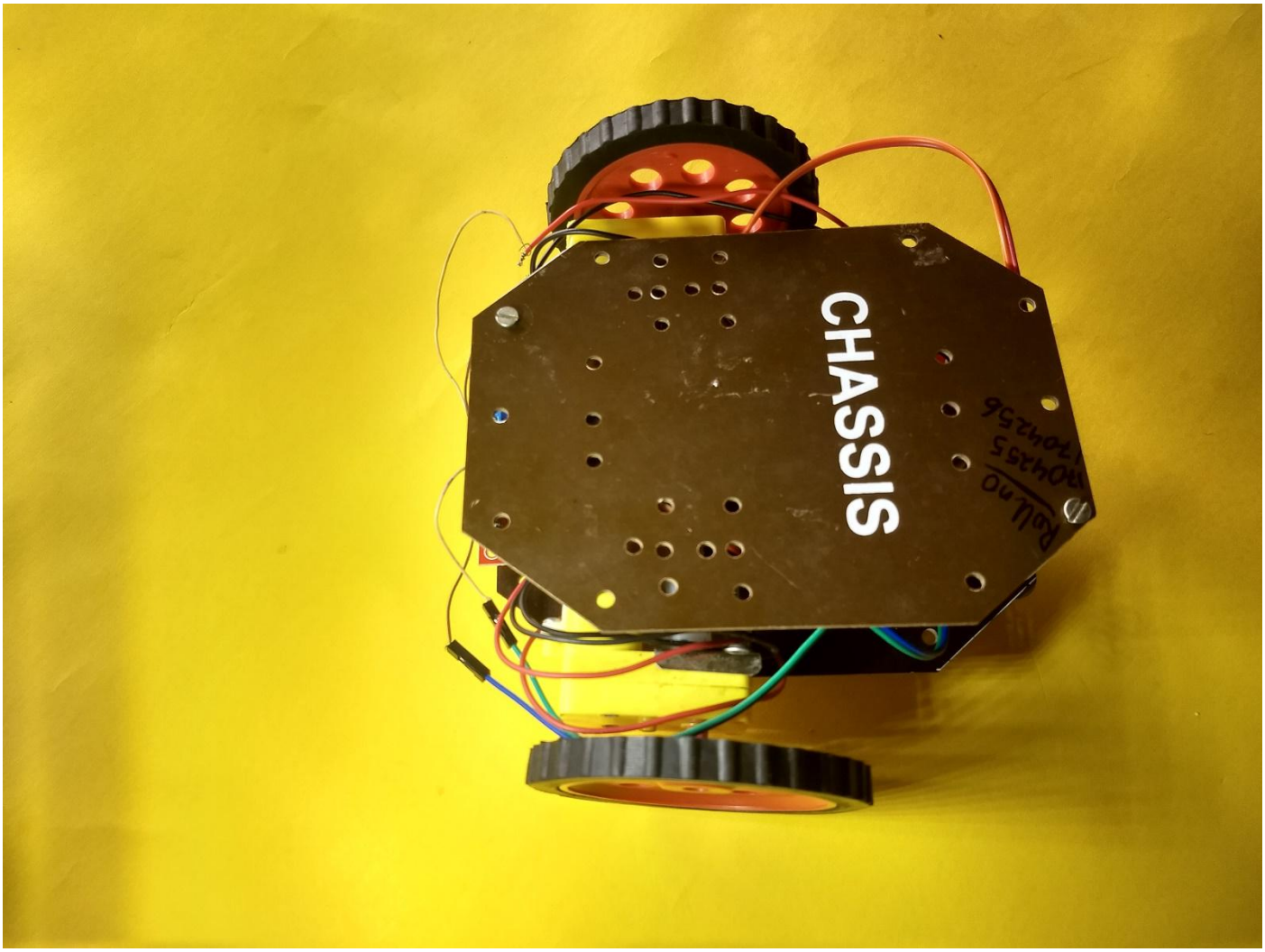
CIRCUIT DESIGN

on

Unmanned Ground Vehicle



Submitted By:

Avneet Kaur (1704256)

Aryabrata Sahoo (1704255)

ETC-04

OBJECTIVE-

Unmanned Ground Vehicle makes use of a mobile phone for controlling a vehicle with the help of Bluetooth. It is a robotics project using Arduino micro-controller. Bluetooth technology (HC-05) is used as a wireless communication technique to control the robot. The handler can use various commands like move forward, reverse, left, right or stop. These commands are sent from the mobile phone to the Bluetooth receiver which is interfaced with the Arduino.

