

ANDROID CONTROLLED ROBOT USING BLUETOOTH

AN INDUSTRIAL INTERNSHIP TRAINING REPORT

Submitted by

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17BEC1195

ECE3099 – INDUSTRIAL INTERNSHIP

in partial fulfillment for the award of the degree of

BACHELOR OF TECHNOLOGY

in

ELECTRONICS AND COMMUNICATION ENGINEERING



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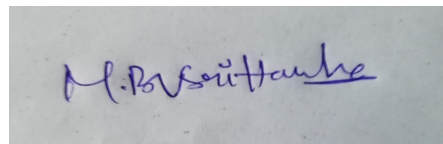
OCTOBER 2020

School of Electronics Engineering

DECLARATION BY THE CANDIDATE

I hereby declare that the Industrial Internship Report entitled " **ANDROID CONTROLLED ROBOT CAR USING BLUETOOTH MODULE** " submitted by me to VIT, Chennai in partial fulfillment of the requirement for the award of the degree of **Bachelor of Technology** in **Electronics and communication**

Engineering is a record of bonafide industrial training undertaken by me under **E.C.I.L , Hyderabad**. I further declare that the work reported in this report has not been submitted and will not be submitted, either in part or in full, for the award of any other degree or diploma in this institute or any other institute or university.



Chennai

Signature of the Candidate

Date: 18-10-2020

Register Number: 17BEC1195

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कम्प्यूटर शिक्षा प्रभाग / COMPUTER EDUCATION DIVISION



PROJECT / INTERNSHIP COMPLETION CERTIFICATE

Date: 18/06/2019

This is to certify that **Mr. M.B.V SRI HARSHA** bearing Reg.No:17BEC1195 a student of **VELLORE INSTITUTE OF TECHNOLOGY, CHENNAI** pursuing the Degree of **B.Tech.**, in Electronics and Communication Engineering, has carried out Project work / Internship titled "**ANDROID CONTROLLED ROBOT USING BLUETOOTH**" in "**EMBEDDED SYSTEMS**" under our guidance during the period from **06/05/2019 to 05/06/2019** in partial fulfillment of the requirements for the award of the above mentioned Degree. The student is punctual, hardworking and shown keen interest to produce the project output and results.

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BONAFIDE CERTIFICATE

This is to certify that the Industrial Internship Report entitled “ **ANDROID CONTROLLED ROBOT CAR USING BLUETOOTH MODULE**” submitted by **M B V SRI HARSHA (17BEC1195)** to VIT University, Chennai in partial fulfillment of the requirement for the award of the degree of **Bachelor of Technology** in **Electronics and communication Engineering** is a record of bonafide internship undertaken by him/her fulfills the requirements as per the regulations of this institute and in my opinion meets the necessary standards for submission. The contents of this report have not been submitted and will not be submitted either in part or in full, for the award of any other degree or diploma in this institute or any other institute or university.

Signature of the Examiner

Date:

ACKNOWLEDGEMENT

I wish to thank those who were involved in the successful completion of my internship at (E.C.I.L), starting from the deputy general manager, for giving me the opportunity and freedom to learn as per my interests; the head of the team at E.C.I.L, for being a constant support and guidance; the project lead for my internship, Sr.Manager (Electronics), for providing me with the necessary resources; and the entire staff of the company for their support and positivity which made my internship a worthwhile experience.

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It is my proud privilege to express my profound gratitude to the Dean of SENSE, Dr.Sivasubramanian.A and Program Chair Dr.Vetrivelan.P for providing me this valuable opportunity to have industrial exposure.

M B V SRI HARSHA

ABSTRACT

The main objective of this project is to build an **Android controlled robot using BLUETOOTH MODULE**. The robot is designed using DC motors and the direction of DC motors will be controlled by the commands received from the android application.

This project will also help for interfacing of HC-05 Bluetooth module with Arduino .We already used Bluetooth module to control home appliances. A robot is usually an Electro-mechanical machine that is guided by computer and electronic programming.

Many robots have been built for manufacturing purpose and can be found in factories around the world. Designing of the latest inverted ROBOT which can be controlling using an APP for android mobile. We are developing the remote buttons in the android app by which we can control the robot motion with them. And in which we use Bluetooth communication to interface controller and android.According to commands received from android the robot motion can be controlled.

