Multiclass emotion prediction using heart rate and virtual reality stimuli

ABSTRACT

Background: Emotion prediction is a method that recognizes the human emotion derived from the subject's psychological data. The problem in question is the limited use of heart rate (HR) as the prediction feature through the use of common classifiers such as Support Vector Machine (SVM), K-Nearest Neighbor (KNN) and Random Forest (RF) in emotion prediction. This paper aims to investigate whether HR signals can be utilized to classify four-class emotions using the emotion model from Russell's in a virtual reality (VR) environment using machine learning. Method: An experiment was conducted using the Empatica E4 wristband to acquire the participant's HR, a VR headset as the display device for participants to view the 360° emotional videos, and the Empatica E4 real-time application was used during the experiment to extract and process the participant's recorded heart rate. Findings: For intra-subject classification, all three classifiers SVM, KNN, and RF achieved 100% as the highest accuracy while inter-subject classification achieved 46.7% for SVM, 42.9% for KNN and 43.3% for RF. Conclusion: The results demonstrate the potential of SVM, KNN and RF classifiers to classify HR as a feature to be used in emotion prediction in four distinct emotion classes in a virtual reality environment. The potential applications include interactive gaming, affective entertainment, and VR health rehabilitation.