Arduino based robot has a trans-receiver unit which receives the commands and gives it to the micro-controller circuit to control the motors. The micro-controller then transmits the signal to the motor driver IC to operate the motors.

COMPONENTS REQUIRED-

- Arduino Uno
- L298N
- HC05
- Jumper Wires
- Motors
- Chassis

THEORY

a. Arduino Uno –

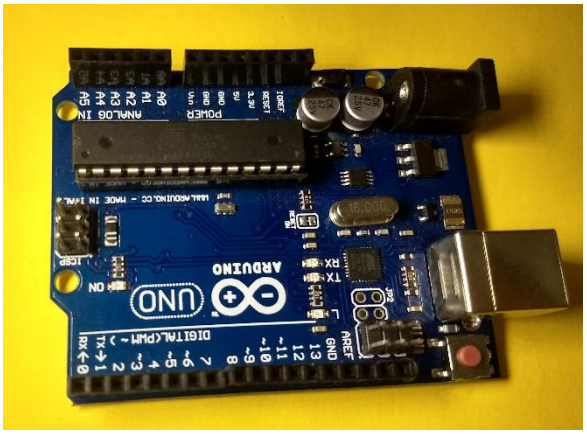


Fig.1- Arduino UNO

Arduino (Fig.1) is a micro-controller board based on ATmega328P. It has 14 digital input/output pins, 6 of them can be used as PWM pins, 6 Analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It has all the components needed to support a micro-controller.

b. L298N –

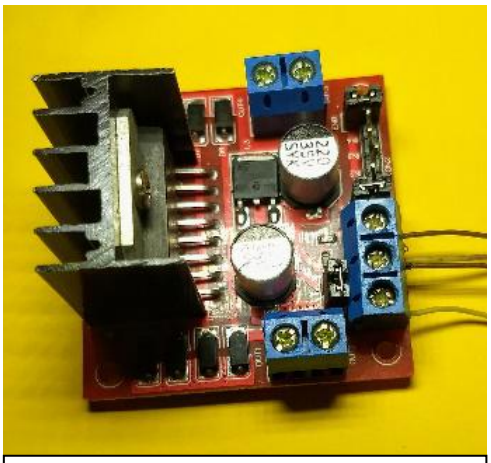


Fig.2 - L298N

The L298N (Fig.2) is a dual H-Bridge motor driver which gives the access to control the speed and direction of two DC motors at the same time. It can control DC motors having voltages ranging between 5V and 35V and a peak current of up to 2A. It also has an onboard 5V regulator which can be enabled or disabled using jumper wires. If the motor supply voltage is up to 12V, we can enable the 5V regulator and then 5V pin can be used as output, for example- for powering the Arduino board or other modules. But if the motor voltage is greater than 12V, we must disconnect the jumper because those voltages can cause damage to the onboard 5V regulator. In this case, the 5V pin is used as input as we need to connect it to a 5V power supply in order for the IC to work properly.

c. HC-05

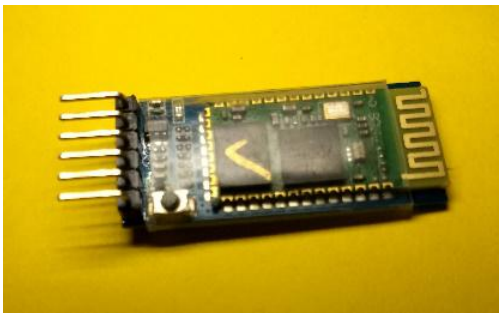


Fig.3- HC-05

The Bluetooth module, HC-05 (Fig.3) is commonly known as a MASTER/SLAVE module. The work of the module can be processed only by ATtention commands. Master module initiates the connection and slave module accepts it. It acts as a bridge between Bluetooth of mobile phone to the Micro-controller. It is a trans-receiver device which receives the signal from mobile and transmits it to the micro-controller.

