A dataset for emotion recognition using virtual reality and EEG (DER-VREEG): Emotional state classification using low-cost wearable VR-EEG headsets

ABSTRACT

Emotions are viewed as an important aspect of human interactions and conversations, and allow effective and logical decision making. Emotion recognition uses low-cost wearable electroencephalography (EEG) headsets to collect brainwave signals and interpret these signals to provide information on the mental state of a person, with the implementation of a virtual reality environment in different applications; the gap between human and computer interaction, as well as the understanding process, would shorten, providing an immediate response to an individual's mental health. This study aims to use a virtual reality (VR) headset to induce four classes of emotions (happy, scared, calm, and bored), to collect brainwave samples using a low-cost wearable EEG headset, and to run popular classifiers to compare the most feasible ones that can be used for this particular setup. Firstly, we attempt to build an immersive VR database that is accessible to the public and that can potentially assist with emotion recognition studies using virtual reality stimuli. Secondly, we use a low-cost wearable EEG headset that is both compact and small, and can be attached to the scalp without any hindrance, allowing freedom of movement for participants to view their surroundings inside the immersive VR stimulus. Finally, we evaluate the emotion recognition system by using popular machine learning algorithms and compare them for both intra-subject and inter-subject classification. The results obtained here show that the prediction model for the four-class emotion classification performed well, including the more challenging inter-subject classification, with the support vector machine (SVM Class Weight kernel) obtaining 85.01% classification accuracy. This shows that using less electrode channels but with proper parameter tuning and selection features affects the performance of the classifications.