

EEG-Based Emotion Recognition: A State-of-the-Art Review of Current Trends and Opportunities

ABSTRACT

Emotions are fundamental for human beings and play an important role in human cognition. Emotion is commonly associated with logical decision making, perception, human interaction, and to a certain extent, human intelligence itself. With the growing interest of the research community towards establishing some meaningful “emotional” interactions between humans and computers, the need for reliable and deployable solutions for the identification of human emotional states is required. Recent developments in using electroencephalography (EEG) for emotion recognition have garnered strong interest from the research community as the latest developments in consumer-grade wearable EEG solutions can provide a cheap, portable, and simple solution for identifying emotions. Since the last comprehensive review was conducted back from the years 2009 to 2016, this paper will update on the current progress of emotion recognition using EEG signals from 2016 to 2019. The focus on this state-of-the-art review focuses on the elements of emotion stimuli type and presentation approach, study size, EEG hardware, machine learning classifiers, and classification approach. From this state-of-the-art review, we suggest several future research opportunities including proposing a different approach in presenting the stimuli in the form of virtual reality (VR). To this end, an additional section devoted specifically to reviewing only VR studies within this research domain is presented as the motivation for this proposed new approach using VR as the stimuli presentation device. This review paper is intended to be useful for the research community working on emotion recognition using EEG signals as well as for those who are venturing into this field of research.