Electromyogram signal based human emotion classification using KNN and LDA

Abstract

In this paper, we presents Electromyogram (EMG) signal based human emotion classification using K Nearest Neighbor (KNN) and Linear Discriminant Analysis (LDA). Five most dominating emotions such as: happy, disgust, fear, sad and neutral are considered and these emotions are induced through Audio-visual stimuli (video clips). EMG signals are obtained by using 3 electrodes over 10 trials per emotion and preprocessed by using Butterworth 6th order filter to remove noises and external interferences. EMG signals on decomposed into four different frequency ranges ((8 Hz-16 Hz), (16 Hz-31 Hz) and (16 Hz-63 Hz)) using Discrete Wavelet Transform (DWT). The ststistical features extracted from the above frequency bands are mapped into five different emotions using two simple classifiers such as KNN and LDA. The value of K in KNN is varied randomly, and maximum classification rate is achieved at K=3. KNN classifier gives the highest classification rate on four emotions (disgust, happy, fear and neutral) different emotions and LDA on sad emotion. The maximum classification rate of disgust, happy, fear neutral, and sad are 90.83%, 100%, 94.17%, and 90.28% and 43.89%, respectively are achieved using KNN and LDA. The results from the proposed methodology are promising and female are easily evoked by different emotional stimuli compared to male.

Keywords — Discrete wavelet transform, EMG, emotions, K Nearest Neighbor, Linear Discriminant Analysis