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Automatic stabilized wheelchair seat with angle adjustment

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Objectives

Elderly or disabled people using wheelchairs use lifts and ramps for vertical movement in spaces that differ in height, such as building entrances in their daily lives. The usability assessment studies related to the ramp design were evaluated for the mild wheelchair users who can propell the wheelchair by themselves, and these inclines are not consider the 'wheelchair occupants' who have more severe disabilities and need help when they move or the 'wheelchair assistants' who move the wheelchair on their behalf. Recent studies have suggested that the anterior head posture is known to exert biomechanical stress on the neck and may be associated with the changes in postural control. In this study, a manual wheelchair was equipped with a tilted angle correction sheet (Fig. 1) and we compared the changes when the subjects were seated on a ramp with manual wheelchair occupancy.

Methods

The tilted angle correction sheet was made with a frame consisted of a backboard cushion, seat cushion, micro controller, tilt sensor, linear motor, and a DC battery. The tilted angle correction sheet is operated by the microcontroller to process the information received from the tilt sensor upon entering the ramp, and to command the linear motor so that the seat remains perpendicular to gravity. The ramp used for the experiment was a 10-meter long slope course with an inclination of 5 degrees, 10 degrees, 15 degrees, and the same target were riding on each wheelchair. Also, the left pressure distribution was measured in real time. It also measured the neck movements when driving by attaching position sensors to the head and back. (Fig. 2)

Results

The change of the pressure distribution of the passenger on the wheelchair during the ramp driving increased with the angle of the ramp, but the change of the pressure distribution of the passenger on the wheelchair equipped with the inclination angle correction sheet (Fig. 3) was not different by the change of the angle of the ramp. In addition, the change in the head position of the person on a manual wheelchair was increased with the increase in the tilted angle of the head position, while that of the person on a wheelchair with the tilt angle correction sheet did not change the head position much.

Conclusions

The tilted angle correction seat is effective in minimizing changes in posture when a passenger rides on a ramp, thereby preventing falls in the wheelchair and improving stability. However, the driving assistant is needed because the position of the wheel blades in a wheelchair equipped with these seats varies from time to time for the target to proceed on his own. In the future, it is expected that the target person will be able to push the wheelchair by himself if there is a change in the driving part in accordance with the change in the seat.

Keywords

Postural stability, Angle Modification Wheel Chair, Slope propulsion

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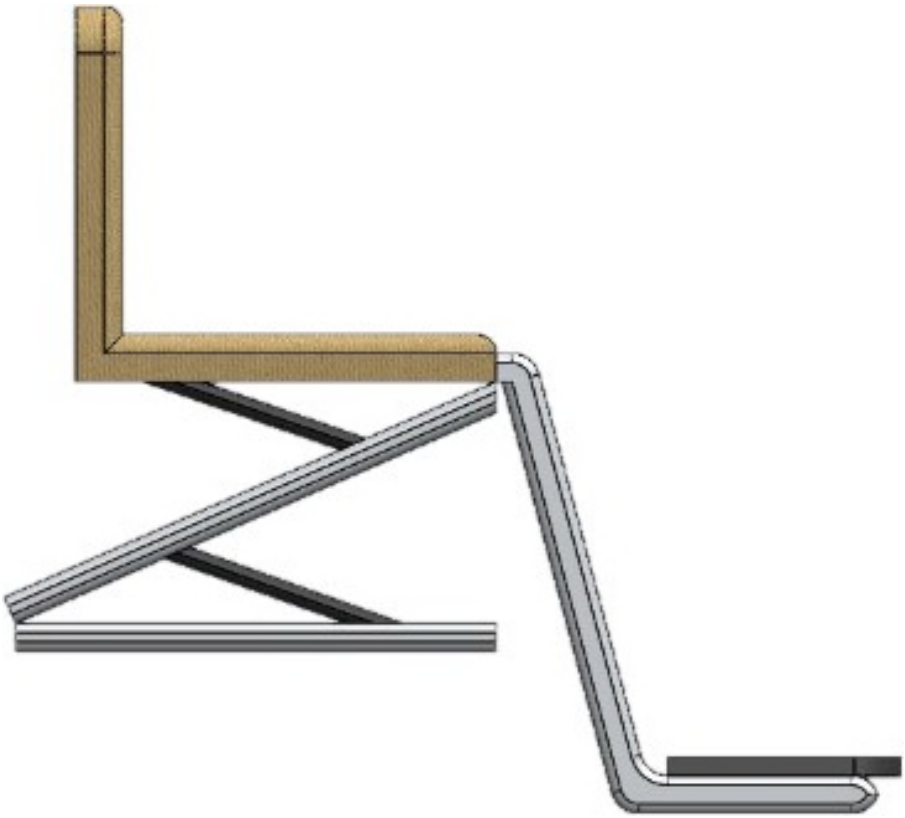

