

## VOICE RECOGNITION -BUTLER BOT

T.KOUSALYA<sup>1</sup>, MOHAMMED YASER ARAFATH<sup>2</sup>, NARENDRAN K<sup>3</sup>, RATHEESH V<sup>4</sup>, SATHEESH R<sup>5</sup>

<sup>1</sup>Assistant professor, Dept. of Mechanical and Automation Engineering, SNS college of Technology, Tamil Nadu

<sup>2,3,4,5</sup>Student, Dept. of Mechanical and Automation Engineering, SNS college of Technology, Tamil Nadu

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**Abstract** - Many of the wireless-controlled robots use RF modules. But our Project make use of Android mobile phone for robotic control. The control commands available are more than RF modules. For this the android mobile user has to install an application on her/his mobile. Then user needs to turn on the Bluetooth in the mobile. The wireless communication techniques used to control the robot is Bluetooth technology. User can use various commands like move forward, reverse, move left, move right using these commands which are sent from the Android mobile. Robot has a Bluetooth receiver unit which receives the commands and give it to the microcontroller circuit to control the motors. The microcontroller then transmits the signal to the motor driver IC's to operate the motors.

**Key Words:** Motor driver circuit, Bluetooth module, Android phone, Embedded code, GSM Evolution, radio frequency, Microcontroller, wireless communication.

### 1. INTRODUCTION

Our Project Aim is to designing a Robot that can be operated using Android mobile phone. The controlling of the Robot done wirelessly through Android smart phone using the Bluetooth feature present in it. Here in the project the Android smart phone is used as a remote control for operating the Robot.

Android Software stack for mobile devices that includes an operating system, middleware and key applications. Android boasts a healthy array of connectivity options, including Wi-Fi, Bluetooth and wireless data over a cellular connection (for example GPRS, EDGE (Enhanced Data rates for GSM Evolution), and 3G). Android provides access to a wide range of useful libraries and tools that can be used to build rich applications. In addition, Android includes a full set of tool that have been built from the ground up alongside the platform providing developers with high productivity and deep insight into their applications. Bluetooth is an open standard specification for a radio frequency (RF)-based, short range connectivity technology that promises to change the face of computing and wireless communication. It is designed to be an expensive, wireless networking system for all classes of portable devices, such as laptops, PDAs (personal digital assistants), and mobile phones. It will enable wireless connections for desktop computers, making connections between monitors, printers, keyboards, and the CPU cable-free. The controlling device of the work system is a Microcontroller. Bluetooth module, DC motors are interfaced to the Microcontroller. The data receive by the Bluetooth module from Android smart phone is fed as input

to the controller. The controller acts accordingly on the DC motors of the Robot. The robot in the project can be made to move in all the four directions using the Android phone. The direction of the robot is indicated using LED indicators of the Robot system. In achieving the task the controller is loaded with a program written using Embedded 'C' language.

### 2. Objective

The objective behind making this robot was to bring the functionalities of a robot service in a cheap and onto a mobile device which almost everybody is having. So while surveying as to on which platform or rather operating system the project has to be implemented, we selected android for the following reasons:

- Android is an open source platform
- Supports multifunction
- Provides rich tools to make interactive application
- Downloading the software's required for making the application are absolutely free Along with this we surveyed the popularity of the operating system. Market share of android which was mere 2.8% in 2009 (initial stage), boosted to 48% till August, 2011 which is almost half the share of the total market. Our basic aim is to make the application reach as many people as possible and this goal is achieved by implementing the application on android. Share of worldwide 2011 Q2 Smartphone sales to end users by O.S, according to Gartner.

Therefore if we become successful in making a robot which is controlled by an Android then almost half of this world can control their home appliances or small robots without expending any much of their fortune.

### 3. Methodology

#### 3.1 Block diagram

The purpose of our Project is to provide simpler robot's hardware architecture but with powerful computational platforms so that robot's designer can focus on their research and tests instead of Bluetooth connection infrastructure. This simple architecture is also useful for educational robotics, because students can build their own robots with low cost and use them as platform for experiments in several courses. The main purpose of this project is to develop a remote user interface to control a robot via a wireless technology. There is a need to communicate with the robot remotely in order to control the robot movements and pass critical data both ways. The current IR control are not good enough because

the robot does not have an IR transmitter but only a receiver, meaning that the communication is one way. The IR communication works only in mean of direct sight and any objects in the way will obstruct the communication. Bluetooth communication will enable us to control the robot up to 100 meters without the need for direct sight which means that the robot could be located behind a wall or some other object and the communication would not be lost. The below figure 3.1.a explain the working of the module

