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Voice Controlled Wheelchair

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ABSTRACT—

Assistive technology has come a long way in providing physically disabled people with greater independence and mobility. One such innovation is the voice controlled wheelchair, which is designed to allow individuals with limited upper body strength or dexterity to operate a wheelchair using voice commands. the traditional wheelchair requires manual control, which can be a challenge for some individuals. The voice controlled wheelchair eliminates this challenge by allowing users to control the wheelchair using pre-programmed or custom voice commands. This technology not only provides greater independence but also allows disabled people to perform everyday tasks such as going to work or shopping without assistance of a caregiver or family member. In this context, this paper aims to explore the benefits of the voice controlled wheelchair, its key features, and its potential impact on the lives of physically disabled people.

Keywords—voice commands ,pre-programmed.

I. Introduction

The voice controlled wheelchair is a groundbreaking innovation in assistive technology for disabled people. The traditional wheelchair requires the user to have sufficient upper body strength to operate the wheelchair manually. The voice controlled wheelchair eliminates this limitation by allowing the user to control the wheelchair using voice commands.

Voice controlled wheelchairs can be particularly useful for individuals with disabilities that affect their ability to use their hands or arms, such as those with quadriplegia, cerebral palsy, or other neuro-mascular disorders. They can also be helpful for individuals with limited vision or cognitive disabilities.

In this project, we will be using NODE MCU as a main micro controller. The micro controller has the capability of Wi-Fi communication. Hence, it can be used to control many devices. The concept in this project is to control the mobility of wheelchair using iot. The node MCU is connected to all the devices to control the system. The advantage being that the devices can be controlled from one place ideal for differently abled people. And also there is a custom made app to process the voice commands and has a speed controller as well. This app also consists direction arrow symbols,if the person wants to control the wheelchair using fingers.

The voice controlled wheelchair also includes additional features to assist the user in avoiding the obstacles. There is an ultrasonic sensor fixed at the front of the wheelchair which detects any obstacle and stops the wheelchair. Also a panic buzzer is provided which can be turned on when the person feels at danger or risk and it makes the buzzer sound which alerts the people around about the condition of the person and gets him the necessary help.

This wheelchair is not only based on voice commands but also has an option for manual control both using buttons provided at the handle and using direction arrow symbols on the app. Which again makes it even more efficient and versatile.

Some potential areas of work related to voice controlled wheelchair includes:

- Design and development: one potential area of work related to voice controlled wheelchairs is designing and developing the technology. This includes developing the hardware, software and other components needed to make voice controlled wheelchairs functional and reliable.`

- User experience research : another area of work related to voice controlled wheelchairs is user experience research. This involves studying how people interact with the technology and identifying areas where improvements can be made to enhanced the user experience.
- Safety and security : ensuring the safety and security of voice controlled wheelchairs is another important area of work. This includes designing the technology to prevent accidents and protecting users personal information and privacy
- Maintenance and repair : as with any technology, voice controlled wheelchairs will require maintenance and repair developing system and

procedures for maintaining and repairing these devices is another area of work.

Background

The history of voice controlled wheelchairs can be traced back to the 1990s when researchers started exploring ways to increase the autonomy of people with disabilities by creating technology that could be operated using their voice.The first voice-controlled wheelchair was developed by researchers at the university of Tsukuba,Japan,in 1993.The wheelchair utilized voice recognition technology to allow users to control its movements using voice commands.

In the late 1990s and early 2000s,significant advancements were made in voice recognition technology,which led to the development of more advanced voice-controlled wheelchair.Research continued in this field,and new technique such as artificial intelligence (AI) and machine learning were incorporated into the development of voice –controlled wheelchairs,making them more sophisricated and users-friendly.

Today,voice-controlled wheelchair have become a popular and widely accepted technology for people with mobility disabilities.The technology has enabled people with disabilities to live more independently and has greatly enhanced their quality of life by allowing them greater freedom and autonomy.

Related Work

An Overview of the systems that are currently in place in this domain was done before the project began. The work of eminent researchers is carefully surveyed, and an excerpt from that work is presented here in a review of the literature.

"Smart wheelchair system based on human-robot interaction" by W.Yan et al. This paper presents a smart wheelchair system that is controlled using a combination of voice and gesture commands. The system also incorporates obstacle detection and avoidance capabilities.

"Voice-controlled electric wheelchair for people with disabilities " by M.S.Rahman et al. This paper presents the design and development of a voice-controlled electric wheelchair . The system uses a voice recognition module to interpret the user's commands and navigate the wheelchair accordingly.

"Development of a smart wheelchair system using Internet of Things technology" by Y.Kim et al. This paper presents a smart wheelchair system that uses IoT technology to enable remote monitoring and control. The system also incorporates a range of sensors for obstacle detection and avoidance.

"Development of a wheelchair system controlled by brainwaves and voice commands" by K.Han et al . This paper presents a wheelchair system that can be controlled using a combination of brainwaves and voice commands. The system uses an EEG headset to detect the user's brainwaves and translate them into wheelchair movements.

"Smart wheelchair with obstacle avoidance using fuzzy logic and ultrasonic sensors" by V.R. Salve et al. This paper presents a smart wheelchair system that uses fuzzy logic and ultrasonic sensors to detect and avoid obstacles. The system also incorporates a voice recognition module for user control.

Overall, the related work in the field of voice-controlled or smart wheelchairs is diverse and innovative, with researchers and developers exploring a wide range of technologies and approaches to improve the mobility and independence of individuals with disabilities.

