

Wireless EEG signals based neuromarketing system using Fast Fourier Transform (FFT)

Abstract

This work aims to identify the most preferred brand on automotive in Malaysia through wireless EEG signals. A group of four major vehicle brand advertisements such as Toyota, Audi, Proton and Suzuki is considered on this work. An advertisement (video) of above said brands were used to simulate the subjects (9 male and 3 female with age range of 22–24 years) and the brain signal responses for the stimuli were collected using 14 channel wireless Emotiv headset with a sampling frequency of 128 Hz. The acquired signals are preprocessed using 4th order Butterworth band pass filter with a cut off frequency of 0.5 Hz–60 Hz and smoothed using Surface Laplacian filter. The alpha frequency band (8 Hz–13 Hz) of EEG signal information has been extracted using the Butterworth 4th order filter. The frequency spectrum of Alpha band is obtained through Fast Fourier Transform (FFT) to extract three statistical features such as power spectral density (PSD), spectral energy (SE) and spectral centroid (SC) from the EEG signals. Extracted features on all the subjects over four different advertisement stimuli are used to develop the feature vector. This feature vector is further given to a two non-linear classifiers namely K Nearest Neighbor (KNN) and Probabilistic Neural Network (PNN) for classifying the subject intention on advertisements. This present experimental results indicate that, the subjects are mostly inspired on Toyota brand vehicles compared to other brands. The maximum mean classification rate of 96.62% is achieved using PSD feature and PNN classifier.

Keywords — EEG, Fast Fourier Transform, K Nearest Neighbor (KNN), neuromarketing, Probabilistic Neural Network (PNN)