

Two Dimension Head Movements Based Smart Wheelchair Using Accelerometer: Head Motion Can Control Wheel Chair

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Abstract: *How far we think about the people who are handicap by birth, old age people and some accidental cases. All the wheelchairs in the market till market till now are not useful for the people whose limbs are not working. They are not involved in the national progress and not only this they are burden for others. The people who have his kind of disability are not able to perform their everyday actions. Due to dependence on others, a person loses their confidence and desire to live their life independently. With the help of this wheelchair they become able to be a bit independent. This research paper introduces the design and implementation of a novel hands free control system for intelligent wheel chair. This is achievement for those whose limbs are not working and who are blind because it works with the movement of head. It's a god's gift for them because independent in some field. Basically my achievement is their happiness. Novel hands-free control system follow by wireless&2D wheelchair and it works on real time basis.*

Keywords: wheelchair, accelerometer, microcontroller, physically disabled, Servomotor, novel algorithm, mechanical actuator, RF receiver

1. Introduction

Most of us do not know about this but there is a type of disability in person who are not able to use any of their limbs. This kind of disability is called quadriplegia and the person with this disability is called quadriplegics. There are several reason for this kind of disability and decreased motion i.e. stroke, high blood pressure, degenerative disease of bones and joints and cases of paralysis and birth defect. Sometimes it is also due to accidents and age. The persons with disability are not able to perform their daily activities. According to the level of disability a person can get his ability of movement by using medical equipments. Many types of wheelchairs are in market currently most of them work with joystick driven. But they are not up to the mark for elderly people. Some hands free are also introduced with work by the movement of head, eye tracking, eye blinding etc. But they also affected by the noise and light around the person. By the noise and light around the person. By the use of eye tracking and blinking the eye sight also affect. Two medical devices with electronic system are introduced to improve the ability of the person inside and outside conditions.

1.1 Robotic wheelchair overview

Robotic wheelchair is divided into two categories these are Automatic and semiautomatic. In automatic the wheelchair work for command and gets its position itself by checking initial and final position. It will work till the command performed. In semiautomatic the person can interrupt while wheelchair is working. The person can move the wheelchair to the required route. Software used are also of three types. Local for the detection of indoor obstacles and global for the outdoor obstacles, control of movement and way planning. Some wheelchairs work with the joystick movement and some with the blowing tube. These kind of

wheelchairs have capability to move through small space due to presence off detection sensor and control panel.

1.2 Motion recognition

The process of acknowledge the motion of user by receiver is called the motion recognition. The movements are expressed by human body like hand, face, head, legs. The best and most effective way to understand electronic device is motion recognition but have some technical issues. It contains commonly used cameras and have video processing hardware, sensors with small dimension motion recognition is made up by using computer vision technology.

1.3 Wheelchairs project

The aim to make this wheelchair is to provide a robotic wheelchair which can provide the right direction information to the user indoor and outdoor so that user can use it efficiently. It is like a complete package of artificial intelligence. There are some basic needs of this type of robotic wheelchair. It should be safe for user to interact and has to navigate safety. In this kind of wheelchairs there is navigational system but it does not contain maps so that the user is not bound for a particular space. Wheelchairs system work with two type of system i.e. low level navigation control system and high level navigation system.

Wheelchair is explained as safe transport due to the navigation system and support to the body. In Exoskeletons there is no body support that's why they are more complex to use. Wheelchair is generally used medical device as compare to exoskeletons. In this paper, a microcontroller system is used which enables the electric wheelchair control by the head motion is developed. A prototype of the system will be implemented and experimentally tested.

These prototypes consist of digital system (an accelerometer and a microcontroller) and a mechanical actuator. In which a microcontroller is used to control wheelchair by head motion is developed. The accelerometer is used to gather head motion data. To process the sensor data, a novel algorithm is implemented using a microcontroller. The output of the digital system is connected with the mechanical actuator, which is used to position the wheelchair joystick in accordance with the user's command. Sensor data is processed by a novel algorithm, implemented within the microcontroller.

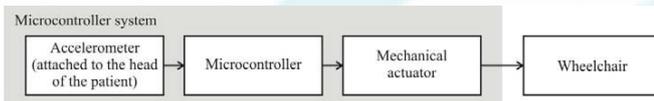


Figure 1: Microcontroller system block diagram

2. Body

Generally used electric wheelchairs are based upon the movement of joystick .Which is moved by user according to his requirement .But this kind of wheelchairs are not useful for the person who are old and have problem in their limbs. In this research paper we studied the novel hands free control system .The working of wheelchair is depend upon the visual recognition of head gesture. The normally used algorithm adaboast face detection and camshaft object tracking combined to get accuracy in face detection and gesture recognition.

