Approach Towards Voice Controlled Wheelchair System for Physically Challenged Person

Abbas NazirAhmed Neelamegam[1], Mahesh Navale[2] ,Vishakha Promad Borse[3] ,Mangesh Laxman Dandime[4] , HimaliGhorpade[5]

[1,2,3,4 ,5] Dept. of E & TC Engg., Smt. Kashibai Navale College of Engineering, Savitribai Phule Pune University, Pune

[1]abbasneelamegam@gmail.com
[2]dr.msnavale@gmail.com
[3]vishakhaborse2016@gmail.com
[4]mangeshdandime4548@gmail.com
[5]himalighorpade@gmail.com

Abstract

Voice controlled wheelchair system is aimed to control a wheel chair by using speech recognition module. The system is designed to control a wheelchair using the voice of any person. It is used to facilitate the movement of people who are disabled or handicapped and elderly people who are not able to move well. The goal of this system will allow certain people to live a life with less dependence on others for their movement as a daily need. Speech recognition technology is a key technology which will provide a new way of human interaction with machine or tools. Therefore, the problems that they face can be solved by using speech recognition technology for the movement of wheelchair and controlling the home appliances. This can be realised and optimised with use of the smart phone device (google voice service) as an intermediary or interface. This paper uses Arduino kit microcontroller circuit and DC motors to create the movement of wheelchair and Ultrasonic Sensors to detect the hurdles in between wheelchair and the way of direction.

Keywords— *Wheelchair, Arduino, ultrasonic sensor, speech recognition.*

I. INTRODUCTION

"World report on disability" [1] jointly presented by World Health Organization (WHO) and World Bank says that there are 70 million people are handicapped in the world. Unfortunately, day by day the number of handicapped people is going on increasing due to road accidents as well as disease like paralysis. Among all the disabilities percentage of physically handicapped person is most. If a person is handicapped, he is dependent on other person for his day to day work like transport, food, orientation etc.

As considering the current situation, at every second the population of World as well as India is increasing very rapidly. In India 120 million people are disabled out of which 41.32% are physicallydisabled [1].

The aim of the paper is to operate wheelchair automatically and operate by using voice control such asmove forward , backward ,left and right by smart phone.[2] As one has to think about the Quadriplegics and Multiple sclerosis patients have severe disabilities and cannot drive joystick operated traditional wheelchairs.Traditionally wheelchair have some limitations in content to flexibility, bulkiness and limited function

A wheelchair is fitted with obstacle sensors, home appliances control with voice, motors and smart phone to help driver to achieve some independent mobility.

ISSN: 2233-7857 IJFGCN

By just giving voice command smart phone which is with the wheelchair user wheelchair can be moved in 4 directions. The obstacle sensor can help the rider control the wheelchair by talking over some of the responsibility for steering and avoiding objects until the user is able to handle the job. The approach allows the user to use human voiceand synchronizewith the movement of wheelchair so that they can use it with comfort.
The complexity is reduced by making use of smart phone so that size of the system is very compact.
The proposed wheelchair integrated with voiceand smart phone. So handicapped person who cannot walk, can drive chair by voice command using smart phone.Taking advantage of technological evolution in order to increase the quality of life for handicap people and facilitate their integration into the working worlds.[2]
The nest part is by using ultrasonic sensors the parameter value is detected for the sake of obstacle detection and providing safety

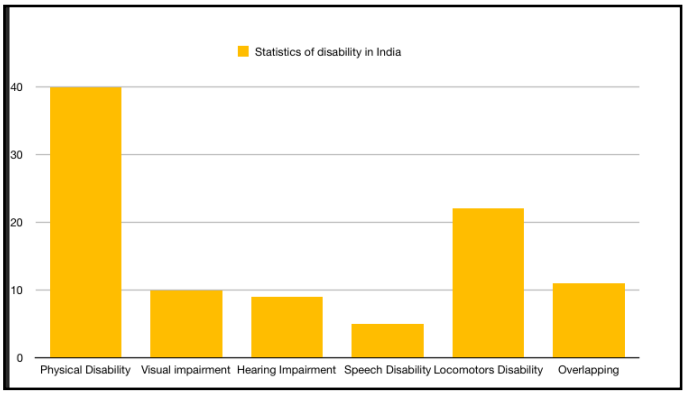


Fig 1): Statistics of Disability in India.

