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CYBORG ARM PROJECT PROPOSAL

Our Website: http://cyborgarm.kumodevdes.com/

Abstract

We plan to make an exoskeleton arm that will attach to the user's existing arm. It will be controlled by the user's movement through the use of an EMG (Electromyography) and either motors or pistons. It will have the effect of increasing the force output of the user. A design requirement is that is must be portable and it must be safe. Our final goal is to have multiple degrees of freedom in our arm.

We will begin by creating a working EMG and the mechanical system separately. These components will be combined to create a functioning system. The EMG reads the muscle movement which is passed through code and outputted to the motor. The motor then acts on what it is told.

Project Description and Statement of Work

We will begin by creating a working EMG and the mechanical system separately. These components will be combined to create a functioning system. The EMG reads the muscle movement which is passed through code and output to the motor. The motor then acts on what it is told. The major components are the EMG, the operation of the motor/pneumatics/gears and the system that interacts with the arm. The system must include safety features that help protect the user's arm and hopefully include comfort features to reduce any skin irritation from the cyborg arm. Our project is unique from other existing cyborg arms in that a cheaper/lower budget than what is usually available.

Team Member Responsibilities

Depending on what the responsibilities are for each member, the team can be split into sub-teams that work together on the two separate parts of the system: the EMG, and the Mechanical. We can have entire team meetings on Mondays/Thursdays to consolidate our progress among different sub teams and try to integrate what we have accomplished. This also works to insure people do not fall behind and that everyone is on same page about the project.

The EMG team is responsible for getting the EMG to accurately match the motion of the arm. They will be in charge of making code that runs the output of the EMG into the input for the mechanical system.

The mechanical systems team is responsible for creating the support structure and preparing the motor/pneumatics/gears to run on what the EMG/software puts out. The mechanical team is also responsible for documenting our project as well as

providing necessary information on the progress in the website.

Both teams are responsible for including safeties such as not having feedback loops for the EMG team and not extending the arm past the breaking point on either side of the arm's natural range of motion for the mechanical team. The EMG team would also build in a physical kill switch and a blinking light so to indicate when the system is active.

Schedule

		Name	Duration	Start	Finish
1		Project Proposal	4d	10/08/2012	10/11/2012
2		Build EMG Sensor	4d	10/11/2012	10/16/2012
3		Program live feed of EMG Sensor	6d	10/11/2012	10/18/2012
4		Record preliminary sensor data	1d	10/18/2012	10/18/2012
5		Piece-wise full system code/debugging	8d	10/17/2012	10/26/2012
6		Create full system schematics	10d	10/15/2012	10/26/2012
7		**⊟Design Mechanical System**	**8d**	**10/11/2012**	**10/22/2012**
8		Motors/pneumatics	3d	10/11/2012	10/15/2012
9		Drawings	4d	10/15/2012	10/18/2012
10		CAD	4d	10/17/2012	10/22/2012
11		Build Mechanical Prototype	7d	10/18/2012	10/26/2012
12		Design Review 1	1d	10/29/2012	10/29/2012
13		Second Mechanical System Iteration	8d	10/29/2012	11/07/2012
14		Fully operational 1 Degree of Freedom (DOF) completed	8d	10/29/2012	11/07/2012
15		Fully operational 2 DOF completed	7d	11/07/2012	11/15/2012
16		Design Review 2	1d	11/15/2012	11/15/2012
17		Experiment Design	4d	11/26/2012	11/29/2012
18		Final testing/debugging/writing-up	9d	11/26/2012	12/06/2012
19		Demo Day	1d	12/06/2012	12/06/2012

Budget

https://docs.google.com/spreadsheet/ccc?key=0Ar8qsJh4iGdpdGZTV2tEcmdHWHlsbUtqYWhvLWpidnc#gid=0

End-of-Life Plan

This would be useful for display. It could include an addition that would also make a good exhibit or something the audience could interact with. The system needs to be calibrated differently for each person; if we could automate this, the exoskeleton arm would make a better display. Our first option would be to display our arm at Olin in the first floor south entrance display of the Academic Center. If the caliber of our project exceeds expectations and turns out to be an attractive exhibit, we may decide to opt for display at the Boston Convention Center using the information below:

Boston Convention Center
415 Summer Street
Boston, Massachusetts 02210
Tel: 617.954.2000
Fax: 617.954.2299

Sources

http://www.cornellcollege.edu/physics/files/mark-novak.pdf
http://www.instructables.com/id/Muscle-EMG-Sensor-for-a-Microcontroller/
https://decibel.ni.com/content/docs/DOC-15971