Voice Controlled Reclining Wheelchair

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Abstract—*In this modern era, physically handicapped people also have their own role in our society. In order to meet their goals and to be self-independent, the existing technology in wheelchair is not sufficient. The proposed objective of this project is to meet these lacking features by modifying it into a reclining voice controlled and autonomous wheelchair. According to our proposed project we are incorporating a voice recognition module to convert human voice signals into commands. The reclining feature is achieved by using gear motors and actuators. We designed the control system including software and hardware. The aim of our proposed project is to make this in a cost effective way so as to make our product available to all sectors of the society*.

Keywords— voice controlling, reclining feature, microcontroller, servomotor.

1. INTRODUCTION

A wheelchair is a device in which the user sits. The device is propelled either manually, by pushing the wheels by hand or through various automated systems. Wheelchairs are used by people whose walking is difficult or impossible due to injury , illness or disability. People with walking disability often need to use a wheelchair "World report on disability" jointly presented by World Health Organization (WHO) and World Bank says that there are 70 million people are handicapped in the world. Unfortunately every day the number of people with disabilities is increasing due to road accidents and illnesses such as paralysis. If someone is disabled, they depend on another person for their daily work such as transportation, food, orientation, etc. Thus, a voice-operated chair that automatically operates on the orders by the disabled user for motion purposes.

Human beings always have the intension to control every process or incident occurring around them so that they can lead a comfortable life .Man has to do certain process in order to control their body or specific body parts .Handicapped people do not have the capability to control their body to move from one place to another. But there are people who are severely paralyzed that they can't move with external support. If they have to be transferred from a bed to wheelchair or need to do rehabilitation exercises they have to depend on others, this brings mental pressure to the patients. In order to overcome this problem people need wheelchair. There are manually operated and electrical wheelchairs but they have limitations. To improve the freedom of mobility of elderly and disabled persons, wheelchair now tend to be more intelligent with superior performance. One of the great step towards the integration of severely physically disabled and aged people is the use of powered wheelchair with high directional intelligence. Here it includes the voice controlled and reclining feature, it becomes easy to operate the wheelchair for disabled people .It improves the quality of life to some extend.

According to user wish wheelchair can be made into a semi sleeper bed .Based on the existing mechanical structure of a multi-posture wheelchair this presents the control system design which includes an android app. Then comes an actuator which is a component of a machine for moving and controlling a system.

Wheelchair is an important vehicle for handicapped person to move anywhere they want. The typical wheelchair is roughly classified as follows: the self-controlled type wheelchair that the user drives by hand using a rim equipped at outside of rear wheel, the helper-controlled type that the helper supports, joystick controlled type equipped a joystick and user control it to move the wheelchair. However, these wheelchairs have several problems, such as, the user cannot control joystick if he/she has a trouble at both hands, the user needs muscular strength and the helper has to support. Therefore, many of researches develop more safely and comfortable wheelchair. These interfaces are available to person who cannot use commercially available wheelchair. The voice is the most natural communication ways and one of the useful interface, then, we developed the voice activated wheelchair. In our system, the user controls the wheelchair by voice control , and it could reduce many incorrect movements by false recognition. However, there was another problem that the wheelchair collided in the wall and obstacle by delaying the voice command. Then, in this research, we equip two kinds of sensor around wheelchair, and sensor-acquired information is fed to the autonomous movement, such as, the deceleration movement, stop movement, and avoidance movement without voice command. The user can control the wheelchair more safely by this system.

2. PRINCIPLE OF OPERATION

For elderly and disabled people wheelchair becomes an assistive means of transportation. We are adding the additional features to the existing mechanical design of wheelchair. For the voice controlled feature here using the android app and through that voice control system and a microphone is also embedded which convert the sound energy into electrical energy. With this voice controlled feature the person can move according to the commands. All the components are given to the PIC microcontroller. Embedded C is the programming language use here . For voice controlling :Voice signal from microphone which transforms it into binary code. This binary code is given to microcontroller. Microcontroller generates output according to the input and output is given to the driving circuit which drives the motor.

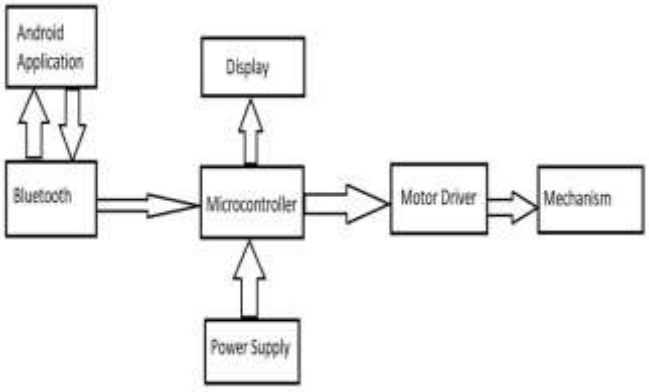


Fig 1.Basic block diagram of Voice Recling Wheelchair

The figure consists of microphone, bluetooth, android application, microcontroller circuit, driver circuit, left motor, right motor and battery. A microphone is a transducer that converts sound into an electrical signal. The mobile phone is paired to the bluetooth module. The speech recognition system is a completely assembled and easy to use programmable speech recognition circuit, in the sense that you train the words you want the circuit to recognize. The bluettoth module is fed into microcontroller circuit. The driving circuit is used to drive the motors and with the commands the motor rotates and the wheelchair works.

