Wavelet Based Classification Approach For EEG Diagnoses

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Abstract


The recognition of an abnormal activity of the brain functionality is a vital issue. To determine the type of the abnormal activity either a brain image or brain signal are usually considered. Imaging localizes the defect within the brain area and relates this area with some body functionalities. However, some functions may be disturbed without affecting the brain. In this case, imaging may not provide the symptoms of the problem. A cheaper yet efficient approach that can be utilized to detect abnormal activity is the measurement and analysis of the electroencephalogram (EEG) signals. The main goal of this work is to come up with a new method to facilitate the classification of the abnormal and disorder activities within the brain directly using EEG signal processing, which makes it possible to be applied in an on-line monitoring system.

Classification of EEG abnormality may be approached using different analysis methods and classifiers. Among these methods are wavelet decomposition, Fourier analysis, and phase space. Four different approaches are proposed in this work to classify EEG abnormal activity. These approaches depend on transforming the signal into another domain to easily extract significant features that allow proper classification. The main goal is to yield an efficient classification yet using a simple, fast, and reliable classifier. The first approach is based on selecting features using wavelet coefficients.
only. The second approach is a combination between wavelet and phase space. The third approach is based on phase space reconstruction only. Finally the fourth approach uses features extracted from Fourier domain. All the proposed approaches showed good results and were able to detect the normal EEG with 100 % accuracy. However, abnormal activity detection accuracy varied among the different proposed classifier. The results obtained using these classifiers are comparable to those obtained from recent published works. Further discussion and conclusions to drive the future research are provided in this thesis.

Key words: wavelet, Phase space, EEG, Epilepsy, Spikes