Voice Controlled Motion System

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Abstract – The need for wireless communication is increasing day by day, something that we don't need to carry around and still it stays connected is a trend of controlling various appliances in today's world. The reason behind this is it clears off almost all messy wires we need, to stay connected to an object. Not only this, it is also an efficient way since wires tend to wear off in the long run. We are going to implement the purpose of wireless communication in a motion controlled system that can be in turn controlled with a Bluetooth enabled device. The Bluetooth enabled device can be a smartphone or a separate device that needs to be constructed. For now, a smartphone can be used as the Bluetooth device that connects and controls the system. The motion controlled system is 9v battery enabled using Arduino Uno and Bluetooth module HC-05. The smartphone controlled motion system is an Arduino based bot, which can be made to work with our smartphones having specifically built application installed in it. This system receives commands from our smartphones with the help of Bluetooth. Nowadays, we are connecting our smartphones with various electronic devices for the purpose of synchronization. By implementing this idea, we can also able to control the speed, direction and upgrade it as per our needs in the future. If this prototype is made real, we can do various operations like controlling a car, from the parking zone by standing outside the car. Once its constructed many more modifications can be applied to the prototype to make it more efficient and more useful to daily life usage. Thus thereby making controlling more easy and efficient to understand.

1. INTRODUCTION

Worldwide investment in industrial robots up 19% in 2003. In first half of 2004, orders for robots were up another 18% to the highest level ever recorded. Worldwide growth in the period 2004-2007 forecast at an average annual rate of about 7%. Over 600,000 household robots in use - several millions in the next few years. UNECE issues its 2004 World Robotics survey[1]. From the above press release we can easily realize that household (service) robots getting popular. This gives the researcher more interest to work with service robots to make it more user friendly to the social context. Speech Recognition (SR) technology gives the researcher the opportunity to add Natural language (NL) communication with robot in natural and even way in the social context. So the promise of robot that behave more similar to humans (at least from the perception-response point of view) is starting to become a reality . Brooks research [2] is also an example of developing humanoid robot and raised some research issues. Form these issues; one of the important issues is to develop machine that have human-like perception.

2. RELATED WORK

This project has referred several other research papers and has gained vital information from them. This project has been made much simpler and easy to construct as well as use thus clearing the difficulties in the observed research papers. The research papers referred for this project are given below:

- ROBOTVOICE - Voice Command Of A Robot by M. Branzila, C. Sarmasanu, Gabriel Fanaru, Technical University 'Gh. Asachi'of Iasi, Electrical Measurements Dept., Iaşi, România
- Voice activated command and control with speech recognition over WiFi by Tony Ayres, Brian Nolan, Science of Computer Programming Volume 59, Issues 1-2, January 2006.

2.1. Robotic Voice -Voice Command Of a Robot

In this, we have observed that the speech recognition is done by a software which is not mobile and a personal computer is needed to give commands to the system.

2.2. Voice activated command and control with speech recognition over WiFi

Observing the details of the research paper revealed that this project too depended upon personal computer's WiFi system, software used includes Sphinx4, Microsoft SAPI and the Java Speech API.

3. PROPOSED MODELLING

The architecture of the voice controlled robot is simple and can be constructed with materials under a low cost. The components of the architecture are as follows:-

i) Arduino Uno

ii) Bluetooth Module Hc-05

iii) Arduino Bread Board

iv) Dc Motors 12V

v) 9 Volt Battery

vi) Motor Driver L293D

vii) Jumper Wires

The architecture of the system has been displayed in chart-1 with the connections of the jumper wire cables.

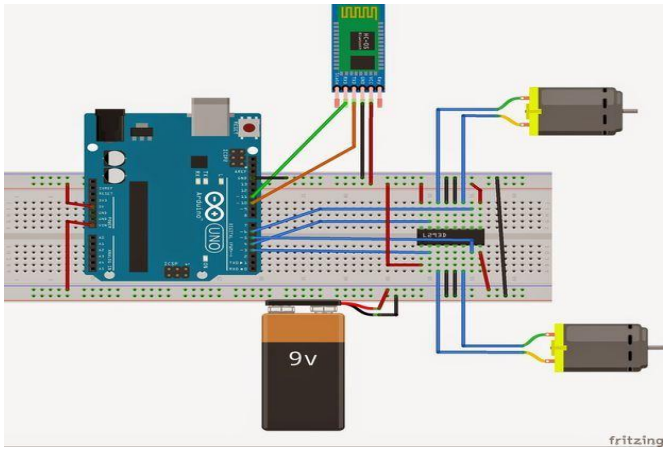

Figure 1 Architecture

3.1 Arduino Microcontroller board and it is based on the ATmega1280

- 16 analog pins
- 14 PWM pins
- A USB connection
- The Arduino integrated environment to work with. It is a cross platform used in java
- It is used to write a code or programs and upload it
- It works with a power jack

