SMART WHEELCHAIR USING VOICE, GESTURE AND EYE MOVEMENT RECOGNITION

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Introduction:

The World Health Organization (WHO) estimates that almost 10% of the global population suffers from one or more forms of disability. In the case of India, this figure is close to 3.8% of the country's population. Nearly 15-20% of the total physical disabilities in children are caused by Cerebral Palsy (CP). In India alone, CP occurs in around 3 of every 1000 live births. However, the expected figure could be way higher given the fact that India is still a developing nation. The feeling of loss of autonomy that a person with disabilities experiences on a day-to-day basis is something that the rest of us often take for granted. A Cerebral Palsy patient is subject to many complications like restricted muscle movements and frequent loss of memory. People with Cerebral Palsy may have uncontrollable muscle spasms, rigid muscles, and occasionally, tremors. People with severe Cerebral Palsy have trouble swallowing, breathing, eating, controlling their bladder and bowel movements, and face digestive and dental disruptions. Recently, significant efforts have been made, as documented, to solve any difficulties between human and PC-based systems by making collaborations (which previously relied on information devices such as consoles and mic) as natural as possible with motion controls. Signal acknowledgment is useful for processing data from people that aren't transmitted by speech or type. Joystick, EEG, Image Processing are some of the various methods that have been used to solve the issues faced by these patients.

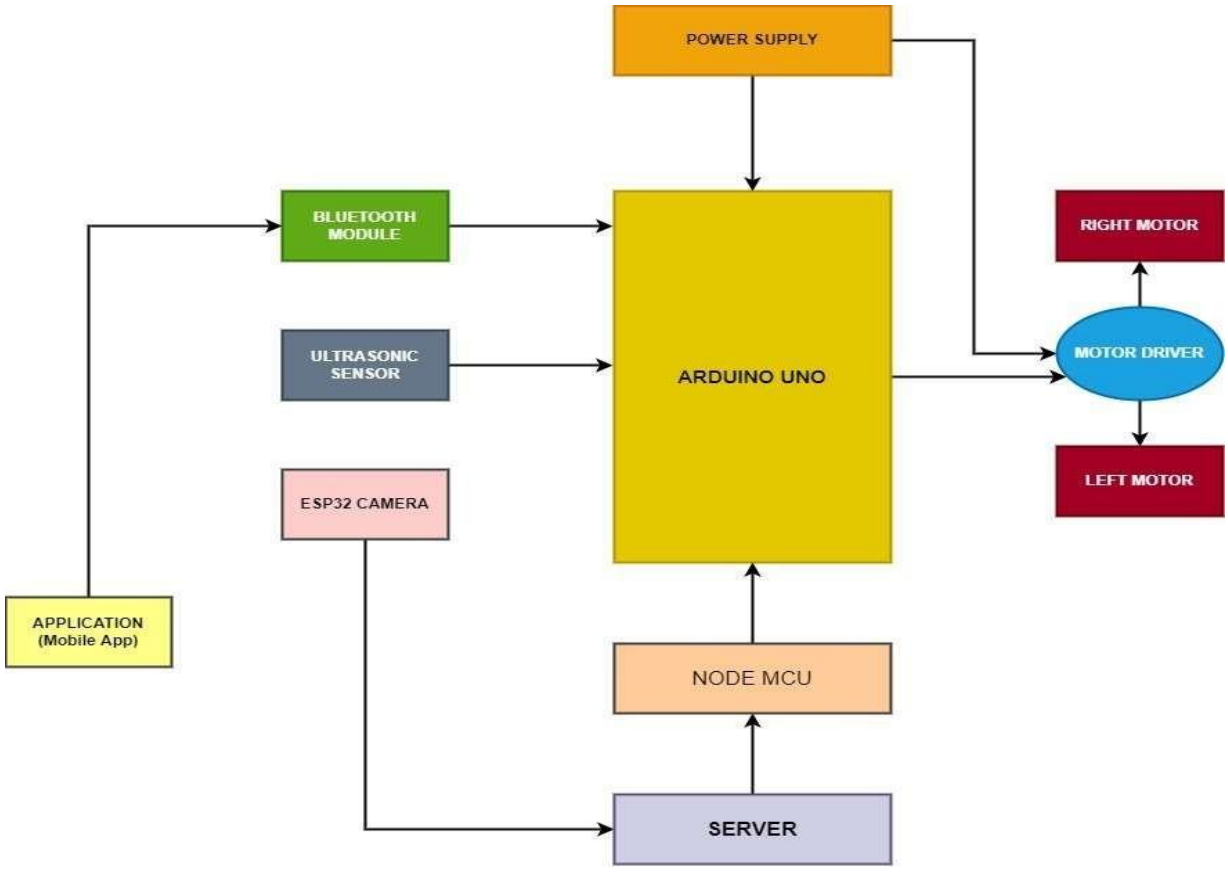
Objectives:

A sector of physically challenged people finds it very difficult to use traditional wheelchairs. Researchers have been working on computer-controlled chairs which utilize sensors and quick control algorithms to minimize the level of human intervention. This project is based on a design that aids the voice activation system for physically disabled people by incorporating manual operation. Arduino microcontroller and voice recognition have been used to support the movement of the wheelchair. The wheelchair does not respond to an incorrect speech command. Depending on the direction given through voice and gesture, the Arduino controls the wheelchair

directions. Ultrasonic sensors are used to detect obstacles. The prototype will be designed in such a way that it can be used independently and efficiently with less effort. It saves time, reduces cost and energy of the users.