3. HARDWARE REQUIREMENTS

1. PIC16F877A Microcontroller
2. MG995 Servomotor
3. Bluetooth module
4. L293D module
5. LCD Display

4. SYSTEM SOFTWARE

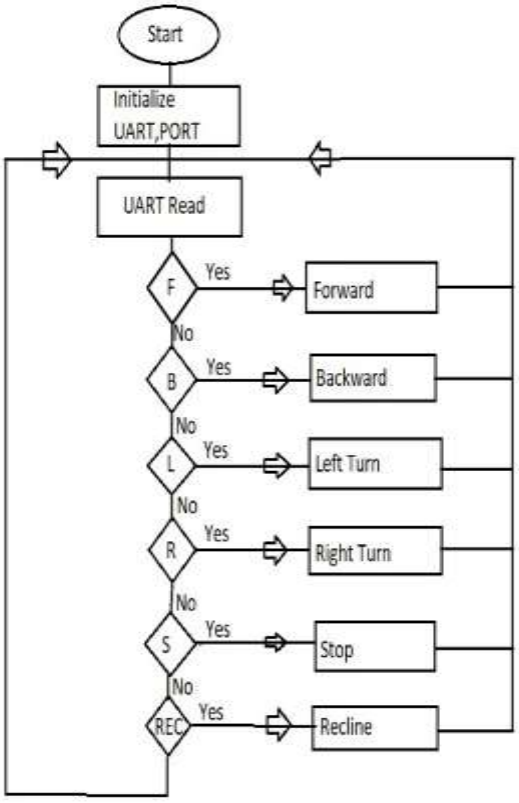


Fig 2.Shows the software flowchart of the project

First initialize the port and UART , then UART read the commands and it compare with the string which is programmed . If the command given is forward ,it will compare and if the commands are same the wheelchair will move forward . If the command are not same the wheelchair will not move. All the process will work like this.The movements forward, backward, left, right and reclining processes are also included

5. ADVANTAGES AND DISADVANTAGES

Advantages

1. Wheelchair can be fully reclined and can reduce the number of assistants and efforts required while transferring the user to the bed.
2. Concept of voice controlling gives the user more freedom and be more independent.
3. Wheelchair is compact and easy to use.
4. The wheelchair is economical compared to the products in the existing market.

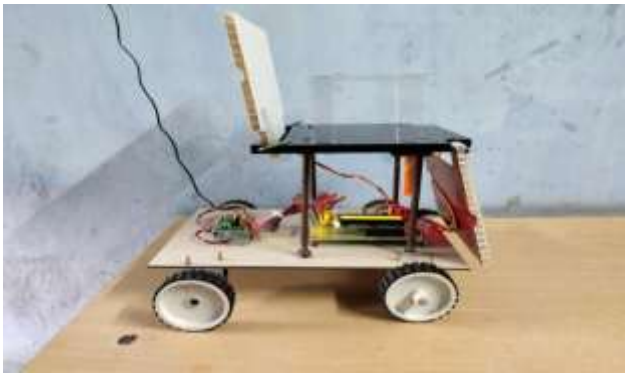
Disadvantages

1. Weight of the person can be a limitation when considering fully reclined position.
2. Cannot used for a person who is fully paralysed.

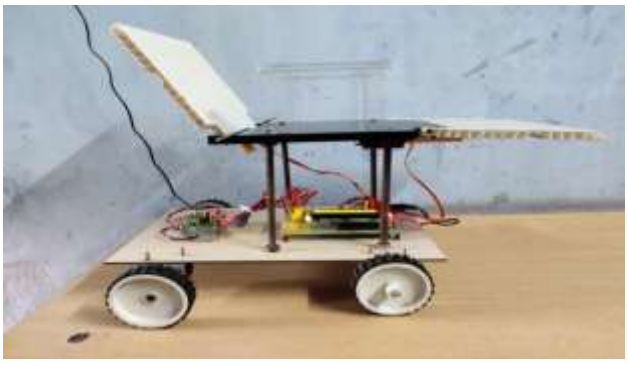
6. OBSERVATION AND SYSTEM RESULT

Commands	Wheelchair Positions
Chair	Chair Position
1	Reclining at 115º
2	Reclining at 135 º
3	Reclining at 165 º
Bed	Reclining at 180 º
Stop	Stop