d. Jumper Wires

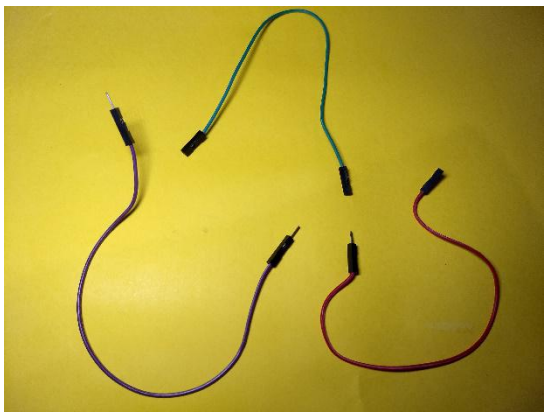


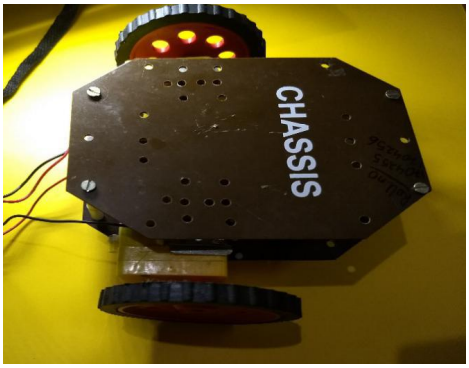
Fig.4 - Jumper Wires

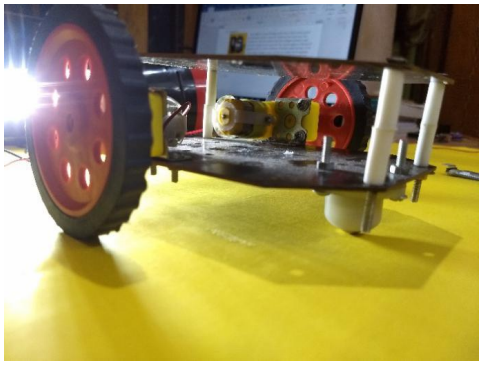
Jumper Wires (Fig.4) are easily removable wires used for connections. These are of 3 types: Male-Female, Male-Male, Female-Female.

e. Chassis (with attached motor)

It is a framework which supports and stores all the components.(as shown in Fig.5)

Fig.5- Chassis





Working Principle:

a. Change of directions

When a vehicle is taking a curve, the inner set of wheels have to move in lower speed as compared to the outer wheels. Here we have used the same logic, to turn left we have lowered the speed of the left wheel and raised the speed of right wheel so as to take sharp turns.

b. Logic

Five sets of user defined functions are used. These are forward, backward, left, right and stop.

For forward, codes are as followed:

```
analogWrite(motor_left[0], 150);
analogWrite(motor_left[1], 0);
analogWrite(motor_right[1], 143);
analogWrite(motor_right[0], 0);
```

For backward, codes are as followed:

```
analogWrite(motor_left[1], 150);
analogWrite(motor_left[0], 0);
analogWrite(motor_right[0], 143);
analogWrite(motor_right[1], 0);
```

For left, codes are as followed:

```
analogWrite(motor_left[1], 150);
analogWrite(motor_left[0], 0);
analogWrite(motor_right[0], 143);
analogWrite(motor_right[1], 0);
```

For right, codes are as followed:

```
analogWrite(motor_left[0], 150);
analogWrite(motor_left[1], 0);
analogWrite(motor_right[1], 143);
analogWrite(motor_right[0], 0);
```

For stop, codes are as followed:

```
analogWrite(motor_left[0], 255);
analogWrite(motor_left[1], 255);
analogWrite(motor_right[0], 255);
analogWrite(motor_right[1], 255);
```

In the void loop, different functions are assigned with some ASCII value which are then calibrated in the mobile app. Now when the ASCII values are encountered it executes the function it is assigned to.

c. Real Life Applications-

- The basic need of having unmanned ground vehicle is that it can operate in places where it is not convenient, treacherous or extremely difficult for a human to reach.

d. Scope for Future Development -

- It can integrate with various sensors, like IR sensor (which can be used to avoid obstacles), Metal Detector Sensor, Plasmon Laser Sensor (used to detect presence of Pentaerythritol Tetranitrate, an explosive compound used in bombs).

- In place of using Bluetooth Technology, LoS (Line of Sight) can be used of a particular frequency to enhance the range.

