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## Wheel Chair Movement Control Using Human Input: Comparative Study Approach.

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### ABSTRACT

Under current well developed engineering and technology it is still a challenging task for mechanical and biomedical engineers to develop a 100% compatible wheelchair for disabled persons. In this paper we aimed to obtain similarity between different methods for wheel chair movement control for physically challenging person. In our comparative study effective utilization of human parts like Eye, Tongue, and Head for disabled person wheel chair control has been discussed. The discussion was based on the control method and key parameters involved and directions of control. The compatibility of different disorder patients are considered as a key factor for the comparative study. Need for particular type of wheelchair control was based on the patient's physical and mental condition.

**Keywords:** Wheelchair, Disabled persons, Direction control, Human parameters.

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## INTRODUCTION

Before going for selection of wheel chair patient's past and present problem history which provides information about what patient may need in the future. Patient age weight, height, obesity are also few key factors to be considered for designing wheelchair. The life span of the disability is a key factor for the awareness or education of individual towards potential mobility and function in a wheelchair. Present physical and medical condition is permanent, progressive or temporary will impact directly on the quality and durability of the wheelchair. Generally wheelchair for disabled person was based on type of seat belt and operator. Number of control motors required to achieve different movements grasp and pull.

More common wheelchair problems is too small, difficult to push, tips over, uncomfortable, sitting slumped, does not fold. There are four condition of motions are considered, moving forward, moving in reverse direction, moving to the left and moving to the right. For the speed, the user may use slow or fast speed command. The system starts by applying the supply voltage to the speech recognition circuit. For fast condition the system will supply higher current to the motors. If the user does not want the wheelchair move in high speed, the slow speed command can be set by applying low current supply to the motors [6, 7].

## COMPARATIVE STUDY

Most of the methods for controlling wheelchair was based on driving the motor to achieve four directions as forward movement, backward movement and right direction and left direction as shown in figure 1. The output from the desired parameter was amplified to drive the particular motor to achieve movement. The primary elements tongue or eye etc., are the sensing element which converts mechanical movement in to electrical signal to drive motors. Under tongue control wheel chair two resistive type accelerometers have been placed on both sides of the cheeks of the disabled person. Three different axes were generated with the help of accelerometer and movement of tongue inside the mouth was detected using sensors. Accelerometer output value is converted in to digital using ADC; data from the controller wheel chair control can be implemented with the help of H-Bridge motor driving circuit [2].

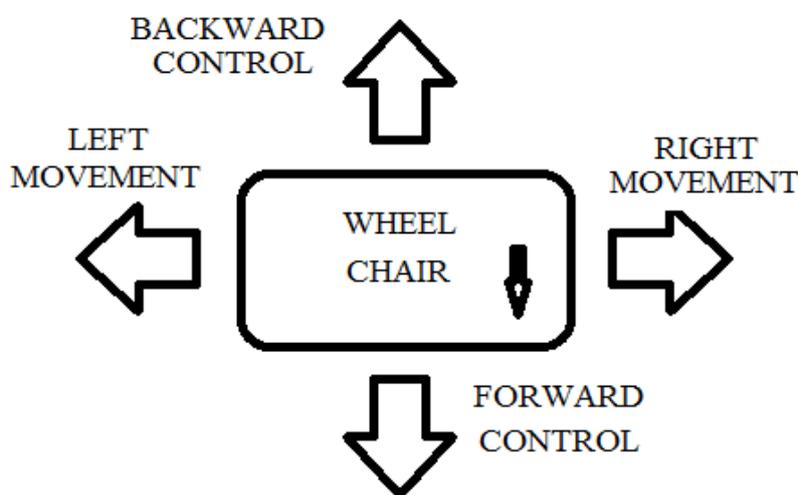


Figure 1: General wheel chair movement direction control block diagram

Head motion recognition is based on the force measurements yielded by an accelerometer attached to the head. As mentioned, there are only four members of the motion set, which represent head leaned in four possible directions. This means that the algorithm needs to estimate when the head is leaned in one of the four directions. In other words, it is sufficient to read only the accelerometer data of two axes: in this case, x and y [1]. The input and its corresponding images are produced after using Daughman's algorithm on input image for processing in MATLAB. The position of iris and pupil detected will be highlighted with the help of a circle. And the position of the image was detected and the decision for the given input image will be produced [3]. Different methods, control parameter and its direction are as indicated in table 1.

**Table 1: Comparative indication of different methods**

S. No.	Method	Control Parameter	Directions
1.	General type	Joy Stick	Left, Right, Forward and Reverse directions
2.	Tongue movement	3 Axis tongue movement inside the mouth	Left, Right and Forward
3.	Eye	Pupil position detection using camera image processing	Left, Right, Forward and Reverse directions
4.	Head	Position of head using accelerometer	Forward Position control and Reverse position control

### CONCLUSION

A different method for control of disabled person wheel chair control mechanism has been studied. In our comparative study effective utilization of human parts like Eye, Tongue, and Head for disabled person wheel chair control has been discussed. The selection of particular parameter was based on present physical and medical condition is permanent, progressive or temporary will impact directly on the quality and durability of the wheelchair.

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