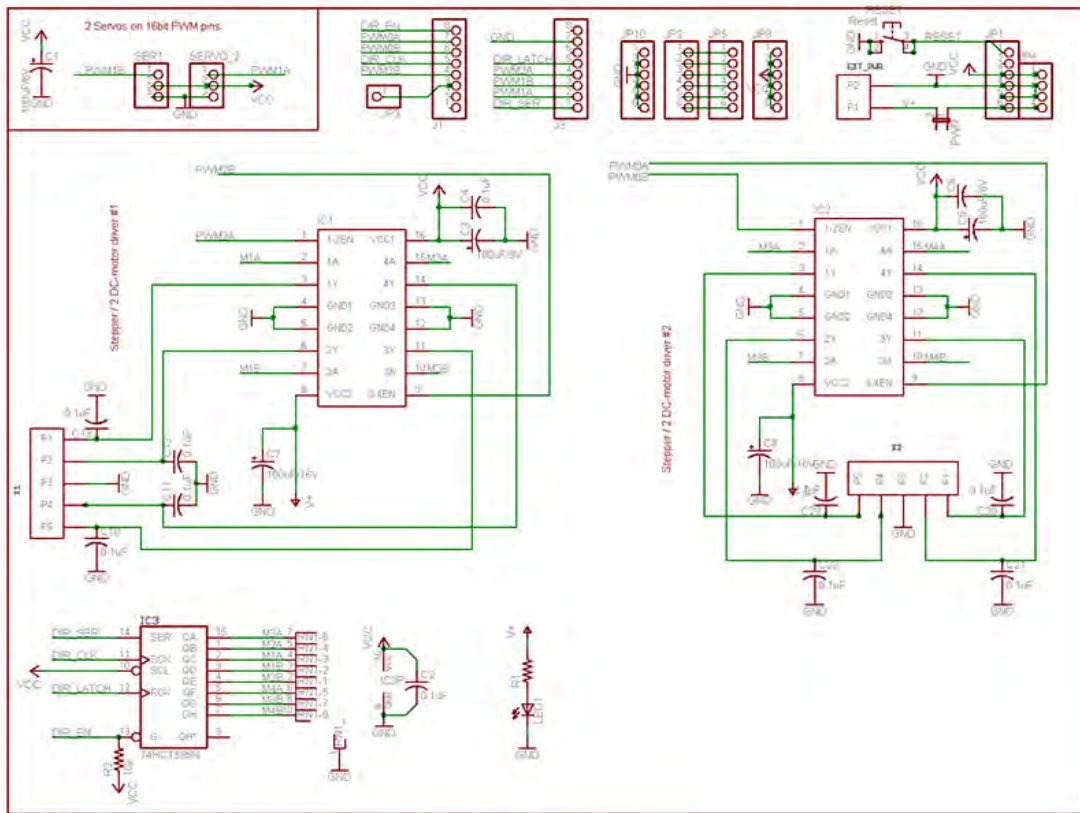
4.4 Pins functions:



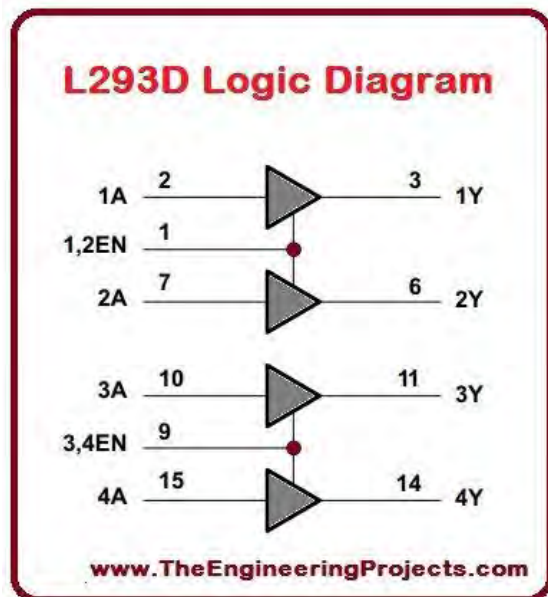
As the above diagram shows the total pins that are on the motor driver IC all have different function and perform the corresponding functions accordingly.

- Number 1 pin is related to the enabling of 1, 2 respectively
- Number 2 pin is related to the input.
- Number 3 pin is related to the output.
- Number 4 pin is related to the ground that is *GND*.
- Number 5 pin is also related to ground that is *GND*.
- Number 6 pin is related to the second output.
- Number 7 pin is related to the second input.
- Number 8 pin is related to second supply of power that v_{cc2} .
- Number 9 pin is related to the second enable that is 3, 4.
- Number 10 pin is related to the third input.
- Number 11 is related to the third output.
- Number 12 is related the ground that is *GND*.
- Number 13 is also related to the ground that is *GND*.
- Number 14 is related to the fourth output.
- Number 15 is related to the fourth input
- Number 16 is related to the supply of power that is v_{cc1} .

