A Hybrid MI-SSVEP based Brain Computer Interface for Potential Upper Limb Neurorehabilitation: A Pilot Study

This pilot study implements a hybrid BCI system in an effort to deduce the effects of measuring more than one brain signal in a motor imagery (MI) task. In addition to sensorimotor rhythms (SMRs), a steady state visual evoked potential (SSVEP) was introduced to acquire additional information relating to user intention. A common spatial pattern (CSP) filter followed by a support vector machine (SVM) classifier were used to distinguish between MI and the resting state. The power spectral density (PSD) was used to classify the SSVEP. Results from online simulations of EEG data collected from 10 able-bodied participants showed that the hybrid BCI's performance achieved a classification accuracy of 77.3±8.2%, with an SSVEP classification accuracy of 94.4±3.5%, and MI classification accuracy of 80.9±8.1%, an improvement upon purely MI-based multi-class BCI paradigms.