

Indian Institute of Information Technology Senapati

**PROJECT TITLE: ARDUINO BASED SMARTPHONE
CONTROLLED SURVEILLANCE VEHICLE VIA BLUETOOTH**

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DECLARATION

I would like to declare that this project is done on my own and no help is taken from any other person.

ACKNOWLEDGEMENT

I would like to thank my course instructor Dr. Gaurav Saxena who provided me with all the required components so that I can make this project.

ABSTRACT

A **robot** is a machine—especially one programmable by a computer— capable of carrying out a complex series of actions automatically. Robots can be guided by an external control device or the control may be embedded within. Robots may be constructed to take on human form but most robots are machines designed to perform a task with no regard to how they look.

Here we are making a robot which is controlled by Bluetooth and can move in all directions.

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INTRODUCTION

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.

Over the years Arduino has been the brain of thousands of projects, from everyday objects to complex scientific instruments. A worldwide community of makers - students, hobbyists, artists, programmers, and professionals - has gathered around this open-source platform, their contributions have added up to an incredible amount of accessible knowledge that can be of great help to novices and experts alike.

COMPONENTS REQUIRED

- ✓ Arduino Mega 2560
- ✓ HC-06 Wireless Bluetooth Module Host
- ✓ 7x4 cm Robot Wheels
- ✓ 12v DC Geared Motor-500 Rpm(2pc)
- ✓ 3.7v rechargeable battery(4pc)
- ✓ Jumper wires
- ✓ IC L293D
- ✓ 100microfarad capacitors(2pc)
- ✓ IC7805(1pc)
- ✓ PCB Board
- ✓ LED

BASIC WORKING PRINCIPLE

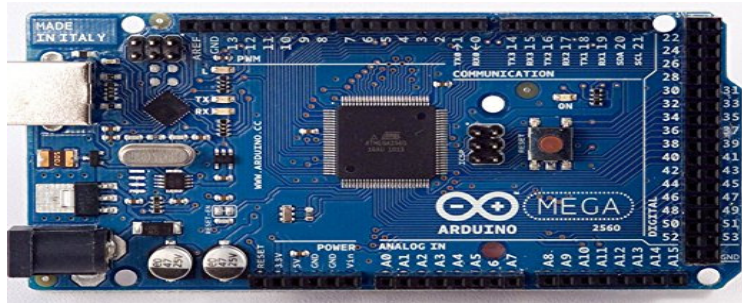
The basic working principle of this robot is that there is a Bluetooth module which receives its command from an android phone with which it is connected. The command is then transferred to the Arduino which according to the program uploaded sends output through its output pin to the motor driver circuit which then sends signal to the two motor connected to the motor driver circuit.

To rotate the motor in forward, backward, Left, right and stop.

TECHINICAL AND THEORTICAL DETAILS

BRIEF DISCUSSION ON THE MAJOR COMPONENTS USED IN THE CIRCUIT.

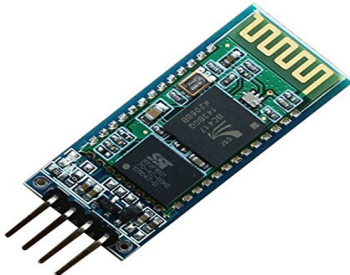
- 1) **Arduino Mega 2560:** The Arduino Mega 2560 is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins (of which 15 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, it has 256KB Flash memory and 8KB SRAM for runtime data, 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.



<-ARDUINO MEGA

- 2) **HC-06 Wireless Bluetooth Module:** HC-06 is a Slave only device. (It looks physically just like the HC-05).(Note: Now HC-06 not cheaper)

These small (3 cm long) modules run on 3.3V power with 3.3V signal levels, they have no pins and usually solder to a larger board.



<-BLUETOOTH MODULE(HC-06)

- 3) **IC L293D:** IC L293D is a 16 pin motor-driver IC that replicates the basic concept of a transistor. It is built-in with two H-bridge driver circuits to

drive two DC motors simultaneously. The L293D is designed to provide bidirectional current up to 600 mA, and the voltages from 4.5 v to 36 v. In this L293D, there are two enable pins (pin 1 & pin 9) for activating the IC. When the ENABLE pin 1 is high, the left part of IC will work, if it is low it will not work. Same condition applies to ENABLE pin 9 in which the right part of IC will work.

