Four-Class Emotion Classification using Electrocardiography (ECG) in Virtual Reality (VR)

ABSTRACT

The main objective of this paper is to investigate if ECG signals can be utilized to classify emotions based on Russell's four-class circumplex emotion model in a VR environment using SVM classifiers. Electrocardiogram (ECG) signals were collected with a medical-grade wearable heart rate monitor from Empatica (E4 Wristband) and Empatica Realtime Monitor application during this research. ECG was employed as the tool to capture the test subjects' physiological signals via their heart rate. A preliminary experiment was conducted using a heart rate monitor to gain ECG signal, and a VR Headset for subjects to view 360 degrees video stimuli. A total of 5 subjects participated in this experiment. Data from the 5 subjects were then processed with R Studio using SVM classifier. The data was classified into four distinct emotion classes using both inter-subject classification and intra-subject classification approaches, with inter-subject classification yielding an accuracy of 48% while intrasubject classification ranges from 50% to 74%. These results demonstrate the potential of using ECG as a promising sensor modality for four-class emotion classification in virtual reality using wearable technology.