Emotion recognition from electrocardiogram signals using Hilbert Huang Transform

Abstract

Equipping robots and computers with emotional intelligence is becoming important in Human-Computer Interaction (HCI). Bio-signal based methods are found to be reliable and accurate than conventional methods as they directly manifest the underlying activity of the Autonomous Nervous System (ANS). This paper focuses on recognizing six emotional states (happiness, sadness, fear, surprise, disgust and neutral) from Electrocardiogram (ECG) signals that were obtained from multiple subjects. The emotional data was collected by inducing emotions internally in the subject using audio visual clips. The normalized QRS derivative signal was obtained from captured emotional ECG data by means of a non-linear transform. Hilbert Huang Transform (HHT) based analysis was done to obtain the emotional features in low, high and total (low and high together) the frequency ranges. The classification results indicate that low frequency Intrinsic Mode Functions (IMF) contain more emotional information compared to the other frequency ranges. The performance of the system can be improved further by analyzing the information in the low frequency range.