II. Methodology

The illustrative diagram below shows the working principle of the project. As shown in the illustrative diagram, the system consists of a Node MCU, Power Supply, Ultrasonic Sensor, L-298 Motor Driver, Motor.

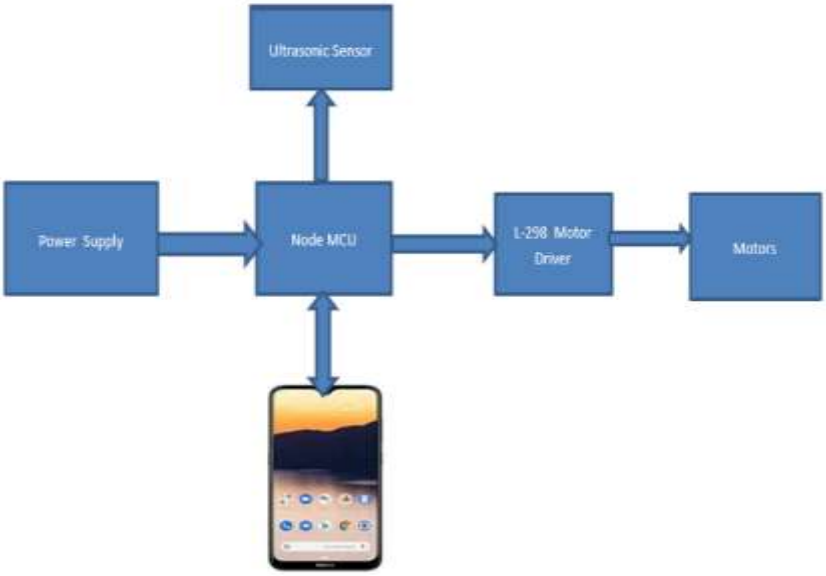


Fig. Block diagram of the project

(A) In this Case we will be using NODE MCU as microcontroller. The steps and methods involved are as follows.

Developing the voice recognition software: There are a variety of voice recognition software options available that can be used with NodeMCU, such as the Google Speech Recognition API . App Is developed which can control wheel chair which can operate on voice as well as manual commands. MIT app Creator is the platform used to develop the app.

Connect the voice recognition module to the NodeMCU: Once the voice recognition software has been developed, it will need to be connected to the NodeMCU board.

Program the NodeMCU: Using the Arduino IDE or the Lua programming language, program the NodeMCU board to respond to specific voice commands. For example, you may program the board to move the wheelchair forward when the user says "forward," or to turn left when the user says "left."

Connect the NodeMCU to the motorized wheelchair components: Once the NodeMCU has been programmed to respond to voice commands, it will need to be connected to the motorized wheelchair components.

Test and refine: Once the system is integrated, it needs to be tested and refined to ensure that it is safe and effective for the user. This may involve testing the system in different environments and situations, as well as making adjustments to the software and hardware to improve its performance.

Implement safety features: It is important to implement safety features in the system, such as emergency stop buttons or obstacle detection sensors, to ensure the user's safety.

(B) Working

The node MCU is programmed in Arduino IDE to interfere with the hardware components.

1.The Node MCU generates hotspot. The IP address is 192.168.4.1. The outputs of NODE MCU are connected to motor driver L298

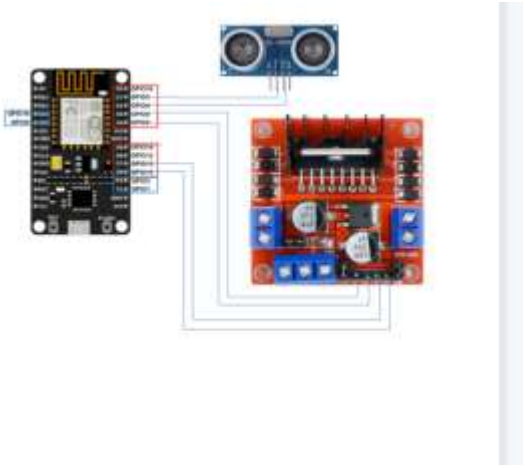
2.The L298 Motor Driver controls the motor speeds and directions.

3.Ultra sonic sensor is connected to NODE MCU to sense the obstacles in between itrs forward motion. Any obstacle detected is immediately sensed and makes an emergency stop.

4.The power supply to all the above components is a battery. NODE MCU operates on 5V hence its converted to 5V using 7805 voltage regulator.

5.The motors operate at 12V. hence direct supply is given to motors via L298 controller.

6.The PWM pins of L298 driver are used to control speed.



(C) Operation:

Activate the system. 'Smart Wheel Chair' is the name of the hotspot that is created. Utilize the cellphone to connect to the hot spot. On your Android smart phones, install the app. 192.168.4.1 should be entered as the IP address. Once linked, you can control it with an app or by speaking commands. The acceptable voice commands are "Go Right," "Go Left," "Go Forward," "Go Backward," and "stop." The chair must be in movable mode in order to function as described. In an emergency, the chair can also be operated manually by using the manual switches. As an emergency switch, the manual mode also offers a panic mode, where if the person presses panic button ,a buzzer goes on which alerts the people around and gets necessary help for the person. In this mode, all operations are suspended.

III. Results

All programming is done using aurdino IDE. The voice recognition feature provides facilitated control over the wheelchair. We have even provided a manual control option, panic buzzer, ultrasonic obstacle sensor to make the wheelchair more versatile. After interfacing of all components according to the circuit diagram we get the desired output.this output or final working of our model consists of certain time delay which is around 3 seconds.and the distance between the obstacle and wheelchair must be approximately 35cm for the sensor to sense the obstacle and stop the wheelchair.

Fig. Model of the wheelchair

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