Fig.1 Tilted angle correction sheet

Fig.2 Theory of operation of the tilted angle correction sheet

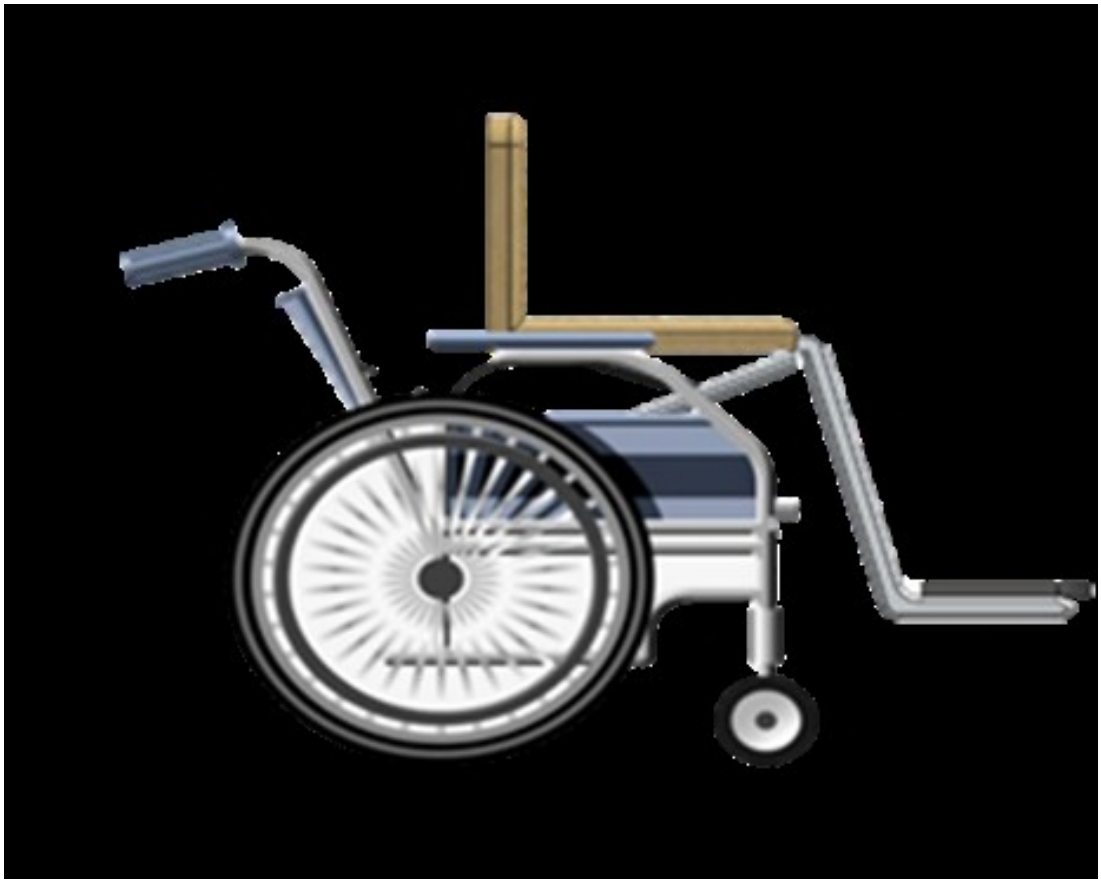

Fig.3 The Attempt to fit the tilted angle calibration sheet to a manual wheelchair