



CALIFORNIA STATE SCIENCE FAIR 2014 PROJECT SUMMARY

Name(s) Ryan S. Wong	Project Number 34588
Project Title Active Tremor Stabilization for Parkinson's Disease and Essential Tremor	
Objectives/Goals Hand tremor affects more than 1 million Americans in the form of Parkinson's Disease and Essential Tremor. These diseases increase the difficulty in performing fine motor movements, causing some patients to be completely reliant on others throughout the day. The purpose of this project was to develop a wearable tremor-reducing glove that could eventually help these people become more independent. Though the glove was not tested on humans, the project is a theoretical approach, and in the future could be designed for human experimentation. Abstract Methods/Materials The project consisted of three main components: an Arduino microcontroller, an accelerometer, and a rotating DC motor. The accelerometer was attached to the finger of the glove and was used to measure the excursion of the tremor. The data is sent to the microcontroller and a Fast Fourier Transform (FFT) algorithm is used to determine the frequency of oscillation. An algorithm then drives the motor to this same frequency and changes the phase of the motor in 10 degree increments until the motor is rotating at 180 degree out of phase with the tremor, which brings the amplitude of tremor to a minimum. Results This device was tested on a prosthetic arm to determine its accuracy. A second vibration motor was attached to the end of the arm in order to generate an oscillation similar to a hand tremor. In each of 10 trials, the hand tremor was initiated and the amplitude of oscillation was recorded in decibels. The tremor-reducing glove was then applied to the oscillating hand and 15 consecutive amplitude measurements were recorded. It was determined after these 10 experimental trials that the amplitude of oscillation in the hand was reduced by an average of approximately 50% due to the tremor-reducing glove. Conclusions/Discussion The phase changing algorithm was proven successful in reducing the hand tremor by a considerable amount. The use of this glove would help people stabilize their involuntary oscillation movements such that their amplitude of tremor effectively becomes much smaller. While the tremor in this situation could not be physically reduced to zero, a reduction of 50% would nonetheless help patients with Essential Tremor or Parkinson's Disease come closer to completing their daily tasks independently.	
Summary Statement This project attempts to reduce tremors similar to those experienced by people with Essential Tremor or Parkinson's disease by using a glove consisting of an accelerometer, a rotating DC motor, and a microcontroller.	
Help Received Father helped troubleshoot some challenges in the project.	