And there are 4 input pins and 4 output pins in this IC. The 4 input pins are 2, 7, 10 & 15.

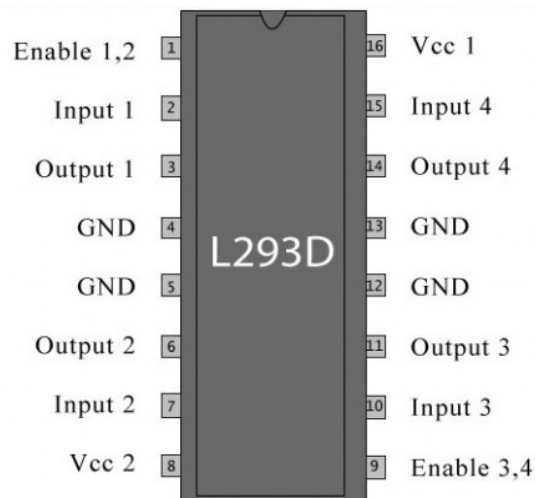
Pin 2 & 7 are in the left hand side and pin 10 & 15 are in the right hand side. Left side pins will regulate the motor connected across the left motor, and the right side pins will regulate the motor connected across the right motor.

And the 4 output pins are 3, 6, 11 & 14, these output pins are connected to the motors respectively.

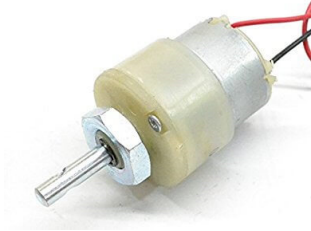
The pins 4, 5, 12 & 13 are ground pins. The pin 8 will go to Vcc, which will be supplied to the motor, and pin 16 will go to Vss that is supplied to the IC.



<-IC-L293D



- 4) DC Geared Motor-500 Rpm:** A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current flow in part of the motor.



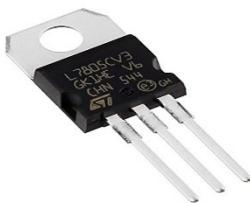
<-500RPM, DC GEARED MOTOR

- 5) 7x4 cm Robot Wheels:** These are plastic wheels covered over by a rubber.



<-ROBOT WHEELS

- 6) IC7805:** 7805 is a voltage regulator integrated circuit. It is a member of 78xx series of fixed linear voltage regulator ICs. The voltage source in a circuit may have fluctuations and would not give the fixed voltage output. The voltage regulator IC maintains the output voltage at a constant value. The xx in 78xx indicates the fixed output voltage it is designed to provide. 7805 provides +5V regulated power supply. Capacitors of suitable values can be connected at input and output pins depending upon the respective voltage levels.



<-IC7805

- 7) **3.7v rechargeable battery:** A lithium-ion battery or Li-ion battery is a type of rechargeable battery in which lithium ions move from the negative electrode to the positive electrode during discharge and back when charging. Li-ion batteries use an intercalated lithium compound as one electrode material, compared to the metallic lithium used in a non-rechargeable lithium battery. The electrolyte, which allows for ionic movement, and the two electrodes are the constituent components of a lithium-ion battery cell.



<-BATTERY

WORKING OF THE ROBOT

- The Bluetooth module (HC-06) is having four pins (+5V, GND, Rx, Tx) which connected to the Arduino board at (+5V, GND, Rx, Tx) respectively.
 - In the Arduino board the pin (12, 11, 10, 9) are the output pins which are connected to the motor driver circuits input pins (2, 7, 10, 15). The Arduino board works in 5v voltage supply.
 - In the motor driver circuits the input pins are (2, 7, 10, 15) and the output pins are (3,6,11,14) which is connected to the two DC geared motor through a 100 microfarad capacitor on each side.
 - The pins(1,9) are the enable pins which is connected to the pin (16) Vcc 5V .
 - The pin (16) is getting 5V constant voltage supply through voltage regulator (IC7805).
 - The pin (8) Vss is getting 14v voltage supply to drive the motor.
 - The pins (4,5,12,13) are the GND pins .
-
- The **working principle** of this robot is that there is a Bluetooth module which is having four pins (+5V, GND, Rx, Tx) which connected to the Arduino board at (+5V, GND, Rx, Tx) respectively .
 - The Bluetooth module at first connects with the android phone. When the phone gives a command, the RX (Receiver) of the Bluetooth module receives the command and transmit it to the Arduino board at the TX (transceiver) pin.
 - The motor driver circuit is connected to the Arduino board with four inputs and the output from the motor driver circuit is connected to the two motors.
 - The Received command from the Bluetooth module is processed by the Arduino board according to the code uploaded in the Arduino board
 - which then sends accordingly the output command to the motor driver circuit input pins (2, 7, 10, 15) and then accordingly the output pins (3,6,11,14) of the motor driver circuit connected to the motors rotates the motor in clockwise or anticlockwise direction.