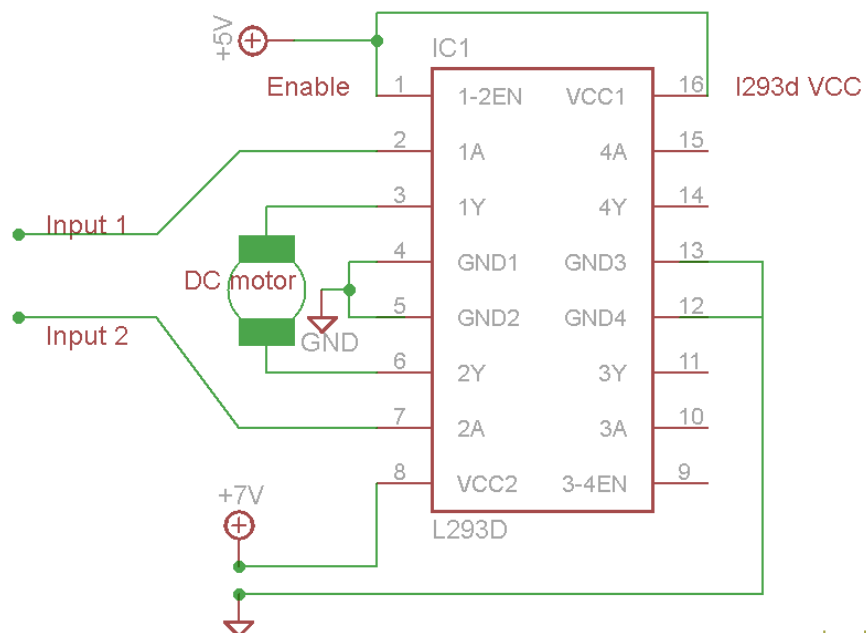
4.5 representational diagram of I293d:



4.7 Logic table:



4.8 internal diagram of motor driver:



4.9 Voltage specifications:

The voltage required to perform the operations is 5V by Vcc pin.

This voltage is not used by L293d for rotation of motors. For the driving of motors there is another. That means the approach if we need to apply voltage of 9 volts then we have to apply it on V_{SS} separately.

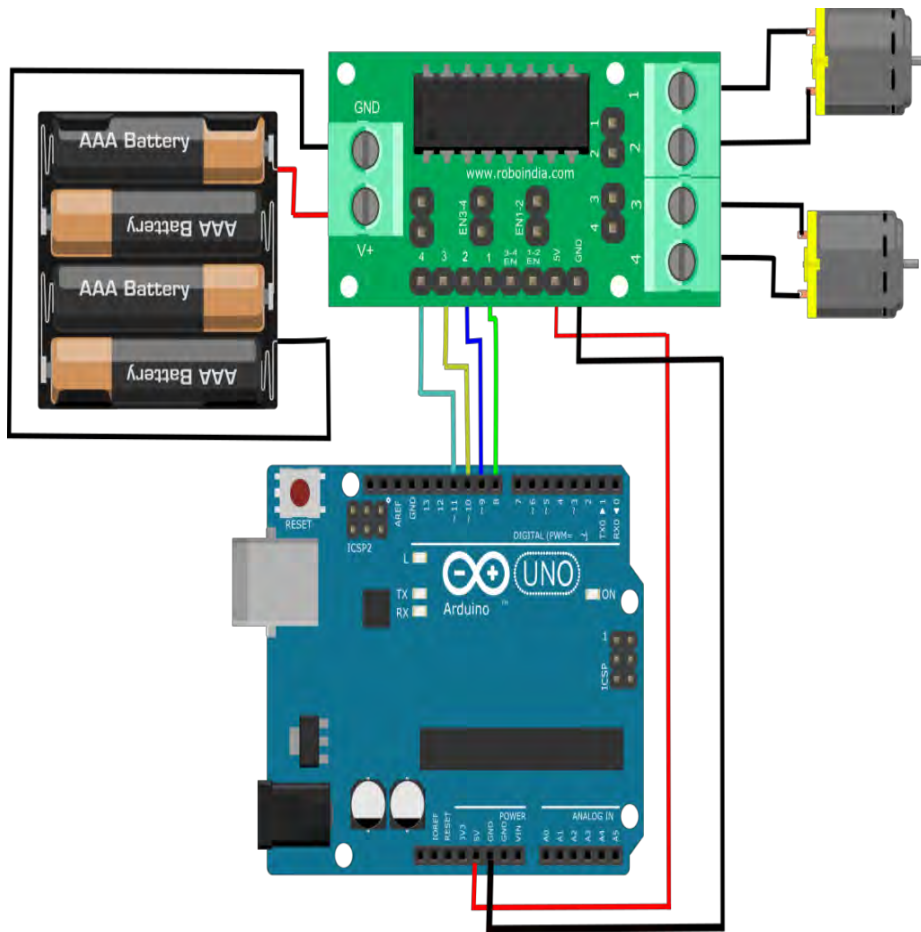
The amount of the voltage that is greater than the motor driver gives at its output is 36 volts that is delivered by V_{SS} . The amount of the current that is maximum, supplied by it is of 600mA in line with channel.

VCC pin sixteen is the voltage for its personal inner Operation. Commonly the range of the voltage minimum is 5 volts and maximum is 36 volts.

Voltage higher than 36 volts can damage your device.

4.10 Connections with arduino:

1. 5 volts of motor driver is connected to 5 volts.
2. Ground of the motor driver is connected ground of arduino.
3. Pin 1 of the motor driver is connected with arduino pin that is D8
4. Pin 2 of motor driver is connected with arduino pin that is D9.
5. Pin 3 of motor driver is connected with arduino pin that is D10.
6. Pin 4 of motor driver is connected with arduino pin that is D11.
7. Terminals of motor driver are connected with arduino terminals.
8. V_{SS} Power terminal of motor driver is connected with 9 volts of arduino.