- GPS (Global Positioning System) module can be used to mark the exact position of the vehicle on the map.

PROCEDURE

Step 1:

Attach the castor wheel to the front end of the chassis. Also, attach the motors and wheels. (as in Fig.6)

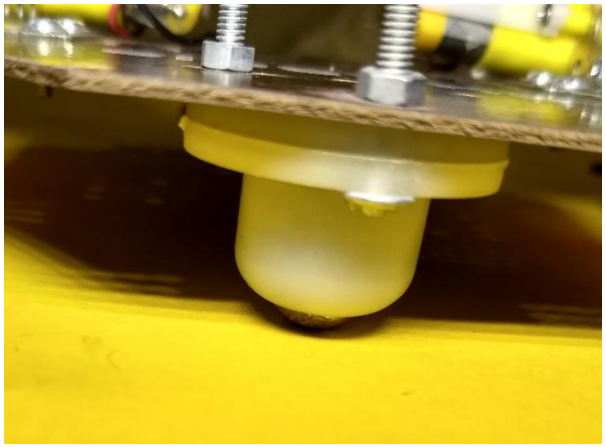


Fig.6

Step 2:

Attach the Arduino and L298N to the base of the chassis. (as in Fig.7)

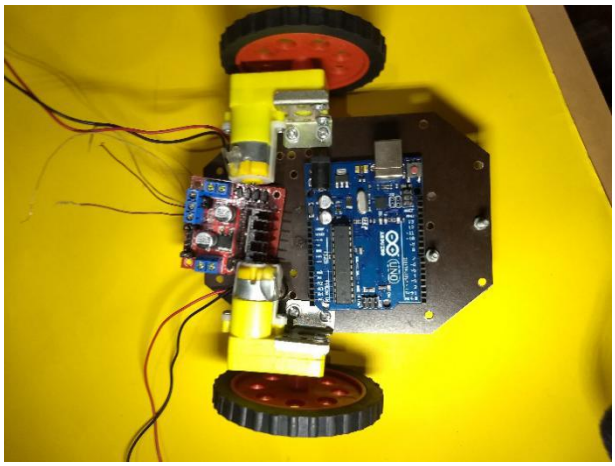


Fig.7

Step 3:

Attach the motor A(right) and motor B(left) to the L298N. (as in Fig.8)

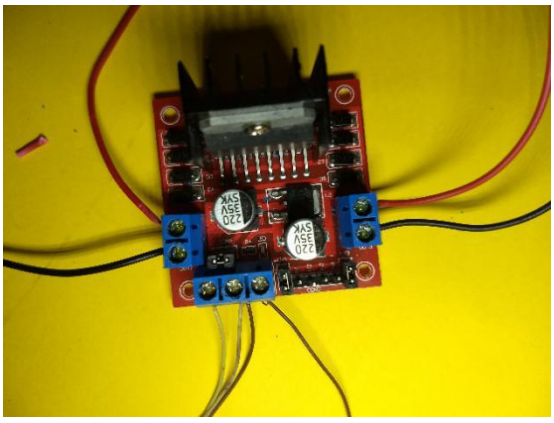


Fig.8

Step 4:

Connect the Arduino with L298N. The analog pin A1 of Arduino is connected to N1 of L298N. Similarly, A2 with N2, A3 with N3, A4 with N4. (as in Fig.9)

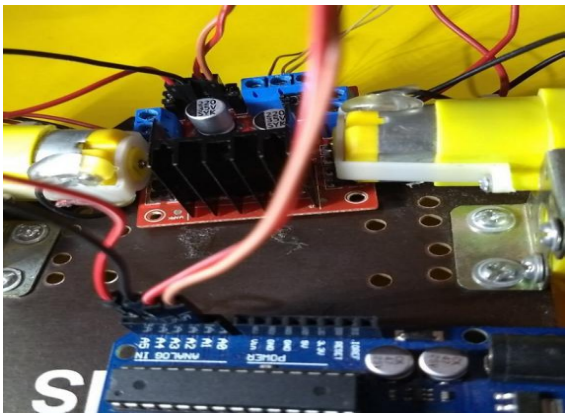


Fig.9

Step 5:

Connect the TX of Arduino with RX of HC05 and RX of Arduino with TX of HC05. (as in Fig.10)

