Motor Imagery based Brain Computer Interface Paradigm for Upper Limb Stroke Rehabilitation

Motor Imagery (MI) based Brain Computer Interface (BCI) systems have shown potential to serve as a tool for neurorehabilitation for post stroke patients to complement the standard therapy. The aim of this study was to develop an MI based BCI system that could potentially be used in neurorehabilitation of hand motor function in stroke patients. Two co-adaptive, three-class MI based BCI systems for realtime processing were developed and compared using the publicly available data from the BCI Competition III Dataset V as well as our own data. The first algorithm utilizes the Filterbank Common Spatial Pattern (FBCSP) for feature extraction, and the other utilizes the Separable Common Spatio-Spectral Pattern (SCSSP) – both combined with a Multi-layer Perceptron (MLP) for classification. The proposed system proved successful when using the competition data showing an average accuracy of 64.71 % for the SCSSP compared to 60.48% for the FBCSP. This proved superior to a related study using the same feature extraction methods, but with other classification methods. The proposed system, however did show results around chance level for the 3-class MI experimental data that we have collected in our laboratory. Further studies needs to be conducted to improve the performance as well as to realize such a system to put in use.

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