4.11 Working in project:

The fourth pin that is related to the input of motor driver IC, stick 2, 7 on the opposite of left side pins and pins 15, 10 on the side opposite to right. Left information pins will manage the movement of the dc engine of left associated side, and right contribution for engine control the movement of the right associated side. The engines are pivoted based on the data sources gave over the information to the related pins of input and output as 0 and 1 according to logic. We should work in a simple way and apply just 0 and 1 according to the logic to drive the robot.

Chapter 5

Dc motors

5.1 Introduction:

DC motors are the machine that runs electrically and changes over electrical vitality into mechanical vitality. These Electric engines that are being controlled by direct flow (DC) sources are called direct current operated machines. The main DC electric engine fit for turning apparatus was imagined by British researcher William sturgeon in 1832. Firstly it was unsuccessful. Fundamentally it was of surprising expense so it was industrially fruitless. An advantage came from these types of machines that are electrically operated; after the disclosure of the reversibility of electric machine the working was proceed on improving productivity of the machine. Today, electric engines devour the greater part of the electric vitality created in the US. A DC engine's speed can be controlled over in the range that is wide enough, utilizing either a supply of the voltage that is vary and by change which can be done in the field windings that is change in the amount of the current. Little DC engines are utilized in instruments, toys, and apparatuses.

5.2 characteristics of DC motors:

- Voltage that is applied for the device to be in operating mode is 4.5-9volts.
- The voltage rate that is recommended to be in the operating mode is 6 volts
- Maximum amount of the current with no load, the amount is of 7 miliampere.
- The amount of the speed when there is no load is 9000 revolutions per minute.
- The amount of the current in case of load is approximately 250 miliampere.
- Standard weight of the dc operating machines is 25 grams.

5.4 Direction of rotation:

Counter clockwise when survey from the output of the end of the shaft. With positive voltage connect it the positive terminal.

5.5 DC Motor Principle:

The activity depend upon the rule that when the current carrying conductor is set in a district of attractive field. The conductor encounters a mechanical power. That bearing is indicated by this left hand rule. That is commonly known as Fleming left hand rule

Fleming Left Hand Rule

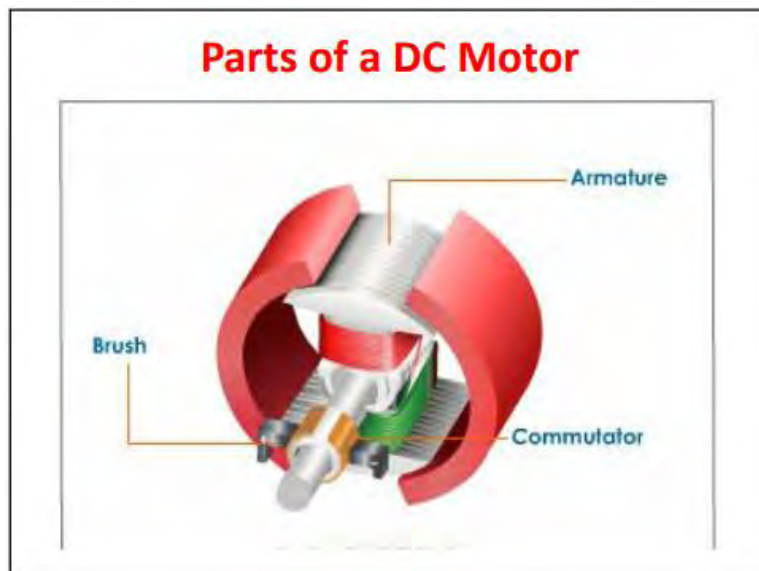


5.6 Parts of a DC Motor:

There are six parts of dc motor but mainly there are three parts which are very important for the operations.

Following are the main parts

- 1 part is armature
- 2 part is commutator
- 3 part is brush



5.8 Types of dc motors:

There are three types of dc motors

- First type is series type wound that is used in our project.
- Second type is shunt type wound.
- Third type is compound type wound.

But in our project we use only series wound

5.9 major equalities of DC motor:

Let in a dc motor

V_{ap} = voltage that is applied and related to the input

E_b = force that is electromotive force (back).

R_a = resistance that is related to the armature.

I_a = current that is related to the armature.

Electromotive force is contrary in course to carried out voltage the total voltage is V_{eb} . Current of the armature I_a is known as voltage equation of the dc motor.

$$I_a = \frac{V - E_b}{R_a}$$

$$V = E_b + I_a R_a$$

5.10 Condition for Maximum Power:

Power delivered by the DC operating machine that is of mechanical type $P_m = E_a I_a$.

hence, V and R_a values are according to the standard that cannot be changed, the energy created by the motor mainly depend upon the values of current that are related to the armature. This ratio dP_m/dI_a will be 0

Therefore $E_b = V/2$ it should be half of the supply of the power.

