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CARDIAC DISEASE ANALYSIS AND DETERMINATION USING DISCRETE WAVELET-BASED ANN

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Abstract: Diagnosis of heart disease is complex. ECG plays an important role inthe analysis and diagnosis of cardiac disease. Normally ECG signals are affected by different noises and analysis of those signal is also a tedious process.The main objective of the paper is to de-noise and analyze the ECG signal using DWT(Discrete Wavelet Transform) technique. We use the Daubechies wavelet analysis (level 5)technique in DWT for better performance. Then we obtain the decomposed wave.By analyzing the parameters of the decomposed ECG signal we find the disease present in the heart of the patient by applying the decomposed parameters to ANN(Artificial Neural Network). Thus, we can identifythe cardiac disease. This method is very effective because the accuracy of the result is high. Also, the training and testing of the network take very less time. Hence, it is more effective for users.

Keywords: ECG, Cardiac disease, Discrete wavelet transform (DWT), Daubechies wavelet analysis, Artificial neural network (ANN)

I. INTRODUCTION

In recent times, computer-assisted ECG interpretation plays an important role in the automatic diagnosisof heart abnormalities.ECG is the recording of the electrical activity of the heart, and generation of signals. The classification ECG performance strongly depends on the characterization power of the extracted features from the ECG data and the design of the classifier [3]. The paper describes preprocessing, processing, Feature Extraction, and Classification of ECG signal. An ECG is a linear graphical recording of the electrical impulses that are generated in the heart during the cardiac cycle.The electrical impulses are measured by the electrodes that are placed on the skin.Electrodes which are placed on different sides of the heart measure the activity of different parts of the heart muscle.The ECG displays the voltage between pairs of these electrodes and the muscle activity that they measure.This indicates the overallrhythm of the heart and abnormalities that are present in different parts of the heart muscle [10].

In ECG terms, a lead is a combination of electrodes that form an imaginary line in the body from, wherethe electrical signals are measured [10].

In a 12 lead ECG, three groups of leads can be used, each looking at different aspects of the heart:

- Bipolar limb leads
- Unipolar limb leads
- Unipolar precordial (chest) leads.

Each lead records the electrical signals from the heart of the patient, combination of recording electrodes which are placed at specific points on the patient's body [The bipolar limb leads are known as the lead I, lead II and lead III. They are also known as standard leads [10].They are placed on each of the patient's arms and legs. These bipolar leads view the frontal plane of the heart from these two points.Like the bipolar leads, unipolar limb leads also record the electrical activity along the heart's frontal plane, but from a different angle [10].The unipolar precordial leads these leads are placed directly on the chest and view the heart's electrical activity in the horizontal plane.

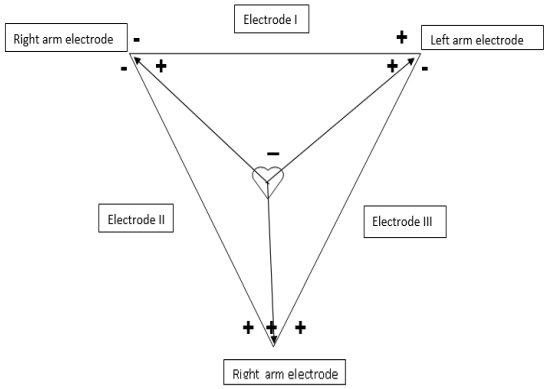

Fig. 1 Placement of ECG electrodes.

II. ECG INTERPRETATION

Now, let us look about the parameters that are to be noticed in an ECG waveform. The following wave shows the normal ECG waveform with the parameters marked in it.

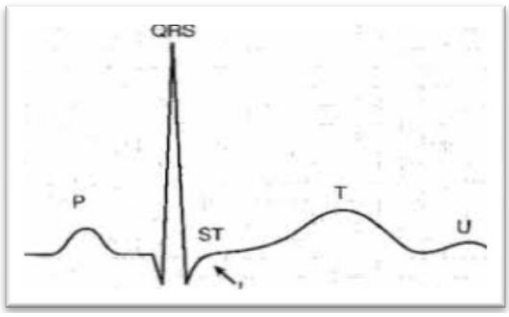

Fig. 2 ECG signal

The P wave is positive in most leads, which means it's above the baseline, on the ECG Signal.The PR interval startsfrom the beginning of the P wave and ends at the beginning of the QRS complex.The QRS complex on an ECG represents the electrical activity associated with the activation of the heart's ventricles, it may have three components:

