Technische Universität München
Neurowissenschaftliche Systemtheorie

Engineering Practical Project

Online Decoding of Surface EMG signals for Katana Robot Arm Control

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Problem description:

A fundamental component of many modern prostheses is the myoelectric control system, which uses the Electromyogram (EMG) signals from an individual's muscles to control the prosthesis movements [1]. Despite the extensive research focus on the myoelectric control of robot arms, few hand gestures have been successfully classified. In a previous work, we have developed an algorithm to decode 6 different hand gestures from the forearm muscles and 85% classification accuracy has been reached.

The aim of this project is to advance/improve **the existing EMG decoding algorithm** and test it online [2]. The student shall record surface EMG signals using our G. Tec system [3] and **test the existing algorithm** in a real-time scenario.

Tasks:

This engineering practical project requires the student to:

- Test our developed EMG-hand gestures decoding algorithm
- Provide an online demonstration (Real-time control of our Katana robot arm using the decoded EMG signals)

Optional Task:

- Combining EMG and IMU sensor to analyze the decoded movement (orientation and joint kinematics data)

Requirements:

- Good knowledge of python and/or Matlab
- Good background in machine learning

Bibliography:

[1] Pradeep Shenoy, Kai J. Miller, Beau Crawford, Rajesh Rao, Online Electromyographic Control of a Robotic Prosthesis", IEEE transactions on biomedical engineering, vol. 55, 2008
[2] Gailey Alycia, Artemiadis Panagiotis, Santello Marco, "Proof of Concept of an Online EMG-Based Decoding of Hand Postures and Individual Digit Forces for Prosthetic Hand Control", Frontiers in Neurology, 2017
[3] Guger Technologies (2017). Online: http://www.gtec.at/

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