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1. INTRODUCTION

1.1 OVERVIEW OF PROJECT:

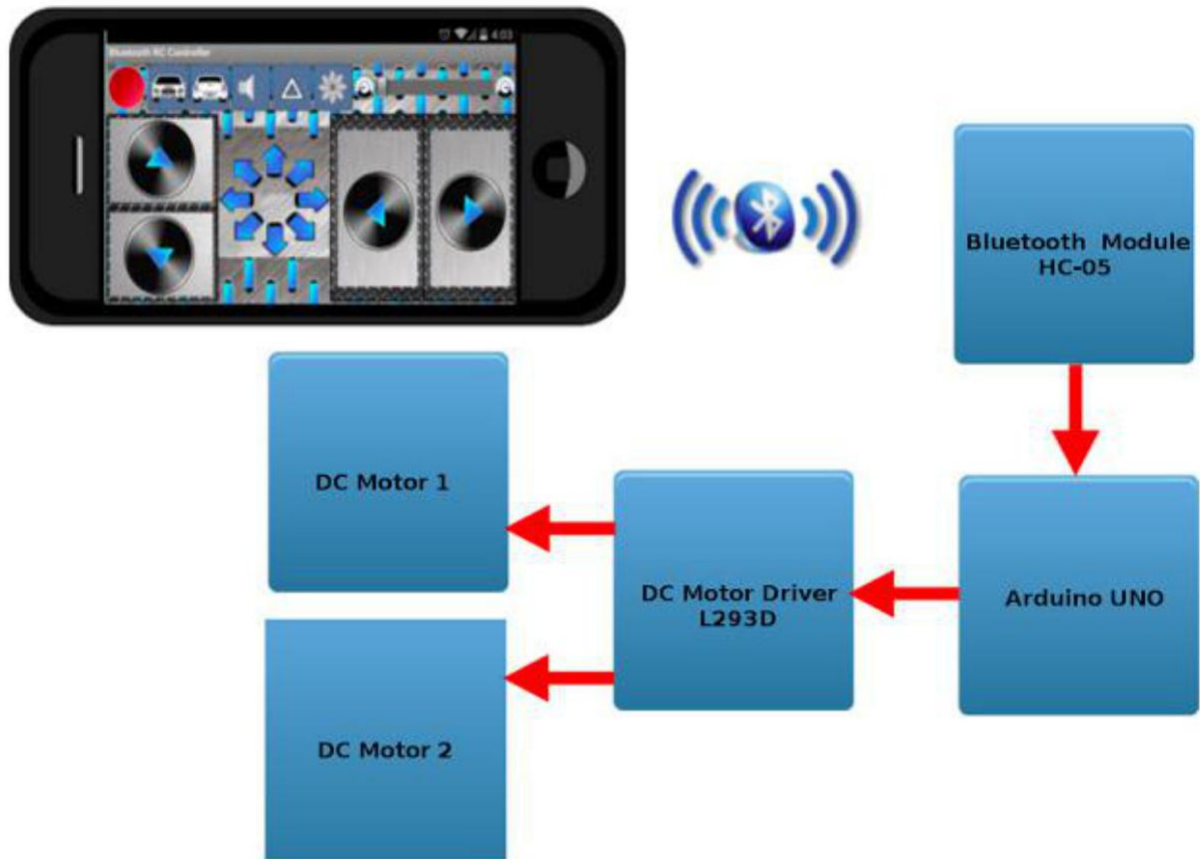
Nowadays smart phones are becoming more powerful with reinforced processors, larger storage capacities, richer entertainment function and more communication methods. Bluetooth is mainly used for data exchange; add new features to smart phones. Bluetooth technology, created by telecom vendor Ericsson in 1994, shows its advantage by integrating with smart phones.

It has changed how people use digital device at home or office, and has transferred traditional wired digital devices into wireless devices. A host Bluetooth device is capable of communicating with up to seven Bluetooth modules at same time through one link . Considering its normal working area of within eight meters, it is especially useful in home environment.

