VACUUM ROBOT

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ABSTRACT

Robots are widely used in modern industrial manufacturing, in households, in entertainment, and in the security sector. In this paper, an intelligent and interactive robotic vacuum cleaner is developed. By using awireless transport protocol (802.11b), the user can control the robot's path and remotely manipulate its movements with a handphone interface. Research has developed the vacuum we can control with our handphone. For the vacuum-cleaning mode, we can control vacuum to on or off it using handphone. Additionally, a system program for plotting the robot's path is developed. Therefore, further path correction commands can be sent to the robot by the remote-manipulating mode in the handphone application. Consequently, a prototype robot has been manufactured and tested.

Hence, this system is intended to help and encourage the public to keep their home floor clean with ease. With the help of a vacuum robot he will inhale all the dust on the floor surface of the house. This system will inspire, indirectly, engage and support the public to assume their responsibility to maintain cleanliness. This is a great innovation for someone who cleaners. This project will be implemented using Arduino Uno by using C programming language.

ABSTRAK

Robot digunakan secara meluas dalam pembuatan industri moden, dalam isi rumah, hiburan, dan di sektor keselamatan. Makalah dengan ini, pembersih vakum robot pintar dan interaktif dibangunkan. Dengan menggunakan protokol pengangkutan tanpa awan (802.11b), pengguna boleh mengawal laluan robot dan jauh memanipulasi pergerakannya dengan antara muka telefon bimbit. Penyelidikan telah membangunkan vakum yang kita dapat mengawal dengan telefon bimbit kita. Untuk mod pembersih hampagas, kita boleh mengawal vakum untuk menghidupkan atau mematikannya menggunakan telefon bimbit. Di samping itu, satu program sistem untuk merancang laluan robot dibangunkan. Oleh itu, arahan pembetulan laluan selanjutnya boleh dihantar ke robot dengan cara manipulasi jauh di dalam aplikasi telefon bimbit. Akibatnya, robot prototaip telah dihasilkan dan diuji.

Oleh itu, dicadangkan sistem ini untuk membantu dan mendorong orang ramai untuk menjaga kebersihan lantai rumah mereka dengan mudah. Dengan bantuan robot vakum ia akan menyedut semua habuk diatas permukaan lantai rumah. Sistem ini akan memberi inspirasi, secara tidak langsung, melibatkan diri dan menyokong orang ramai untuk memikul tanggungjawab mereka menjaga kebersihan. Ini adalah satu inovasi besar bagi seseorang yang pembersih. Projek ini akan dilaksanakan menggunakan Arduino Uno dengan menggunakan bahasa pengaturcaraan C.

ACKNOWLEDGEMENT

In preparing this report, I dealt with many people and they have a great contribution towards my understanding and thoughts.

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Furthermore, my great appreciation dedicated to my friend and those who involve directly or indirectly with this project. Their views, tips, support, and assistance in various conditions are usefulindeed.

CHAPTER 1

INTRODUCTION

The tedious process of floor cleaning has become a menial, labor demanding, and the time consuming task, which can be accomplished without an overwhelming amount of skill. We have realized that people at home are too busy for daily or weekly floor cleaning, especially for families with children. The elderly who lives by themselves do not have the strength or ability to clean by themselves do not have the strength or ability to clean by themselves, and the cost of hiring a maid is expensive. Out in the industry, nightly office cleaning almost always includes vacuuming of the floor which takes efforts away from other cleanups or becomes an entire person's task. Labor costs are expensive and quickly adds up. We believe an autonomous robotic vacuum cleaner can help by automating this task. A robotic vacuum can vacuum a floor space on its own without the help of anyone. And the cost of using one has a fixed price rather than paying an escalating price on workers. The device

has to be simple enough for any adult to use. For this product to succeed, it needs to do its job well by covering the entire floor space in a timely fashion.

1.0 Problem Statements

Nowadays, a lot users are using manual vacuum system that consume Electricity. As we know, the system needs a lot of time and human energy to moving. So, that is not practical nowadays especially for working person. In this situation, an automatic vacuum is more practical in order to replace manual vacuum system. In order to solve this problem, vacuum robot is powered by batteries and we can control its using Arduino bluetooth controller application to clean up the dust. It is equipped with Arduino to make vacuum easily controlled.