This research paper explains the model and implementation of a noval hand free control system for intelligent wheelchairs. This system enhances mobility for people who are severe handicap. In this system HGI is at the center position so that it could find out the useful head gesture. To make physical handicapped people to be more independent .We are making smart wheelchair component system.

3. Problem

In electric powered wheelchair, wheelchairs moves with the help of electric power and the movement of wheelchair depend upon the command given by user movement on mechanism. Generally used wheelchairs work with the joystick used by the user but they are not able to fulfill the needs of elderly and disable persons whose limbs are not working. In this research we have introduce the naval hands free control system. This research explains the indoor navigation system and the customizable user interface. A robotic wheelchair is basically a semi-autonomous system. Robotic wheelchair is a complete solution to artificial intelligence problem .Benefits of this robotic wheelchair is it can navigate indoor and outdoor. The software are used they supposed to be programmed well in order to do multi types of operations for example analyze and display the useful signals .Different kind of programs are required for different operations. The output signal should match the data logger and have to be compatible. If the disturbance signals are high then they could affect the output signal so they have to be reduced.

Because the signal is suppose to be exact to produce a correct signal.

4. Method and Result

This research project is depends upon the wireless technology with 2D motion. We are using two circuits in the project. They are as follows: One is transmitter circuit and other is receiver. We use 3 axis accelerometer base circuits in the transmitted circuit and a small wheel chair with RF at the receiver end.

4.1 Transmitter

The value we got in 3 axis accelerometer is depends upon the movement of hand and measuring it convert it in to digital with the help of ADC IC. Afterwards ADC converts the data from sensor and proceeds to the microcontroller for next conversion. Microcontroller gets the hex data from the accelerometer and converted in to ASCII code for LCD display. If we move our hand then the value changes automatically and changed value visible on LCD.

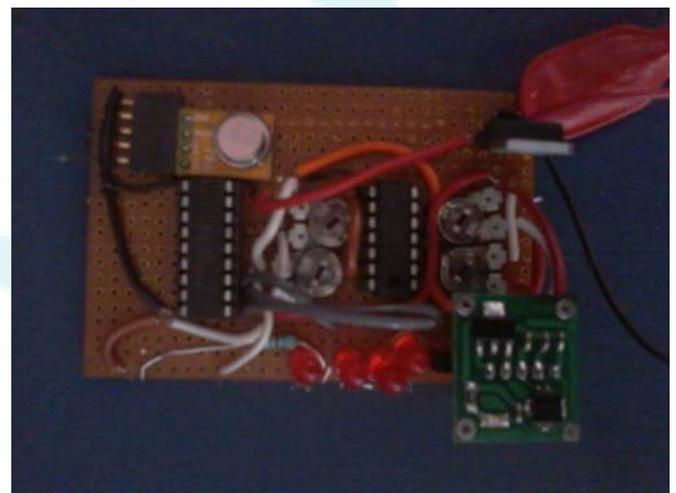


Figure 2: Transmitter Circuit

4.2 Receiver

Receiver circuit contains a RF receiver motor driving circuit and decoder circuit. Receiver got RF frequency transmitted from transmitter and provides this signal to HT12D decoder circuit. The output from the decoder circuit provide commands to motor driver circuit .To drive the motor wheels of the wheelchair H- bridge is used. Direction of the chair totally depends upon the signal received. The wheelchair can be moved forward backward, left and right by changing the position of head.



Figure 3: Receiver Circuit

5. Conclusion and Future Scope

This paper introduces a automated wheel chair for physically handicapped persons for their independent movement. It will able to navigate in indoor and outdoor environment. It is a reactive system and does not require mapping or planning. Interaction between user and wheelchair is investigated. We will implemented 2 dimension head movement for good control. This shows a novel hands-free control system for intelligent wheelchair based on visual recognition of head gestures. So, this is an extremely useful system for user having restricted limb movements caused by some diseases such as Parkinson's diseases and quadriplegics. We can use this wheelchair for the person whose only one sense is working that is their mind and their body does not respond to any machine which may be due to any reason i.e. by birth or accidental case this wheelchair is good gift for them.

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