Electroencephalogram Based Approach for Mental Stress Detection during Gameplay with Level Prediction

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Abstract : Many mobile games come with the benefits of entertainment by introducing stress to the human brain. In recognizing this mental stress, the brain-computer interface (BCI) plays an important role. It has various neuroimaging approaches which help in analyzing the brain signals. Electroencephalogram (EEG) is the most commonly used method among them as it is non-invasive, portable, and economical. Here, this paper investigates the pattern in brain signals when introduced with mental stress. Two healthy volunteers played a game whose aim was to search hidden words from the grid, and the levels were chosen randomly. The EEG signals during gameplay were recorded to investigate the impacts of stress with the changing levels from easy to medium to hard. A total of 16 features of EEG were analyzed for this experiment which includes power band features with relative powers, event-related desynchronization, along statistical features. Support vector machine was used as the classifier, which resulted in an accuracy of 93.9% for three-level stress analysis; for two levels, the accuracy of 92% and 98% are achieved. In addition to that, another game that was similar in nature was played by the volunteers. A suitable regression model was designed for prediction where the feature sets of the first and second game were used for testing and training purposes, respectively, and an accuracy of 73% was found.

Keywords : brain computer interface, electroencephalogram, regression model, stress, word search

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