Visualization Tool for EEG Signal Segmentation

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Abstract : This work is about developing a tool for visualization and segmentation of Electroencephalograph (EEG) signals based on frequency domain features. Change in the frequency domain characteristics are correlated with change in mental state of the subject under study. Proposed algorithm provides a way to represent the change in the mental states using the different frequency band powers in form of segmented EEG signal. Many segmentation algorithms have been suggested in literature having application in brain computer interface, epilepsy and cognition studies that have been used for data classification. But the proposed method focusses mainly on the better presentation of signal and that's why it could be a good utilization tool for clinician. Algorithm performs the basic filtering using band pass and notch filters in the range of 0.1-45 Hz. Advanced filtering is then performed by principal component analysis and wavelet transform based de-noising method. Frequency domain features are used for segmentation; considering the fact that the spectrum power of different frequency bands describes the mental state of the subject. Two sliding windows are further used for segmentation; one provides the time scale and other assigns the segmentation rule. The segmented data is displayed second by second successively with different color codes. Segment's length can be selected as per need of the objective. Proposed algorithm has been tested on the EEG data set obtained from University of California in San Diego's online data repository. Proposed tool gives a better visualization of the signal in form of segmented epochs of desired length representing the power spectrum variation in data. The algorithm is designed in such a way that it takes the data points with respect to the sampling frequency for each time frame and so it can be improved to use in real time visualization with desired epoch length.
Keywords : de-noising, multi-channel data, PCA, power spectra, segmentation