

Voice Controlled Wheelchair for Physically Challenged People

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Abstract- *This project describes the design of a smart voice-controlled wheelchair for physically challenged people using embedded system. Proposed design is based on voice activation system for physically differently abled persons incorporating manual operation. The voice command is given through a cellular device to wheelchair having Bluetooth and the command is transferred and converted to string by the BT Voice Control for Arduino and is transferred to the Bluetooth Module HC-05 connected to the Arduino board for the control of the Wheelchair. For example, when the user says „Go“ then chair will move in forward direction and when he says „Back“ then the chair will move in backward direction and similarly „Left“, „Right“ for rotating it in left and right directions respectively and „Stop“ for making it stop. The wheelchair will move according to the command given. This system was designed and developed to support the patient in terms of save cost, time and energy. Ultrasonic sensor is also made a part of the design which helps to detect obstacles lying ahead in the way of the wheelchair that can hinder the passage of the wheelchair.*

Indexed Terms- *Arduino Uno, Wheelchair, Voice Recognition, Bluetooth Module HC-05*

I. INTRODUCTION

This project is designed as an idea to ease the lives of those among us who are unfortunate enough to have lost the ability to move their legs due to a significant amount of paralysis, accident or due to old age. Many physically disable people usually depend on others in their daily life especially in moving from one place to another. Even by using wheelchair, they need

continuously someone to help them in getting the wheelchair moving. Their lives are made difficult by the fact that there is lack of an intuitive control system for their wheelchairs that allows moving independently. This project is based on Voice-controlled Wheelchair design based on mobile platforms, by means of Bluetooth technology, design and implementation of wireless remote-control solutions. The project also incorporates use of ultrasonic sensors to detect obstacles within range of 4 meters and notifies the system and stop the wheelchair till further command. In this work, Smart Wheelchair control using Arduino UNO microcontroller and Bluetooth Module via android application is presented.

II. METHODOLOGY

The Voice commands are given with the help of smart phone. The android phone that is connected through Bluetooth with Bluetooth Module HC-05. The voice command is converted to an array of string and the string is passed to Arduino Uno connected to it. Once the Bluetooth Module receives the message, the command sent will be extracted and executed by the microcontroller attached to it and depending on the commands fed to the Motor Driver, the motors will function accordingly. The system will interpret the commands and control the Wheelchair accordingly via android application. Meanwhile, the ultrasonic sensor works while the circuit is on and it detects the obstacle within a range of 4 meters and makes sure the path has no obstacle. If any obstacle occurs it notifies the Arduino and stops wheelchair till further command is obtained from the use.

A. Components used

1. HARDWARE REQUIREMENTS:
 - I. ARDUINO UNO.
 - II. DC GEAR MOTORS.
 - III. HC-05 BLUETOOTH MODULE.
 - IV. MOTOR DRIVER L293D.
 - V. HC-SR04 ULTRASONIC SENSOR.
 - VI. SERVO MOTOR.
 - VII. 12V BATTERY.
 - VIII. ANDROID PHONE.
2. SOFTWARE REQUIREMENTS:
 - I. ARDUINO SOFTWARE (IDE).
 - II. ANDROID APPLICATIONS.

B. Block diagram

This project represents the “Voice-controlled Wheel chair” for the physically differently abled person where the voice command controls the movements of the wheelchair.

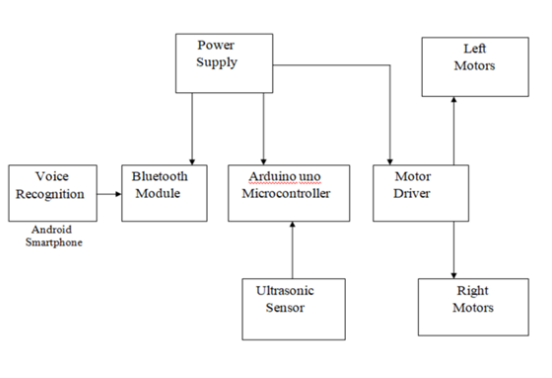


Figure 1: Block Diagram

The system has two parts, namely; hardware and software. The hardware architecture consists of an embedded system that is based on Arduino Uno board, a Bluetooth Module, Motor Driver and an Android phone. The Bluetooth Module provides the communication media between the user through the android phone and the system by means of voice command given to the android phone.

The user speaks the desired command to the “BT Voice Control for Arduino voice (Arduino automation Application)” software application installed in the android phone that is connected through Bluetooth with Bluetooth Module HC-05. The voice command is converted to an array of string and the string is passed to Arduino Uno connected to it. Once the Bluetooth Module receives the message, the command sent will

be extracted and executed by the microcontroller attached to it and depending on the commands fed to the Motor Driver, the motors will function accordingly. The system will interpret the commands and control the Wheelchair accordingly via android application.

III. DESIGN OF VOICE CONTROLLED WHEELCHAIR

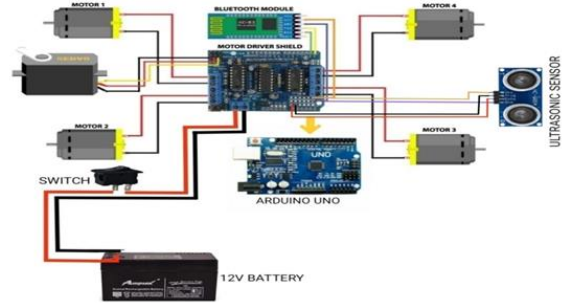


Figure 2: Circuit diagram

The Voice commands are given with the help of smart phone. The android phone that is connected through Bluetooth with Bluetooth Module HC-05. The voice command is converted to an array of string and the string is passed to Arduino Uno connected to it. Once the Bluetooth Module receives the message, the command sent will be extracted and executed by the microcontroller attached to it and depending on the commands fed to the Motor Driver, the motors will function accordingly.

