Communications in Computer and Information Science, vol. 330(CCIS), 2012, pages 236-243

EMG signal based human stress level classification using wavelet packet transform

Abstract

Recent days, Electromyogram (EMG) signal acquired from muscles can be useful to measure the human stress levels. The aim of this present work to investigate the relationship between the changes in human stress levels to muscular tensions through Electromyography (EMG) in a stimulated stress-inducement environment. The stroop colour word test protocol is used to induce the stress and EMG signal is acquired from left trapezius muscle of 10 female subjects using three surface electrodes. The acquired signals were preprocessed through wavelet denoising method and statistical features were extracted using Wavelet Packet Transform (WPT). EMG signals are decomposed to four levels using db5 mother wavelet function. Frequency band information's of third and fourth levels are considered for descriptive analysis. Totally, seven statistical features were computed and analyzed to find the appropriate frequency band and feature for stress level assessment. A simple non-linear classifier (K Nearest Neighbor (KNN)) is used for classifying the stress levels. Statistical features derived from the frequency range of (0-31.5) Hz gives a maximum average classification accuracy of 90.70% on distinguishing the stress levels in minimum feature.

Keywords — EMG, KNN classifier, stress, stroop colour word test, wavelet packet transform