AUTOMATED HOME CLEANING VEHICLE

MINI PROJECT REPORT

Submitted by

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in partial fulfilment for the award of the degree of

BACHELOR OF ENGINEERING

IN

ELECTRONICS AND COMMUNICATION ENGINEERING

KARPAGAM
COLLEGE OF ENGINEERING
Rediscover | Refine | Redefine
Coimbatore - 641 032

Autonomous | Affiliated to Anna University, Chennai
Accredited by NAAC with 'A' Grade | NBA (ECE, EEE, CSE, MECH & IT)

JULY 2022

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(Autonomous)
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Bonafide record of work done by

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..…………………………   …………….…………………

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Faculty guide   Head of the Department

Certified that the candidate was examined in the viva-voce examination held on

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(Internal Examiner)   (External Examiner)

ACKNOWLEDGEMENT

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ABSTRACT

Households of today are becoming smarter and more automated. Home automation delivers convenience and creates more time for people. Domestic robots are entering the homes and people's daily lives, but it is yet a relatively new and immature market. However, a growth is predicted and the adoption of domestic robots is evolving. Several robotic vacuum cleaners are available on the market but only few ones implement cleaning of floors. The purpose of this project is to design and implement a Automated vehicle for cleaning and to Manual via Phone Application. This machine is designed to make cleaning process become easier rather than by using manual vacuum. The main objective of this project is to design and implement a automated vehicle prototype by using Arduino UNO, Motor Driver L293D shield, 4 Gear Motors, IR sensor, Bluetooth module and Jumper wires to connect and to achieve the goal of this project. This Automated vehicle will have several criteria that are user-friendly.

TABLE OF CONTENTS

1. INTRODUCTION

The research and development of an Automated Vehicle and a Manual Phone Application Control prototype able to clean a room. This vehicle operate semi- or fully autonomously to perform services useful to the well-being of humans. With the aim of keeping our vehicle as simple as possible, while able to perform the initial goals, i.e. an automated vehicle able to randomly navigate through a room or a house with the minimum human assistance, the following specifications were found:

- Obstacle avoidance

- Collision detection

- System based on control

Design Methodology :

A number of software and hardware implementation techniques were used to design and develop the system. The above figure shows the block diagram of system. We used a 4 gear motors, L293D Motor Driver shield, IR Sensor, Bluetooth Module and Arduino to develop our system.

The operation of the automated vehicle is going to be based on retrieving data from an array of inputs that will tell the condition. Each of these parts will be described in further detail further on later in the documentation. The data from these inputs will be fed into the chip(s) which through its software program will decide which direction the vacuum should move by sending the control signals out to the drive motors

2.COMPONENTS

2.1 Microcontroller: Arduino UNO

Arduino Uno is a microcontroller board based on the ATmega328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, 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 an AC-to-DC adapter or battery to get started. Functionality of this board can be verified in TinkerCad software and this avoid damage that shall be encountered during real-time operations.

Fig 2.1-Arduino UNO

2.2Motor Driver Shield

L293D is a monolithic integrated, high voltage, high current, 4-channel driver. Basically this means using this chip you can use DC motors and power supplies of up to 16 Volts, thats some pretty big motors and the chip can supply a maximum current of 600mA per channel, the L293D chip is also what's known as a type of H-Bridge. The H-Bridge is typically an electrical circuit that enables a voltage to be applied across a load in either direction to an output, e.g. motor.

The L293D V1 Motor Shield can drive up to 4 DC motors at voltages from 4.5 – 25V and at currents of up to 1.2A peak (600mA continuous) per motor with speed and direction control.The module can also support up to 2 stepper motors. Each stepper motor takes the place of 2 of the DC motors, so you can run 2 stepper motors or 1 stepper motor and 2 DC motors or 4 DC motors.
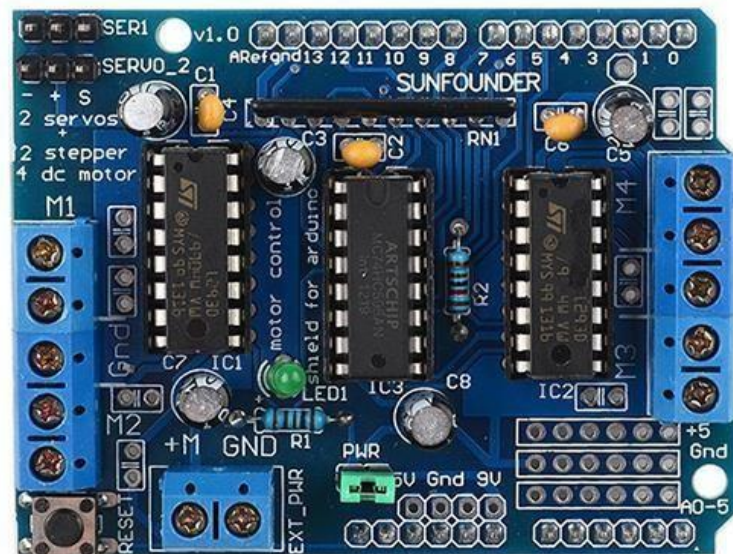