1.1 Objectives

The objective of this project are:

i. To design a small cleaning robot for floor which is portable, small size, lightweight, and can clean all the corners of the house floor.

ii. To build the electrical part of the cleaning robot

iii. To assembly and testing the vacuum robot that can be operated on the house floor.

1.2 Scope And Limitation Project

The scope and limitation of this project are:

i. The developed small cleaning robot is only a prototype and not readily functioning as commercial product.

ii. The developed small cleaning robot is operated using Arduino and Bluetooth.

iii. The developed small cleaning is operated on the floor with no obstacle.

iv. The operating time of the small cleaning robot is limited which depend on the battery lifetime.

1.3 Important And Impact Of Project

The important and impact of this project are:

i. Ability to make life easier and more convenient.

ii. Can make it yourself

iii. Low cost

CHAPTER 2

LITERATURE REVIEW

There are many different vacuum robots in the market, but they all have shortages in certain points. As I can see, some vacuum need to be controlled manually, some vacuum need to use too long wire, some depending on the plug and this is very troublesome to the person handling it. Unlike other products already on the market, we believe that "Vacuum Robot" is more unique as it can be controlled by phone and system. At the same time it will allow the owner to clean their home floor easily and easily.

2.0 Introduction

This chapter informs us all about the research before the robot has been set up. To build this project, it requires the knowledge that are not readily offhand. There are two main parts need to be investigated in this project , namely mobile robot design and microcontroller

specification. Motor is a one of the method an electronic device achieving movement. Motors are the most important parts of mobile robotics platform. Moreover, a vacuum pump is a divice which suck all of the dust. The main objective of incorporation sensors technology in robotic system is to enable the robots to work in non-structured and random environment. The robot needs the microcontroller specification in order build the robot that will follow the project planning. The microcontroller performs as a brain of the system. After that, the mechanical part, electrical part and programming will be combined together to produce an antonomous system.

