Robotic Mobility Walker

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Abstract

The focus of the design is creating a high functionality, low weight, and low maintenance walker that would increase the freedom of movement of the user. In this case, the main goal of the Robotic Mobility Walker's design is to help improve the quality of life of a high school student with Dystonic Cerebral Palsy (DCP). Various aspects of the walker were tailored to help meet their needs. Namely, a design that would be compact enough to move through small doorways and aisles between desks, help assist in sitting and standing, and help avoid any unseen obstacles.

Introduction

Dystonic Cerebral Palsy, or DCP, is a movement disorder in which involuntary muscle contractions cause the twisting and stiffening of various muscle groups. As a result, many of those afflicted with DCP develop a very inefficient gait or walk cycle that makes moving even a small distance an incredible challenge.

Fig.1. Concept art (By Erin Crawford)

Methods and Materials

Mechanical Design: The mechanical design was created using SOLIDWORKS. The primary linkage consists of a single scissor which allows height adjustability.

Fig. 2. Example of single scissor linkage

Electrical Design: All programming for the walker runs on an Arduino Mega 2560 and was programmed using the Arduino IDE. The walker is powered using off the shelf DeWalt Max 20V batteries. Various sensors are used to provide functionality including tilt detection, stair/ ledge detection, and battery monitoring.

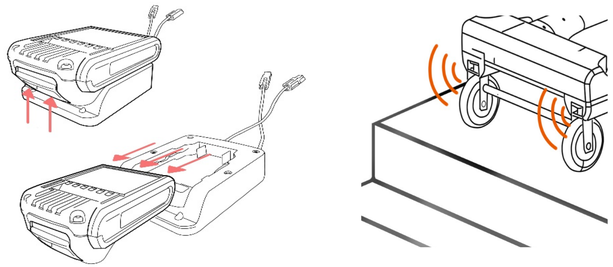

Fig. 3. (Left) Battery insertion/removal (Right) Ledge detection (concepts by Erin Crawford)

Discussion/Results

The Robotic Mobility Walker allows the user greater stability than what crutches or traditional walkers provide. The walker also allows the user to exercise their legs to prevent muscle wasting and improve their walk cycle. This increase in mobility leads to a great increase in the quality of life of the user.

Conclusions

The Robotic Mobility Walker increases the freedom of movement for those affected by DCP using creative and efficient design. The compact mechanical design allows the walker to be easily transported while the electrical design aids the user with information about their surroundings and assists movement over most terrain.

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