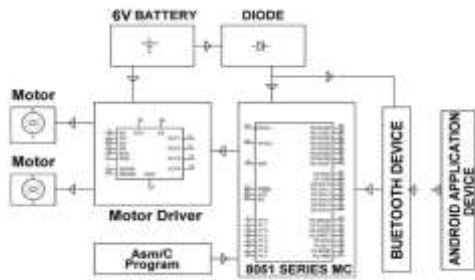


FIG 3.1.A BLOCK DIAGRAM

### 3.2 CONNECTIVITY AND COMMUNICATION

For the communication of the robot with the cell phone or a mobile we are using the Bluetooth device. The Bluetooth device (HC-05) it is attached to the robot that receives the data from the mobile and also can transmit the data. Bluetooth is a wireless communications protocol running at 2.4 GHz, with client-server architecture, suitable for forming personal area networks. It s designed for low power devices such as mobile phones [3.5]. Bluetooth now comes as standard on the majority of mobile phones, and desktop computers. It can be easily fitted with a module to allow Bluetooth communication. Bluetooth is the only appropriate communications protocol because there is no fear of getting the frequency interference. Bluetooth uses the MAC Address of the device. The Bluetooth gives the connectivity between two devices using their MAC Address show in figure 3.2.a

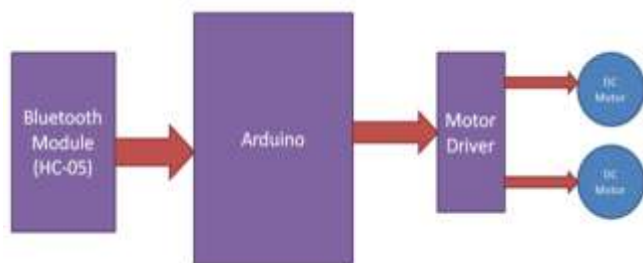


FIG 3.2. A COMMUNICATION MODULE

### 3.3 ANDROID

Android devices are powerful mobile computers and they become more and more popular smart phones used worldwide. They becomes more and more popular for software developers because of its powerful capabilities and open architecture, it's based on the java programming

language. Because Android uses the Java programming language getting started with the Android API to easy; the API is open and allows easy access to the hardware components. Android devices provide numerous communication interfaces like USB, Wi-Fi and Bluetooth, that can be used to connect to the robot. We think it is a great platform for a robotic system control, because it's much cheaper than any other ARM-based processing unit. We use android platform because it is the widest used in the world and runs the largest number of Smart phones worldwide.

### 3.4 DC MOTOR

Almost every mechanical movement that we see around us is accomplished by an electric motor. Electric machines are means of converting energy. Motors take electrical energy and produce mechanical energy. Electric motor is used to power hundreds of devices we use in everyday life. An example of small motor applications includes motors used in automobiles, robot, hand power tools and food blenders. Micro-machines are electric machines with parts the size of red blood cell and find many applications in medicine.

### 3.5 PROPOSED ALGORITHM

- Step 1: Establish Communication between Android and Bluetooth Module.
- Step 2: Press Command input button from App.
- Step 3: Corresponding Command input string is send to Bluetooth Module.
- Step 4: Check Command is received by the Bluetooth module.
- Step 5: If "Disconnect" Command given then end communication.
- Step 6: Close Application.

### 3.6 ALGORITHMFOR ARDUINO

- Step 1: If input is received, check for a string received.
- Step 2: Compare contain of string received with pre-defined command in Arduino
- Step 3: Command matches with desired if-else block and motor will drive accordingly to output of that block.
- Step 4: If Command received is "Stop" entire process will stop.
- Step 5 If Command received is "Disconnect" it will reset all the codes.

### 3.7 STEP TO CONNECT

- 1) Connect the wiring, power up, while the device is not connected, the Bluetooth module board has a white LED flashing
- 2) At PC side, search Bluetooth device.
- 3) Found name called "HC-05" device

First make sure your HC-06 Bluetooth module is paired with your mobile. The default password for pairing is "1234" or "0000". Check the manual of Bluetooth module. 4.2 Click on "SELECT DEVICE" icon to select paired Bluetooth module. 4.3 When press "up arrow" it sends the data "A" to Bluetooth module connected with the circuit. When microcontroller detects "A" the robot/robot car moves FORWARD. 4.4 When press "DOWN ARROW" to sends the data "B" to Bluetooth module connected with the circuit. When microcontroller detects "B" the robot/robot car moves REVERSE. 4.5 When press "LEFT ARROW" to sends the data "C" to Bluetooth module connected with the circuit. When microcontroller detects "C" the robot/robot car turns LEFT. 4.6 When press "RIGHT ARROW" to sends the data "D" to Bluetooth module connected with the circuit. When microcontroller detects "D" the robot/robot car turns RIGHT. 4.7 When press "STOP" button which is in the centre of remote it sends the data "E" to the Bluetooth module connected with the circuit. When microcontroller detects "E" the robot/robot car gets stopped. 4.8 Click on "DISCONNECT?" icon to disconnect paired Bluetooth module show in fig 3.7 a