2.1 Full system block diagram

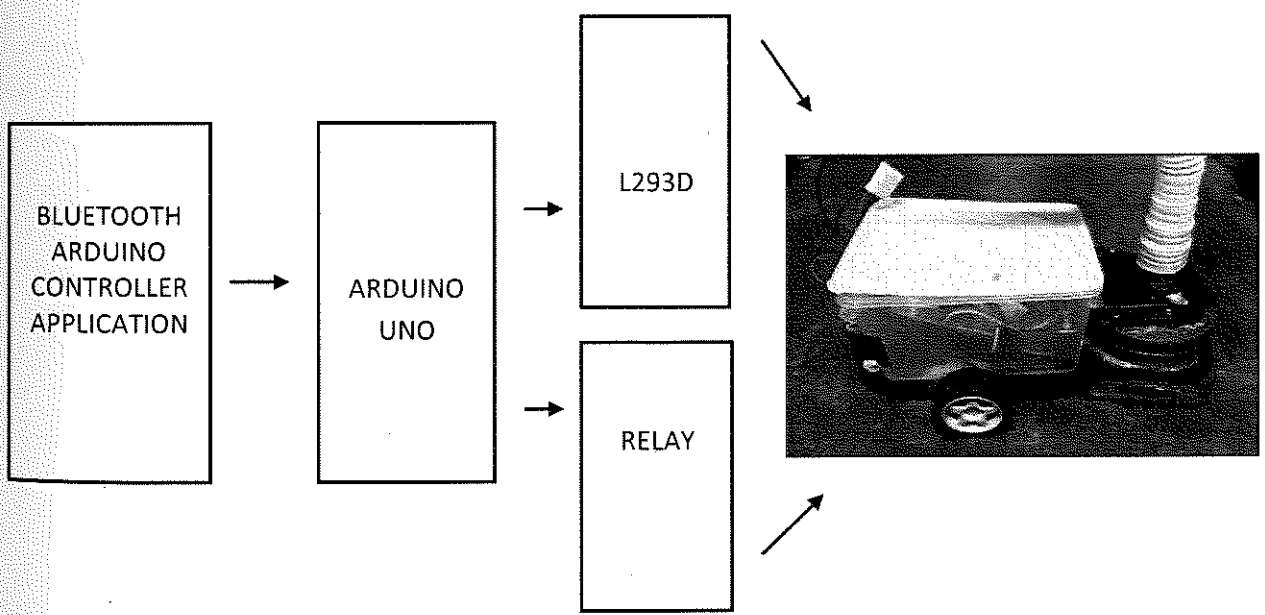

Figure 2.1: Full system block diagram

This system is controlled by Arduino uno, the relay and L293d circuit will be connected to the Arduino uno. We was write the command for communicate with Arduino uno. The Arduino uno was controlled the 12 volt dc motor for instructions. The 12 volt dc motor will function when the user wants to inhale the dust and will act as a vacuum. Arduino uno is a microcontroller, they control the entire system command using the programming language C.

2.2 Circuit Description

The circuit on this system can be devided into 3 part

1. A brain which is Arduino uno which will control instruction the whole system.

2. Second circuit, connection of two dc motor, l293d and bluetooth module.

3. Third circuit, connection of relay circuit for 12 volt dc motor.

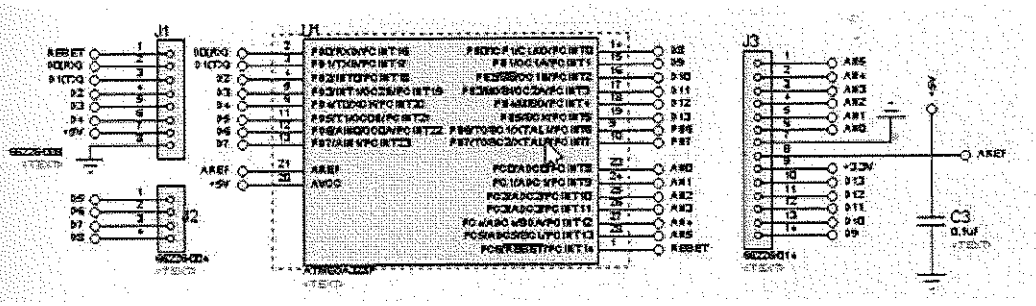

Figure 2.2(a): Arduino circuit.

