Development of an Adaptive Control for Upper Limb Rehabilitation

M.Sc. Thesis

Contacts

Please, reach out to both of the following people if you are interested in joining us at the *Chair of Healthcare and Rehabilitation Robotics* (Department of Informatics):

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Project Abstract

In total, 1.5 million Europeans suffer a stroke each year, with a forecasted increase of 34% until 2035. While rehabilitation efforts focus mostly on lower limbs, the affected upper limbs of stroke patients are often neglected in the current rehabilitation standard of care. We aim to build a control method for the rehabilitation of stroke patients based on electromyography (EMG) recordings from the upper limbs, to be tested in an AR/VR setting and with a robotic arm.

Background and Motivation

Current attempts of movement intention classification based on EMG data of motor-impaired stroke patients has shown a relatively good accuracy. However, the hardware used to develop control software for stroke patients has been mostly limited to a few electrodes and studies have been conducted over limited range of movement.

Task Description

The purpose of the thesis is to develop an adaptive control method and test in an AR/VR environment and with a robotic arm. The task comprises: (i) Functional integration for the transmission of raw sensor data; (ii) Feature extraction and dimensionality reduction of sensor data; (iii) Detection and classification of movement intention; (iii) Development of AR/VR setting. You will closely collaborate with the other team members, as all of your works have many interdependencies.

Technical Requirements

Past execution of Python projects in production-level environments and needs to be familiar with the Arduino IDE. Experience with Machine Learning models and Unity3D is welcome. A knowledge of EMG signal processing is a plus

References

Meeker, C., *et al.* EMG Pattern Classification to Control a Hand Orthosis for Functional Grasp Assistance After Stroke. 2017 Int Conf Rehabilitation Robotics Icorr 1203–1210 (2017).