Monitoring and controlling hand stimulation with finger stretch sensor

Summer student project for May-August 2018, supervised by Dr Milos Popovic and mentored by Dr. Bastien Moineau.

Target Student Population(s)

Undergraduate student in Biomechanical or Electrical Engineering, Computer Science, in years 2-4, providing that their training matches with the skills described below.

Brief Project Description

The objective of the project is to prepare the tools necessary to create an assistive device using functional electrical stimulation (artificial muscle contraction) in individuals with neurological paralysis such as stroke. Specifically, the student will be asked to design the experimental setting and software based on material developed in our lab and in collaboration with an industrial partner. The recording device will be stretch sensors instrumented on the hand and forearm to monitor finger flexion and extension. These measurements will be used to fine-tune the intensity of electrical stimulation on the forearm muscles to generate finger extension/flexion. As per student's progress, other functions might be added to this rehabilitation system.

Expected Learning Outcomes

Through this project, we expect you to learn the following -

1. Effectively reading scientific literature to identify the current state of the art.
2. Framing a research question
3. Collaborate with peers and supervisors to define the best material and methods
4. Understand and take over previous methods to improve and expend them for a different use.
5. Design and construction of a biomechanically sound device.
6. Writing scientific reports to report your developments and your findings.
7. Presenting your work to audiences from a diverse set of backgrounds.

Expected Research Outcomes

The expected achievements are to deliver a practical device to instrument fingers, a simple calibration procedure, and to generate successive and comfortable hand opening and closing with stimulations.

Required technical Skills

- Hands-on experience in building custom device and electronic system
- Extensive programming experience (LabView, MatLab, C++)
- Good knowledge of computer science, VISA function, serial communication
- Understanding of controller theory

Funding

Funding for this project may be obtained through competitive scholarship: NSERC USRA and IBBME Director's Awards. It is the student's responsibility to apply in a timely manner, with the approval and assistance of their supervisor.

Application Details

To apply for this project, you must first complete the IBBME USRP application (Note: only need to do this once). Once you've don't that, please email your updated CV and a statement of intent to Dr. Bastien Moineau (Bastien.Moineau@uhn.ca). Explain briefly why you are interested by the project and its outcomes, and why you would be a good fit for this project. Please also provide your latest transcript (can be unofficial) to help us assess your chances to obtain funding. The subject of your email should be "*Summer Student Application: FES finger instrumentation*".