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Automatic Detection of Electroencephalogram Artefacts Arising from Head Movements in Transmission Lines using Artificial Neural Network

K.S.Prabhakar¹, Dr. M. Anto Bennet²

Lecturer, Department of Surveying Engineering, JIGJIGA University, JIGJIGA, Ethiopia¹

Professor, Department of Electronics and Communication Engineering, Vel Tech, Chennai, Tamil Nadu, India²

ABSTRACT: Today in the current growing medical field, scanning the whole body with the MRI scans is very difficult which results in side effects and it does not give appropriate result. It is also time-consuming method. To overcome this disadvantage, we are implementing the new method with the signals such as ECG and EEG. Using these signals, analyzing is very easy which gives accurate results and also less time consuming. In this, we are analyzing the cardiac problems by using these signals. The diagnosis system presents to classify the EEG brain signal of patient to distinguish between normal and abnormal which are cardiac with better classification accuracy. Here, the system uses the Artificial Neural network (ANN) with feed forward for classification which follows the Neural Network (NN) classification with Data Set training. For training, the statistical principal features will be extracted with the help of data base samples. The test sample will be classified using Artificial Neural network classifier parameters and its features. The system gives better performance accuracy for different test samples.

KEYWORDS: Artificial Neural network (ANN), Electroencephalogram (EEG), Discrete wavelet transform (DWT)

I.INTRODUCTION

EEG signals are bio potential generate neural activity of the brain. Used particularly for the non-invasive identification of cardiac foci and for the mapping for the neuronal oscillations at rest and the movement. It is used to diagnose sleep disorders, depth of anaesthesia, coma, encephalopathy and brain death. Frequency range of bioelectrical signal EEG amplitude is 2 μ V-100 μ V. EEG signal is analysed in five band for reference paper. Electroencephalography (EEG) is an electrophysiological monitoring method to record electrical activity of the brain. It is typically non-invasive, with the electrodes placed along the scalp, although invasive electrodes are sometimes used, as in electrocorticography. EEG measures voltage fluctuations resulting from ionic current within the neurons of the brain. Clinically, EEG refers to the recording of the brain's spontaneous electrical activity over a period of time, as recorded from multiple electrodes placed on the scalp. Diagnostic applications generally focus either on event-related potentials or on the spectral content of EEG. Although EEG are designed to record cerebral activity, it also records electrical activities arising from sites other than the brain. The recorded activity that is not of cerebral origin is termed artefact and can be divided into physiologic and extra physiologic artefacts. C.Nagarajan et al [11-14] developed the physiologic artefacts are generated from the patient, they arise from sources other than the brain (i.e., body). Extra physiologic artefacts arise from outside the body (i.e., equipment, environment).

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II.PROPOSED SYSTEM

Analysis and removal of artefacts in signals for transform features system through textural analysis and ANN classifier. The system involves feature extraction and classifier. The purpose of this module is to convert the signal waveform.

BLOCK DIAGRAM

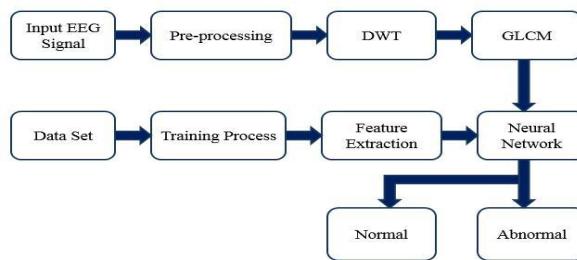


Fig 1: Block Diagram of Proposed System

INPUT EEG SIGNAL

Input is given in the form of EEG signals of peak values with respect to amplitude and time period where data are stored in the excel sheet, that values are given as input to mat lab software and further process is carried out. The electroencephalogram (EEG) is a recording of the electrical activity of the brain from the scalp shown in fig1.

PRE-PROCESSING

pre-processing is a mining technique that involves transformation of raw data into an understandable format. It is a proven method of resolving such issues. It prepares a raw data for further processing. It is used in database-driven applications such as customer relationship management and rule-based applications like neural networks (NN). Removal of unwanted signal is taken over here shown in fig 2.

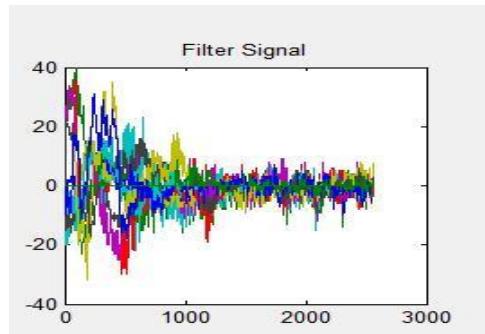


Fig :2 Waveform of Pre-Processed Signal

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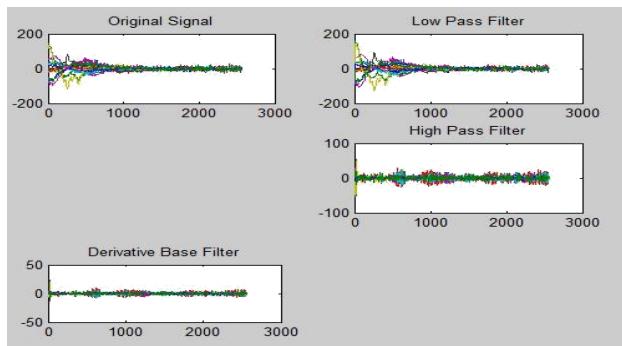


Fig : 3 Representation of DWT

DISCRETE WAVELET TRANSFORM (DWT)

In numerical analysis and functional analysis, a **discrete wavelet transform (DWT)** is any wavelet transform for which the wavelets are discretely sampled. The DWT of a signal is calculated by passing it through a series of filters. First the samples are passed through a low pass filter with impulse response resulting in a convolution. The signal is also decomposed simultaneously using a high-pass filter. It is important that the two filters are related to each other and they are known as a quadrature mirror filter shown in fig 3.

