

Mental tasks classifications using S-transform for BCI applications

Abstract

The classification of different types of mental tasks is an active area of research that seems to be ever expanding. This field is gaining interest from researchers all over the world. This study is intended to utilize the Stockwell transform (ST) to investigate the classification accuracy of five different types of mental tasks. A well known electroencephalogram (EEG) database (Keirn and Aunon database) has been used in this study. Two subjects from the database were considered for the study. k-means nearest neighborhood (k-NN) and Linear Discriminant Analysis (LDA) based classifiers were used to perform a pair-wise classification of the 10 combinations of mental tasks. Two different discriminant functions such as linear and quadratic were used in LDA classifier and their effects on the classification performance are presented. The effect of different k values (1 to 10) was also studied in kNN algorithm. Conventional and k-fold cross validation methods were used to investigate the reliability of the classification results of the classifiers. The experimental results show that the proposed method gives promising pair-wise classification accuracy from 78.80% to 100%.

Keywords — Electroencephalogram, K-means nearest neighborhood, linear discriminant analysis, mental task, stockwell transform