

Emotion Recognition through Classification Based on EEG Signals and Heart-Rate Variability

TS Thalagala[#] and LP Kalansooriya

Department of Computer Science, Faculty of Computing,
General Sir John Kotelawala Defence University, Sri-Lanka
[#]tharushishehara96@gmail.com

One aspect of affective computing is making the computer more empathetic to the user. With emotion recognition, a computer system can get a glimpse of the user's mental state. This study aims at recognizing human emotions through classifying the obtained EEG signals and Heart-rate Variability into four emotional states. Most emotion recognition research is done based on external characteristics like facial expressions, body posture and speech. But these research studies have proven to be ineffective since these characteristics can be consciously altered and since there is no standard way a person can show an emotion they are feeling; it can differ from person to person. The classification model proposed in this study is formed by adopting the independence of arousal and valence, two emotional dimensions instead of using discrete emotions as labels. Emotions like happiness, anger, fear, sadness will be transferred to arousal – valence space. There are a few databases that contain data for emotion recognition research. One of these is the Mahnob HCI tagging database which yields a considerable accuracy when considering EEG and ECG data. The EEG data and the Heart-rate Variability (HRV) derived from ECG data obtained from this database will be used in conducting this research. The obtained EEG and HRV data are pre-processed using MATLAB-EEGLAB Toolbox. Then feature extraction is carried out. Next, the data will be mapped into the arousal valence scale according to emotions. A Support Vector Machine (SVM) classifier model is then trained to classify emotions accordingly. The study is conducted with the intention of further evolving it to derive a real-time emotion recognition model that can be affiliated with computer games.

Keywords: Affective Engineering, Electro-encephalography (EEG), Brain-Computer Interface (BCI), Emotion Recognition, Heart-Rate Variability