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SCHOOL OF ELECTRONICS ENGINEERING

COURSE CODE: ECE3003

COURSE TITLE: MICROCONTROLLERS AND ITS APPLICATIONS

PROJECT TITLE: ANDROID CONTROLLED ROBOT USING 8051 MICROCONTROLLER

MEMBERS:

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SLOT: L51+L52

AIM:

In this project, main aim is to build an Android Phone controlled robot using 8051 microcontrollers and 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. The status of the robot is sent back to the Android app. This project will also help for interfacing of HC-05 Bluetooth module with 8051 microcontrollers.

INTRODUCTION:

A voice controlled robot takes specified command in the form of voice. Whatever the command is given through voice module or Bluetooth module, it is decoded by the existing controller and hence the given command is executed.

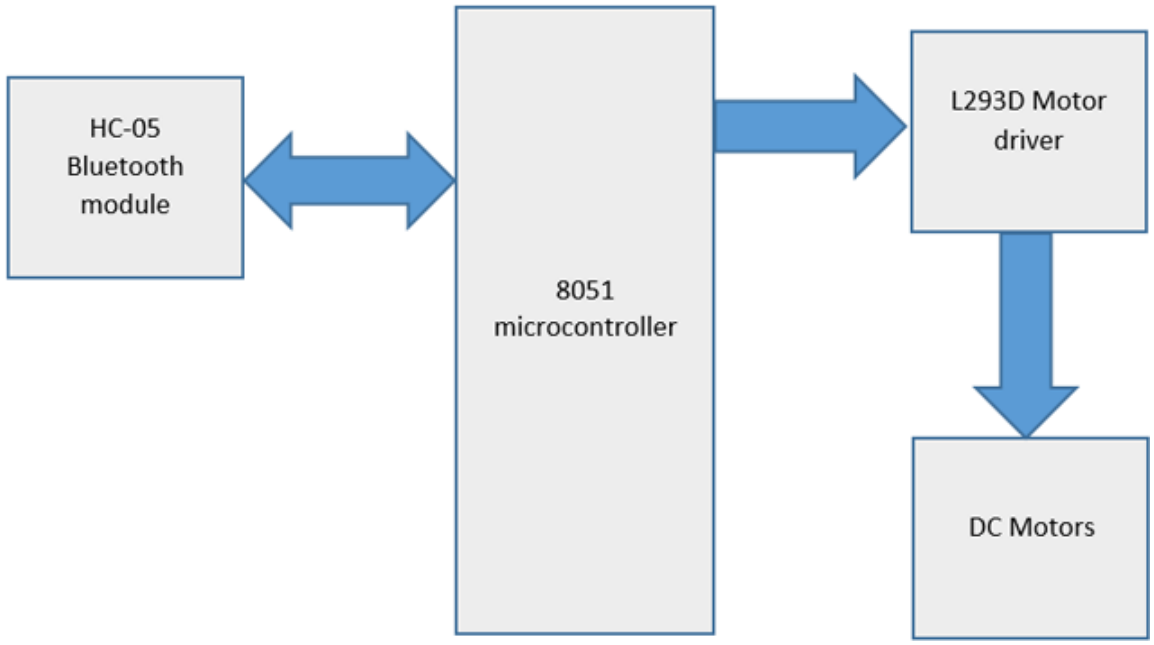
In this project, Bluetooth module and Android application is used to give voice command in the form of hex code. There are certain digits which can be sent directly to the Bluetooth module and automatically the digit is converted into its hex code.

We can use these digits as a voice command for the specified operation pre-programmed in the microcontroller.
Using digits as a voice command is easier than using alphabetical commands.