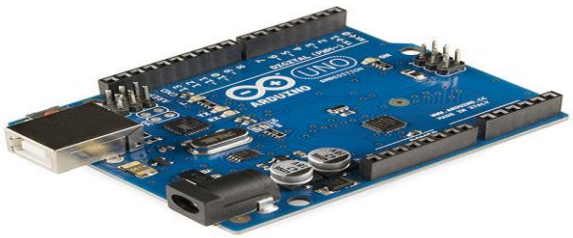

Figure 2 Arduino Uno

3.2 Bluetooth Module HC-05

- For the communication between phone and microcontroller Bluetooth module is used
- It uses low power 1.8v in operation
- Serial port Bluetooth module have a Bluetooth 2.0 EDR 3 mbps modulation with complete radio transmitter and baseband
- Using Bluetooth profile and architecture different types of Bluetooth connections can be developed

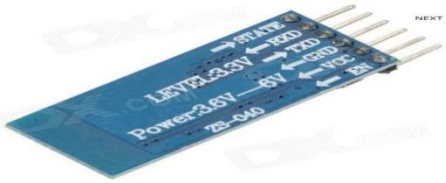

Figure 3 Bluetooth Module HC-05

3.3 Dc Motor Driver (L293D)

- It has a high current half h driver
- Wide supply voltage range
- High noise immunity brands
- Peak output current1.2Apr per channel
- Output current is very high

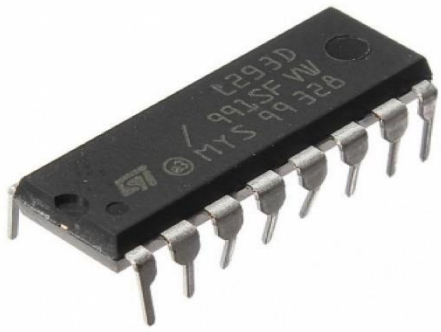

Figure 4 Dc Motor Driver

3.4 Android App

- It is an open source operating system which means any user can make changes to it
- Furthermore it utilizes java virtual machine
- It was built to be truly open
- Open source programming can be done

4. CIRCUIT AND WORKING

The working circuit is presented in Figure 5. We can observe that the process starts when we connect to the Bluetooth Module HC-05 via Android Application Device. As, the voice is recognized by the Android Application Device, it processes

it and sends the respective command via Bluetooth technology to Arduino Uno. The Arduino Uno has a user custom program uploaded to it that will detect the commands received and executes its program in accordance to the command.

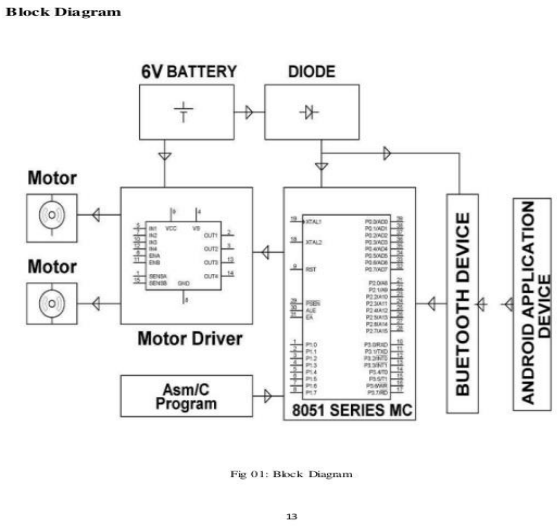

Figure 5 Circuit Diagram

4.1 Bluetooth Module HC-05 processing

As, the voice is recognized by the Android Application Device, it processes it and sends the respective command via Bluetooth technology to Bluetooth Module HC-05 where it is received and transferred to Arduino. Following are the connections of Bluetooth Module HC-05 with the Arduino Uno pins (Table 1):

Bluetooth Module HC-05	Arduino UNo
VCC	+5v
GND	GND
TX	Pin 10
RX	Pin 11

Table 1 Pin connections

4.2 Arduino Uno Processing

The Arduino Uno received the input from Bluetooth Module HC-05. It then process the input with the help of the arduino .ino program uploaded to it using the software Arduino Sketch. Arduino Sketch helps in compiling the Arduino programs and also upload it to the Arduino. Thus, in this case also Arduino Uno uses the user custom program to process the input and activate respective pins for its execution. The activated pins will inform the L293D to activate the Dc motors as per the command of the user. Arduino has a number of pins and must not be confused one another. The pin structure of Arduino Uno is given below (Figure 6):