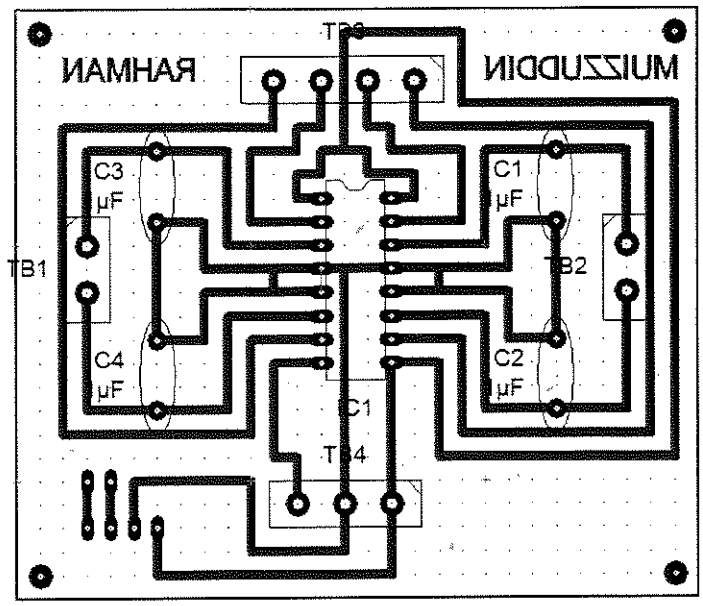

Figure 2.2(b): Two dc motor and bluetooth module with microcontroller

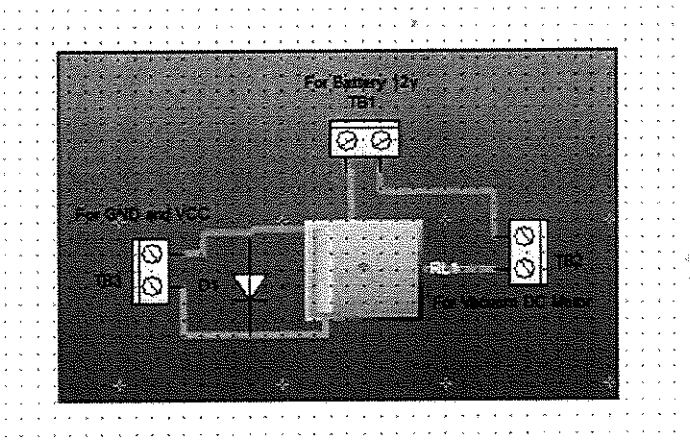

Figure 2.2 (c): Relay circuit for 12 volt dc motor

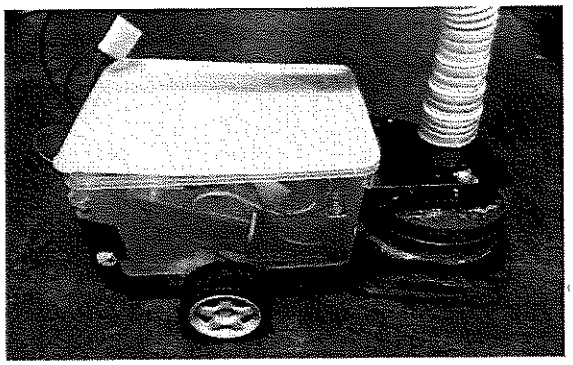

Figure 2.2(d): View of project

2.3 Software

Software to write code to ATMEGA328P-PU is Arduino 1.6.5, which has written in C language. Below is the code to for this system.

```
int motor1Pin1 = 3; // pin 2 on L293D IC

int motor1Pin2 = 4; // pin 7 on L293D IC

int enable1Pin = 6; // pin 1 on L293D IC

int motor2Pin1 = 8; // pin 10 on L293D IC

int motor2Pin2 = 9; // pin 15 on L293D IC

int enable2Pin = 11; // pin 9 on L293D IC

int state;

int flag=0;        //makes sure that the serial only prints once the state

int stateStop=0;


int relay = 7;  //for set a pin for output of relay circuit


void setup() {

  // sets the pins as outputs:


  pinMode(relay, OUTPUT);
```

```
  pinMode(motor1Pin1, OUTPUT);
  pinMode(motor1Pin2, OUTPUT);
  pinMode(enable1Pin, OUTPUT);
  pinMode(motor2Pin1, OUTPUT);
  pinMode(motor2Pin2, OUTPUT);
  pinMode(enable2Pin, OUTPUT);
  // sets enable1Pin and enable2Pin high so that motor can turn on:
  digitalWrite(enable1Pin, HIGH);
  digitalWrite(enable2Pin, HIGH);
  // initialize serial communication at 9600 bits per second:
  Serial.begin(9600);
}

void loop() {
  //if some date is sent, reads it and saves in state
  if(Serial.available() > 0){
    state = Serial.read();
    flag=0;
```

```
}
// if the state is '1' the DC motor will go forward
if (state == '1') {
   digitalWrite(motor1Pin1, HIGH);
   digitalWrite(motor1Pin2, LOW);
   digitalWrite(motor2Pin1, LOW);
   digitalWrite(motor2Pin2, HIGH);
   if(flag == 0){
    Serial.println("Go Forward!");
    flag=1;
   }
}

// if the state is '2' the motor will turn left
else if (state == '2') {
   digitalWrite(motor1Pin1, LOW);
   digitalWrite(motor1Pin2, LOW);
   digitalWrite(motor2Pin1, HIGH);
   digitalWrite(motor2Pin2, HIGH);
```

```
    if(flag == 0){
     Serial.println("Turn LEFT");
     flag=1;
    }
    delay(1500
    );
    state=3;
    stateStop=1;
  }
  // if the state is '3' the motor will Stop
  else if (state == '3' || stateStop == 1) {
    digitalWrite(motor1Pin1, LOW);
    digitalWrite(motor1Pin2, LOW);
    digitalWrite(motor2Pin1, LOW);
    digitalWrite(motor2Pin2, LOW);
    if(flag == 0){
     Serial.println("STOP!");
     flag=1;
    }
```

```
    stateStop=0;
  }
  // if the state is '4' the motor will turn right
  else if (state == '4') {
    digitalWrite(motor1Pin1, HIGH);
    digitalWrite(motor1Pin2, HIGH);
    digitalWrite(motor2Pin1, LOW);
    digitalWrite(motor2Pin2, LOW);
    if(flag == 0){
      Serial.println("Turn RIGHT");
      flag=1;
    }
    delay(1500);
    state=3;
    stateStop=1;
  }
  // if the state is '5' the motor will Reverse
  else if (state == '5') {
    digitalWrite(motor1Pin1, LOW);
```

```
    digitalWrite(motor1Pin2, HIGH);
    digitalWrite(motor2Pin1, HIGH);
    digitalWrite(motor2Pin2, LOW);
    if(flag == 0){
      Serial.println("Reverse!");
      flag=1;
    }
  }

  else if (state == '6') {
    digitalWrite(relay, HIGH);
  }

  else if (state == '7') {
    digitalWrite(relay, LOW);
  }
  //For debugging purpose
  //Serial.println(state);
}
```