- The objective of our project is to assist the physically challenged people.
- It uses speech recognition technology which voice can be realized and organized withsmart phone device as an intermedia interface.
- It also uses an obstacle sensor to detect the hurdles in between wheel chair in the wayof its direction.
- It used to facilitate the movement of people who are disabled or handicapped. It also enables a disabled person to move around independent

Block diagram:



Methodology:

The aim is to design and implement a smart wheelchair which can be controlled by gesture and voice commands. The wheelchair is fitted with ultrasonic sensor and voice recognition module. The wheelchair can be navigated in the four directions. By using the voice recognition module, the user can control the movement of the model by sending voice commands such as forward, reverse, left and right.

The system mainly consists of Arduino Uno, Bluetooth module, Motor driver L293D

and an Ultrasonic sensor

- Arduino Uno is powered by 5V regulated from a 12V battery. The Bluetooth module is connected to the handset and the motion control is done through a mobile application. The input to the application is either voice or gesture.
- Google Voice Search Engine is used for recognizing the commands and controlling the model through voice. For gesture control gyroscope sensor in the smartphone is utilized.
- Based on the input given to the Bluetooth Module, the direction of rotation of the motor is controlled by the motor driver. The motor driver used is L293D which is a dual h- bridge motor driver IC This, in turn, controls the movement of the prototype.
- An ultrasonic sensor is used to detect any obstacles on the path that may hinder the movement of the model. The coding for the functioning of the prototype will be done using Arduino IDE.

The Arduino Software (IDE) contains a text editor to write code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino hardware to upload programs and communicate with the hardware.

Results and conclusion:

The proposed method explains the design and construction of Voice and Gesture controlled Wheelchair using a Bluetooth module. The model works in accordance with the commands given by the user. The model aids physically challenged people to control their wheelchair using an android application in their smartphones. The detection of any obstacle is successfully done using Ultrasonic sensor. As the person switches ON the prototype, it starts moving and any obstacle which is expected to lie within a certain range will be detected. The proposed system is contributed differently abled and older people for their self-dependency.

Applications& future scope:

- Hospitals
- Health care centers
- Old age home
- The wheelchair can also be operated by blind people
- Can be operated by the handicapped person itself
- Ability to provide sufficient risk management
- Obstacles in the way of wheelchair are detected and avoided using IR sensors

Future Scope:

- The efficiency of voice command based wheel chair can be imported by neural basedalgorithm and in future the proposed system using various gesture and commands.
- -Instead of using gesture recognition can use eye retina using optical sensor to movewheel chair in different directions.
- -To enhance the speed of the wheelchair dc motor can be replaced by servomotors.

Advantages:

Power wheelchairs, also referred to as electric wheelchairs, are a common aid to daily living for people who are disabled or elderly. Power wheelchairs provide many advantages for wheelchair-bound people. Many people who require a wheelchair find a power wheelchair offers more benefits than a bulky manual wheelchair.

1. Increased mobility, for disabled people who cannot use their arms to power a manual wheelchair, or for people who do not have the upper body strength to self-propel a manual wheelchair, power wheelchairs offer the ability to be mobile with the use of a joystick or mouthpiece, such as the sip and puff control described by Wheelchair.ca or a tongue-controlled wheelchair.
2. Increased Manoeuvrability, Power wheelchairs use casters that swivel a full 180 degrees to provide more manoeuvrability, especially in small areas, according to the Electric Wheelchairs Centre. Manoeuvrability is one of the key problems associated with wheelchair use. Power wheelchairs allow a disabled individual to get around tight spaces and move through smaller areas, which is especially beneficial at home.
3. Increase disabled people's ability to live independently – to enjoy the same choice, control and freedom as any other citizen –at home, at work, and as members of the community.
4. Enable young disabled children and their families to enjoy „ordinary" lives, through access to childcare, early education and early family support to enable them to care for their child effectively and remain socially and economically included;
5. Improving the life chances of disabled people
6. Depending on the direction given through voice and gesture, the Arduino controls the wheelchair directions.
7. Ultrasonic sensors are used to detect obstacles.
8. The prototype is designed in such a way that it can be used independently and efficiently with less effort.
9. It saves time, reduces cost and energy of the users.
10. This gesture controlled wheelchair will help the handicapped person to be self-dependent for the purpose of movements for which they mostly dependent on other people

Hardware model:

TOP VIEW

SIDE VIEW

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