Review of Diagnosis and Classification of Heart Diseases Based On ECG Signals Using Artificial Neural Network

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***Abstract*—According to the ECG signals can benefit in diagnosing most of the heart diseases. The heart condition is used to diagnose by important tool is Elecrocardiography. One cardiac cycle in an ECG consist of the P-Q-R-S-T waves or segments. The ECG signal analysis and classification system gives overall idea about the diseases. This researcher has taken up the challenge of managing to devise a system that does 3 functions in a short time. Those functions are i) finding whether a person is suffering from one of the four heart diseases namely, Atrial Fibrillation, Atrial Flutter, Branch Bundle Block and Myocardial Infarction. After locating the exact heart disease, the system calculates the criticality of that disease. In recent years, many research and methods have been proposed and developed for analyzing the ECG signals and extracting features such as amplitude and time intervals for classification of signals. This paper focuses on some of the techniques proposed earlier for the heart diseases classification and extraction of parameters from the ECG signal which is used for filtering and normalisation and classification system. This paper also gives the brief idea about the proposed work using Artificial Neural Networks (ANN).**

***Index Terms*— ECG signals , Wavelet Transform and Artificial Neural Network, Cardiovascular Diseases.**

I. INTRODUCTION

Heart attack, often causing sudden death, has been brought under control to some extent by mean of ECG. The ECG is electrocardiogram (ECG) provides information about electrical activity of the heart. The each beat of your heart is triggred by an electrical impulse normally generated from special cells in upper right chamber of heart .An ECG record this electrical signals as they travel through heart. An Electrocardiogram is noninvasive & painless test which gives the fast result. ECG can detect areas of muscles which deprived of oxygen or dead tissues in the heart. The methodology involves three steps: i) Artificial Neural Network (ANN) training process ii) ANN testing process and iii)features extraction(wavelet transform).

Wavelet Transform is number of alternative time and frequency methods are now available for signal analysis.It is used for reducing data.Time is inversely proportional to the frequency.The wavelet transform is most important tool for analyzing the problematic signals.Wavelets are functions that are wave above and below X-axis have,1) varrying frequency 2) Limited duration and 3)Average value of zero.this is in contrasts to sinosoids used by fourier transform, which have infinite energy. The Artificial neural network is a mathematical model inspired to biological neural network.Neural network is nonlinear,it consist of interconnected group of artificial neurons having multiple inputs and multiple outputs.System receives signal from inputs, and produce resultant signal, and transmits that signal to all outputs.

II. LITERATURE REVIEW

M.K.Islam. [1] in this paper the author use LABVIEW.LABVIEW is a software application from National Instruments that is specially designed for easy and powerful data acquisition purpose. Thus, LABVIEW software was used for data recording and visualization, due to its known capabilities . Since, ECG signals are very noisy, usually 50Hz noise, MATLAB was used to test and adjust a digital filter , in order to obtain a good QRS complex, which represents the ventricular depolarization in the ECG, i.e., it shows the electrical impulse of heart as it passes through the ventricles. Finally, LABVIEW were used again to implement real time filtering of the signal, with the MATLAB filter studied in the initial step, and it is implemented a small application for real-time visualization of an ECG. Both MATLAB and LABVIEW have immense effect on ECG signal processing. They are so useful and handy that even one can monitor his/her heart condition simply utilizing the power of MATLAB and/or LabVIEW without having an ECG machine and also self diagnosis is possible.

A.Muchuthuder, Lt Dr.S.Santosh Baboo. [2] this paper focuses on an ECG signals will have some cycles (PQRST) repeated after regular intervals. These cycles are analyzed using Signal to Noise Ratio (SNR) method in order to classify the relevant and irrelevant cycles for the study. The method of classification involves selecting one cycle as the reference cycle and the remaining cycles are compared with the selected reference cycle and their SNR is calculated. The same process is repeated with different reference cycles and their respective SNR values are calculated. Number of diseases may be diagnosed in a short time so that the diseased person can be attended to immediately by using Artificial neural network. This research is limited to only 4 specific heart diseases. If further research is taken up, more number of diseases may be diagnosed in a short time so that the diseased person can be attended to immediately. This kind of system will, no doubt, be a powerful tool in the hands of the healthcare personnel in their life saving mission.

Mourad Talbi [3] In this paper, we have developed a new method for R-peaks detection using the modified continuous wavelet transform (MMycwt) which is obtained from (Mycwt) used for the bionic wavelet transform (BWT). After detecting the R-peaks, Q and S are detected then the Modulus Maxima is applied to multi-scale product in order to detect P and T waves. This detection is performed frame by frame and each frame is localized between S-peak and Q-peak (SQ). The multi-scale product is calculated from the product of undecimated wavelet coefficients of successive scales (scale1, scale2 and scale3). The undecimated wavelet coefficients are obtained from Undecimated Discret Wavelet Transform (UDWT) application to each modified frame. For evaluating the proposed method, we have used 46 half-hour recording for a total 23 hours of ECG data, extracted from MIT-BIH arrhythmia database. The advantages of this algorithm are; very fast to implement, easy to execute, and achieves very good detection performance. This algorithm attains Se=99.94% and P+=99.94%.

KUMAR,RG [4] this paper introduced a new approach for investigating ECG sinals and classify that ECG signals through feed forword neural network.A single normal cycle of ECG represents successive arterial depolarization and ventricular repolarization that occurs with every heartbeat. These can be approximately associated with the peaks and other ECG waveforms, labeled as P, Q, R, S and T segments.The technique used in this paper is Artificial Neural Network is used for ECG classification, Features are extracted using Discrete Cosine Transform (DCT). Radial Basis Function(RBF), Multi layer Perceptron Neural Network (MLP-NN), Using proposed method , the classification accuracy is improved up to some extent. Further work needs to be done in the area of optimization to select the best learning rate and momentum.

Hari mohan Rai,Anurag Trivedi [5] this paper discussed on methodology is divided into three basic parts: Preprocessing, feature extraction and classification. The first stage of ECG signal processing is preprocessing, where it is necessary to eliminate noises from input signals using Wavelet Transform. For pre- processing of the ECG signal, noise elimination involves different strategies for various noise sources . This pre- process of ECG signal is done before the extracting the feature, can result better extracted features to increase the system efficiency. Preprocessing of ECG signal consists of De-noising of ECG signal and baseline wander removal using multiresolution wavelet transform. The original ECG signal should be pre-processed with the purpose of removing existed noises of ECG and preparing this processed signal for the next stage. The preprocessing stage further divided into de-noising and Baseline wander removal of ECG signal. The next stage of the proposed model is feature extraction that is preparing the input which best characterize the original signal. Final step of the method is to classify the processed signal into the normal and abnormal class.

K.O.Gupta, DR.P.NChatur[6] In this paper The origin of the electrical activity measured by ECG is in the muscle fibers of different parts of the heart. The ECG may roughly be divided into the phases of depolarization and repolarisation of the muscle fibers making up the heart. The depolarization phases correspond to the P- wave (atrial depolarization) and QRS-wave (ventricles depolarization). The repolarisation phases correspond to the T-wave and U-wave. In addition to that proposed method aims to analyze and classify the ECG signal using two approaches namely artificial neural network and data mining.

III. CONCLUSION

TheECG signal has been studied by various researchers for classification of heart disease.The abnormality detection of the ECG signal based on wavelet transform. To analysis and classify various signal by using two approaches such as rrtificial neural network and wavelet transform.After classifying the ECG signals both the technique will compared and calculate accuracy of each method.

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