2.4 Flowchart Of Project

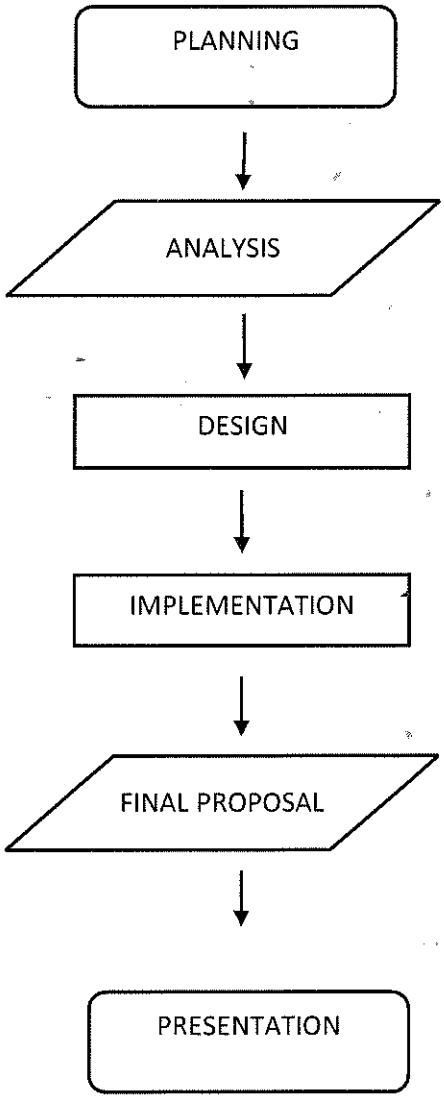

Figure 2.4: Flowchart of project

2.5 Component Of Projects

This is the proposed for vacuum robot of material as on planned.

COMPONENT OF VACUUM ROBOT	
DESCRIPTION	**QUANTITY**
BOARD 1	
Arduino UNO	1
IC L293D	1
4.5 Volt Dc Motor	2
12 Volt Dc Motor	1
Bluetooth module HC-06	1
Capacitor 0.1µf	4
Terminal Block (2 pin)	7
Terminal block (3pin)	1
9-Volt Battery	1
12-Volt Battery	1
SRD Relay single 5volt	1
Diode 1N4007	1

Table 2.5: Component of Projects

a. Arduino Microcontroller UNO

Arduino Compatible can mean many things, but most of the time it means that some company has made something they sell to a customer that supports development with the Arduino IDE. The thing is that most Arduino Compatible units use the Atmel processors, but some use others too. Third party developers then make "board"- projects that you can add Arduino IDE. Be aware though that you in some cases can run into issues if you don't do your work homework, here are some of the issues you can run into. Some "compatible" boards use different architectures, so even if you can do many things with the Arduino IDE, maybe some sensor libraries are not supported. (Might have to be hacked or updated). Some "compatible" boards have different USB-circuits (if they have them at all).

