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Classification of ECG Signal using Wavelet Transform

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Abstract: This paper presents a reliable ECG signal analysis and classification approach using Discrete Wavelet Transform. This methodology is made out of three phases, including ECG signal pre-processing, feature selection, and classification of ECG signal. The ECG signal are being selected and tested from Physio Net Database using MIT-BIH Arrhythmia Database. During this paper, a computerized system is presented to categorize the ECG signals. MIT-BIH ECG arrhythmia database is employed for analysis purpose. After de-noising the ECG signal within the pre-processing stage and extract the subsequent time domain features; mean, variance, standard deviation and skewness are extracted within the feature extraction stage.

Keywords: ECG signal, Signal pre-processing, Discrete wavelet transform, Feature extraction and Classification.

I. INTRODUCTION

ECG the recording of the heart electrical activity. The deviations within the normal electrical patterns indicate various cardiac disorder. Cardiac cells, within the normal state are electrically polarized. Their inner sides are negatively charged relative to their outer sides. These cardiac cells can lose their normal during a process called depolarization, which is that the fundamental electrical activity of the centre. This depolarization is propagated from cell to cell, producing a wave of depolarization which will be transmitted across the whole heart. This wave of depolarization produces a flow of electrical current and it can be detected by keeping the electrodes on the surface of the body. Once the depolarization is complete, the cardiac cells are able to restore their normal polarity by a process called re-polarization. This is often also sensed by the electrodes. During this paper a study about the extraction of feature and classification of ECG signal is discussed in. the extracted wavelet coefficients from the DWT process are used as feature.

II. LITERETURE REVIEW

- Many algorithms are developed up to now for the detection of ECG signal, feature extraction of the signal and classification of ECG signals. A.B Ramli and P.A. Ahmad used cross-correlation analysis technique for the extraction of features from 12-lead ECG signal measurement technique. They also concluded that the cross-correlation and auto-correlation methods work better in evaluating and analyzing the parameters which are extracted. Thus differentiating between normal and abnormal ECG signal. Pawel Tajedko and Waldemar Rakowski used Kohonen maps or self-organizing maps. They also used learning vector quantization algorithms to classify and compare the QRS complexes. Normal or arrhythmic beats are for his or her performance. They used MIT-BIH arrhythmia database for their evaluation method based classification. Researcher Aykut Diker,Engin AVCI is feature extraction of ECG signal by using deep feature. In this study, the ELM technique was applied for ECG signal classification. For this purpose the CNN method which is a deep learning approach was used for feature extraction. It is aimed to improve the performance of the classification of ECG signals by using different types of deep learning method.

III. METHODOLOGY

The ECG signal classification system consists of four stages Data Acquisition, Pre-processing, Feature Extraction and Classification. The centre sound using ECG will record simultaneously from patients. The ECG Database in PhysioBank

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also getting used as a knowledge of ECG input for feature extraction part processing. Partitioning the ECG signal into cardiac cycles, and detection of the most events and intervals in each cycle.

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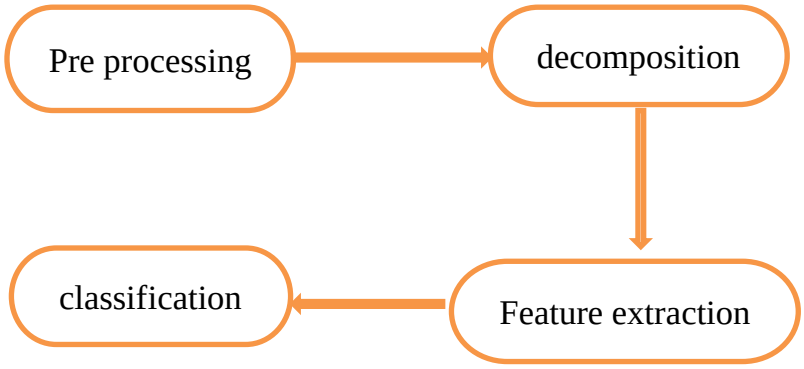