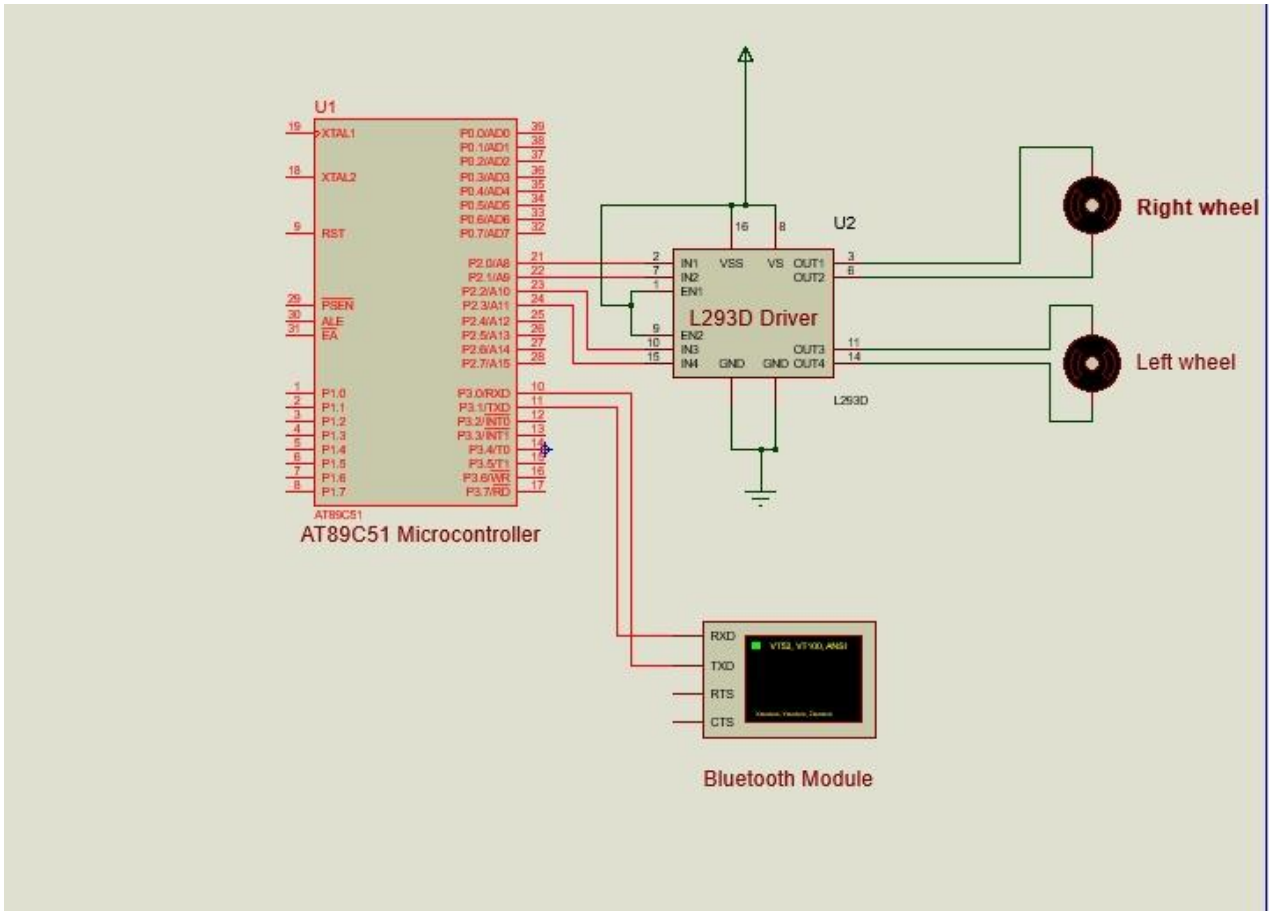
In this project 8051 and Bluetooth module are communicating over UART @9600bps. Bluetooth module HC-05 is controlled via simple AT commands. This module comes in SMD package and works on 3.3v power supply. The BT module is a SPP supported profile so it can be connected easily to any controller or embedded device. In this profile the data sent and receive to module directly comes on the RX pin of microcontroller. It becomes really easy to make your device Bluetooth compatible.

L293D H-Bridge motor driver are used to control two DC motors. A readymade compact size chassis is used to avoid the chassis assembly complexities. The chassis contains 2 decks the lower is used for BO motors fitting the upper are used as a battery stack. On top plate the controller board is mounted by screw fitting.

BLOCK DIAGRAM:



CIRCUIT DIAGRAM:



COMPONENTS:

- 8051 microcontroller (AT89S52)
- HC-05 Bluetooth module
- L293D Motor Driver
- Robot chassis
- DC Motors (2)

- Wheels (2)
- Castor Wheel
- Jumper wires
- Bluetooth terminal android app

BLOCK ROLES:

8051 MICROCONTROLLER:

8051 microcontroller is a 8-bit microcontroller which has 128 bytes of on chip RAM, 4K bytes of on chip ROM, two timers, one serial port and four 8bit ports. 8052 microcontroller is an extension of 8051 microcontroller. In this project we are using AT89S52 microcontroller. The table below shows the comparison of 8051 family members.