Thank for Bluetooth technology and other similar techniques, with dramatic increase in Smartphone users, smart phones have gradually turned into an all-purpose portable device and provided people for their daily use . In recent years, an open-source platform Android has been widely used in smart phones . Android has complete software package consisting of an operating system, middleware layer and core applications. Different from other existing platform like iOS (iPhone OS), it comes with software development kit (SDK), which provides essential tools and Application.

Using a Smartphone as the “brain” of a robot is already an active research field with several open opportunities and promising possibilities. In this paper we present a review of current robots controlled by mobile phone and discuss a closed loop control systems using audio channels of mobile devices, such as phones and tablet computers. In our work, move the robot upward, backward, left and right side by the android application such as Arduino Bluetooth RC Car.

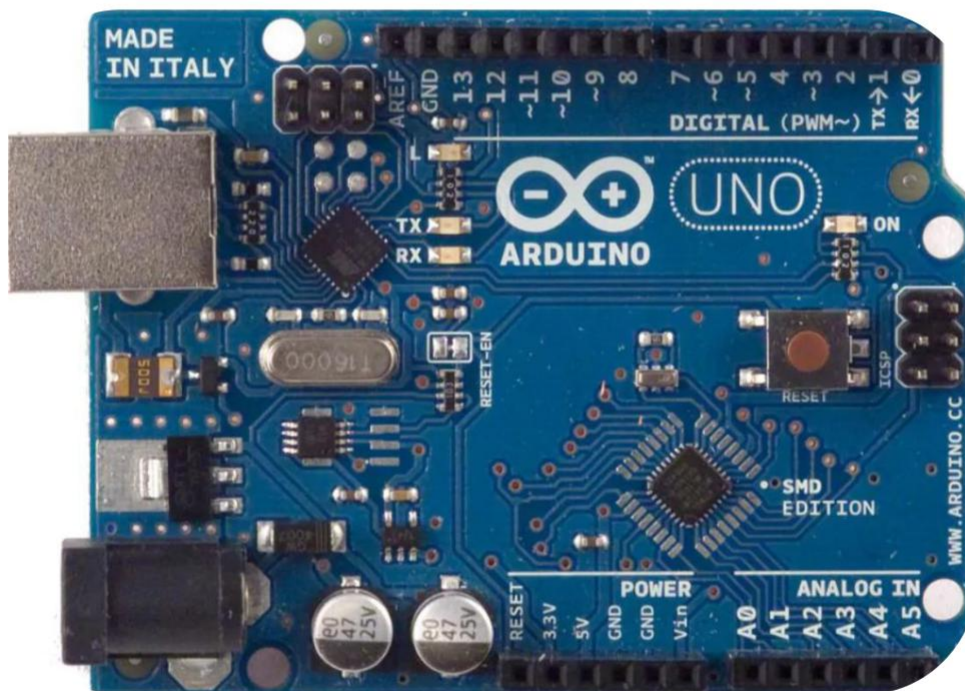
1.2. BLOCK DIAGRAM:



2. DESIGN ANALYSIS

2.1 THEORY AND APPARATUS:

ARDUINO UNO:



The Arduino UNO is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter. Revision 2 of the Uno board has a resistor pulling the 8U2 HWB line to ground, making it easier to put into DFU mode. Revision 3 of the board has the following new features: 1.0 pinout: added SDA and SCL pins that are near to the AREF pin and two other new pins placed near to the RESET pin, the IOREF that allow the shields to adapt to the voltage provided from the board. In future, shields will be compatible both with the board that use the AVR, which operate with 5V and with the Arduino Due that operate with 3.3V. The second one is a not connected pin, that is reserved for future purposes. Stronger RESET circuit. Atmega 16U2 replace the 8U2. "Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 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, see the index of Arduino boards.