Fig 2.2 L293D-Motor Driver

2.3 Bluetooth Module

Bluetooth is a technology for wireless communication. It is designed to replace cable connections.It uses serial communication to communicate with devices. It communicates with microcontroller using serial port (USART). Usually, it connects small devices like mobile phones, PDAs and TVs using a short-range wireless connection to exchange documents. It uses the 2.45GHz frequency band. The connection can be point-to-point or multi-point where the maximum range is 10 meters. The transfer rate of the data is 1Mbps.

HC-05 Bluetooth module provides switching mode between master and slave mode which means it able to use neither receiving nor transmitting data. Comparing it to the HC-06 module, which can only be set as a Slave, the HC-05 can be set as Master as well which enables making a communication between two separate Arduino Boards. User can use Bluetooth module simply for a serial port replacement to establish connection between MCU, PC to your embedded project and etc.

HC-05 Specification:

Application:

- Computer and peripheral devices
- GPS receiver
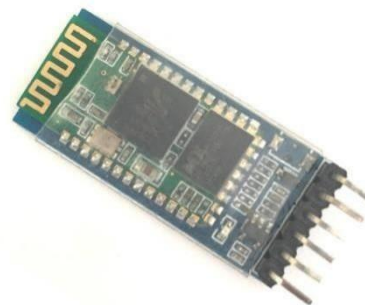- Industrial control
- MCU projects

Fig 2.3 HC-05

Bluetooth Module

2.4 Gear Motor

The 60 RPM Single Shaft BO Motor - Straight motor gives good torque and rpm at lower operating voltages, which is the biggest advantage of these motors.

Small shaft with matching wheels gives an optimized design for your application or robot. Mounting holes on the body & light weight makes it suitable for in-circuit placement. This motor can be used with 69mm Diameter Wheel for Plastic Gear Motors. It is an alternative to our metal gear DC motors. It comes with an operating voltage of 3-12V and is perfect for building small and medium robots. The motor is ideal for DIY enthusiasts. This motor set is inexpensive, small, easy to install, and ideally suited for use in a mobile robot car. They are commonly used in our 2WD platforms.

Fig 2.4 Gear Motor

3.WORKING AND CONSTRUCTIONS

In this Project, for controlling the vehicle we are using Bluetooth Module and it is at the transmitter side and receiver side. By passing the commands, from mobile phone and maintain minimum prescribed distance by the Bluetooth committee for transfer of information. Based on the instructions vehicle will starts the working. The Arduino is a microcontroller board based on the ATmega328. It has 14 digital input/output pins, 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button.