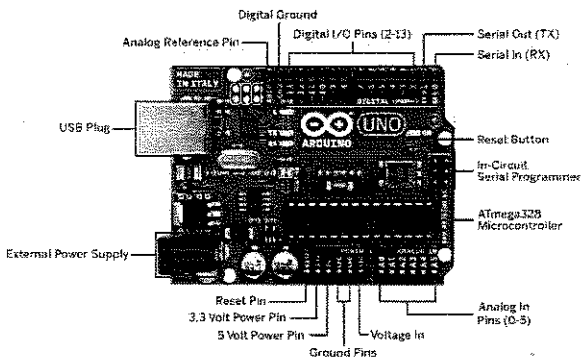

Figure 2.5(a): Arduino Microcontroller UNO Output Pin

b. IC L293D

L293D is a dual H-bridge motor driver intergrated circuit (IC). Motor drivers act as current amplifiers since they take a low-current control signal and provide a higher-currentsignal. This higher current signal is used to drive the motors.

L293D contains two imbuilt H-bridge driver circuits. In its common mode of operation, two DC motors can be driven simultaneously, both in forward and reverse direction. The motor operations of two motors can be controlled by input logic at pin 2 & 7and 10 & 15. Input logic 00 or 11 will stop the corresponding motor. Logic 01 and 10 will rotate it in clockwise and anticlockwise directions, respectively.

Enable pin 1 and 9 (corresponding to the two motors) must be high for motors to start operating. When an enable input is high, the associated driver gets enable. As a result, the outputs become active and work in phase with their inputs. Similarly, when the enable input is low, that driver is disabled, and their outputs are off and in the high-impedance state.

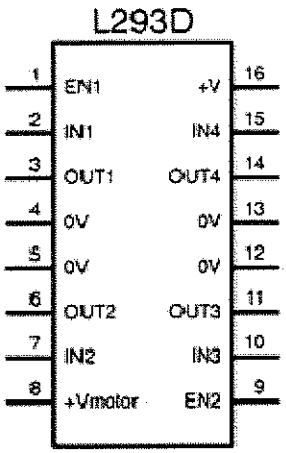

Figure 2.5(b)(i): Output pin of L293D

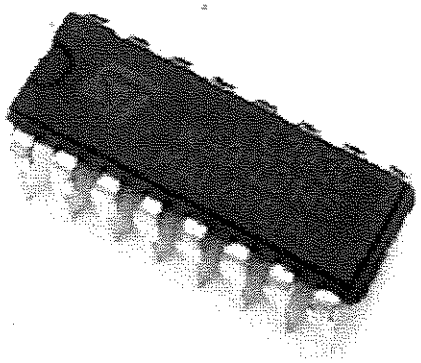

Figure 2.5(b)(ii): L293D

c. DC Motor

A DC motor is any of a class of rotary electrical machines that converts direct current electrical power into mechanical power. 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.

DC motors were the first type widely used, since they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances. The universal motor can operate on direct current but is a lightweight motor used for portable power tools and appliances. Larger DC motors are used in propulsion of electric vehicles, elevator and hoists, or in drives for steel rolling mills. The advent of power electronics has made replacement of DC motors with AC motors possible in many applications.