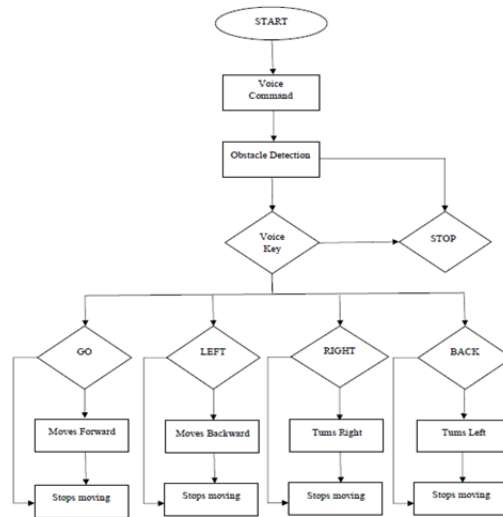


Figure 3: Flow chart

IV. IMPLEMENTATION

Step 1: Uploading program to Arduino UNO board: Select Arduino UNO board and COM port to upload the code.

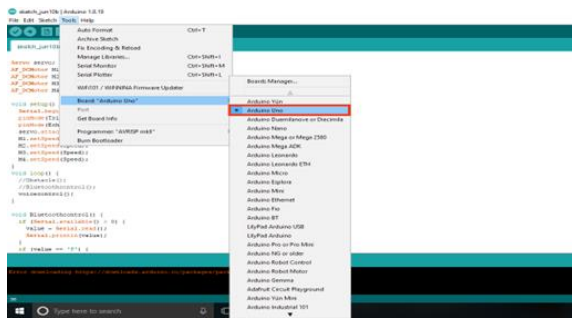


Figure 4: Uploading program to Arduino UNO board

Step 2: Installation of app: Download and install the Arduino Bluetooth Control app.

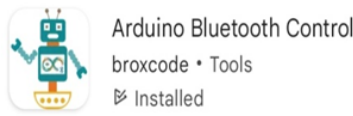


Figure 5: App Installation

Step 3: App interface: After, run this application and click the setting button. Then, click the “voice commands configuration” button and include the commands one by one.

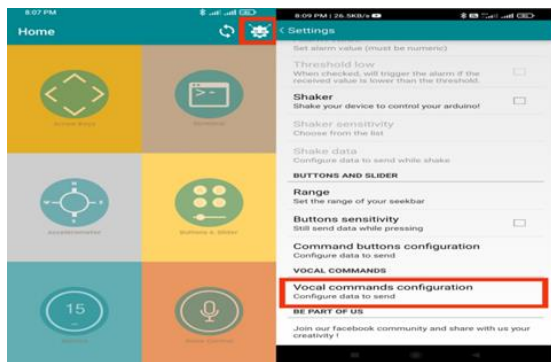


Figure 6: App Interface

Step 4: Voice commands to control wheel chair

The voice commands are given through the arduino Bluetooth control and Bluetooth rc car app. Such as “GO”, “BACK”, “LEFT”, “RIGHT” and “STOP”. The wheelchair will move according to command given.



Figure 7: Voice commands

V. ADVANTAGES AND DISADVANTAGES

Advantages:

1. A handicapped person without legs can use this and become Independent.
2. Less Hardware require i.e compact in size.
3. Reduce man power: the manual work is reduced to its minimum since voice is there to control the wheelchair.
4. Automated operation: these methods are employed could bring the whole device to a fully automated one.

5. Less wiring because of Bluetooth: wiring could increase complexity because the aged and disabled would find it difficult to handle.

Disadvantages:

1. It causes problem during noisy environment.
2. It only operates on commands like Back, Left, Right and stop.

VI. RESULTS

The project will begin once the power is turned on. The mobile module in the project must be linked to the Bluetooth module. The wheel chair is controlled by voice commands using smart phone apps. It may be moved to the desired location with the use of a voice commands.



Figure 8: Hardware part of the prototype.

CONCLUSION

This project elaborates the design and construction of Smart Electronic Wheelchair with the help of Bluetooth Module. The circuit works properly to move as the command given by the user. After designing the circuit that enables physically disabled to control their wheel using an android application in their smartphones and it has also been tested and validated. The detection of any obstacle is successfully controlled by the microcontroller. As the person switches on the circuit and starts moving, any obstacle

which is expected to lie within a range of 4 metres will be detected by the Ultrasonic sensor. This proposed system contributes to the self-dependency of differently abled and older people.

ACKNOWLEDGEMENT

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REFERENCES

- [1] Deepak Kumar Lodhi et al, International Journal of Computer Science and Mobile Computing, Vol.5 Issue.5, May- 2016, pg.no 433-438.
- [2] M R Sreeraj et al. International Journal of Advances in Computer Science and Technology, 9(6), June 2020, pg.no 34 – 38.
- [3] International Journal of Engineering Trends and Technology (IJETT) - Volume4Issue4- April 2013 pg. no 1242-1244.
- [4] Holly A. Yanco wheelchairs, a robotic wheelchair system: indoor navigation and user interface.
- [5] Kyung Mog Lee study on the electronic wheelchair controlled with a smart phone, here the author uses the android smart phone to control the wheelchair with voice commands.
- [6] Sachin S. Patil, Kiran N. Patil, Sanjay P. Patil: "Gesture based wheelchairs for physically disabled", it focus the hand movements and the hand gesture for controlling the wheelchairs.