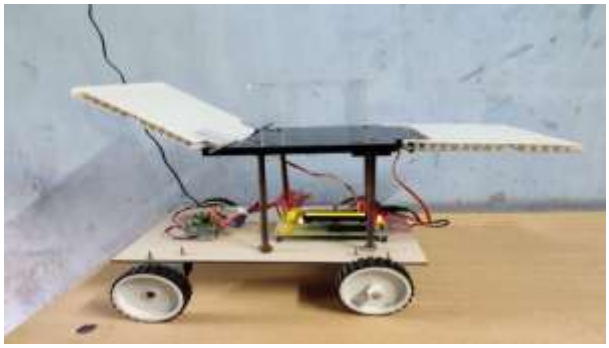
Step 1: Chair position



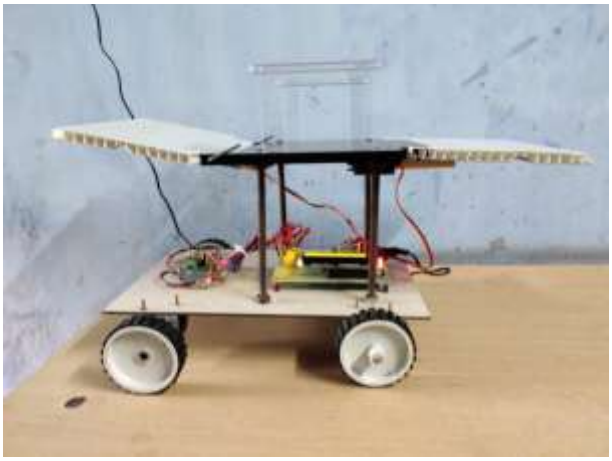
Step 2: Angle position 1



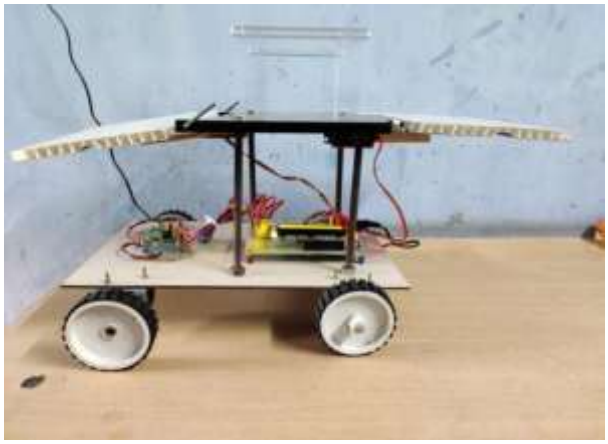
Step 3: Angle position 2



Step 4: Angle position 3



Step 5: Bed position



The below given figures are the different positions of wheelchair:

- Step1 shows the wheelchair at its chair position when the command is given.
- Step2 shows the wheelchair which move to its angle1 position from chair position when the command is given.
- Step3 shows the wheelchair which move to its angle2 position from angle1 position when the command is given.
- Step4 shows the wheelchair which move to its angle3 position from angle2 position when the command is given.
- Step5 shows the wheelchair which move to its bed position from angle3 position when the command is given.

7. CONCLUSION

For older and disabled people, the wheelchair becomes a supportive means of transport. Here we have integrated three applications that are completely horizontal, voice controlled and height adjustable. These functions help to improve freedom of movement. There are many multi-function wheelchairs that have improved their quality of life, like hand-operated, electric ones only to a degree. In this article we supplement the existing mechanical functions with additional functions Design of the wheelchair. For the voice-controlled feature here with the Android app and through In this voice control system, a microphone is embedded, which converts the sound energy into electrical energy.

With this voice-controlled function, the person can move according to the commands Components are transferred to the PIC microcontroller. For lying and height adjustment actuators are used here. Actuators is responsible for moving or controlling a system. In electric linear motor actuators, the components are connected to the microcontroller. Embedded C is the programming language used here. To voice control: voice signal from the microphone, which converts it to binary code. This binary code is passed to the microcontroller. The microcontroller generates an output according to the input, and the output is given to the driver circuit which drives the motor. The design of the wheelchair is compact Multi-purpose wheelchair can reduce the work of caregivers.

Future scope: May include functions such as control of the facial muscles and eye movements and placed in walking position to assist the person while walking. By installing an ultrasonic distance sensor for distance measurement and an image sensor for off-road recording, autonomous obstacle avoidance and automatic navigation of the intelligent wheelchair can be achieved.

8. REFERENCES

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