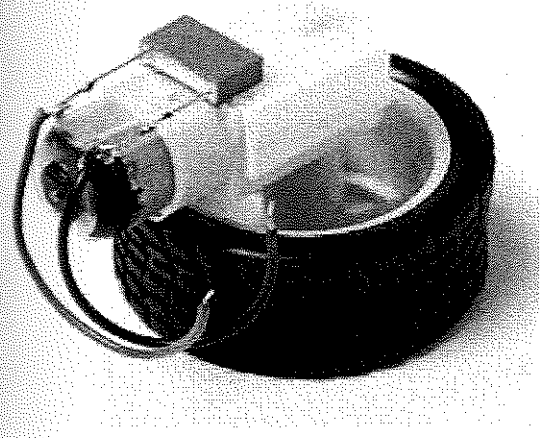

Figure 2.5(c)(i): DC Motor

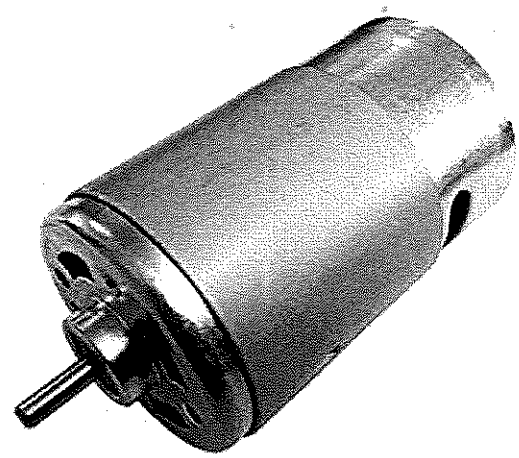

Figure 2.5(c)(ii): DC Motor 12V

d. Bluetooth module HC-06

Bluetooth is a wireless technology standard for exchanging data over short distances (using short-wavelength UHF radio waves in the ISM band from 2.4 to 2.485 GHz) from fixed and mobile devices, and building personal area networks (PANs). Range is approximately 10 Meters (30 feet).

These modules are based on the Cambridge Silicon Radio BC417 2.4 GHz BlueTooth Radio chip. This is a complex chip which uses an external 8 Mbit flash memory.

HC-05 PinOut (Right) :

- KEY: If brought HIGH before power is applied, forces AT Command Setup Mode. LED blinks slowly (2 seconds)
- VCC: +5 Power
- GND: System / Arduino Ground
- TXD: Transmit Serial Data from HC-06 to Arduino Serial Receive. NOTE: 3.3V HIGH level: OK for Arduino
- RXD: Receive Serial Data from Arduino Serial Transmit
- STATE: Tells if connected or not

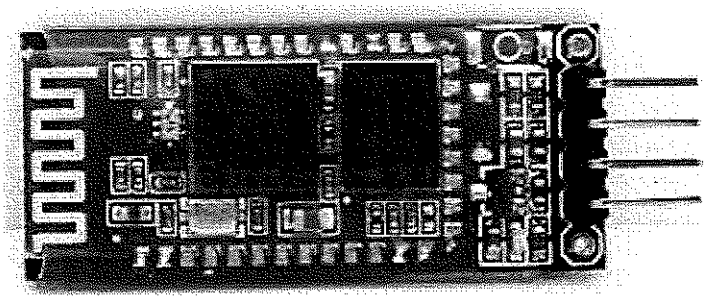

Figure 2.5(d): Bluetooth module HC-06

e. Capacitor

A capacitor is a passive two-terminal electrical component that stores electrical energy in an electric field. The effect of a capacitor is known ascapacitance. While capacitance exists between any two electrical conductors of a circuit in sufficiently close proximity, a capacitor is specifically designed to provide and enhance this effect for a variety of practical applications by consideration of size, shape, and positioning of closely spaced conductors, and the intervening dielectric material. A capacitor was therefore historically first known as an electric condenser.

The physical form and construction of practical capacitors vary widely and many capacitor types are in common use. Most capacitors contain at least twoelectrical conductors often in the form of metallic plates or surfaces separated by a dielectric medium. A conductor may be a foil, thin film, sintered bead of metal, or an electrolyte. The nonconducting dielectric acts to increase the capacitor's charge capacity. Materials commonly used as dielectrics includeglass, ceramic, plastic film, paper, mica, and oxide layers. Capacitors are widely used as parts of electrical circuits in many common electrical devices. Unlike a resistor, an ideal capacitor does not dissipate energy.

Figure 2.5(e): Capacitor