Abstract

With the advancements in modern signal processing techniques, the field of Brain Computer Interface (BCI) is progressing fast towards noninvasiveness. A noninvasive Electroencephalogram (EEG) based BCI is developed for classification of Motor Imagery (MI) as the first step. Feature extraction and classification of EEG signals are the core issues of EEG-based BCI. Classification is largely dependent on feature extraction and the type of classifier. In the project, the objective is to select feature set based on EEG signals. Support Vector Machine (SVM) is chosen as the classifier to be used.

As part of this project, detailed studies have been carried out on the different feature set selection approaches and the training of SVM. Feature selection is the task of choosing a small subset of features that is sufficient to predict the target labels well. It is an important step in efficient learning of large multi-featured data sets. The feature selection research field clearly enters into research on the fundamental issue of data representation. The feature extraction can be done using two approaches: the Filter approach and the Wrapper approach. There are two basic steps to using the SVM classifier: training and classification. Training is an iterative process whereby we build the best classifier possible, and classification is a one-time process designed to run on unknown content. An architecture is proposed which exploits the features of EEG for MI classification. EEG from a publicly available dataset – BCI Competition II has been used for the experiments. The dataset contains MI related to Left and Right hand movements from two bipoar channels viz., C3and C4.

EEG waveforms are generally classified according to their frequency, amplitude, and shape, as well as the sites on the scalp at which they are recorded. These frequencies are categorized into various bands. To further improve the accuracy of classification, bandpass filtering of EEG signals can be carried out to extract rhythms such as α (8-12Hz), β (12-36Hz), etc. For further classification we consider the features extracted from various rhythms of EEG data.

The discrimination of individual finger using noninvasive EEG is promising to improve number of features for control, which can facilitate the development of noninvasive BCI applications with rich complexity.