International Journal of Research in Engineering and Science (IJRES)
ISSN (Online): 2320-9364, ISSN (Print): 2320-9356
www.ijres.org Volume 10 Issue 5 ǁ 2022 ǁ PP. 15-18

Bluetooth Controlled Wheelchair

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ABSTRACT
This paper describes intelligent Bluetooth controlled wheelchair which can be operated on user's voice commands, hand gestures as well as touch buttons. The disabled people, who cannot move from one place to another on their own are continuously relying on someone to help them in getting the wheelchair moving. In the past few years powered wheelchair with Joystick control have come into use but it comes with few drawbacks. In case of any failure in the joystick the wheelchair will have to be controlled manually till the joystick is repaired or replacedwhile the project we have developed can be connected and operated with the help of any smartphone.This Bluetooth-controlled system makes them more independent as it helps them to drive the wheelchair without anyone's help.
This project includes two parts which is software and hardware. It is realized that for input of human voice we are using Android phone as an intermediary which is connected to a microprocessor with the help of HC-05 Bluetooth module.Microprocessor 328p is used as controller to control the movement of wheelchair based on the human voice, gesture or buttons as an input. There are five different instructions that can be given to the motors, they are forward, backward, left, right and stop.
Keywords: *microprocessor, Bluetooth module, motor driver, wheelchair, android application*

I. INTRODUCTION:

Many patients depend on others to help them move their wheelchair, and patients with limited mobility still face significant challenges when using powered wheelchairs in public and in other places [1]. Statistics also indicate that 9–10% of patients who were trained to operate power wheelchairs could not use them for daily activities, and 40% of limited mobility patients reported that it was very tedious and almost impossible to steer and manoeuvre a wheelchair through joystick [2]. Moreover, it was reported that approximately 40% of patients with impaired mobility could not control a powered wheelchair [3]. However, most of the people identified controlling wheelchair through voice commands as an easier and less tedious method [4].Therefore, Bluetooth-controlled wheel chair with voice command featurehas been built to overcome the problems faced by such people and enable them to operate the wheelchair. The wheelchair can be operated using the voice commands through the given input. But voice-controlled system has a major drawback, people with speech impairment would not be able to use voice-controlled wheelchair. Keeping that in mind we have also introduced tap button control and gesture control with no extra cost, as all the control action are performedwith the help of a smart phone. The microprocessor will take care of all the directions the user wants. The instruction for each and every direction is written in the form of program and loaded in the microprocessor itself. The voice commands to the wheelchair will be given through a smartphone. The output from this module is then received by the microprocessor through a Bluetooth module. The already written programs in the processor helps the processor to convert this voice command into considerable output and the wheelchair moves accordingly.

II. PROPOSED SYSTEM:

The proposed system contains the following components
i)battery: The battery is used in this work is wet type. To create electrical energy the chemical reaction between lead and sulphuric acid which is use wet batteries. There is need filling with distilled water to the batteries, wheelchair battery do have a higher maintenance rate, but are lighter than AGM (Absorbed Glass Mat) or Gel batteries.
ii) Microprocessor: The microprocessor contains the instructions in the form of a program. Atmega 328p microprocessor has been used in this project. Atmega 328p is an 8 bit microprocessor with 28 i/o pins.

iii) Bluetooth Device: Bluetooth Device is main component when connection of the wheelchair and android phone is to be made. The Bluetooth device provides the security to the wheelchair as only one device is connected at a time. Frequency is of 2.4GHz. It is highly cost effective. Used for serial communication between android device and the wheelchair.
iv) Motor Driver: It is an interface between the DC motor and the microcontroller Atmega328p. The commands are processed further by Atmega 328p towards driver and executed by DC motor to rotate the wheels in specific direction or to stop. The l298 motor driver used in this project id a dual H-bridge motor driver which can control the motion of two motors at a time.
v) Motors: Motors are arguably one of the most important parts of a mobile robotics platform. Overpowered motors cause waste the already limited supply of power and inefficiency from the on-board batteries. At critical times undersized motors could be short on torque. The available speed range as well as the optimal rotation speed of the motor must also be taken into consideration. Too high of an output rpm from the motor shaft will cause the robot to operate at a fast, uncontrollable speed. Too low of an output and the robot will not be able to attain a speed and the available speed range of the motor must also be considered. Too high of an output rpm from the motor shaft will cause the robot to operate at a fast, uncontrollable speed. To meet the user's needs it is low of an output and the robot will not be able to attain a suitable speed. The torque is the output of the motor plays a role in the performance because locomotion may not occur in certain situations. Therefore, the selection of the proper motor for the platform is very important. There is many shapes and sizes of motors. Here we have used two 12V BO DC motors. One Driver is sufficient to control two motors simultaneously.
vi)Android application: To perform the control actions through android smartphone we are using two applications-