BLUETOOTH MODULE(HC-05):

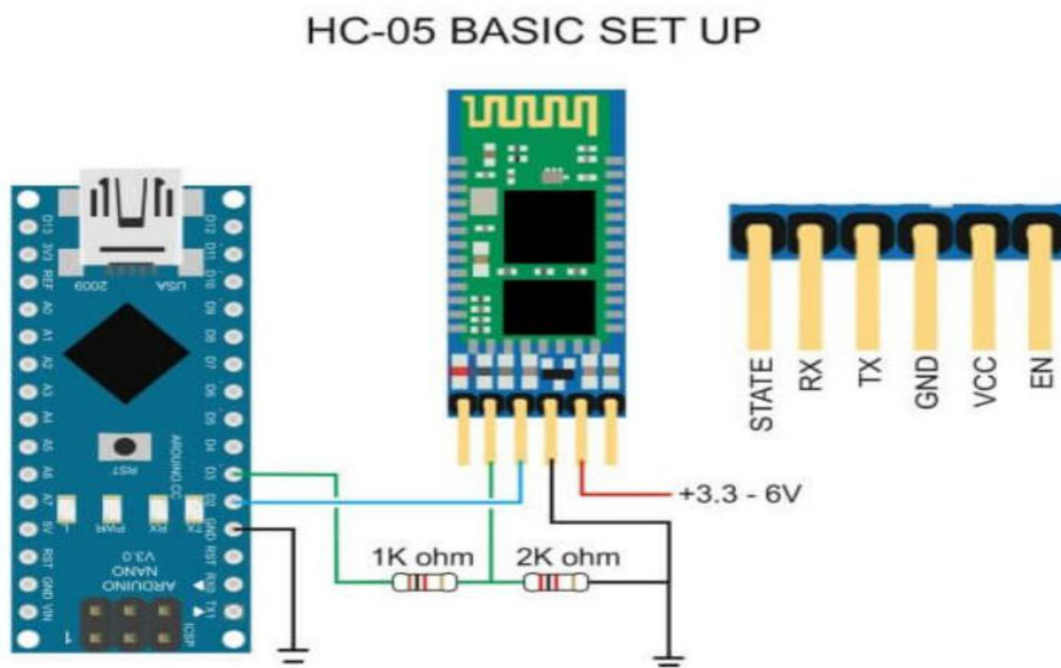
The HC-05 is a very cool module which can add two-way (full-duplex) wireless functionality to your projects. You can use this module to communicate between two microcontrollers like Arduino or communicate with any device with Bluetooth functionality like a Phone or Laptop. There are many android applications that are already available which makes this process a lot easier. The module communicates

with the help of USART at 9600 baud rate hence it is easy to interface with any microcontroller that supports USART. We can also configure the default values of the module by using the command mode. So if you looking for a Wireless module that could transfer data from your computer or mobile phone to microcontroller or vice versa then this module might be the right choice for you. However do not expect this module to transfer multimedia like photos or songs; you might have to look into the CSR8645 module for that.

How to Use the HC-05 Bluetooth module

The **HC-05** has two operating modes, one is the Data mode in which it can send and receive data from other Bluetooth devices and the other is the AT Command mode where the default device settings can be changed. We can operate the device in either of these two modes by using the key pin as explained in the pin description.

It is very easy to pair the HC-05 module with microcontrollers because it operates using the Serial Port Protocol (SPP). Simply power the module with +5V and connect the Rx pin of the module to the Tx of MCU and Tx pin of module to Rx of MCU as shown in the figure below.



During power up the key pin can be grounded to enter into Command mode, if left free it will by default enter into the data mode. As soon as the module is powered you should be able to discover the Bluetooth device as "HC-05 " then connect with it using the default password 1234 and start communicating with it.

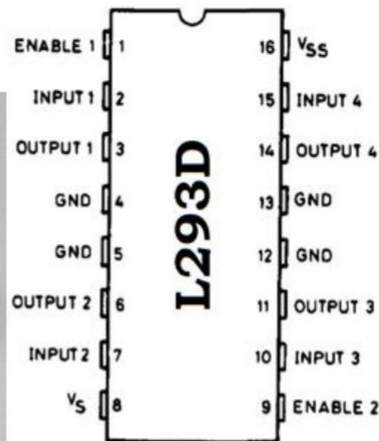
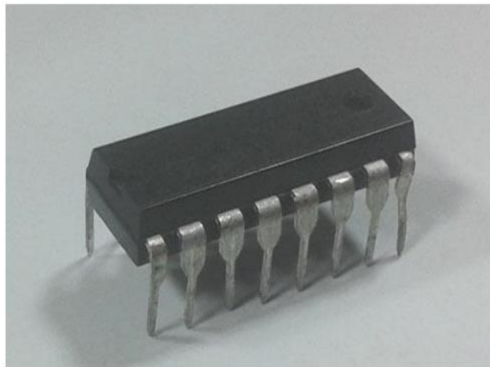
DC MOTOR:

