CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Jordan S. Feldman

Project Number

J0910

Project Title

Controlling a Robot with Electromyography

Abstract

Objectives/Goals

The goal of this project was to create a robot that could be controlled by EMG signals. This approach could lead to improved prosthetics as well as to advancements in remote surgery.

Methods/Materials

Electrodes were placed on the subject's left arm. The subject was asked to perform various movements, such as clenching their left fist or extending and flexing their left wrist, interspersed with periods in which the subject performed no movement. Via a DSP board, the electrodes then relayed the EMG signals to a computer. The board filtered the signals to remove noise. Then, the digitized signals were used to design a classifier to distinguish between the various movements. Once the classifier was designed, the subject was retested. However, this time, the computer used the classifier to identify the subject's movements and sent the results to a robot that moved accordingly.

Results

The classification algorithm was able to correctly identify the subject#s movements. Based on the algorithm#s classifications, corresponding commands were successfully transmitted via Bluetooth to the robot, which responded accordingly.

Conclusions/Discussion

The project was successful. It showed that it is possible to identify a movement based on the EMG signals that occur when it is performed. It also suggests further lines of questioning: how do EMG signals differ between different individuals, and what movements have sufficiently distinct EMG signals that they could be used for controlling a robot.

Summary Statement

EMG signals were processed in real-time and used to remotely control a robot.

Help Received

I would like to thank my dad for giving me helpful critiques on my writing and for helping me write the computer program. Also, I would like to thank Mr. Hartung for advising me on my choice of a project and for discussing with me how to write each section in my report.