II. EXISTING METHODOLOGY

K.Sudheer, et al proposed voice and gesture based electronic powered wheelchair using ARM used combination of speech and gesture recognition[3] .In this speech recognition module , hidden markov model are used. The MEMS sensor is used and it senses the angle of hand. For Voice recognition the voice IC is used. The major drawback of the system was its high cost.

M. Prathyusha et al were discussing about Voice and touch screen-based direction and speed control ofwheelchair[11]. The speech recognition system uses programmable speech recognition circuit. The speed controller works by varying the average voltage sent to the motor. The system was made too complex and this complexity can be reduced with latest tech available.

Rakhi A. Kalautri , D.K Chitre mentioned in their research how one can use automatic gesture recognition system control functionality acceleration sensor[12].By calculating amount of tilt and output of tilt is decided of next movement. Gesture recognition required mandatory presence of light which made the system limited to bright areas.

Jinhua Zeng ,Yaoru sun , Fang wang mainly focused on natural hand gesture system for intelligent human-computer interaction and medical assistance[5]. The hand gesture vocabulary in the system consist of 5 keys static hand gesture and 3 dynamic components. The hand motion in the vocabulary is limited to metacarphalangeal joint (MCP) abduction and adduction of index finger , ring finger and little finger and the thumb basal joint (TBJ) radial abduction and adduction of the thumb. The major drawback is the system required some very complex coding that could be reduced by using JAVA.

ISSN: 2233-7857 IJFGCN

III.IMPLEMENTATION PLATFORM

For better results, it is proposed to meet the following hardware and software conditions.

Hardware Requirements:

Atmega328p Micro controller
Smart Phone
Ultrasonic sensors
L293D motor driver IC
Bluetooth controller – HC05
Power supply 5V
ULN 2803 – High Voltage high current Darlington array for logic circuitry and multiple peripheral power loads

Software Requirement:

UNO IDE for Embedded Programming
Proteus for PCB Design
Android studio for Android Application

IV.BLOCK DIAGRAM

In the project I have made use of voice operation using smart phone to control the location of wheelchair.
The system is controlled by Atmega328P which also controls the ultrasonic sensor.

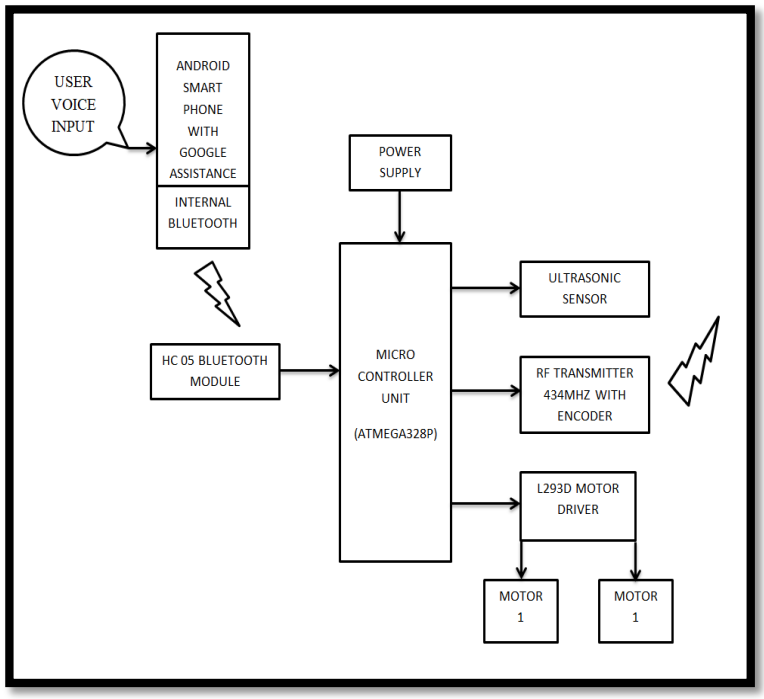


Fig. 2. Block Diagram of Transmitter Section.

As per the proposed system`s block diagram shown in fig.2 DC motors are attached to the wheels of the wheelchair hence based on rotation of motor direction of wheelchair will be easily controlled.

ISSN: 2233-7857 IJFGCN

Motors are interfaced to microcontroller by using motor drivers. The Atmega328P microcontroller is interfaced with Android phone through Bluetooth controller. Depending on the user the voice operationis done.

Panic button is provided on wheelchair to avoid any mis happenings during emergency which force to turn on the buzzer.

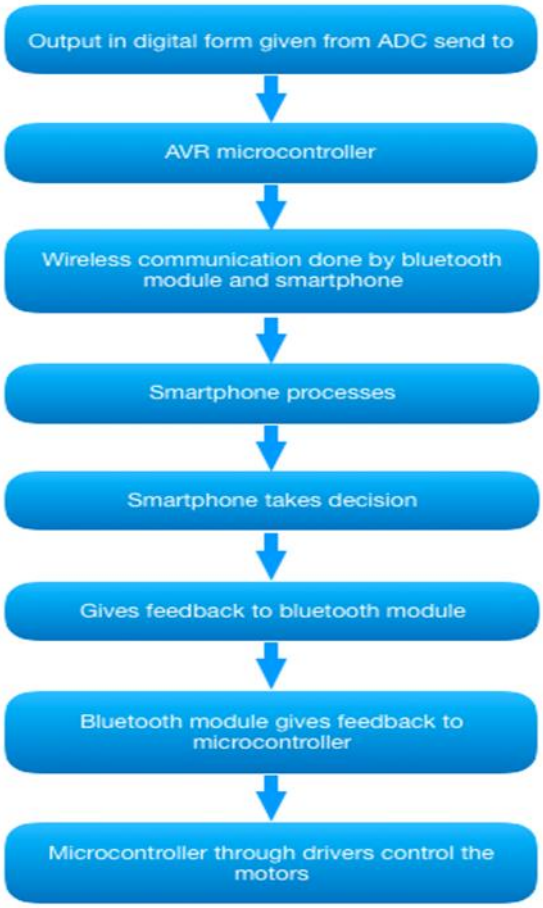
In this paper Atmega328P microcontroller and Bluetooth module are communicating over UART 9600bps. The module comes in SMD package and works on 3.3V power supply. In this profile the data send and receive to module directly comes on the RX pin of microcontroller. It becomes really easy to make your device Bluetooth compatible.

HC-05 has only 4 pins: 5V, GND, TX and RX. The 5V pin and the GND pin are used for power and the TX and RX pin implement a serial interface. The TX pin is used by the module to send information and the RX pin is used to receive information.

To test the module, one has to connect this module to laptop. This makes it easier to see whether the module is receiving characters or not. By simply using a terminal program like Hyper terminal to visualize what the module is sending from its serial interface.

With ref to fig.3 the function of voice controlled wheelchair is discussed as, the person gives voice command to the system, the ADC converts the voice signal into digital form and feeds it to the smartphone now the IFTTT is used to set the desired commands to get specific characters, now these characters are sent to the microcontroller using Bluetooth module. The smartphone and the Bluetooth module does the wireless communication. Now for the system to communicate with the smartphone will require a platform for interface, this is provided by the application that we have developed especially for this sole purpose. Now the microcontroller processes this character and provides respected output command to the motor driver and the motor driver drives the motors accordingly.

Fig. 3. Flow chart of proposed system.



ISSN: 2233-7857 IJFGCN

V.CONCLUSION

The hardware set up is purposely made simple so that anyone can operate it easily. And has wide opportunity for future development.

For better accuracy one can use ANN based algorithm to control movement of wheelchair and it may be considered couple of situations where user is so challenged to speak as well. In such case one can,

- Instead of using voice recognition can use eye retina usingoptical sensor to move wheelchair in different directions.
- Use brain controlled (neural recognition).

By using this system physically handicapped people find easy way to navigate within the house using wheelchair without the external help. This provides ease of operation. As the systemuses Smart phone so that the accuracy is increased. The sensor provides obstacle detection giving safety measures. The IR sensor is used for obstacle avoidance. If any emergency, then the Panic button is there (HELP) it blows buzzer.

REFERENCES

[1] Rajesh Kannan Megalingam, Ramesh Nammily Nair, Sai Manoj Prakhya, " Automated Voice based Home Navigation System for the Elderly and the Physically Challenged", Feb. 13~16, 2011 ICACT201,pp.603
[2] P.Sutha, S. Prabhu, S. Manikandan,S. Venkateshkumar, A. Stephen paul. International Journal of Engineering and Innovative Technology (IJEIT) Volume 2, Issue 12, June 2013
[3] K. Sudheer, T.V.Janardhanarao, CH. Srhidevi, M.S.Madhan Mohan, Voice and Gesture Based Electric-Powered Wheelchair Using ARM 2278-5841, Vol 1, Issue 6, November 2012.
[4] HaoyunXue, Shengfeng Qin, Mobile Motion Gesture Design for Deaf People, 17th International Conference on Automation and Computing, University of Huddersfield, Huddersfield, UK, 10 September 2011
[5] Jinhua Zeng, Yaoru Sun, and Fang Wang, A natural hand gesture system for intelligent human-computer interaction and medical-assistance, 978-0-7695-4860-9/12 $26.00 © 2012 IEEE DOI10.1109/GCIS.2012.60
[6] BojanMrazovac, Milan Z. Bjelica, DjordjeSimić, SrdjanTikvić and Ištvan Papp Gesture Based Hardware Interface for RF Lighting Control ©2011 IEEE
[7] Diksha Goyal and Dr. S.P.S. Saini Accelerometer Based Hand Gesture Controlled Wheelchair, International Journal on Emerging Technologies 4(2): 15-20(2013)
[8] Rajesh Kannan Megalingam, Ramesh Nammily Nair, Sai Manoj Prakhya, " Automated Voice based Home Navigation System for the Elderly and the Physically Challenged", Feb. 13~16, 2011 ICACT201,pp.603-608
[9] 608Rakhi A. Kalantri, D.K. Chitre Automatic Wheelchair using Gesture Recognition, International Journal of Engineering and Innovative Technology (IJEIT) Volume 2, Issue 9, March 2013
[10] R.A.Ramlee, M.H.Leong, R.S.S.Singh, M.M.Ismail, M.A.Othman,H.A.Sulaiman, M.H.Misran, M.A.Meor Said, " Bluetooth RemoteHome Automation System Using Android Application", The International Journal of Engineering And Science(IJES) Volume- 2 ,Issue 01 ,Pages- 149-153 ,2013 ISSN: 2319 – 1813 ISBN: 2319 – 180
[11] M. Prathyusha ,K.S Roy, Mahboob Ali sheikh, "Voiceand Touch Screen Based Direction and Speed Control ofWheel Chair for Physically Challenged Using Arduino"International Journal of Engineering Trends andTechnology (IJETT) - Volume4Issue4- April 2013
[12] Rakhi A. Kalantri, D.K. Chitre. "Automatic Wheel Chair by Gesture Recognition"International Journal of Engineering and Advanced Technology (IJEAT) ISSN: 2249 – 8958, Volume-2, Issue-6, August 2013

ISSN: 2233-7857 IJFGCN