FEATURE	8051	8052
ROM	4K	8K
RAM	128	256
TIMERS	2	3
I/O PINS	32	32
SERIAL PORT	1	1
INTERRUPT SOURCES	6	8

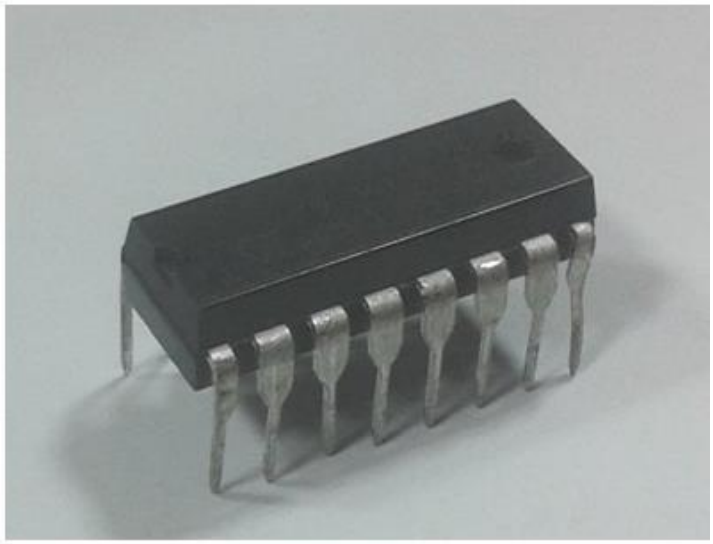
HC-05 BLUETOOTH MODULE:

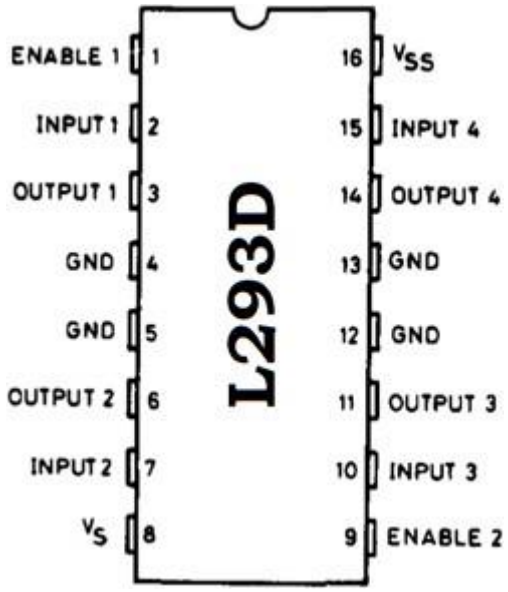
HC-05 is a serial Bluetooth module. It can be configured using AT commands. It can work in three different configurations (Master, Slave, Loop back). In our project we will be using it as a slave. The features of HC-05 module includes,

- Typical -80dBm sensitivity.
- Default baud rate: 9600bps , 8 data bits , 1 stop bit , no parity.
- Auto-pairing pin code: “1234” default pin code
- It has 6 pins.
- Vcc and Gnd pins are used for powering the HC-05.
- Tx and Rx pins are used for communicating with the microcontroller.
- Enable pin for activating the HC-05 module. when it is low , the module is disabled
- State pin acts status indicator. When it is not paired/connected with any other Bluetooth device, LED flashes continuously. When it is connected/paired with any other Bluetooth device, then the LED flashes with the constant delay of 2 seconds.

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:

Hence an android controlled robot was made using a microcontroller.

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)

WORKING AND CONNECTIONS:

In this Smart Phone controlled Robot, the user of android app sends the data to 8051 microcontroller through HC-05 module. The received data is compared in 8051 microcontroller and the decision is made accordingly. The below table shows the direction of motors and status of robot for different received characters:

Received character	Motor 1	Motor 2	Status of robot
f	Forward	Forward	Moves forward
b	Backward	Backward	Moves backward
r	Forward	Backward	Moves Right
l	Backward	Forward	Moves left
s	Off	Off	Stopped

The Bluetooth terminal app allows us to emulate a Bluetooth terminal. This app supports bidirectional communication and this app is compatible with most of the devices.