The DC Motor or Direct Current Motor to give it its full title, is the most commonly used actuator for producing continuous movement and whose speed of rotation can easily be controlled, making them ideal for use in applications where speed control, servo type control, and/or positioning is required. A DC motor consists of two parts, a "Stator" which is the stationary part and a "Rotor" which is the rotating part.



L293D MOTOR DRIVER IC:

L293D is a dual H-bridge motor driver IC. This acts as a current amplifier, the output of L293D drives the DC Motors. It contains two inbuilt H-bridge circuits. In common mode of operation , it can drive two dc motors simultaneously in both the directions. The below table shows the pin description of L293D IC.

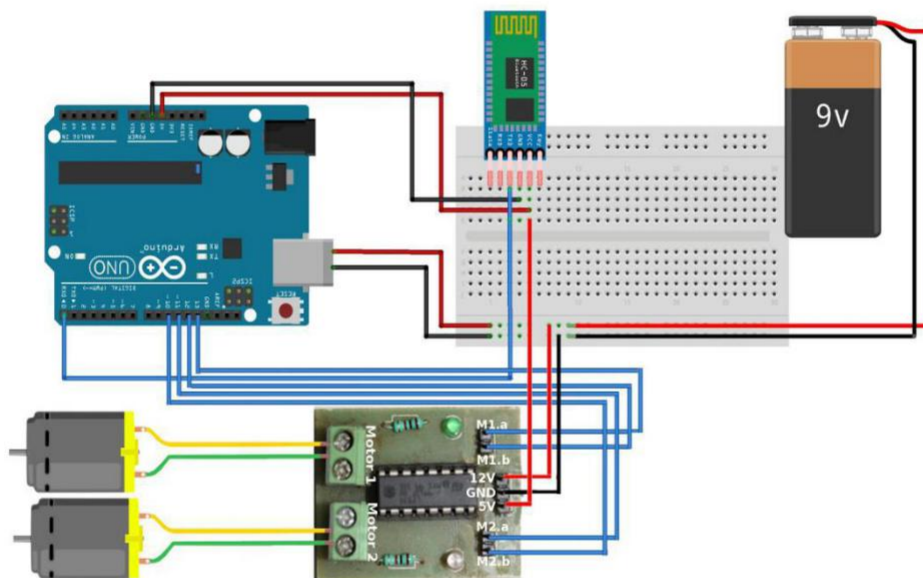


PIN DESCRIPTION:

Pin No.	Name	Function
1	Enable 1,2	Enable pin for motor 1
2	Input 1	Input 1 for motor 1
3	Output 1	Output 1 for motor 1
4	Gnd	Ground (0V)
5	Gnd	Ground (0V)
6	Output 2	Output 2 for motor 1
7	Input 2	Input 2 for motor 1
8	Vcc 2	Supply voltage for motors(5V)
9	Enable 3,4	Enable pin for motor 1
10	Input 3	Input 1 for motor 2

11	Output 4	Output 1 for motor 2
12	Gnd	Ground (0V)
13	Gnd	Ground (0V)
14	Output 4	Output 2 for motor 2
15	Input 4	Input 2 for motor 2
16	Vcc 1	Supply voltage (5V)