5.11 Armature Torque of a DC Motor:

Turning snapshot of the power is called torque about a pivot point and estimated by the result of power and range or radius at the point where power demonstrated $T = F \times R$

5.12 dc motors losses:

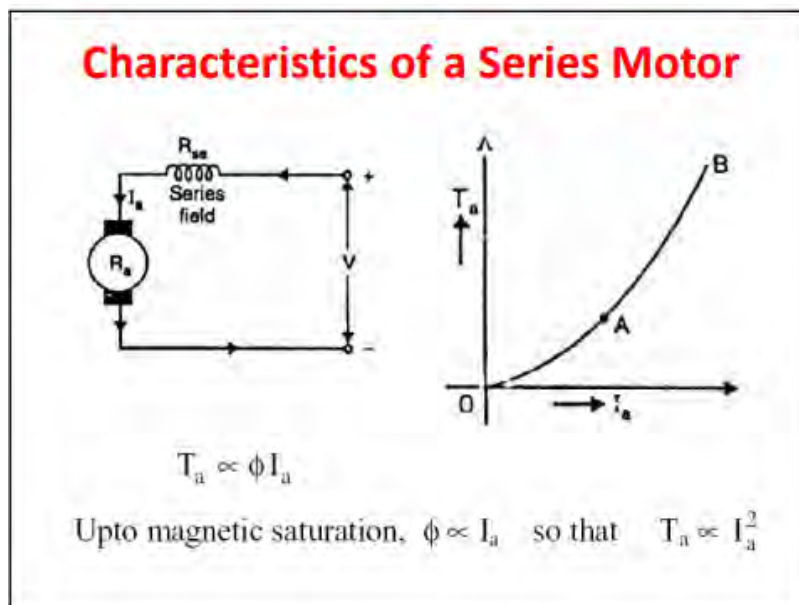
The proficiency of a dc engine is the proportion of yield control over the info control losses

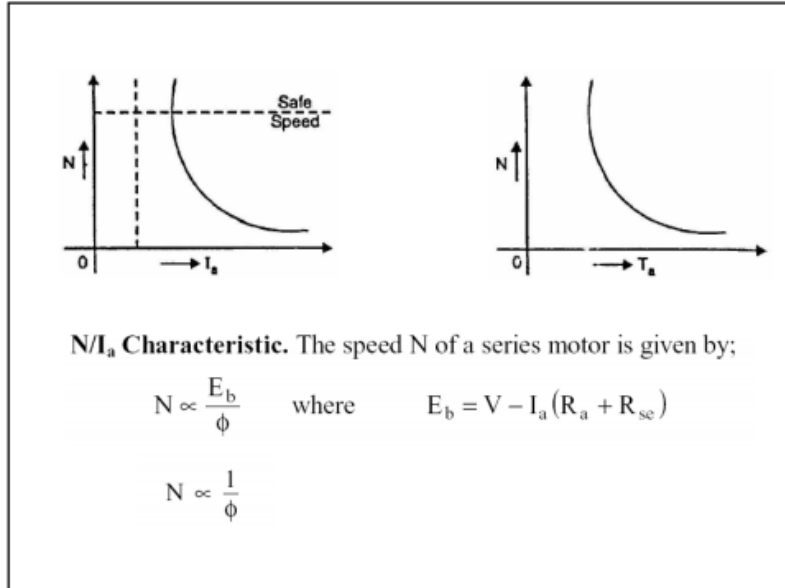
- Copper losses
- Machine losses
- Power losses

Efficiency = output /input×100

5.13 DC Motor Characteristic:

- **The amount of the current that is related to the torque and the armature their specifications are (T_a / I_a):**
The bend that lies among the current and torque of armature
- **the amount of the current in armature (N/I_a):**
The bend that lies among the current and speed of armature
- **the amount of the speed and the torque:**





5.14 Speed Control of DC Motor:

The speed of the engine can be vary with the following procedures

- Voltage controlling factors
- Flux controlling factors
- Armature controlling factors

5.14.1 Voltage controlling factors:

Source of the voltage that is supplied to the field of the current is not the same as that of voltage that is related to armature. These strategies give us a favorable position of speed guideline and great effectiveness that cannot be stayed away from the control in the armature in this technique. Be that as it may be it is very costly. Consequently this strategy of speed control is utilized for the enormous size engines.

5.14.2 Armature controlling factors:

This should be possible by fluctuating the voltage over the armature subsequently the back emf and the speed of the engine can be varied. By connecting the resistance that can be varied in the arrangement with the arrangement with the armature this strategy can be connected.

5.14.3 Flux controlling factors:

This should be possible by changing the amount of flux ϕ , the engine speed (N) can be change likewise that is why it is called flux controlling factor. In this strategy the resistor that can be varied is set in arrangement with the shunt field winding.

Speed of a DC Motor

$$E_b = V - I_a R_a$$

But $E_b = \frac{P\phi ZN}{60 A}$

$$\therefore \frac{P\phi ZN}{60 A} = V - I_a R_a$$

or $N = \frac{(V - I_a R_a) 60 A}{\phi P Z}$

or $N = K \frac{(V - I_a R_a)}{\phi}$ where $K = \frac{60A}{PZ}$

Speed of a DC Motor

But $V - I_a R_a = E_b$

$$\therefore N = K \frac{E_b}{\phi}$$

or $N \propto \frac{E_b}{\phi}$

Therefore, in a dc motor speed is directly proportional to back emf, E_b and inversely proportional to flux, ϕ .