Brushes are used for sweeping the floor. So that the sweeping is performed. It can be moved in any angles like forward, backward and side wards. Gear Motors, we are using it to rotate the wheels through the given external energy like external battery with 13V and to control speed of the vehicle. Motor Driver, we are using it for amplify the power from Arduino UNO and stabilizes the motor.
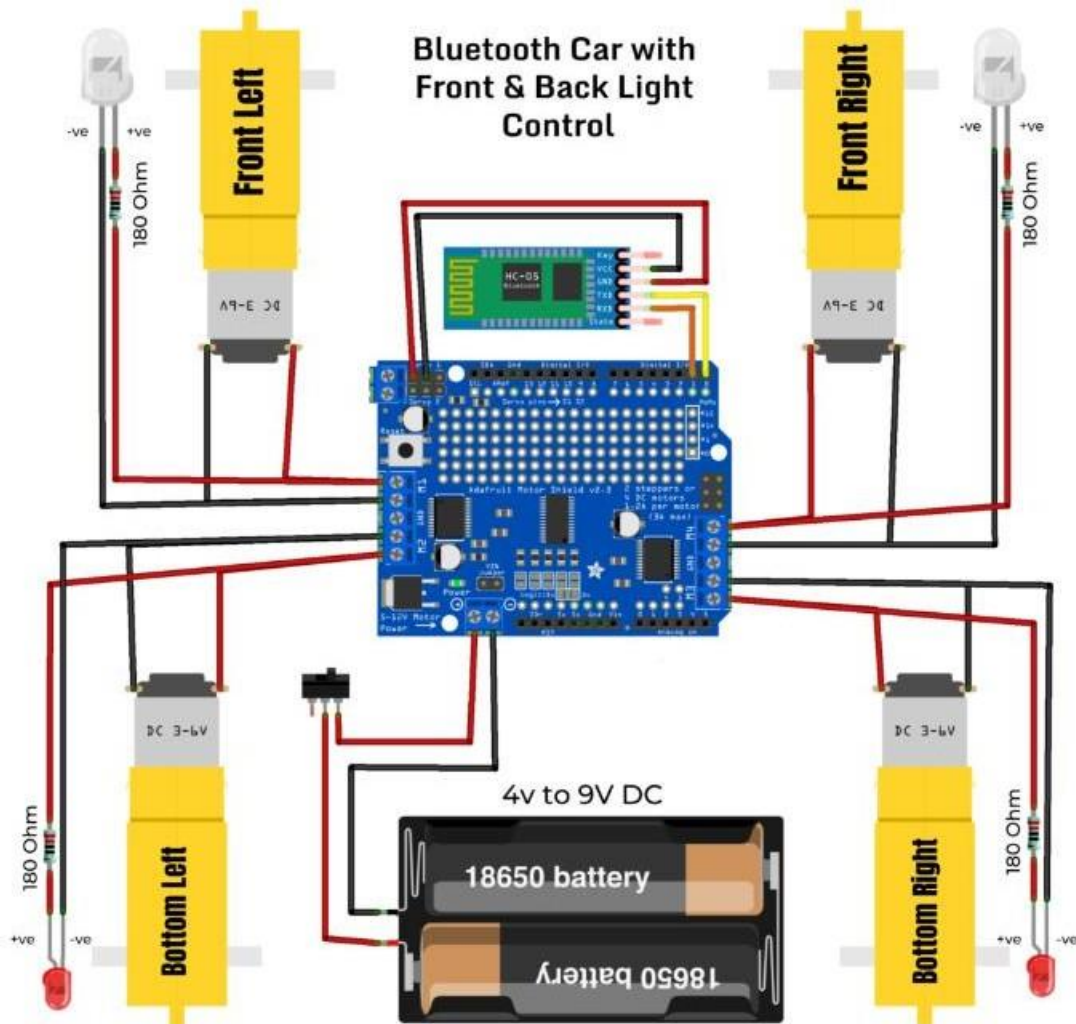
3.1 Simulated circuit in Tinker cad

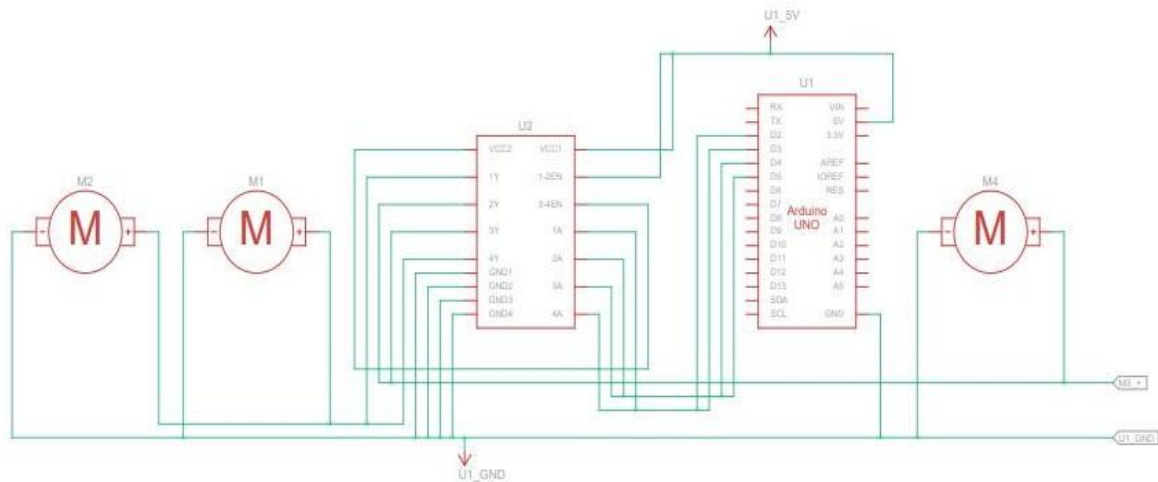Fig 3.1 - Simulated circuit in Tinker cad

