Technische Universität München
Neurowissenschaftliche Systemtheorie

Practical Project / Forschungspraxis:

Real-time robot arm control using motor imaginary movements decoded from EEG signals

Problem description:

Brain machine interface (BMI) is used to control a system through which people with motor disabilities could achieve a better quality of life by improving their interaction ability with the surrounding environment. Using BMI, patients suffering from severe motor disabilities can also control robot arm to carry out their activity of daily living by just generating control commands using their own EEG signals.

The main objective of this project is to implement the algorithm described in [1,2] to discriminate and decode four motor imagery movements (left hand, right hand, both hand imaginary movement and rest) from EEG signals. Afterwards, the developed algorithm has to be used to control a robot arm in a real-time scenario.

Tasks:
This project requires the student to:

- Implement an existing algorithm to classify four motor imaginary movements from EEG recorded signals.
- Test and validate the developed algorithm in a real-time scenario when the user imagines one of the four actions, this imagination would be decoded with a BMI and the robotic arm executes the desired movement.

Optional task:
- Extend the work by using the implemented algorithm to classify reach and grasp imaginary movements

Bibliography:
[1] Jianjun Meng, Shuying Zhang, Angeliki Bekyo, Jaro Olsoe, Bryan Baxter, Bin He," Noninvasive Electroencephalogram Based Control of a Robotic Arm for Reach and Grasp Tasks", vol 6, Scientific Reports, 2016
[2] Yong X, Menon C. "EEG Classification of Different Imaginary Movements within the Same Limb". PLoS ONE, 2015

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