2.2 CIRCUIT DIAGRAM



2.3 PROGRAM:

// Starting of Program

```
int m1a = 10;
```

```
int m1b = 11;
```

```
int m2a = 12;
```

```
int m2b = 13;
```

```
char val;
```

```
void setup()
```

```
{
```

```
pinMode(m1a, OUTPUT); // Digital pin 10 set as output Pin
pinMode(m1b, OUTPUT); // Digital pin 11 set as output Pin
pinMode(m2a, OUTPUT); // Digital pin 12 set as output Pin
pinMode(m2b, OUTPUT); // Digital pin 13 set as output Pin
Serial.begin(9600);
}
```

```
void loop()
{
  while (Serial.available() > 0)
  {
    val = Serial.read();
    Serial.println(val);
  }
```

```
if( val == 'F') // Forward
{
  digitalWrite(m1a, HIGH);
  digitalWrite(m1b, LOW);
  digitalWrite(m2a, HIGH);
  digitalWrite(m2b, LOW);
}
else if(val == 'B') // Backward
{
  digitalWrite(m1a, LOW);
  digitalWrite(m1b, HIGH);
  digitalWrite(m2a, LOW);
  digitalWrite(m2b, HIGH);
}
```

```
else if(val == 'L') //Left
{
  digitalWrite(m1a, LOW);
```



```
digitalWrite(m1b, LOW);
digitalWrite(m2a, HIGH);
digitalWrite(m2b, LOW);
}
else if(val == 'R') //Right
{
digitalWrite(m1a, HIGH);
digitalWrite(m1b, LOW);
digitalWrite(m2a, LOW);
digitalWrite(m2b, LOW);
}

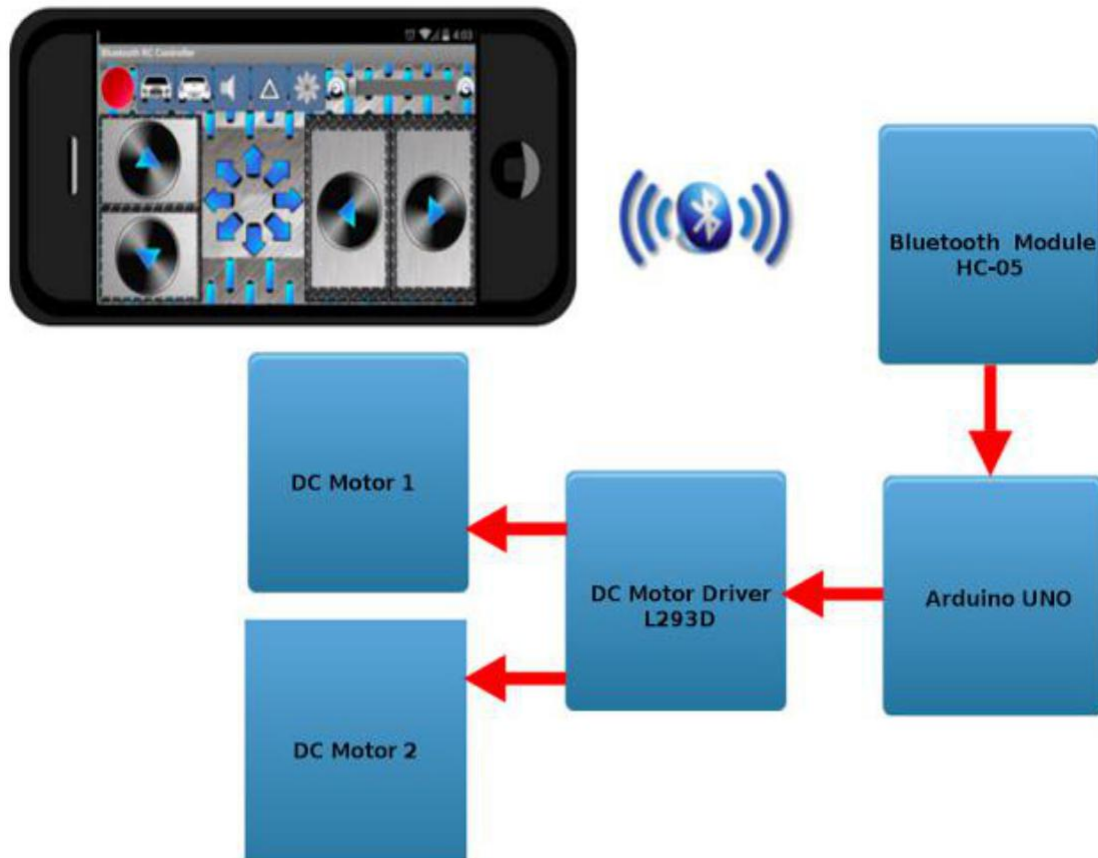
else if(val == 'S') //Stop
{
digitalWrite(m1a, LOW);
digitalWrite(m1b, LOW);
    digitalWrite(m2a, LOW);
digitalWrite(m2b, LOW);
}
else if(val == 'I') //Forward Right
{
digitalWrite(m1a, HIGH);
digitalWrite(m1b, LOW);
digitalWrite(m2a, LOW);
digitalWrite(m2b, LOW);
}
else if(val == 'J') //Backward Right
{
digitalWrite(m1a, LOW);
digitalWrite(m1b, HIGH);
digitalWrite(m2a, LOW);
digitalWrite(m2b, LOW);
}
```

```
else if(val == 'G') //Forward Left
{
digitalWrite(m1a, LOW);
digitalWrite(m1b, LOW);
digitalWrite(m2a, HIGH);
digitalWrite(m2b, LOW);
}
else if(val == 'H') //Backward Left
{
digitalWrite(m1a, LOW);
digitalWrite(m1b, LOW);
digitalWrite(m2a, LOW);
digitalWrite(m2b, HIGH);
}
}

// End of program
```