AMR VOICE (for voice control)
Bluetooth RC CONTROLLER (for gesture and touch button control)
The android application will need Bluetooth access permission to connect with the Bluetooth module connected to the microprocessor of our system
The connection of the above components can be seen in block diagram shown in the below fig.1.

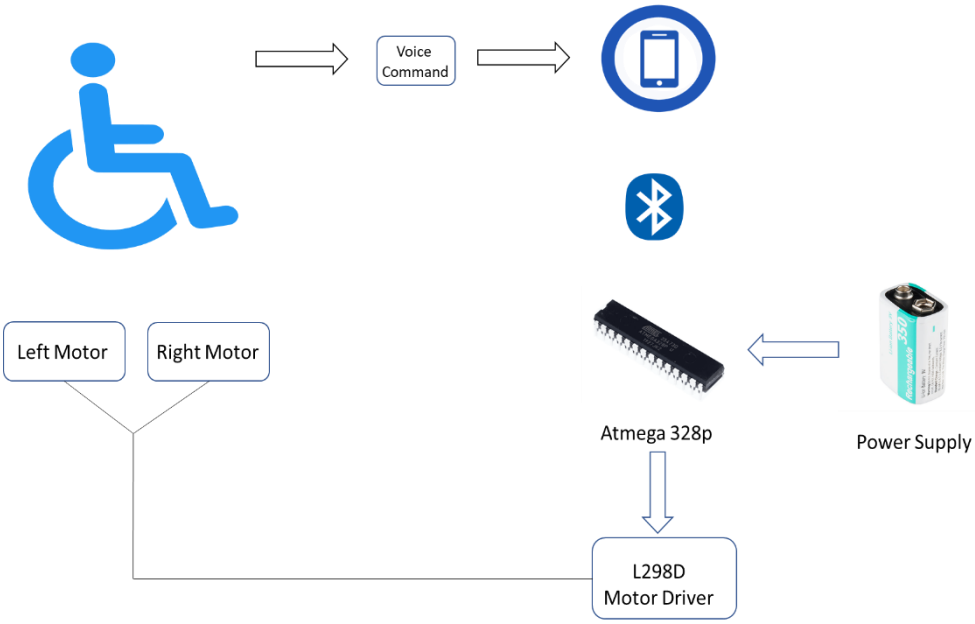

Fig.1- Block Diagram of the System

III. Methodology:

As it can be seen in the block diagram in fig.1 the motors of the wheelchair wheels are connected to a motor driver. The l293D motor driver controls the power supply and it's direction with the help of commands given to it by the Atmega328p microprocessor. The microprocessor receives commands from our smartphone through HC-05 Bluetooth module and executes the following command from the list of commands that have been encoded into the microprocessor in the form of a program. For giving directions with the help of our android phone we have used two android applications. First one is AMR Voice which is used for voice command instructions and second one is Bluetooth RC Controller which is used for gesture control or touch button control. The user will first have to choose the method of control they want to use and the application

according to that and then switch on the Bluetooth and connect with the Bluetooth device embedded in our system. After connecting with the Bluetooth the user can give instruction in either voice, gesture or touch button whichever he has chosen.

