Planning Relax Data Set

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Abstract: The dataset concerns with the classification of two mental stages from recorded EEG signals: Planning (during imagination of motor act) and Relax state.

Data Set Characteristics:	Univariate	**Number of Instances:**	182	**Area:**	Computer
Attribute Characteristics:	Real	**Number of Attributes:**	13	**Date Donated**	2012-07-17
Associated Tasks:	Classification	**Missing Values?**	N/A	**Number of Web Hits:**	8764

Source:

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Data Set Information:

EEG record contains many regular oscillations, which are believed to reflect synchronized rhythmic activity in a group of neurons. Most activity related EEG patterns occur within the following frequency bands. Delta (0.5 â€“ 4 Hz.), Theta (4 â€“ 8 Hz), Alpha (8 â€“ 13 Hz), Beta (13 â€“ 22 Hz), and Gamma (30 â€“ 40 Hz). The waves with the frequency of 7 â€“ 13 Hz over motor processing areas are called mu rhythm and reflect idling activity in motor areas. It is more pronounced when the subjects are at rest and at least a second before subjects initiate voluntary movement, the mu activity over the hemisphere contralateral to the region moved shows a decrease in amplitude and is called Event Related Desynchronization (ERD). For the current study, EEG data was collected for 5 times on various days from a healthy right-handed subject of 25 years of age. The data was recorded on a Medelec Profile Digital EEG machine. The settings of high frequency filter 50 Hz, low frequency filter 1.6 Hz, notch filter 50 Hz, sensitivity 70 micro volts/mm, and a sampling rate of 256 Hz were used for the basic signal processing.
Eight EEG electrodes (C3, C4, P3, P4, F3, F4, T3, and T4) were placed according to the international standard 10-20 system of electrode placement. Bipolar and unipolar EEG was recorded from eight Ag/AgCI scalp electrodes, which were placed 2.5 cm anterior and posterior to the central electrodes C3 and C4 (left and right side of the hemisphere). A1 and A2 are reference electrodes. The reference electrodes are placed on the left and right ears and the ground electrode on the forehead. EOG (Electrooculogram) being a noise artifact, was derived from two electrodes, placed on the outer cantus of left and right eye in order to detect eye movement. These EOG signals are then used to eliminate eye movement artifacts. The subject was asked to lie down comfortably in a relaxed position with eyes closed and advised to minimize eye movements. The EEG was recorded for the relaxed state for 5 minutes. Following this, an audio beep of 60 db and 0.91 sec. duration was given at the start and end of a 5 second epoch where the subject was asked to mentally plan lifting of the right hand thumb. This activity is collected as a 5 second epoch data corresponding to â€˜movement imageryâ€™ state. After a gap of 5 minutes, the same cue is given to repeat the experiment. The whole experiment lasts for approximately 30 minutes, collecting data for 5 trials of 5 second epoch each for normal relaxed state and 5 trials of 5 second epoch each for movement imagery. No actual movement is performed during the session. All data sets were visually checked for artifacts before final selection.

Attribute Information:

Wavelet transform has been applied for feature extraction for EEG classification. However, wavelet transforms pyramidal algorithm work only on approximation coefficients. So it can not identify 7-13 Hz frequency band. We have extended the methodology by applying wavelet packet analysis, which also decompose detail coefficients. Wavelet packet analysis has been used for signal decomposition with equal frequency bandwidth at each level of decomposition, which leads to an

been used for signal decomposition with equal frequency bandwidth at each level of decomposition, which leads to an equal number of the approximation and detail coefficients. By applying wavelet packet analysis on the original signal, we have obtained twelve wavelet coefficients in the 7-13 Hz frequency band at the 6th level node (6,2). The signal is reconstructed at node (6,2) and its FFT plot gave the frequency band 7-13 Hz as the most discriminating, in conjunction with the wavelet Daubechies#6 (db6).

Relevant Papers:

1. Rajen B. Bhatt and M. Gopal, 2008, â€œFRCT: Fuzzy-Rough Classification Treesâ€, Pattern Analysis and Applications, 11(1), pp. 73-88.
2. Shweta Sahu and Rajen B. Bhatt, â€œAutomatic classification of Electroencephalography Signals using Wavelet Packet Analysis and Fuzzy Decision Treesâ€, in Proc. of 28th National Systems Conference (NSC-2004), Dec. 16-18, Vellore, India.
3. Rajen Bhatt, 'Fuzzy-Rough Approach to Pattern Classification:Hybrid Algorithms and Optimization', Ph.D. Thesis, IIT Delhi, 2006.

Citation Request:

Rajen Bhatt, 'Planning-Relax Dataset for Automatic Classification of EEG Signals', UCI Machine Learning Repository