CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
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Project Number
S0309

Project Title
An Improved Wheelchair for Playing Wheelchair Tennis

Abstract

Objectives/Goals

The purpose of my project is to see if wheelchairs for playing wheelchair tennis can be further improved upon. I intend to design and test a model system that utilizes a hands-free electronic interface that can lock and unlock an axle, thus enabling at times one-handed drive or two-handed drive to occur.
If successful, I hope on a larger context that my results will cause two things to occur:
- stimulate further discussion and engineering research on additional innovations for wheelchairs used in wheelchair tennis and other sports played by disabled athletes, and
- explore further safety and performance mechanisms that can be engineered into manual wheelchairs utilized by the broader population of disabled people.

Methods/Materials

Metal Pipes, Beams, and Disks, Arduino Uno Microcontroller, Servomotor, Electronic Components, Voice Recognition Module, Universal Joints, Couplers
I broke down the creation of my model wheelchair test system into four different phases:
1) Integration of an Arduino microcontroller to a small electronic components 2) Integration of voice recognition in the Arduino interface to operate the axle coupling mechanism 3) Construction of a scale model test wheelchair 4) Integration of the electronic interface and mechanical framework

Results

After constructing 3 prototype wheelchair models, I successfully created a model wheelchair, which I performed tests on. Following a flowchart I created, I tested my project in 4 different experiments that were designed to represent all possible situations that could be encountered. My wheelchair returned expected results for each test.

Conclusions/Discussion

- I was able to design, build, and test a user controlled, hands-free, one-handed drive system in a model wheelchair so my hypothesis is correct.
- I believe that the innovations I have developed can be applied to conventional wheelchairs for disabled people.
- For future experiments, I would like to build a real tennis wheelchair and test it by playing competitive wheelchair tennis. I would also like to optimize the one-handed driving system by including braking and motorization.
- A one-handed drive system that can be selectively engaged and disengaged should be seriously considered as an improvement for future wheelchairs.

Summary Statement

My project sought to test the feasibility of designing and building an improved wheelchair for playing wheelchair tennis.

Help Received

Machinist cut out parts I designed for my wheelchair.