GREY LEVEL CO-OCCURRENCE MATRIX (GLCM)

The Grey Level Co-occurrence Matrix, GLCM (also called the Grey Tone Spatial Dependency Matrix). The GLCM is a tabulation of how often different combinations of pixel brightness values (grey levels) occur in an image. A statistical method of examining texture that considers the spatial relationship of pixels is the grey-level co-occurrence matrix (GLCM). The GLCM functions characterize the texture of an image by calculating how often pairs of pixels with specific values and in a specified spatial relationship occur in an image, creating a GLCM, and then extracting statistical measures from this matrix.

DATA SET

A set of predefined samples of ECG signals are stored in the database, to compare and classify the normal and abnormal of a person. It consists of 22 acquisition from the healthy subjects in which the EEG and ECG signals are simultaneously acquired. The data are not filtered so, leaving the data as raw as possible.

TRAINING SET

In machine learning, the study and construction of algorithms that can learn from and make predictions on data is a common task. Such algorithms work by making data-driven predictions or decisions, through building a mathematical model from input data. The data used to build the final model usually comes from multiple datasets. Three data sets are commonly used in different stages of the creation of the model.

FEATURE EXTRACTION

Feature extraction is the process of transforming the input data into a set of features which can very well represent the input data. It is a special form of dimensionality reduction. When the input data to an algorithm is too large to be processed and it is suspected to be redundant (e.g. the same measurement in both feet and meters, or the repetitiveness of images presented as pixels), then it can be transformed into a reduced set of features (also named a feature vector). Results can be improved using constructed sets of application-dependent features, typically built by an

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expert. One such process is called feature engineering. Providing the input data into the group of features is called Feature Extraction of image. Image characteristic gives the useful information about an image and rejects the rest. Figure 5 represents the waveform of the feature extracted signal.

NEURAL NETWORK

A neural network (NN), in the case of artificial neurons called artificial neural network (ANN) or simulated neural network (SNN), is an interconnected group of natural or artificial neurons that uses a mathematical or computational model for information processing based on a connectionist approach to computation. In most cases an ANN is an adaptive system that changes its structure based on external or internal information that flows through the network. In more practical terms neural networks are non-linear statistical datamodelling or decision making tools. They can be used to model complex relationships between inputs and outputs or to find patterns in data. Figure 6 represents the structure of neural network.

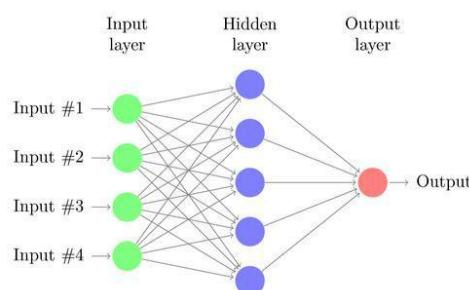


Fig 3: Neural Network

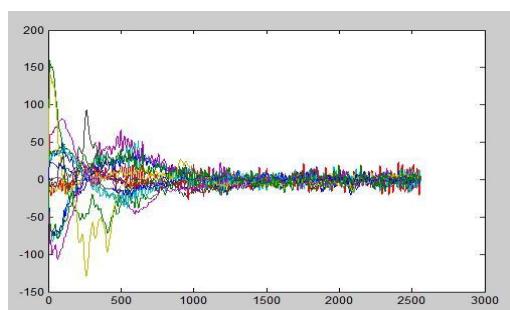


Fig 4: Waveform of Neural Network

Figure 4 represents the waveform of neural network. One classical type of artificial neural network is the recurrent Hopfield network. The concept of a neural network appears to have first been proposed by Alan Turing in his 1948 paper Intelligent Machinery in which called them "B-type unorganized machines". The Neural Network will classify the input signals as Normal and Abnormal persons as message shown in Figure 5& 6.

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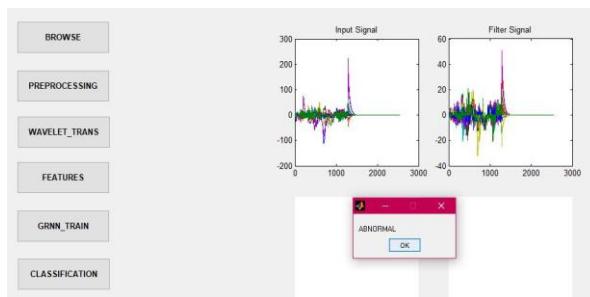


Fig 5 :Classification of Normal Signal

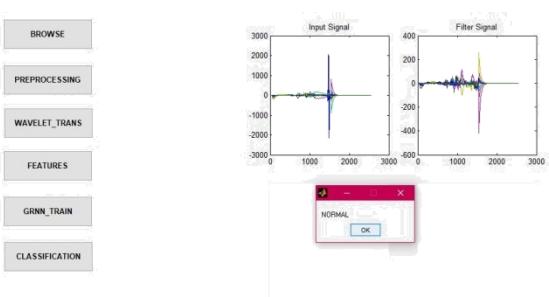


Fig 6:Classification of Abnormal Signal

III.CONCLUSION

The proposed design will deal with critical issues faced by patients in the medical field and will help to solve them with technically sound equipment's and ideas. The ECG is used for diagnosis of heart disease. Various supervised and unsupervised ANN model have been proposed in the literature for ECG signals feature extraction and classification. The ANN classifier was fed by parameters derived from the heart rate signals are discussed. Furthermore, we can implement the technique in python programming also which helps the design to be very simple and effective which leads to the observation of accurate result.

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