ARDUINO CODE SNIPPET

```
char data = 0;
```

```
//Variable for storing received data
```

```
void setup()
```

```
{
```

```
    Serial.begin(9600);    //Sets the data rate in bits per second (baud) for serial  
data transmission
```

```
    pinMode(13, OUTPUT);
```

```
    pinMode(12, OUTPUT);
```

```
    pinMode(11, OUTPUT);
```

```
    pinMode(10, OUTPUT);
```

```
    pinMode(9, OUTPUT);
```

```
    pinMode(2, OUTPUT);
```

```
    pinMode(3, OUTPUT);
```

```
}
```

```
void ledon() {
```

```
    digitalWrite(13, HIGH);
```

```
    digitalWrite(2, HIGH);
```

```
    digitalWrite(3, LOW);
```

```
}
```

```
void ledoff() {
```

```
    digitalWrite(13, LOW);
```

```
    digitalWrite(2, LOW);
```

```
    digitalWrite(3, LOW);
```

```
}
```

```
void forward(){
```

```
    digitalWrite(12, HIGH);
```

```
    digitalWrite(11, LOW);
```

```
    digitalWrite(10, LOW);
```

```
    digitalWrite(9, HIGH);
```

```
    delay(10);
```

```

}

void reverse(){

    digitalWrite(12, LOW);
    digitalWrite(11, HIGH);
    digitalWrite(10, HIGH);
    digitalWrite(9, LOW);
    delay(10);
}

void left(){
    digitalWrite(12, LOW);
    digitalWrite(11, HIGH);
    digitalWrite(10, LOW);
    digitalWrite(9, HIGH);
    delay(10);
}

void right(){
    digitalWrite(12, HIGH);
    digitalWrite(11, LOW);
    digitalWrite(10, HIGH);
    digitalWrite(9, LOW);
    delay(10);
}

void stopp(){
    digitalWrite(12, LOW);
    digitalWrite(11, LOW);
    digitalWrite(10, LOW);
    digitalWrite(9, LOW);
    delay(10);
}

void loop()
{
    if(Serial.available() > 0) // Send data only when you receive data:

```

```
{  
  
    data = Serial.read();  
    Serial.print(data);  
    Serial.print("\n");  
  
    if(data=='a')  
        forward();  
  
    if(data=='e')  
        reverse();  
  
    if(data=='b')  
        left();  
  
    if(data=='d')  
        right();  
  
    if(data=='c')  
        stopp();  
  
    if(data=='f')  
        ledon();  
  
    if(data=='g')  
        ledoff();  
  
}  
}
```


RESULTS AND DISCUSSION

INPUT1 (PIN 12)	INPUT2 (PIN 11)	INPUT3 (PIN 10)	INPUT4 (PIN 9)	ENABLE(1,2) (ALWAYS HIGH)	RESULT
HIGH	LOW	LOW	HIGH	HIGH	FORWARD
LOW	HIGH	HIGH	LOW	HIGH	REVERSE
HIGH	LOW	HIGH	LOW	HIGH	RIGHT
LOW	HIGH	LOW	HIGH	HIGH	LEFT
LOW	LOW	LOW	LOW	HIGH	STOP

Future scope:

1. We can add camera and make it a surveillance vehicle
2. With using artificial intelligence we can
 - A. Make it go from one place to another automatically.
 - B. Make it person counter for a big hall.
 - C. We can make this as automatic transporter.

Uses:

1. Can be used as surveillance Vehicle with Camera.
2. Used as Transporter for small objects in small range.
3. Can be used in defense field for spying and making Suicide Bombers etc.

REFERENCES

- Arduino tutorial – Tutorials point.
- Working of IC L293D - <http://blog.jayroboticsclub.in/how-ic-l293d-runs-a-motor/>