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Smart Wheelchair with Trolley for Elderly People

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Abstract - *The present-day society demands the people to be independent, irrespective of their natural challenges, mentally or physically. Physically challenged people have to rely on someone for fulfilling their even minor needs. The probability of them to go and interact with the outside world is very minimal, unless they are provided with modern moving tools such as a Wheelchair. There are two possibilities of either using manual driven or electric powered driven wheel chairs. The former solution is only for the people who have disability in lower limbs and also long-term usage poses further health problems. This project aims to control a wheelchair by means of hand gesture. It enables the physically challenged people who can't move their legs to move around independently using the hand gesture which is interfaced with motors to make the movement easy as much as possible. The prototype of the wheelchair is built using software and hardware, in addition to its versatility and performance in mathematical operations and communication with other electronic devices. The system has been designed and implemented in a cost-effective way so that if our project is commercialized the needy users in developing countries will benefit from it.*

Key Words: **Gesture, Wheelchair.**

1.INTRODUCTION

Elderly people with physical disabilities always find it difficult to navigate without the assistance. Wheelchair is the most common mean of locomotion after paralysis or physical disability. Driving a wheelchair in domestic environments is a difficult task even for a normal person and becomes even more difficult for people with impairment. For that, a working model demonstrating of hand gesture for controlling a wheelchair has been developed and that too at a very low cost.

The number of people, who need to move around with the help of some artificial means, whether through an illness or an accident, is continually increasing. These means have to be increasingly sophisticated, taking advantage of technological evolution, in order to increase the quality of life for these people and facilitate their integration into the working world. In this way a contribution may be made to facilitating movement and to making this increasingly simple and vigorous, so that it becomes similar to that of people who do not suffer deficiencies.

2.LITERATURE SURVEY

Paper 1: Brain Controlled Wheelchair.

This paper [1] is proposed by Anita, Bhavana, G S Surabhi, Madhu, and Sudarshan. This is an EEG based brain-controlled wheelchair which has been designed using the brain computer interface BCI technology with the help of a neurosky mind wave EEG headset. Implementation of this device helps the patient to move on their own. Movement of the wheelchair is controlled by the variation levels of the patient's brain where the wheel chair will turn off by a double eye blink given by the patient. The neurosky head set is attached to the patient's head. By which the wheelchair starts moving.

Paper 2: Hand gesture-controlled Wheelchair using image processing.

This paper [2] is proposed by Amruta S Magar, M.R. Bachute. He presented hand gesture-controlled wheelchair using image processing through web camera. This proposed system is totally depended on the raspberry pi board that contains the Arm11 controller that should control the movements of the wheelchair with help of web camera and dc motor. This system not only recognizes hand gesture but also control the wheelchair according to the hand movement i.e., wheelchair will perform according to the number of fingers. This System approaches the vision-based methodology exposed hand motion. This system has used the HSV color space technique to detection of hand gesture through image processing.

Paper 3: Voice controlled Wheelchair using embedded system.

This paper [3] is proposed by Deepak Kumar describes the design of a smart, motorized, voice-controlled wheelchair using embedded system. This paper represents the "Voice-controlled Wheel chair" for the physically differently challenged people. Where the voice command controls the movements of the wheelchair. The voice command is given through a cellular device having Bluetooth and the command is transferred and converted to string by the BT Voice Control for Arduino and is transferred to the Bluetooth Module SC-05 connected to the Arduino board for the control of the Wheelchair.

Paper 4: Joystick Controlled Wheelchair.

This paper [4] is proposed by Fahad and Muhammad Asif. Many disable persons are able to operate a joystick to control the electric wheelchair but on the other hand, many people do not have the legerdemain necessary to operate a joystick. Moreover, many of them face difficulty to avoid obstacles. The aim of this paper is to implement a multi-control system to control the movement of the wheelchair by integrating finger movement tracking system, a small vocabulary speaker dependent based word recognition system and a group of monitoring sensors in order to avoid obstacles. Moreover, a joystick control system is also implemented in order to facilitate the patients that are able to use the joystick. The theme is accomplished by using a micro- controller with digital signal processor for isolated word recognition and sets of sensors.