5.15 DC motor working for robot:

In this robot in which arduino is used its working is identified with the development of the robot as per the info given by the client.

Chapter 6

9 volts Power

Introduction:

9 volt battery is typical size battery that was early presented for the radio transistors. It is rectangular fit as a fiddle with adjusted edges as spellbound snap connector at the top end. These sorts of batteries are utilizing in wakie talkies, and smoke alarms etc.

9 volt battery is accessible normally in the organization of essential carbon zinc and soluble science and battery is repowered type composed of nickel lithium ion.

6.2 Technical specifications:

According to the standard usually 9 volts are utilized in many experiments and also they are accessible

- Both terminals are separated by the distance of 0.5 inches
- In the inner side of battery there are 6 cells rounded and hollow from inside that are associated in arrangement.
- There are also kinds of batteries that have welded tabs inside append to the cell.

6.3 How the batteries can be tested and repowered again:

Most 9 Volt battery voltage test instruments and repowered instruments requires the clips that are called snap clips to lift up the batteries, the batteries which shapes are like the cylinders their size can varied. One formal method to test the voltage the reason due to the terminals which are both \pm that are present at the top of the batteries it can be test by placing the tongue between the two terminals. A strong tingle will indicate a battery is charged, the absence of the tingle a discharged battery.

6.4 Connectors:

There are two terminals in normal batteries. Little one roundabout terminal is certain, and other terminal is bigger and the shape of that terminal is like hexagon is negative. The little one is associated with the bigger one and the other way round.

A similar snap-style connector is utilized on the other battery types in the power pack arrangements. Battery polarization is typically one guided since mechanical association is normally just conceivable in one step.

The main issue is that it is difficult to associate with two batteries together in a short out

Which rapidly release heat and perhaps a flame as a result of the risk batteries ought to be kept in the first bundling until they will be utilize.



6.5 determination states:

Details of batteries

- battery specification is alkaline in nature
- the amount of current drawn is 2.1 Ampere
- profundity: 17.0 mm
- stature 48.5mm
- width is 26.2 in millimeters
- capacity of battery is 50 miliampere
- grams of weight 44 grams

Voltage limits at 9 volts

6.6 Composition of 9 volt battery:

AT the point external front of the battery is expelled there will be six cells associated in arrangements packaged together additionally contained additionally contained warmth contracting tubes every cell is of 1.5 volts so 1.5 multiplied with 6 gives 9 volts. Since everyone of the cell are in associated arrangement but current rating is same for every one of the cell is valued at 2.1 amp with the vitality limit is 550 milliampere hours. Inside the cell there is zinc powder that has astounding electrical properties



6.7 How batteries work:

To apply voltage to any circuit the simplest method is via battery source. There are also other ways through which energies can be provided like AC adaptors that transform light source from sun into voltage source when we give certain amount of current to them. The way through which we can utilize electrical energy into mechanical energy is only via battery.

Important things that are utilized for the presentation of battery one basic thing is electrolyte of two blend plates made out of recognized metal another thing that is also essential is the significant working of two plates comprised of various metals and exceptional substance that is electrolyte. The metal plates are plunge into the arrangement of electrolyte the metal respond to the electrolyte and produce the progression of charges that will begin amassing on the negative plate called as the anode. The positive charges will collect on the second plate called cathode. Accordingly the voltage is created between two plates.

These plates are associated with the outside terminal through which we can interface a circuit that reason the current to stream.



Cylindrical batteries come in four standard sizes:

- 1 standard is AAA
- 2 standard is A
- 3 standard is C
- 4 standard is A/ B

Every one of the cells is of identical voltage but these batteries can give 1.5V of each only distinction is of size. Enormous size batteries can provide increasingly current

Chapter 7

Working mechanism

In the previous chapters we will discuss about all the technical details of our project. In this chapter we discuss about the working mechanism of Bluetooth control robot. Its transmission of signals from application that is installed in the Android device and its receiving end its Bluetooth module that receives the desired signals and through programming of the Arduino it will work.

7.1 Bluetooth control robot:

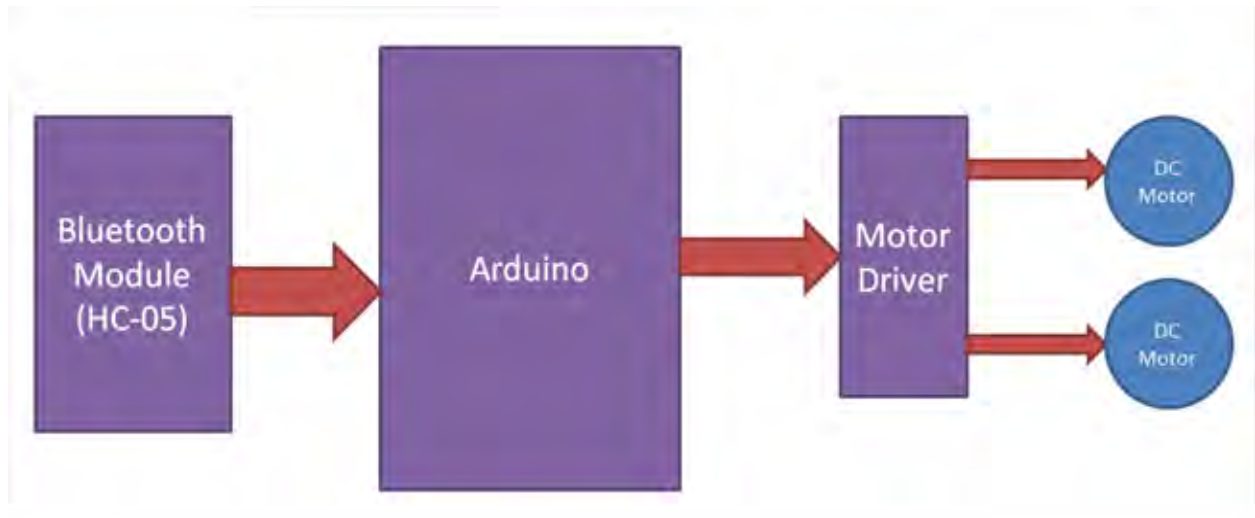
It is simple kind of car. We named it bluetooth control car because it is moved and controlled by the bluetooth module using an android application and signals can be receive by HC-05 and it is attached with the receiving device that is Arduino and motor driver and through the instructions from the application its motion can be controlled.

