

Camera tracking of the upper-limb for rehabilitation applications

Summer student project for May-August 2018, supervised by Dr Milos Popovic and mentored by Dr. Bastien Moineau, in collaboration with Dr César Marquez-Chin and Dr José Zariffa.

Target Student Population(s)

Undergraduate Engineering Science, Electrical and Computer Engineering, or Computer Science student in years 2-4; OR an undergraduate student with a strong programming background.

Brief Project Description

The objective of the project is to prepare the tools necessary to create a rehabilitation chess game using functional electrical stimulation (artificial muscle contraction) in individuals with neurological paralysis (stroke, spinal cord-injury). Specifically, the student will be asked to design the experimental setting and software based on the material already developed in our lab. The recording device will be a 3D camera which should recognize the XYZ position of participants' hand in a predefined environment (coordinates on the chess board). As per student's progress, other features of body position may be added to increase accuracy of the computer vision and to extend the functions that could be trained with such 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. Develop proficiency with computer vision methods in OpenCV.
5. Creating the hardware (environment, camera position) and software components (data flow, recognition algorithm) necessary.
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 achievement is to obtain a reliable recording on a frame-by-frame basis (post-processing) of hand position, state, and/or orientation, accurate as compared to gold standard assessment. Achieving a form of real-time processing would be an outstanding outcome as it would allow feed a closed-loop controller in a later stage of this project.

Required technical Skills

- Extensive programming experience (Python, MATLAB, C++, etc.)
- Experience with Computer vision theory an asset
- Experience with reading and critiquing scientific literature an asset

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: Chess Computer Vision"*.