Abstract

With recent advances in Electroencephalogram (EEG) signal processing and biomedical instrumentation, brain machine interfaces are used for rehabilitation of people suffering from neuromuscular disorders. This paper presents a novel method employing Hierarchical classifier using optimised Neural Networks to classify left-hand movement, right-hand movement and word generation using EEG signals. One of the most important components of brain computer interface (BCI) is feature extraction of EEG signals. Power spectral density (PSD) is used for feature extraction from EEG signals. The proposed pre-processing and reconfiguration of PSD samples make them more discriminative & yield appropriately organized feature vectors. The adaptation of network weights using Comprehensive Learning Particle Swarm Optimization (CLPSO) is proposed to improve the performance of Neural Network (NN). Further, the two level hierarchical neural network is used to enhance the discriminative property of the features and hence better classification accuracy is achieved. Results are verified on BCI benchmarking database as well as our own experimental database. Results obtained using the proposed methods are compared with other contemporary methods such as Linear Discrimination
analysis (LDA), neural networks based on improved particle swarm optimization (IPSONN) and to a recently proposed approach based on Evidence-based combining classifier. It is found that the proposed method outperforms all the contemporary techniques for the multi-task EEG classification. This new method can be easily extended to other multitask BCI applications.

References


Index Terms

Computer Science Signal Processing

Keywords

Hierarchical Classifier, Successive input resampling, CLPSO