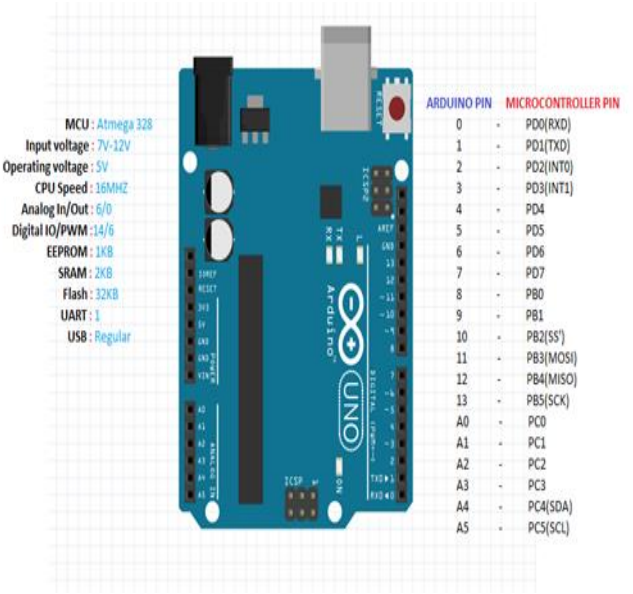

Figure 6 Arduino Pin structure and specification

4.3 Dc Motor Driver L293D Processing

The Dc Motor Driver L293D is responsible for controlling the motion of the robot though it can be said that the motor driver is getting controlled by the Arduino Uno, still on the edge it can be declared that if connections of the arduino uno is not made correct with the motor driver, the wheels wont rotate resulting in no motion of the robot, which is why it is very important to make the connections absolutely correct as well as firm such that no loose connections take place.

The motor driver solely is responsible for giving command to the motors and make them rotate in particular a direction. Following is the connections of Dc Motor Driver L293D to Arduino Uno (Table 2):

Dc Motor Driver L293D	Arduino Uno
Pin 2 (for left motor: pins 3 and 6)	Pin 8
Pin 7 (for left motor: pins 3 and 6)	Pin 4
Pin 10(for right motor: pins 11 and 14)	Pin 7
pin 15 (for right motor: pins 11 and 14)	Pin 3

Table 2 L293D to Arduino Connections

4. RESULTS AND DISCUSSIONS

4.1 Result

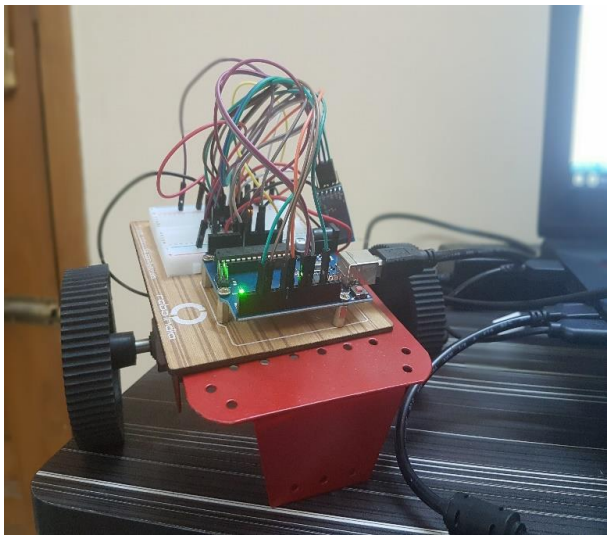

Figure 7 Implementation of architecture with circuit.

4.2 Discussion

The system has been successfully completed though there were some connection issues regarding loose connections and jumper wire failures. Besides, the connection of arduino uno to motor driver L293D are to be made accurate, one wrong connection may result in the failure of the wheels attached. The android application that has been constructed showed few bugs at the beginning but have been resolved after implementing the open source Google recognition mechanism in it.

5. CONCLUSION

Human-Robot interaction is an important, attractive and challenging area in HRI. The Service Robot popularity gives the researcher more interest to work with user interface for robots to make it more user friendly to the social context. Speech Recognition (SR) technology gives the researcher the opportunity to add Natural language (NL) communication with robot in natural and even way. Also the appearance of the SR interface in the standard software application as a Natural Language (NL) user interface in HCI field for the novices encourages Roboticist to use SR technology for the HRI. Most of the presented projects in SR interface for robotics emphasize on Mobile Autonomous Service Robot. The working domain of the Service Robot is in the society -to help the people in every day's life and so it should be controlled by the human. In the social context, the most popular humans' communication media is Spoken Natural Language, so to communicate with human the SR interface for Human-Robot interaction is coined.

REFERENCES

[1] ROBOTVOICE - Voice Command Of A Robot by M. Branzila, C. Sarmasanu, Gabriel Fanaru, Technical University 'Gh. Asachi'of Iasi, Electrical Measurements Dept., Iaşi, România
[2] Voice activated command and control with speech recognition over WiFi by Tony Ayres, Brian Nolan, Science of Computer Programming Volume 59, Issues 1-2, January 2006..
[3] Professional Android 2 Application Development, book by Reto Meier.

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