The steps below show how to install and use this app.

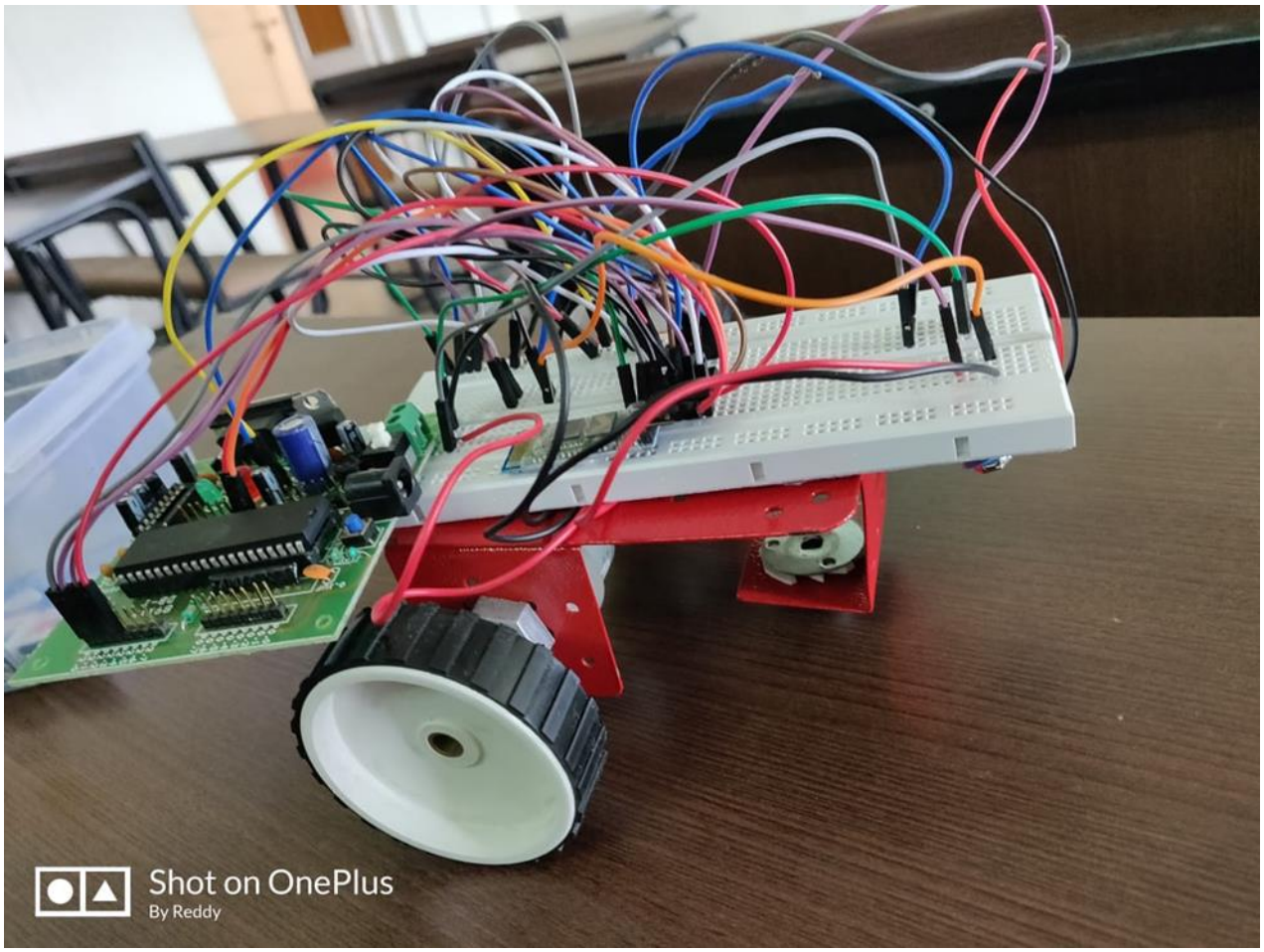
1. Download and install Bluetooth terminal app on your android phone. The app can be downloaded from the below link.