Fig 3.7.a connecting module

### 4. DESIGN

The Android app is generally developed using JAVA language but the Android app can also be built without knowing the Java language. The app was developed in "App Inventor" developed by MIT [8]. This app inventor is designed specifically for Non — Computer Science students those who don't know the JAVA language. The figure shown below is the block diagram back-hand design for the application. The app shown below has 5 buttons and all the buttons gives 5 different bytes in the output that has to be fed to the Microcontroller to process [9]. For example. If we press forward button, the Bluetooth Module will give byte at its output as shown in the figure. The app consists of the option in the main screen whether to use the accelerometer of the phone or to use the buttons to control the Robot. This app inventor brings out the revolution in the Embedded Systems & Robotics. The app invented by the searches for the Bluetooth devices along with their MAC addresses. The user just has to select the particular MAC Address. When a particular MAC is selected, the status shown on the screen is "Connected". Now all the buttons are active and the app is now connected with the robot and mobile phone can control the robot.

### 5. SYSTEM ARCHITECTURE



Figure 5.a shows the overall architecture of the system, and with which components the different types of users will interact.

## 6. MOBILE APPLICATION



### USAGE

1. Coupled Mode: Two modules will establish communication automatically when powered
2. PC hosted mode: Par the module with bluetooth dongle directly as virtual serial
3. Bluetooth protocol : Bluetooth Specification v2.0+EDR
4. Frequency: 2.4GHz ISM band
5. Modulation: GFSK(Gaussian Frequency Shift Keying)
6. Speed: Asynchronous: 2.1Mbps(Max) / 160 kbps
7. Synchronous: |1Mbps/1Mbps
8. Security: Authentication and encryption
9. Profiles: Bluetooth serial port
10. CSR chip: Bluetooth v2.0
11. Wave band: ?4GHz-2?.8GHz, ISM Band
12. Protocol: Bluetooth V2.0 Voltage: 5V (3.6V-6V, NO more than 7V)
13. User defined Baud rate : 4800, 9600, 19200, 38400, 57600, 115200, 230400, 460800, 92 1600, 1382400

## 7. CONCLUSION

Wireless control is one of the most important basic needs for all living beings. But unfortunately due to a huge amount of data and communication overheads the technology is not fully utilized. Many of the wireless –controlled robots use RF modules. But this project make use of android mobile phone for robotic control which is very cheap and easy available the control commands available are more than RF modules. For this the android mobile user has to install an application on her/his mobile. The user needs to turn on the Bluetooth on mobile, The wireless communication techniques used to control the robot is Bluetooth technology. User can use various commands like move forward, reverse, move left, move right using these commands which are send from the

android mobile, Robot has a Bluetooth receiver unit which receives the commands and give it to the micro controller circuit to the motors. The micro controller Transmits the signal to the motor driver IC'S to operate the motor. The objective of the motor is to realize the smart living, more specifically the home lighting system using Bluetooth technology. Robot and smart phones are the perfect match, specially mobile robots. As phones and mobile devices are each time more powerful, using them as robot for building robot with advanced feature such as voice recognition . Android Bluetooth –enable phones and Bluetooth module via HC-06 and communication among Bluetooth devices. It is concluded that smart living will gradually turn in to areality that consumer can control the home remotely and wirelessly as shown in fig 7.a

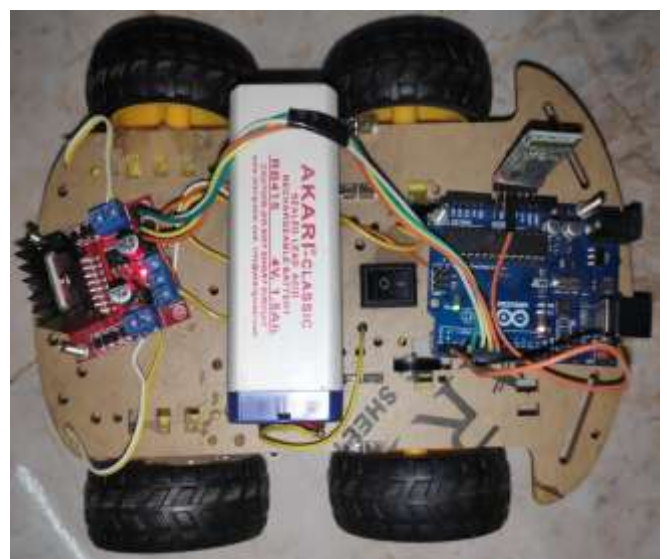


Fig 7.a Fully designed BOT

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