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Design and Implementation of Hand Gesture Controlled Wheel Chair

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ABSTRACT:

Generally, robots are modified to perform particular errands which people cannot. To increase the use of robots where conditions are not certain, robots can be made to follow the instruction of human operator and perform the task. In this way choices are taken agreeing to the working conditions by the administrator and the errand is performed by the robots. This paper describes about the voice assisted and hand gesture control wheelchair which can be controlled by your normal hand gesture and voice assistance. • The gesture control consists of mainly two parts, one is transmitter part and another is receiver part. The transmitter will transmit the flag agreeing to the position of accelerometer and your hand signal and the recipient will get the flag and make the robot move in particular course. Here, the program is arranged by utilizing Arduino IDE.

Introduction:

With the advancement in technology, home automation has made possible everywhere. Home automation is extremely useful for someone with disabilities in many aspects. Lots of individuals think that Home Automation could be a Luxury Thing. Home Automation isn't just a luxury one but, it's the way beyond. Physically paralyzed person is that the one who has lost his/her physical mobility. There are various sorts of paralysis. They are monoplegia (which effects just one arm or leg), hemiplegia (effects one arm and one leg on same side of body), paraplegia (effects both legs), quadriplegia(effects both arms and legs). Such a physically paralyzed person wants to hunt other person's help even for his/her basic task like clothing, bathing, eating etc.. Things become even worse when there's no guardian to handle the care of such person. How such person would control the house appliances? And, there are more such questions. Many people would say they'll hire some people whose duty is to take care of such people but, it's not a reliable solution. How much a new person would care about all the items.

A project report on a hand gesture controlled wheelchair focuses on designing and implementing a system that allows wheelchair users to control their mobility through natural hand gestures, rather than relying on traditional manual or power-driven mechanisms. This involves several key aspects, including sensor integration for gesture recognition, algorithm development for interpreting gestures, and control mechanisms for translating those gestures into wheelchair movements

Objectives:

- Wheelchair is the best assistive device used by elder and disabled people.
- The driving and controlling of traditional wheelchair are much harder task.
- Our point is to construct a moo fetched and capable wheel chair which makes a difference the incapacitated individuals to travel without depending on others.
- We want to give the disabled person the sense of freedom where they can go on their own.
- To monitor all the acquired data through a mobile application using IOT.
- Thus to increase the efficiency of the solar energy system ...

Block Diagram



Compoents Requirements

- 1. Arduino nano
- 2. Mpu6050 module
- 3. Zero PCB
- 4. nRF24L01 module
- 5. Battery cap
- 6. Motor driver (L298N)
- 7. Motors

Working

The hand gesture-controlled wheelchair operates by detecting specific hand movements and translating them into directional commands that control the wheelchair's motion. The system uses an accelerometer sensor, such as the MPU-6050 or ADXL335, which is typically attached to a glove or hand-mounted module worn by the user. This sensor continuously measures the orientation of the hand across three axes (X, Y, and Z). Each gesture—such as tilting the hand forward, backward, left, or right—corresponds to a specific movement of the wheelchair, such as moving forward, reversing, or turning. The sensor data is transmitted to a microcontroller, commonly an Arduino Uno or similar, which processes the incoming analog values. The microcontroller compares these values against predefined thresholds to determine the user's intended gesture. Once a gesture is recognized, the microcontroller sends appropriate signals to a motor driver circuit (such as L298N), which in turn controls the DC motors connected to the wheelchair's wheels. This enables the wheelchair to respond in rea ltime to the user's hand movements. The working of gesture-controlled wheelchair is explain in the following steps :

1. Gesture Detection The user wears a glove-mounted sensor or a controller with an accelerometer (commonlytheMPU-6050) which detects the orientation and motion of the hand in three axes (X, Y, and Z). Each hand gesture (such as tilting forward, backward, left, or right) corresponds to a specific directional command:

- Tilt Forward \rightarrow Move Forward
- Tilt Backward \rightarrow Move Backward
- \bullet Tilt Left \rightarrow Turn Left \bullet Tilt Right \rightarrow Turn Right
- Steady Hand \rightarrow Stop

2. Signal Processing The accelerometer continuously sends raw analog data (voltage values) corresponding to the hand's position to a microcontroller (usually Arduino Uno or Nano). The microcontroller reads and filters the analog values compares them with predefined threshold values for each gesture maps each gesture to a control command using conditional logic. 3. Motor Control Once the gesture is identified the microcontroller sends signals to the

motor driver module(L298N). the motor driver controls the rotation and direction of the DC motors attached to the wheelchair wheels. Based on the command, motors are activated to move the wheelchair forward, backward, or turn accordingly.

4. Power Supply The system is powered by a battery pack (usually 12V) which supplies power to both the control circuitry and the motors. Voltage regulators may be used to supply appropriate voltages to different components

Advantages

- Increased Mobility and Independence:
- Hand gestures allow users to move the chair naturally, without requiring extensive training or complex commands.
- Reduced Reliance on Others:
- Users can move independently without needing assistance, enhancing their autonomy and self-sufficiency.
- Accessibility:
- The system is designed to be accessible to a wide range of users,.
- Natural Movement:
- The system leverages natural hand movements, making it easy for users to learn and adapt to the control scheme
- Cost-Effectiveness:
- The project can be implemented using readily available and affordable components, making it a viable solution for individuals with limited budgets.

Conclusion

It has been designed to integrate functionality from all of the Hardware components used. Every module's presence has been carefully considered and arranged, resulting in the best possible operation of the unit. Second, the idea was effectively implemented employing modern integrated circuits and growing technology. The disabled person can maneuver the wheel chair right, left, front, and back with their hand movements. As a result, the project has been designed and tested successfully. This paper is implemented using many components; nevertheless, the project is only a prototype; if we develop this project into a commercial project, it will undoubtedly benefit all disabled persons who are unable to operate and drive a standard wheel chair on their own.

Future Scope: The hand gesture wheelchair has the ability to bridge the gap between man and machine. The design involves many features like patients body temperature, SPO2 levels. But these are implemented separately with separate modules. But it is possible to design a single module with all these features can reduce circuit complexity and ease of use. Multiple modules for multiple features is not a desirable feature in any embedded system design. Further this hand gesture can be changed to speech and brain signal recognition which will be a battle winning factor for all those people whose whole body is paralyzed.

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