7.2 Hardware description:

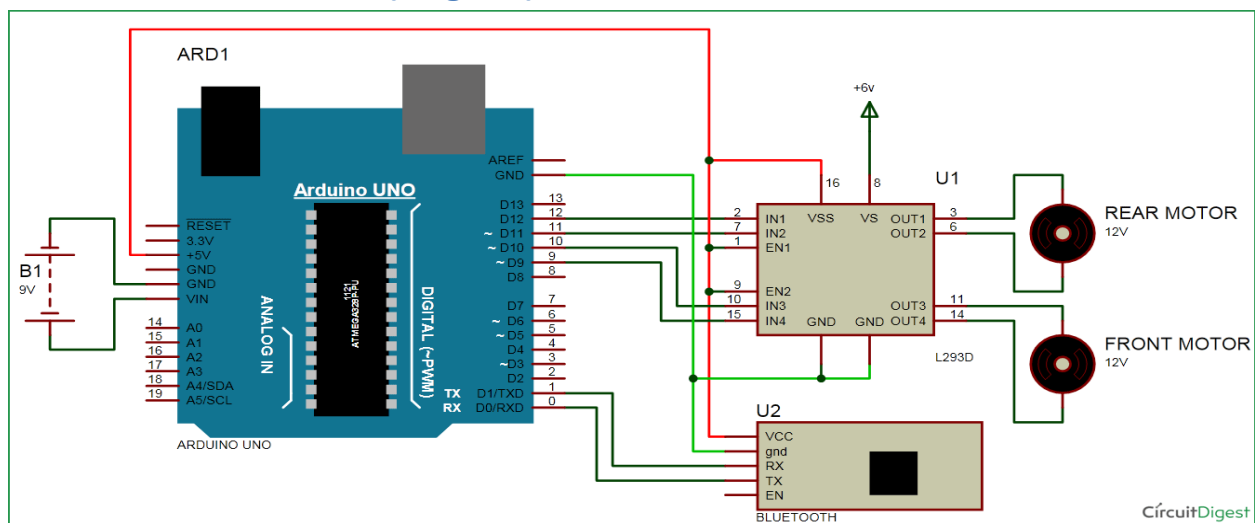
7.2.1 Components used in this project:

- 1 component is Arduino Uno
- 2 component is HC-05
- 3 component is L293D
- 4 component is supply of the power source
- Dc motors

7.3 blocks representation:



7.4 connection of circuit (diagram)



7.5 Connection of components:

7.5.1 Arduino Uno:

Arduino is actually the Brain of this car and it is loaded by the program written by in the programming language that is like c language for the required functioning of the car and it is directly connected with the Bluetooth module.

7.5.2 Connection with Bluetooth module:

The connection of module with the Arduino is quite easy.

- Firstly we connect the V_{cc} with the 5 volt input pin of the arduino.
- Secondly we connection of GND with the ground of the arduino uno.

- *RX* pin with the arduino pin that is *TX*. and vice versa
- *Dout* pin with the arduino *D_o*
- *Din* pin with arduino *D1* pin

7.6 Bluetooth module HC-05:

The bluetooth HC-05 module is used for giving connection between the robot and device like cell phones and PC and some are utilizing bluetooth it is the remote connection that is intended for the low power device it is the proper connection principle that has no need dependence of frequencies since it utilize (MAC)address of this device. Its modulation is 2.4 GHz radio transceiver and baseband to utilize bluetooth module with arduino associate v_{cc} to 5 volts yield on the arduino ground pin to ground, receiver with transceiver pin, and *Dout* with *d0* this connection is connected and *D_{in}* and *D1* are also connected. This is used here because it provides bidirectional current up to 1 A in the voltage range from 4.5 volts from and its terminals are separated. This can work in range of temperature 0 to 70 degree centigrade.

7.7 Connection of motor driver:

1. 5 volts of motor driver is connected to 5 volts.
2. Ground of the motor driver is connected ground of arduino.
3. Pin 1 of the motor driver is connected with arduino pin that is D8
4. Pin 2 of motor driver is connected with arduino pin that is D9.
5. Pin 3 of motor driver is connected with arduino pin that is D10.
6. Pin 4 of motor driver is connected with arduino pin that is D11.
7. Terminals of motor driver is connected with arduino terminals.
8. V_{SS} Power terminal of motor driver is connected with 9 volts of arduino

7.8 DC motors:

HC-05 module dc operated motor is constrain by the direct voltage and push ahead in reverse , left, right, following the commands given to it and corresponding voltage provided to it. Movement is done by DC motors. Utilization of motors (electric) is for the change of mechanical energy to electrical.

