Design of Voice Based Control System for Robot

Tejas Deshmukh[1] ;Sneha Jadhav[2] ; Prerna Ghag[3] ;Omkar Darshane[4]

[1]deshmukhtejas19@gmail.com;[2]snehajadhav1993@gmail.com;[3]prernaghag26@gmail.com;
[4]om199360@gmail.com

[1-4]B.E. Students

Dept. of Electronics and Telecommunication

K.C. College of Engineering, Thane.

Abstract—**This paper presents proposal, design and implementation of a hardware software system, which is powered by a PIC microcontroller using a motor driver, a Bluetooth module, managed remotely by an Android application through an Android supported Smartphone or Tablet. The process involved in building the robot which includes the assembling of a chassis used for the robot, programming the microcontroller and developing an application to result in an interface with an android device using Basics 4 android tool. The voice command is person independent. An application is designed to recognize keywords online with the assistance of Google and send signals to corresponding pins on microcontroller. The microcontroller then processes the received data and executes the commands accordingly. The embedded Basic language has been used to program the microcontroller.**

Keywords-PIC Microcontroller, Bluetooth module, Android, embedded BASIC, Basics 4 Android.

I. INTRODUCTION

Our society has entered a digital age in which many of our activities depend on computers, the internet and many other digital devices. The word "robot" generally implies some anthropomorphic appearance[1]. Robots are smart machines which can be programmed to do numerous activities and can be used in various areas such as industries, manufacturing, production lines, health care, etc. These robots perform rigorous, fatal and accurate work to facilitate our life which can also result in significant increase in production as they can work untimely without getting tired, precisely with less time and better accuracy. The idea of this research is to exploit assistive mobile robotics usage in everyday activities in many areas such as industries, manufacturing units, production lines, healthcare, etc.[2]

Over the past decade, technology has impressively changed our life and also the lifestyle. Internet has facilitated human life to a great extent. It has made the world closer and wireless communication has enabled people the convenience to stay in touch anywhere anytime. Speech is the most preferred way of communication. With enhanced advancement of communication technology in the last era, speech stands is an important interface for many systems. Speech is easier to communicate, instead of using various complex interfaces. In this project, it is used to control a robot. The robot is able to recognize the spoken words and perform the functions accordingly. Considering other aspects an assistive touch control is also provided.

A Smartphone is a mobile phone built on a mobile computing platform, with more advanced computing ability and connectivity than a feature phone. Smartphone's are a more affordable and efficient hand held devices which can be used to support collaborative activities in a community. It is a result of a huge advancement in mobile phones technology.

Android is a very familiar word in today's world. Millions of Smartphone's are running on Google Android OS and millions are developed daily[8]. Google has made the Android development platform open to everyone around the world, so there are millions of developers[6]. One of the possibilities of android development is its fusion with microcontroller[7].

This research aims to combine the capabilities of robot with an android mobile phone platform via a Bluetooth connection offered by android mobile phones. This provides an interactive system by which people can control an assistant robot with simple touches on user friendly interface, within the range of Bluetooth signals. The user will be able to control the movement of the robot.

II. RELATED WORK

While there are many results already published, there are more innovations every day. This project focuses on the outcome of the possible combination of Android and

Microcontroller. Although the project has been carried out numerous times before, this project gives detailed information on building a robot which can be controlled by any android device and also through the voice over the android device.

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, also it's based on the java programming language. Because Android uses the Java programming language getting started with the Android API is 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.[2].

In the global arena of technological revolution, remote control is one of the fastest growing fields where the technology is thrust on distance and type of data command. The popular methods of remote controller are using Radio Frequency, Frequency modulation, Infrared technology etc[5]. These techniques have limitation of range and are quite old established technique.[3]

III. METHODOLOGY

The embedded BASIC (Beginners' All-purpose Symbolic Instruction Code) language has been known as one of the popular high level language used in embedded system today. This language is used to program the microcontroller. Basics 4 android is the simplest and most powerful Rapid Action Development (RAD) tool for the android platform. It supports java libraries. It supports SQL databases including encrypted databases. The "RecognizerIntent" command initializes constants for supporting speech recognition through starting Intent.[6]

TABLE 1: Working of microcontroller

Command	Action	Left Motor	Right Motor	Arm Motor
0	Stop	Halt	Halt	Halt
1	Back	Reverse	Reverse	Halt
2	Go	Forward	Forward	Halt
3	Right	Right	Forward	Halt
4	Left	Forward	Reverse	Halt
5	Up	Halt	Halt	Up(250ms)
6	Down	Halt	Halt	Down(250ms)

TABLE 2: Working of an android application:

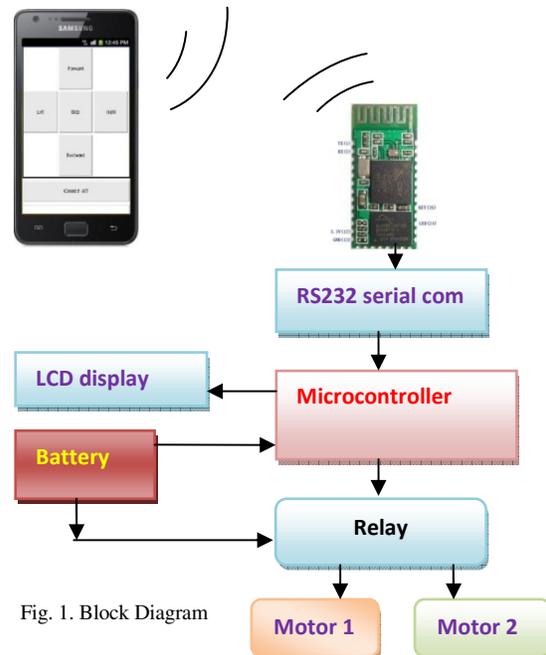| Button	Voice Recognition	Command
-	Go	2
-	Back	1
-	Left	4
-	Right	3
-	Stop	0
-	Up	5
-	Down	6
1	-	2
2	-	1
3	-	4
4	-	3
5	-	0
6	-	5
7	-	6
8	-	Speech prompt

IV. EXPERIMENTAL SETUP

Fig. 1. Block Diagram

PIC Microcontrollers are quickly replacing computers when it comes to programming robotic devices. They can be programmed to be timers or to control a production line and much more. They are found in most electronic devices such as alarm systems, computer control systems, phones, in fact almost any electronic device. The direct drive, double-shaft motor MS Chassis features a 3-piece set up split into nose, centre and tail sections for easy attachment and detachment. This tough chassis form features an 80mm wheelbase to provide an advantage through corners.[4]

Fig.2. Chassis Information

Permanent Magnet DC motor is used which requires a 12V supply. Front wheels are free while the rear wheels are connected with the motor. Two 6V sealed maintenance free lead acid batteries are used. A 7805 voltage regulator is used to regulate varying voltage to a lower fixed voltage. Heat sink is connected to the voltage regulator. If battery goes down, then a provision for battery charging is also provided. A step down transformer (230V-12V) is used. The output of transformer will be AC, bridge rectifier and capacitor will filter the signal and hence we get 12V DC supply. As battery is also connected across the capacitor it'll also get charged.

To run the microcontroller other important component required is clock. An 11MHz crystal oscillator is used to provide the oscillations. Temperature senor (10kohms NTC) is made as a potential divider and its junction output is received at pin0 of port A. The gas senor, whose value is calculated using the preset and its output is received at pin1 of port A. Single Pole Double Throw (SPDT) Relay is used which requires 12V supply. Two relays per motor are used to control its functioning. Relay is an inductive load which generates back emf, so to avoid it diodes are used. Current limiting resistors of 1kohms are used as (5V/1k=5mA) is sufficient to light LED as well as to drive the base of transistor. RX and TX pins of port C are connected with the RX and TX of the Bluetooth module. HC-05 Bluetooth module is used and 5V supply is provided. LCD is configured at port D.
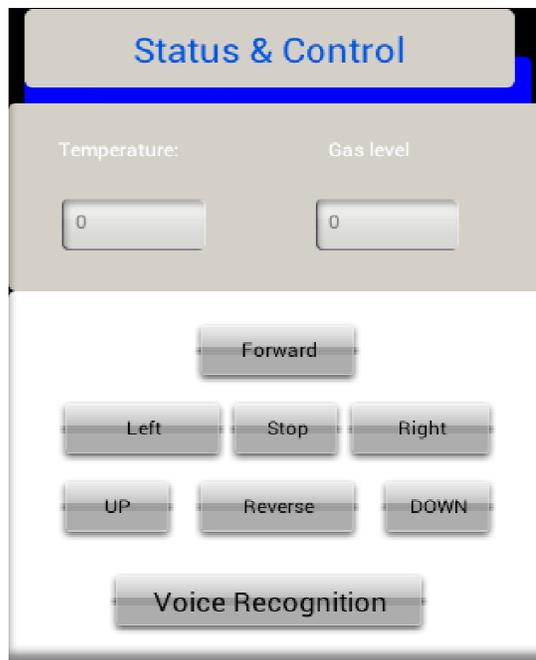

Fig.3. Screen shot of Android application

V. CONCLUSION

A highly reliable and versatile system to accomplish a purpose design specific task. The operation by voice command could best be used for handicapped. The system is not user dependent, any person can access it.

The system can be controlled only within the range of Bluetooth and voice recognition can be used only when connected to the internet. The accuracy of this system is still far from perfection.

VI. FUTURE SCOPE

At some point in the future, speech recognition may become speech understanding. The statistical models that allow computers to decide what a person just said may someday allow them to grasp the meaning behind the words. We can talk to our computers today. In 25 years, they may very well talk back.

Some of interfacing applications which can be made are controlling home appliances, robotics movements, Speech Assisted technologies, Speech to text translation, industries, manufacturing units, safety purposes and many more.

VII. REFERENCES

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