2.4 WORKING PROCESS:

The Android Application that we are going to use for this project. This Application can be downloaded from the Android Playstore. The Name of the Application is: **Arduino Bluetooth RC Car** we are not going to use the full features of this App. We will try to do it in some other project.



Now let me try to explain the working of this project. The Circuit will get ready to receive commands once the Android Application is successfully paired with the Bluetooth Module HC-05.

When a button is pressed(Suppose Forward Button) a value will be sent(Value "F") and it will be received by the Bluetooth Module. This Value again will be sent to Arduino UNO by the Bluetooth Module.

Once Arduino receives the Value it will check what action need to be taken according to the value received. In this case Arduino will set digital pins 10 to 13 in such a way that the DC Motor will rotate in forward direction. The digital pins 10-13 of Arduino UNO is connected to the input pins of DC Motor Driver M1.a,M1.b,M2.a and M2.b respectively. Output pins of DC Motor driver will be connected to the DC Motors. This way Arduino will start to control the DC Motors using their Digital pins 10-13

The Table shown below explains the Value and action that are used for this project.

Value	Action
F	Forward
B	Backward
S	Stop
R	Right
L	Left
I	Forward Right
J	Backward Right
G	Forward Left
H	Backward Left

Hence DC Motor 1 & DC Motor 2, These two DC motors will decide the direction of the Car. This car can move to the following directions.

- 1.Forward Direction
- 2.Reverse Direction
- 3.Forward Right
- 4.Forward Left
- 5.Reverse Right
- 6.Reverse Left

3.1 ADVANTAGES & DISADVANTAGES

ADVANTAGES:

Wireless Control:

By using this project wireless control can be within the hands of user.

Monitoring:

This circuit allow monitoring of all appliance within range of communication with Bluetooth.

Manual Control:

Manual control is given so that even an unskilled user can be able to change the current status.

DISADVANTAGES:

Bluetooth Range:

It is good to use Bluetooth for automation but automation is kept within a range of 10-30metres. So control can't be achieved from outside range.

The structure of Arduino is its disadvantage as well. During building a project you have to make its size as small as possible. But with the big structures of Arduino we have to stick with big sized PCB's. If you are working on a small micro-controller like ATmega8 you can easily make your PCB as small as possible.

3.2 CONCLUSION AND FUTUREWORK

CONCLUSION:

The conclusion of the paper is to realize the smart living , more specifically the home lighting control system using Bluetooth Technology. Robot and smart phones are a perfect match, specially mobile robots. As phones and mobile devices are each time more powerful, using them as robot for building robot with advanced feature such as voice recognition. Android blue-tooth enable phones and blue-tooth module via HC-06 and communication among blue-tooth devices. It is concluded that smart living will gradually turn into a reality that consumer can control their home remotely and wirelessly.

FUTURE WORK:

- It can be built further to work as a HUMANOID.
- It can have many uses in practical fields like working in industries.
- The proposed robot can be further improved in terms of decision taking capabilities by employing varied types of sensors and thus could be used in big industries for different applications.

3.3 REFERENCES:

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