7.9 9-volt battery:

It is used to supply voltage to the car basically provide power. The VIN of the Arduino is connected with the positive terminal of the battery and the terminal that is negative of the

battery is attached with the pin of the arduino that is *GND*. It is use to power off and on of the Arduino Uno.

7.10 How to configure application with Bluetooth controller:

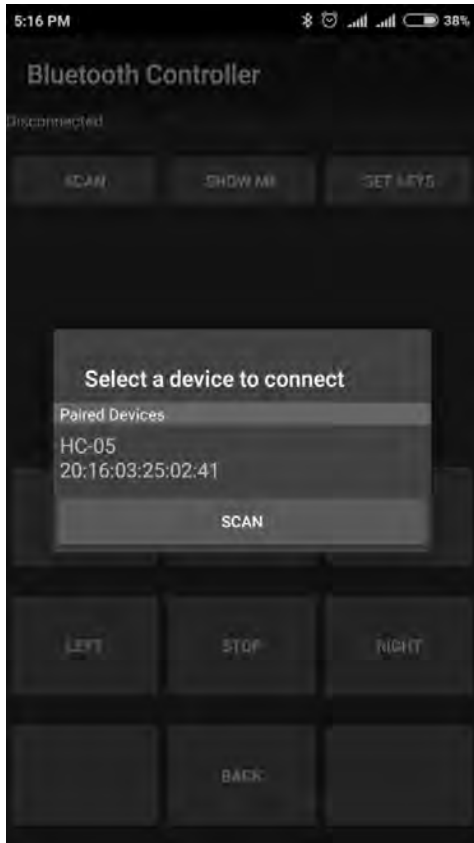
After downloading the app from Google playstore go to the settings. There are all the blanks are easily accessible.



Then we see the buttons and then by pressing the buttons there is an arrangement of keys will be shown then another tab will open then give names to the keys. *Forward, backward, left, right, stop* this content will catch following values 1,2,3,4,5 or A,B,C,D,E.... Press ok from the instructions



Bluetooth when connects with the android app as we discussed in the diagram after deliver it. It can pair with the HC-05 component. The secret code is "1234". After pairing we can discover it from the application on android device then "scan" should be pressed.



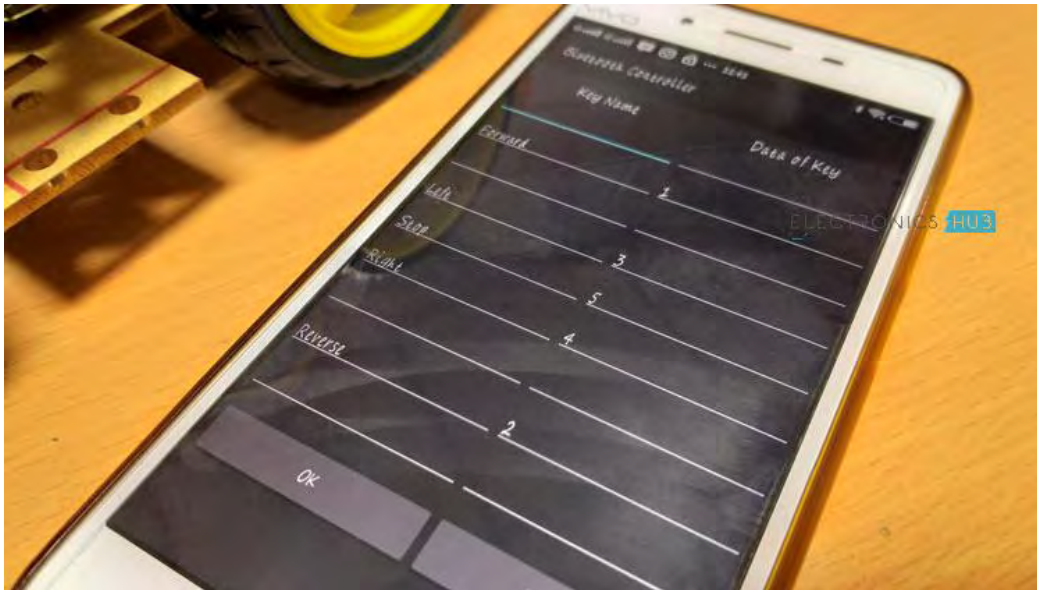


After the above process is completed! Then write the password to the AVR after it the robot can be controlled by the key words like 1,2,3,4,5 or A,B,C,D,E.

7.11 Software description:

7.11.1 Android app:

I even use a simple Android application that is established on Android cell phone to connect with bluetooth. It control module. After it the program that is written on the arduino will accompany with the information in the mobile application.