3.2 Schematic Diagram:
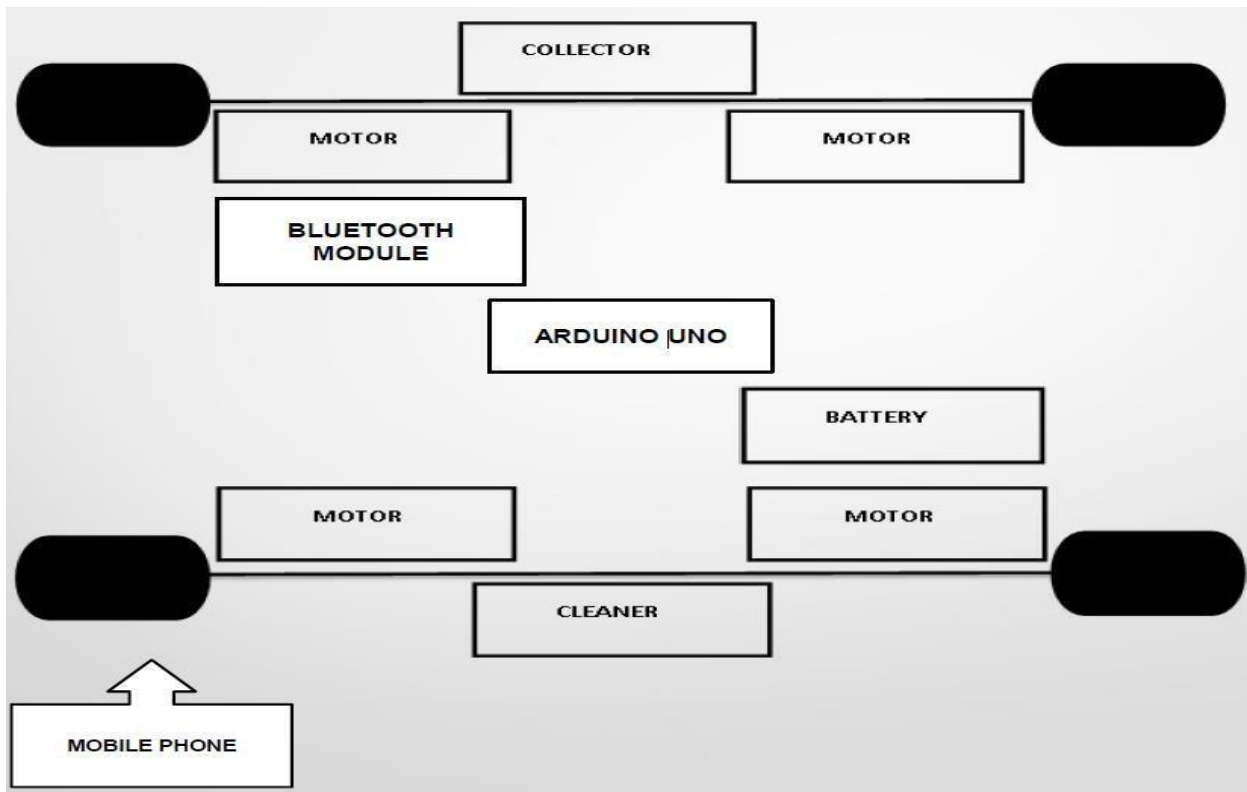

Fig 3.2 Schematic Diagram

3.3 Flow Chart:

Fig 3.3 Flow Chart

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4.APPLICATION SOFTWARE

4.1 For Coding:

The Arduino app is generally developed using C language. David Mellis developed the Arduino software, which was based on Wiring. Before long, Gianluca Martino and Tom Igoe joined the project, and the five are known as the original founders of Arduino.

Fig 4.1- Interface of the APP

The app invented by these searches for the USB port devices i.e., Arduino UNO. The user just needs to select a particular port. When a particular port is selected, the app is ready to process it and to upload the program in it.

