Adaptive CSP for user independence in MI-BCI paradigm for upper limb stroke rehabilitation - DTU Orbit (23/10/2019)

Adaptive CSP for user independence in MI-BCI paradigm for upper limb stroke rehabilitation

A 3-class motor imagery (MI) Brain-Computer Interface (BCI) system, that implements subject adaptation with short to non-existing calibration sessions is proposed. The proposed adaptive common spatial patterns (ACSP) algorithm was tested on two datasets (an open source data set (4-class MI), and an in-house data set (3-class MI)). Results show that when long calibration data is available, the ACSP performs only slightly better (4%) than the CSP, but for short calibration sessions, the ACSP significantly improved the performance (up to 4-fold). An investigation into class separability of the in-house data set was performed and was concluded that the “Pinch” movement was more easily discriminated than “Grasp” and “Elbow Flexion”. The proposed paradigm proved feasible and provided insights to help choose the motor tasks leading to best results in potential real-life applications. The ACSP enabled a successful semi user independent scenario and showed potential to be a tool towards an improved, personalized stroke rehabilitation protocol.

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