Paper 5: Eyes Based Electric Wheelchair Control System.

This paper [5] is proposed by Kohei Arai. The proposed EBEWC is controlled by human eyes only. Therefore, disabled person can control the EBEWC by themselves. Most of the computer input system with human eyes only consider in specific condition and does not work in a real time basis. Moreover, it is not robust against various user races, illumination conditions, EWC vibration, and user's movement. Though experiments, it is found that the proposed EBEWC is robust against the aforementioned influencing factors. Moreover, it is confirmed that the proposed EBEWC can be controlled by human eyes only accurately and safely.

3. SYSTEM DESCRIPTION

In this Gesture Remote an MPU-6050 accelerometer is used as a sensor which will be giving an analog signal on moving it in X, Y, Z axis respectively [We are suing X and Y axis]. Before sending, the data is encoded with an encoder with a secured address so as to avoid its interference from another device.

This will decrease interference and unwanted noise. After that, the signal is sent wireless. Now, the receiver receives the signal and then it is processed through decoder so as to decode the signal further is passed through the receiver and it is being sent to Arduino Nano as an input. On receiving the input signal, the Arduino Nano compares the data which is preinstalled in the controller. We use comparators to compare the two inputs and give the result accordingly.

We also have to adjust the tilting angle as per the motion of the hand. If the input data matches the preinstalled data, then the signal should be given to motor. and then motor starts rotating and then the wheelchair starts moving.

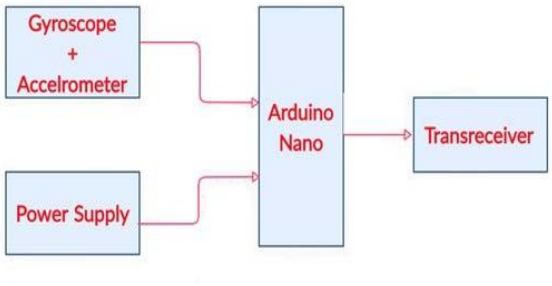

Fig 1: **Block Diagram for Hand Gesture Remote**

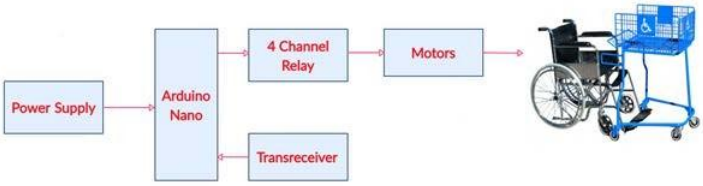

Fig 2**: Block Diagram for Wheelchair with Trolley**

- Wear the Gesture Belt.
- Sit on the Wheelchair.
- Turn on the Gesture Remote.
- Turn on the Wheelchair power supply.
- Make the hand movement as per your requirement.

Note: By making Hand movement,

- For upward direction the wheelchair will move backward.
- For downward direction the wheelchair will move forward.
- For left direction the wheelchair will move left.
- For right direction the wheelchair will move right.

To make wheelchair stop do the hand movement in horizontal.

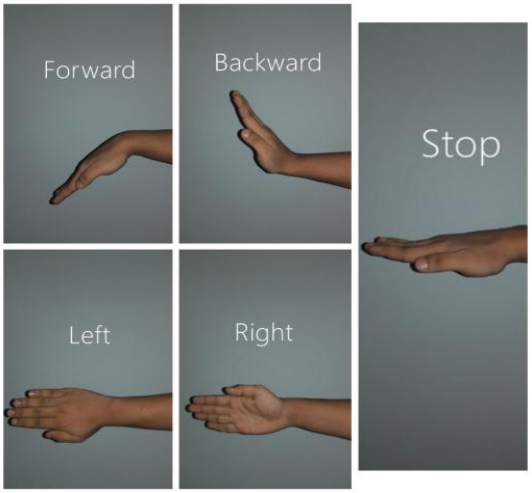

Fig 3**: Hand Gesture Movement Diagram**

4. HARDWARE AND SONFTWARE REQUIRED

Hardware Components	Software Components
• Arduino Nano (x2)	• Arduino IDE
• Accelerometer Sensor (MPU6050)	
• NRF24L01 Trans receiver	
• Ebike 24VDC Motor (x2)	
• 4 Channel Relay	
• 2 x 12V Battery	