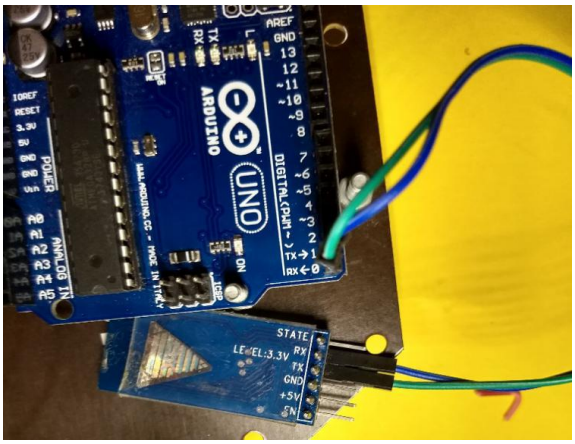


Fig.10

Step 6:

Connect 5V and GND of Arduino on a breadboard so that we get multiple ports for power supply to different components. (as in Fig.11)

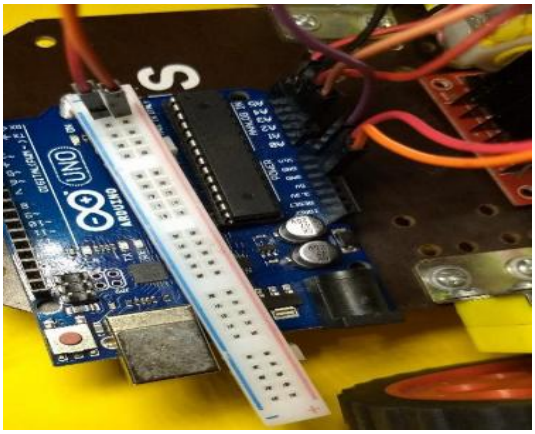


Fig.11

Step 7:

Now, connect 5V power of breadboard to 5V of LN298N and GND of breadboard with GND of LN298N. (as in Fig.12)

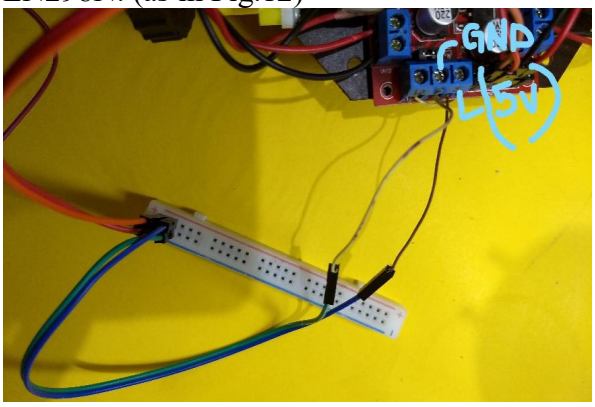


Fig.12

Step 8:

Now, connect 5V power of breadboard to 5V of HC05 and GND of breadboard with GND of HC05. (as in Fig.13)

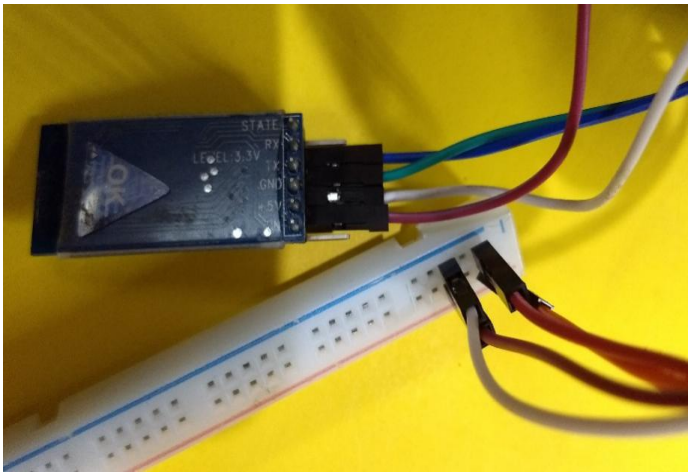


Fig.13

Step 9:

Connect the Arduino to the PC through USB. (as in Fig.14)