4.2 For Bluetooth Connection

This App that gives you compatibility with all microcontrollers. All you need is a HC-05 serial adapter connection with serial ports of the controllers. Control any Micro-controller that uses a Bluetooth Module HC 05 or HC 06 through your smart phone. This app can send and receive commands via Bluetooth so you can debug your hardware problems easily.

FEATURES:

- Separate panels for sending and receiving data.

- Custom your own buttons for frequent sending of same data.

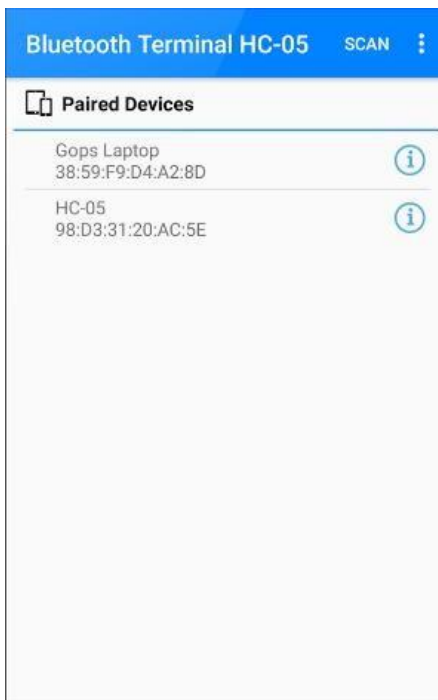- Monitoring receiving data as HEX or ASCII.

- Sending Data as ASCII or HEX.

Fig 4.2 Interface of the APP

4.3 Arduino Instructions

In this project, we have used AFMotor.h header file for including motor fucntions ,

Instructions:

* AF_DCMotor motor1(1) - Assigning motor number

* Serial.begin(9600)   -Establishing Connection for bluetooth module

* motor1.setSpeed(246) - Setting speed of motor

* motor1.run(FORWARD) - To run motor forward

* motor1.run(BACKWARD) - To run motor backward

*motor1.run(RELEASE) -To stop the motor

 *delay(2000) - Delaying for 2 seconds

  *if clause - Control Flow Statement

5. RESULT AND ANALYSIS

The aim of this project is to design and develop an Autonomous and Android
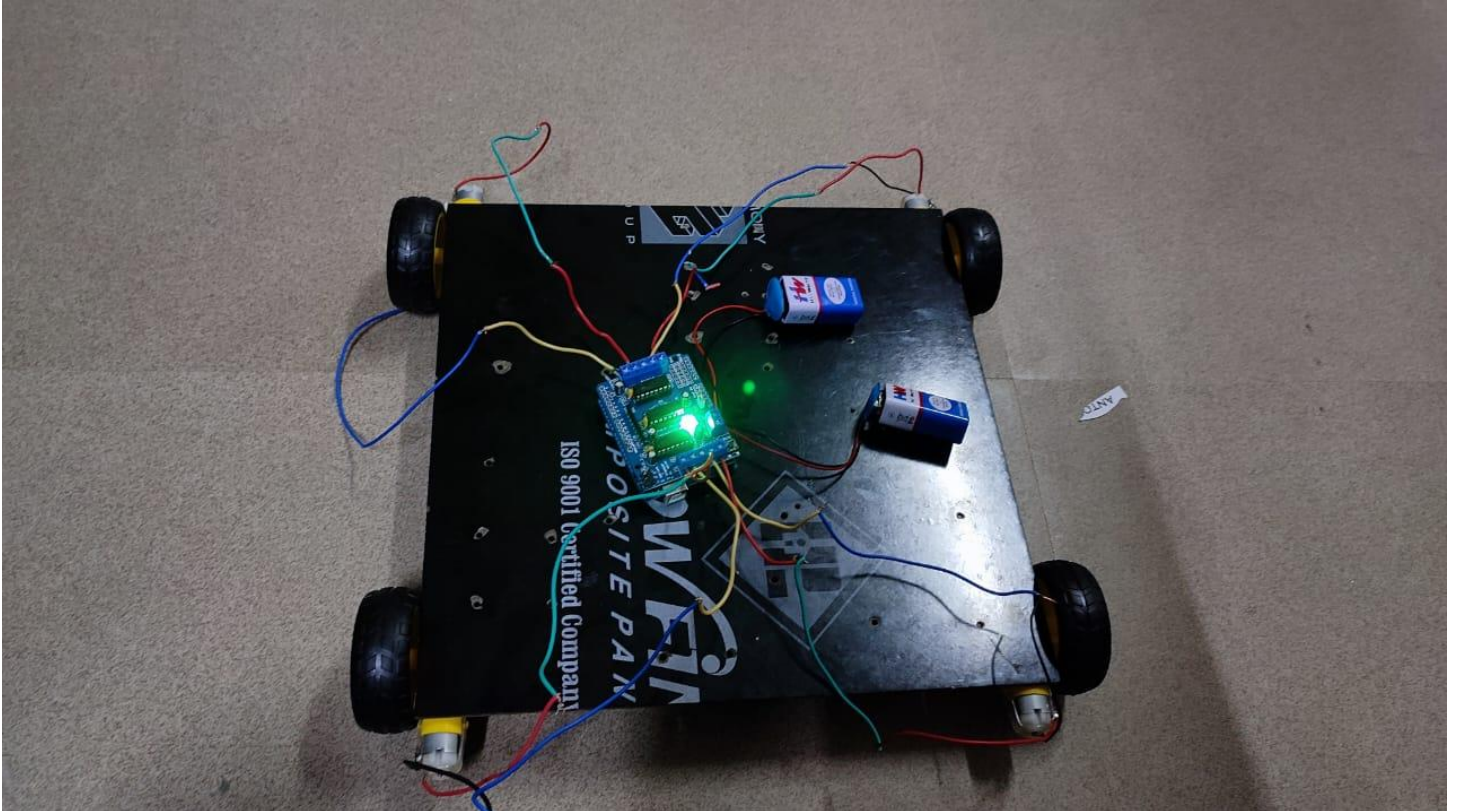Application based Cleaning Robot.

