Q&A Session for OpenSim Webinar: Human-machine Interfacing via Real-time Neuromechanical Modeling

Date: Thursday, July 18, 2019

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Q1: Is CEINMS compatible with compatible with OpenSim 4.0?

Yes. CEINMS is compatible with OpenSim 3.3 and above, including with OpenSim 4.0.

Q2: Is there any guideline for the calibration procedure?

Calibration best practice is detailed in CEINMS's user's guide: https://simtk.org/projects/ceinms

This is also detailed in our recent publications including:

G. Durandau, D. Farina, and M. Sartori, "Robust Real-Time Musculoskeletal Modeling Driven by Electromyograms," *IEEE Trans. Biomed. Eng.*, vol. 65, no. 3, pp. 556–564, May 2018.

Q3: In your real-time control, what is considered real-time latency? Loop times?

The objective is to run the full control loop (from EMG acquisition to device control) always < 30ms. This would assure to be within the muscle electromechanical delay. Please, also refer to this publication:

[1]   M. Sartori, D. G. Lloyd, and D. Farina, "Neural Data-driven Musculoskeletal Modeling for Personalized Neurorehabilitation Technologies," *IEEE Trans. Biomed. Eng.*, vol. PP, no. 99, 2016.

Q4: Regarding generating neuromechanical modelling for stroke patients, I wonder how do you deal with spasticity and low alfa motor neuron activation in these group of people?

At the moment we do not have special algorithms for dealing with spasticity. We simply record EMGs and translate them into torques for exoskeleton control. What we found is that exoskeleton assistance contributes to decrease EMG standard deviation in post-stroke and SCI patients, thereby making EMGs ore repeatable. This may be used to help re-training movements with less spastic activity. More at this publication:

https://link.springer.com/article/10.1186/s12984-019-0559-z

Q5: May I know how real-time this whole pipeline is?

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