World Academy of Science, Engineering and Technology
International Journal of Cognitive and Language Sciences
Vol:11, No:05, 2017

A Psychophysiological Evaluation of an Effective Recognition Technique Using Interactive Dynamic Virtual Environments

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Abstract : Recording psychological and physiological correlates of human performance within virtual environments and interpreting their impacts on human engagement, ‘immersion’ and related emotional or ‘effective’ states is both academically and technologically challenging. By exposing participants to an effective, real-time (game-like) virtual environment, designed and evaluated in an earlier study, a psychophysiological database containing the EEG, GSR and Heart Rate of 30 male and female gamers, exposed to 10 games, was constructed. Some 174 features were subsequently identified and extracted from a number of windows, with 28 different timing lengths (e.g. 2, 3, 5, etc. seconds). After reducing the number of features to 30, using a feature selection technique, K-Nearest Neighbour (KNN) and Support Vector Machine (SVM) methods were subsequently employed for the classification process. The classifiers categorised the psychophysiological database into four effective clusters (defined based on a 3-dimensional space – valence, arousal and dominance) and eight emotion labels (relaxed, content, happy, excited, angry, afraid, sad, and bored). The KNN and SVM classifiers achieved average cross-validation accuracies of 97.01% (±1.3%) and 92.84% (±3.67%), respectively. However, no significant differences were found in the classification process based on effective clusters or emotion labels.

Keywords : virtual reality, effective computing, effective VR, emotion-based effective physiological database
Conference Title : ICACII 2017 : International Conference on Affective Computing and Intelligent Interaction
Conference Location : Paris, France
Conference Dates : May 18-19, 2017