Table -1**: The Hardware and Software Requirements**

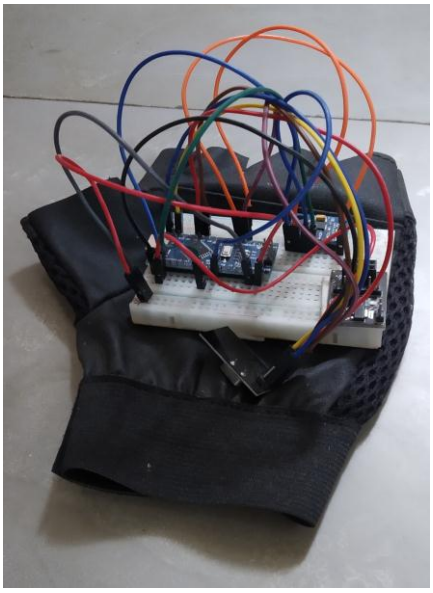

Fig 4: **Final Prototype for Hand Gesture Controlled Remote (1)**

5.

Fig 5**: Final Prototype for Hand Gesture Controlled Wheelchair (2)**

5 CIRCUIT DIAGRAM

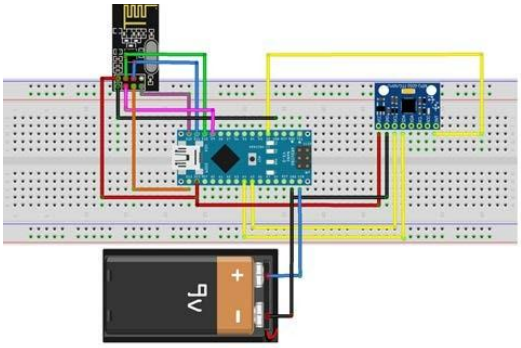

Fig 6: **Circuit Diagram for Hand Gesture Device**

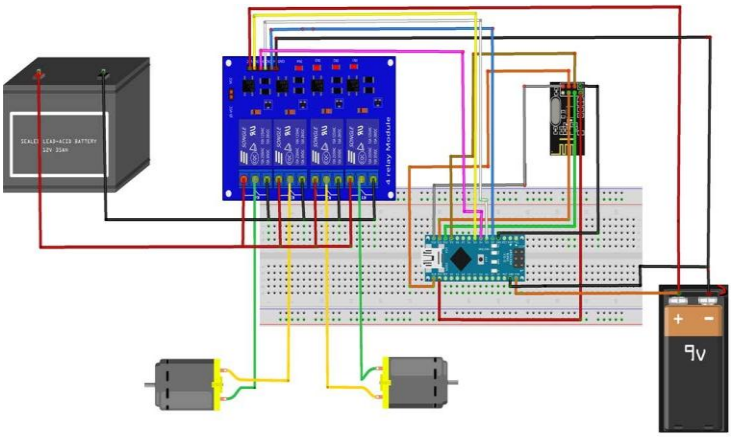

Fig 7**: Circuit Diagram for Wheelchair Trolley**

6. CONCLUSION

In this proposed system we used hand gesture technology system based on portable and low-cost components in a wearable form. These wearable Gadgets utilize the acceleration data to recognize the hand motion and then transfer the information, which indicates certain motion commands into the wheelchair's smooth motions. This gives the user independence and an advantage of being independent. Of course, some training is necessary to use the accelerometer as its quite sensitive but in the end, there could not be a better use of Technology for an Individual who is deprived of the same physical strength.

7.FUTURE SCOPE

•Health monitoring system can be implemented on wheelchair which is very useful for handicapped person. This system checks health of handicapped persons daily.

•IoT can also be implemented to know the exact location of the person using GSM & GPS who is in wheelchair.

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