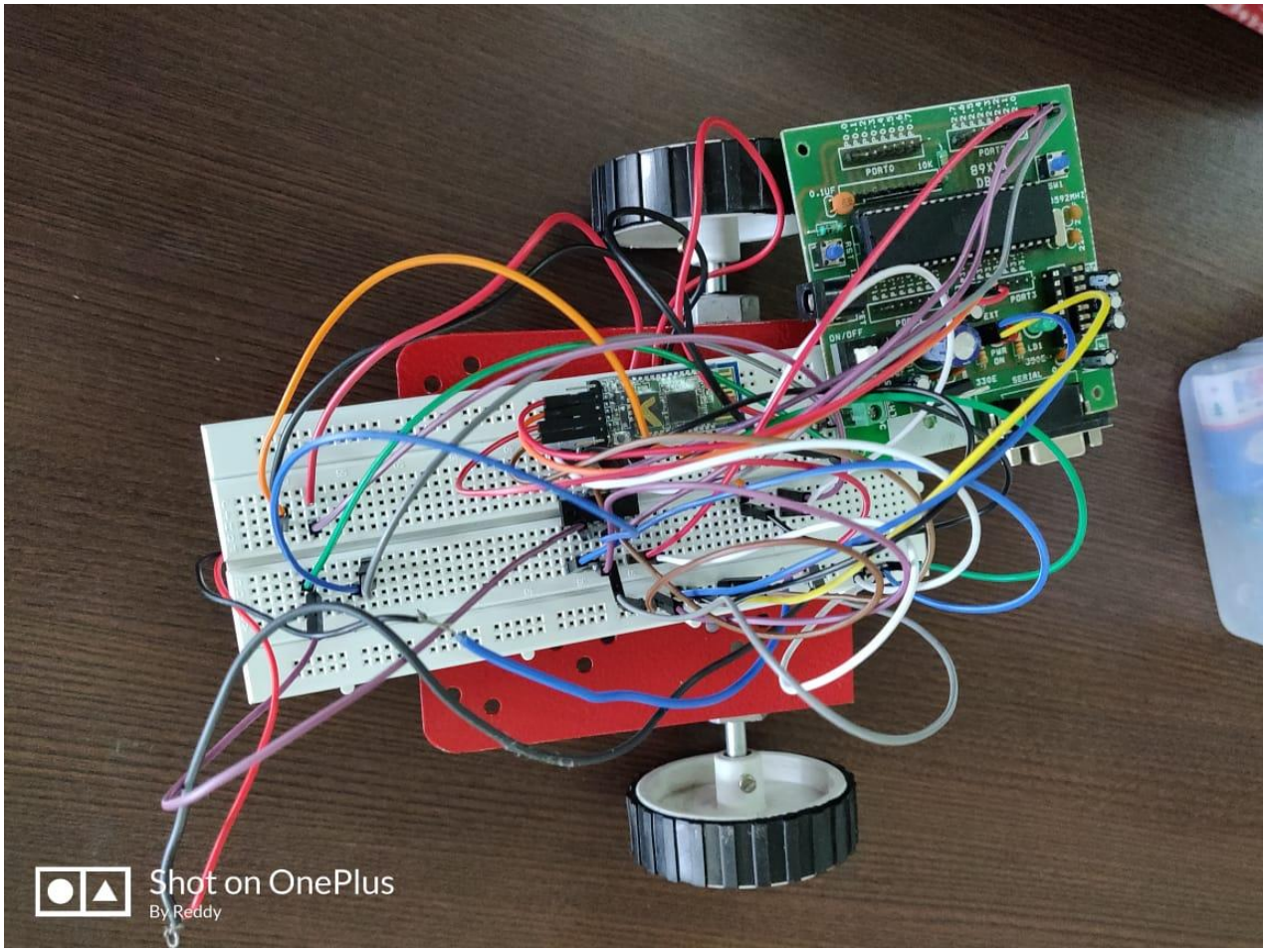
https://play.google.com/store/apps/details?id=ptah.apps.bluetoothterminal

2. After installing the app, open the app and turn on Bluetooth.

3. Select the device and click on connect option. After successful connection, we can start sending data to HC-05 module.

RESULTS:


Shot on OnePlus
By Reddy


PORT0
10K
ON/OFF
Shot on OnePlus
By Reddy