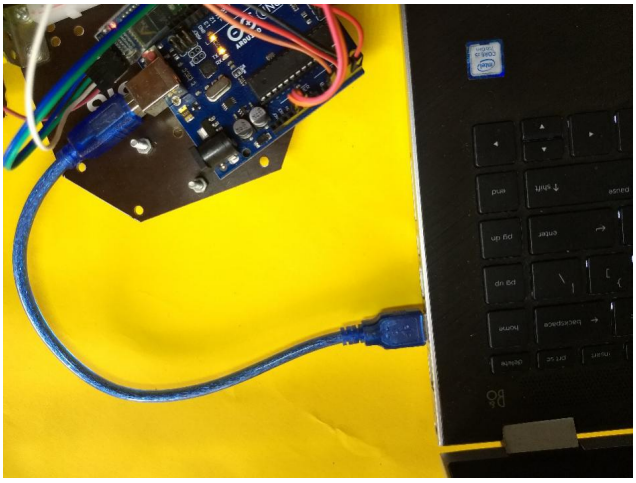


Fig.14

Step 10:

Open the Arduino software in the PC, in the tools section, change the board to Arduino Uno and the port.

Step 11:

Write the desired code, compile it and check for any errors and debug it, then upload the code to the board.

(NOTE- While uploading the codes, TX and RX Pins must be disconnected.)

Step 12:

Download Arduino Bluetooth Controller App, connect to the HC05, pair it with PIN-1234, open HC05 in controller mode.

Step 13:

Connect a 9V or 12V battery to the LN298N for more power to the wheels. (Fig.15)

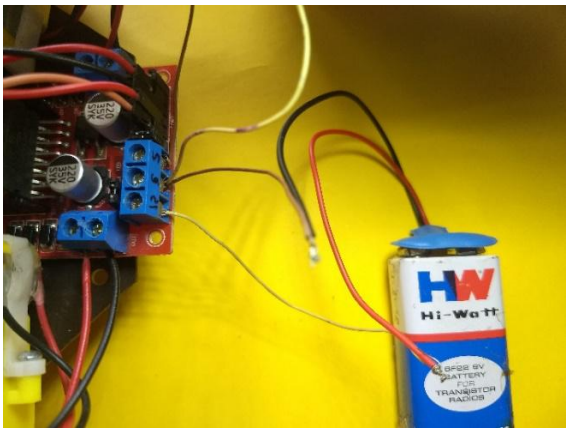
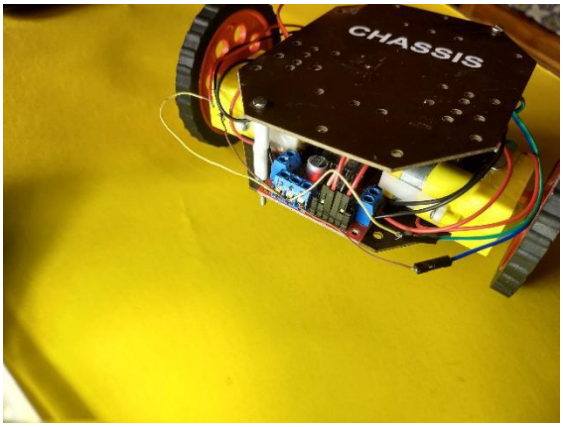


Fig.15

Step 14:

Attach the roof of the vehicle with the bolts after sticking all the components to the base of the Bot. (as in Fig.16)



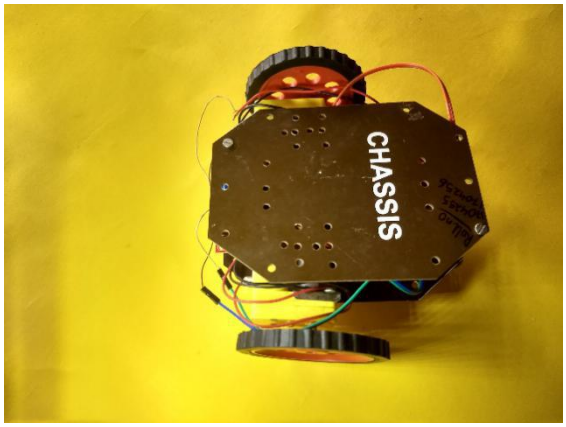


Fig.16

Bibliography

- Microtronics Technologies "**Bluetooth controlled robot using android mobile**".
- "**Building Arduino Robot"** By- Miguel Grinberg, Dated- March 27 2013