Project Name: Exo Suit

Project Member:

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Project Details:

EmgExtract gets the raw EMG Signal data as a form of serial data from the user where the supporting actors are UserArm and DataController. The data is then sampled, process and analyzed by EmgProcess and EMGAnalyse. This data can also be store in a database for learning and further processing purpose as EmgStoreCompareandLearn. The process signal helps to drive the motor and hydraulic system for unloading supplies or enabling user to carry heavy objects by mapping the average power of raw EMG data with the processed Data.

Pitching

Exoskeleton is a wearable mobile machine that is powered by a system of electric motors, hydraulics and combination of computing technologies that allow for limb movement with increased strength and endurance. The core component is an EMG signal wave from the user arm. EMG stands for electromyography that is a technique for evaluating and recording the electrical activity produced by skeletal muscles. Here the user is an Actor and the controller that performs analysis and processing is the supporting actor. The analysis is performed in two stages. One is qualitative analysis (visual interpretation of signal) another is quantitative analysis (analysis amplitude, duration frequency and power spectrum analysis, mean power, median power)

(Exoskeleton is a wearable mobile machine that is powered by a system of electric motors, hydraulics and combination of computing technologies that allow for limb movement with increased strength and endurance.) Imagine a construction site, where lots of people are working as they rely on physical strength and also as people grow older there joints gets weaker and they would have hard time performing daily taskes.

Object interaction

Step1: Identify UserArm Actor using Bio Metric Sensor (Finger print)

Step2: Make sure electrodes are placed on correct positions

Step3: Measure the flex, muscle contraction and force of the actor and convert to voltage level

Step4: Convert the analog signal to digital using ADC making sure that Fs>F

Step6: As soon as serial data arrives, DataController actor samples the data

Step7: EmgAnalyze object analyses the data (FFT, Wavelet transformation, Power and Energy Spectrum to determine which muscle group is activated and how much power should be amplified.

Step8: EmgStoreCompareandStore object compares the EmgAnalyze data if the pattern matches to the stored data.

StepA: If not in Database:

EMGProcess object learns the pattern and store it in the database based on the rising curve values and its voltage level

StepB: else:

EmgProcess object convert the EMGAnalyse object data to required hydraulic motor movement data to replicate the muscles movement of the UserArm actor

Step9: Send a reply back signal that the operation has been performed.

Pitching 2.0

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Particularly, for this projects there are two actors involved: UserArm and DataController. The UserArm acts as input for the system wherease the DataController bridges the data between arm and the system. The DataController sends the data to EmgAnaysis object that performs various analysis to indicate which particular muscle group is activated and find out the power factor needed to be amplified. EmgStoreCompare object compares the EmgAnalyzed data to the stored signal, weather if the pattern matches to the stored data or not. If not in DB then the EmgProcess Object learns pattern of the signal and updates the database as well as also convert the processed data object to the datatype required for motor movements. Finally, the DataController actor parses that converted data for the required hydraulic movements.