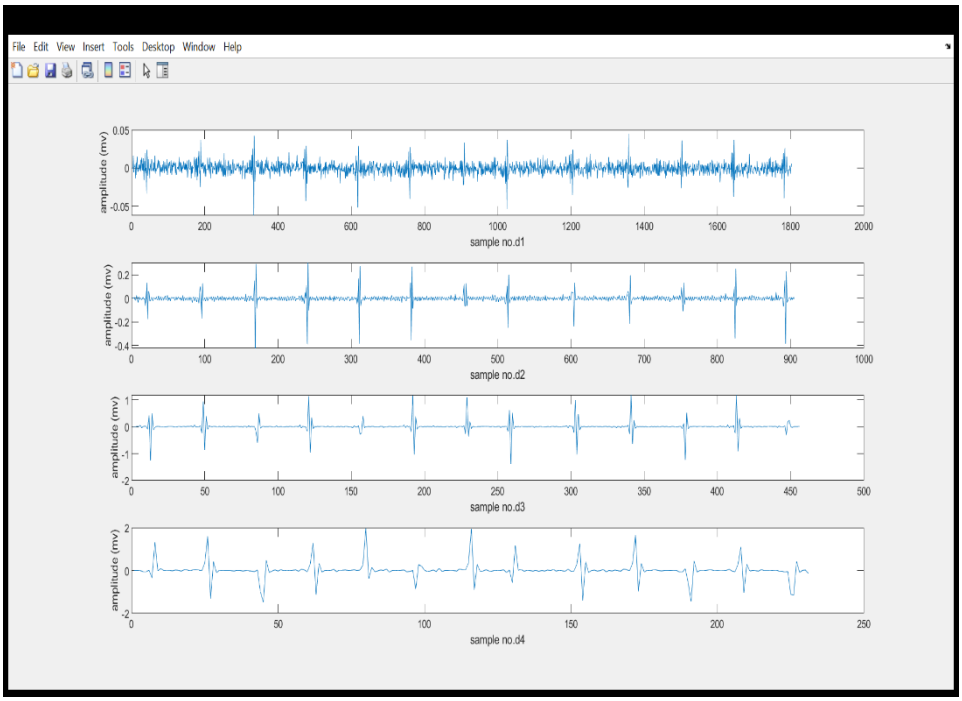
Structure of Methodology

First is the pre-processing stage. It is a common name for operations with signals at the lowest level of abstractions and it is an improvement of the signal data that suppresses unwanted distortions or enhances some signal features. In this stage, signal denoising is employed using the median filter. After that The selection of appropriate wavelet and the number of decomposition level is very important in analysis of signals using the WT. The number of decomposition levels was chosen to be 4. Thus, the ECG signals were decomposed into the details d1−d4.

The third stage is feature extraction which uses time domain features for the classification. Followed by the stage of decomposition the succeeding pace is extraction of features from the pre-processed signal. In the pace, WPD's i.e. wavelet packet decomposition's higher order statistics coefficients, features as well as frequency domain features are extracted. The relevant time–amplitude information of ECG signal is extracted by using the wavelet transform. Due to the smoothing feature of Discrete Wavelet Transform, it is well suited for detection of changes happened in the ECG signals. Then the final step is classification of the signal by means of the selected features of the signal

IV. RESULT

The experimental results of ECG analysis have been obtained by means of MATLAB programming. The MIT-BIH arrhythmia dataset is employed for the analysis of ECG signal. The following figure shows the decomposition result for the signal.After feature extract in time domain and classification of signal.



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V. CONCLUSION

ECG signal carries some vital information about the heart and it is one in every of the important tool for the doctors to for diagnosing the heart related diseases. Within the past a lot of work has been presented by various researcher to extract the features from the ECG signal so that the analysis of ECG become automate and easier. In this paper, ECG signal classification using statistical features is analysed. MIT–BIH arrhythmia database records are employed for the classification task. First, pre-processing is complete using the median filter, and statistical features are extracted.

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