IV. Result:

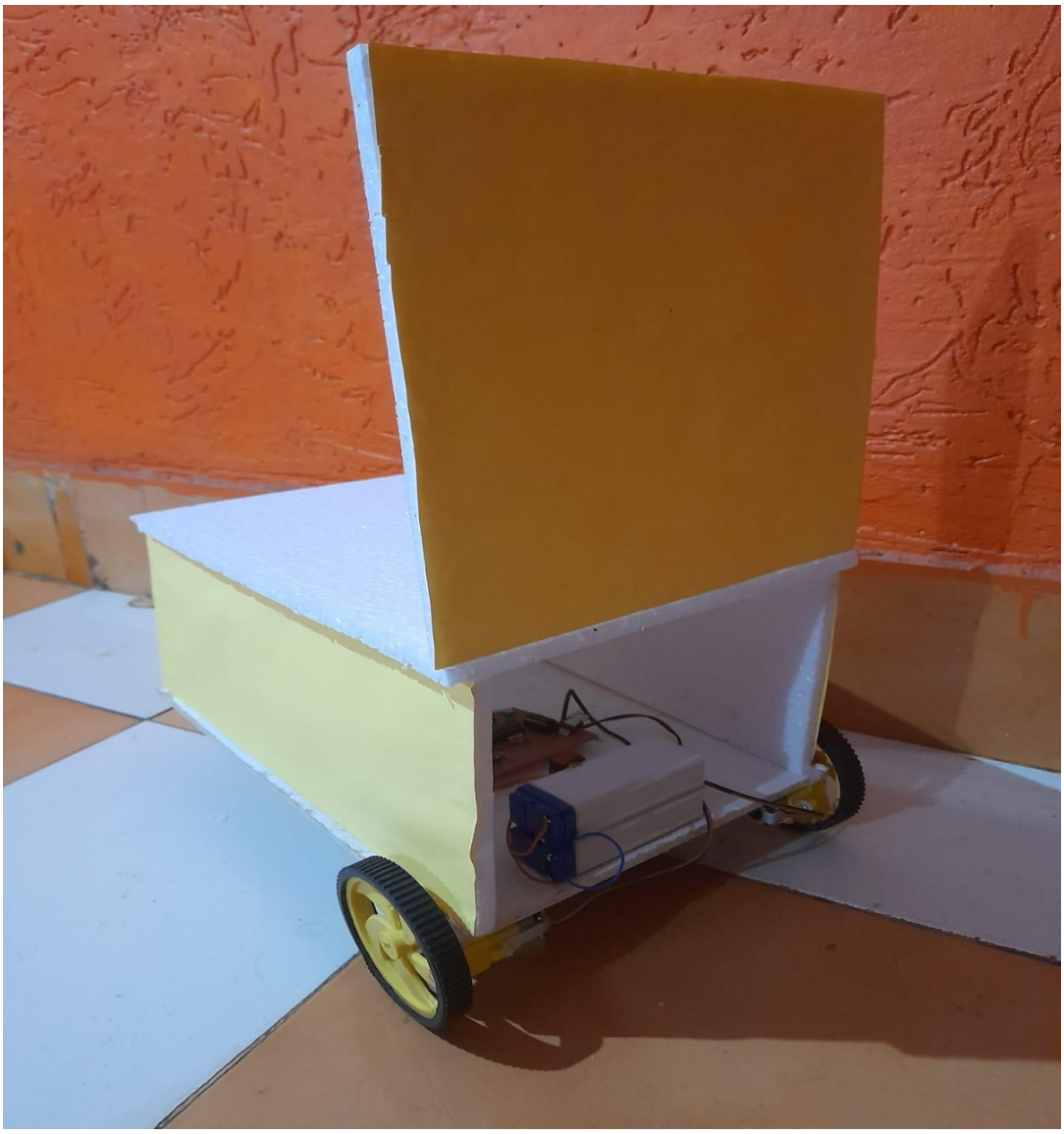

Fig.2 Bluetooth controlled wheelchair

The proposed system for Bluetooth controlled wheelchair has been developed successfully as shown in fig.2 with low cost and easy to use interface. With the different control options of voice control, gesture control and touch button control it also provides the user choice of using the operating method which is best suitable and more convenient for them.

V. Conclusion:

This proposed system contributes to the self-dependency of physically challenged and older people. It reduces the manual effort for acquiring and distinguishing the command for controlling the motion of a wheelchair & home appliances. The direction of the wheelchair now can be selected using the specified commands. Thus the only thing needed to ride the wheelchair is a smartphone which is available with 80% of the people nowadays. Besides that, the development of this project is done with less cost and hence is affordable. However this system requires some improvements to make it more reliable. This design could be improved by implementing wireless communication in the wheel chair and by employing ultrasonic sensor for object detection which will provide safety from accidents and also the current development id not completely

handsfree due to which less upper body mobility might face a problem. By improving this system, we directly enhance the life style of the disabled people in the community. Lastly, we hope that this kind of system could contribute to the evolution of the wheelchair technology.

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