An Exoskeletal Robot for Human Shoulder Joint Motion Assist

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Abstract

The idea of an exoskeleton has been around since the 1960’s. They are also known as power suits, man amplifiers, or power assist systems; however these robots were designed for industrial and military use. The exoskeleton studied in this report is used to assist the motion of physically weak persons such as the handicapped or the elderly. The report will focus on setting up an exoskeleton which gives the user 2 degrees of freedom, and the exoskeleton is automatically activated based on the users electromyogram (EMG) signals which reflect the muscle activity levels of the user.

This report will simulate a human shoulder joint by using a series of motors directly controlled through the user’s EMG signals. Since EMG levels are biologically generated, and their strength tends to vary from user to user, we will endeavor to have a neurocontroller which is able to adapt to the users EMG level. To achieve this, we will use matlab/simulink to simulate a human beings nervous response in hopes to trigger the motors to function in accordance to the user’s intended motion. The simulation is vital because it would be too costly to implement such a system without knowing if it will be feasible to make a generic exoskeleton rather than tailor making each exoskeleton to each user. It will also be easier to simulate various levels of EMGs rather than looking for subjects with varying levels of EMGs.

For this report, we will focus on simulating an exoskeleton, specifically the interface between the user and the motors. We hope to be able to simulate interpreting EMG signals into commands that tell the motor how much or how little to move. The key to this report is being able to accurately analyze the EMG signal, and interpret it’s meaning.