Fig 5.1 - Prototype of Automated Home Cleaning Vehicle

6. CONCLUSION

A cheaper and user-friendly Automated vehicle for cleaning purpose can be developed with controlling using an Arduino Board with more electronics functionality. Battery monitoring, self-charging and lighter body weight time manually are the future scope of this project.

7 . FUTURE SCOPE

In place Bluetooth technology GSM MODEM will be use and obstacles detection will be added.

8. REFERENCES

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5. https://electrosome.com/hc-05-serial-bluetooth-module/

6. https://www.electronicscomp.com/60-rpm-single-shaft-bo-motor-straight?gclid=Cj0KCQjw3eeXBhD7ARIsAHjssr-W8zN4H3MqpUgLQ3i4VNrh4POPtP5BIakEJr1eFRaT17KQZZnvmrAaAiWPEALw_wcB

9.APPENDIX

```cpp
#include "AFMotor.h" // Including header file

AF_DCMotor motor1(1);

AF_DCMotor motor2(2);

AF_DCMotor motor3(3);

AF_DCMotor motor4(4);



void setup(){     // intial steps that execute one time


  Serial.begin(9600);

  motor1.setSpeed(246); //setting motor1 speed

  motor2.setSpeed(246); //setting motor2 speed

  motor3.setSpeed(246); //setting motor3 speed

  motor4.setSpeed(246);//setting motor4 speed

}
void loop(){    // steps  that execute continously
//M3-off for right
//M4 off for left
while(Serial.available()>0){
  int a=Serial.parseInt();
```

```
if(a==1){
 motor1.run(FORWARD);
 motor2.run(FORWARD);
 motor3.run(FORWARD);
 motor4.run(FORWARD);
   delay(5000);
 }
 if(a==2){
   motor1.run(BACKWARD);
  motor2.run(BACKWARD);
  motor3.run(BACKWARD);
  motor4.run(BACKWARD);
delay(5000);
    }
   //left
   if(a==3){
    motor1.run(RELEASE);
  motor2.run(FORWARD);
  motor3.run(FORWARD);
  motor4.run(RELEASE);
delay(5000);
   }
   //right
```

```
    if(a==4){
  motor1.run(FORWARD);
   motor2.run(RELEASE);
   motor3.run(RELEASE);
   motor4.run(FORWARD);
 delay(5000);

     }
 if(a==5){
   motor1.run(RELEASE);
   motor2.run(RELEASE);
   motor3.run(RELEASE);
   motor4.run(RELEASE);
 delay(1000);

    }
   if(a==6){
    motor3.setSpeed(100);
    motor4.setSpeed(100);
    delay(2000);

    }
}

}
```