

EEG-based excitement detection in immersive environments: An improved deep learning approach

ABSTRACT

The use of machine learning approaches to detecting the human emotion of excitement via electroencephalography (EEG) while immersed in an immersive virtual reality environment is studied in this investigation. The ability to detect excitement has many potential applications such as in affective entertainment, neuromarketing and particularly in virtual reality computer gaming. Users are exposed to a roller-coaster experience as the emotional stimuli, which is expected to evoke the emotion of excitement, while simultaneously wearing virtual reality goggles, which delivers the virtual reality experience of excitement, and an EEG headset, which acquires the raw brain signals detected when exposed to this excitement stimuli. In this study, a deep learning approach is used to improve the excitement detection rate to well above the 90% accuracy level. In a prior similar study, the use of conventional machine learning approaches involving k-Nearest Neighbour (kNN) classifiers and Support Vector Machines (SVM) only achieved prediction accuracy rates of between 65-89%. Using a deep learning approach here, rates of 78-96% were achieved. This demonstrates the superiority of adopting a deep learning approach over other machine learning approaches for detecting human excitement when immersed in an immersive virtual reality environment.