Empirical Analysis of Intra vs. Inter-Subject Variability in VR EEG-Based Emotion Modelling

ABSTRACT

This study presents the classification of emotions on EEG signals using commercial BCI headsets known as wearable EEG. One of the key issues in this research is the lack of mental classification using VR as the medium to stimulate emotion. Moreover, we endeavor to present the first comprehensive and systematic analysis of intra-versus inter-subject variability in EEG-based emotion classification using VR and wearable EEG. The approach towards this research is by using K-Nearest Neighbor (KNN) and Support Vector Machine (SVM) as the machine learning classifiers. Firstly, each of the participants will be required to wear the EEG headset to record their brain waves when they are immersed inside the VR environment. The data points are then marked if they showed any physical signs of emotion or by observing the brain wave pattern. Secondly, the data will then be tested and trained with KNN and SVM algorithms. We conduct subject-dependent as well as subject-independent classifications in order to compare intra-against inter-subject variability, respectively in VR EEG-based emotion modeling. The highest subject-dependent classification accuracy achieved was 97.9% while the highest subject-independent classification accuracy obtained was 91.4% throughout the brain wave spectrum (α, β, γ, δ, θ). These methods showed highly promising results and will be further enhanced using other machine learning approaches such as deep learning in VR stimulus.