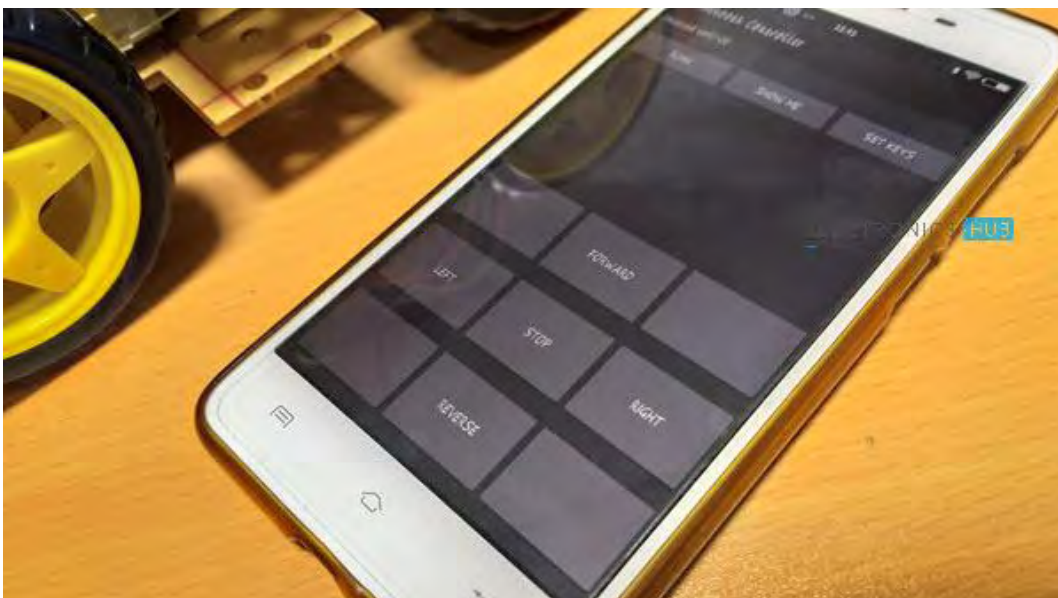


7.11.2 Working of the app:

Right off bat transfer the code to the arduino then the information is related with the comparing keys

- 1 key is for forward
- 2 key is for reverse
- 3 key is for left
- 4 key is for right
- 5 key is for stop

At the point when the key is pressed then the related information is forwarded to the module from the device to car.



Gathered information from bluetooth module to the Arduino and through the code plays out a straightforward switch tack, where each is relates with fitting guidelines for the motor driver input pins. For instance the forward key is pressed from the Android application at that point 1 is forwarded to the module and from here transmitted to the Arduino then instructions will pass to the motor driver and the operation is performed. Then arduino will make *in2, in4* as low or 0 and *in1* and *in3* as high or on to perform forward motion.

7.11.3 Limitations

There are certain limitations for the Bluetooth robot

- It has limited range of 10 meters because of Bluetooth communication
- Bluetooth module needs a specific range of power if the power is not sufficient then the module will not work or transmit data whether it paired.

7.11.5 Working Mechanism:

Revolving of motors or engines depend upon input mechanism (pins). Motor is associated with the left pins of IC will turn as per following ways when input is on or high

Chapter 8

Discussion and conclusion

It is a simple project model it can be use in several ways and also improved in many ways I have faced some problems in designing this robot.

8.1 Problems faced during configuration and implementation of robot:

I have use Bluetooth module HC-05 this create problem during configuration with the Android application it create problem during scanning and entering the password but download the appropriate application from the play store its link is given below. There is a distinction between HC-05 and HC-06. In HC-06 there is only one mode we cannot switch from one mode to another. But in HC-05 we can switch the modes of master and slave mode. Also save the address of the slave or master device to pair them again and again. Also there is a problem in loading the program in the arduino several times changing were done in it also when power is supply to it when terminals were wrongly connected they can damage the device when terminals were connected wrongly

8.2 Suggestions and improvements:

The suggestion for the Bluetooth module is that it is easy to use HC-05 instead of HC-06 because both of them has same functions but only difference is of the modes switching we can easily switch from master to slave mode. And during the configuration of Android application and module download the latest application from the play store and configure it as the instruction are given above. Downloading the program from the Google may create error during the procedure when we load the program to the arduino write your own code and compile it then load it to the arduino. Be careful during the circuit designing do not attach the opposite terminals to the arduino it can damage the device.

8.3 Future implementations:

A camera can be mounted on the robot for the purpose of surveillance and spying and utilize even in evening by utilizing infrared lightening. It can also be used in home automation, for the long battery time use the microcontroller and attach it with the arduino it work for long time. Alarm can be mounted and use for the security purpose when it feel any movement or hurdle it beep the alarm hence use for the security purpose Arduino Nano can be used to reduce the size

of the project and instead of motor driver only IC of the driver can be used to reduce the size. Also use in for the military purpose. Gestures control can also be added using accelerometer and microcontroller to this robot.

8.3 Conclusions:

The working of car is controlled by using Android application, which can create powerful remote control program. This working frame is utilizing the program and further more require the bluetooth association. This has demonstrated the importance for two way communication between the Android and car which would permit to cooperate with and change the setting the framework which we use. Remote control is one of the most significant and essential requirement for everyone in the era of growing technology. In any case our undertaking for mechanical control requires Android cell phones which are financially safe and its segments are easily accessible. For this reason the android versatile user need to introduce a planned application on this portable android device. My goal is keen living control and frameworks through the bluetooth as the Android devices are amazing and effective to control.

8.4 References:

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