Arrhythmia Detection Using a Radial Basis Function Network With Wavelet Features

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ABSTRACT

This article describes how the demand of hospital services increasing day by day. The smart service to the patients is highly essential that counts the death rate. The diagnosis of the heart disease facilitates to store our data. It motivates the application of data mining techniques are useful in health sectors. Some progress has been made for data mining in different areas. However, a large gap of this application found in medical and patient services. In this paper authors have taken an approach to detect arrhythmias using wavelet transform and data mining technique. In first stage R-peaks of arrhythmia data has been detected using wavelet transform. In the next stage the wavelet coefficients are consider as the input features to the radial basis function (RBFN) model. It has been found that the peaks have been detected using discrete wavelet transform. However, the result with RBFN using wavelet features outperforms. The accuracy and the mean square error (MSE) are obtained and shown in result section.

KEYWORDS
Classification, Discrete Fourier Transform, Discrete Wavelet Transform, Multilayer Perceptron, Radial Basis Function Network

INTRODUCTION

In recent years many countries in world adopting automated diagnosis system to detect a disease at an early stage. This system can detect a disease by analyzing the data collected from different medical test. This automatic diagnosis job can be performed by a machine using different learning algorithm. Machine learning based diagnosis system is a supportive tool in clinical environment. Accuracy of the overall system is one of the essential point in the process of disease diagnosis (Sarkar, 2017). With the fast expansion of current society network and database technology have gained extraordinary ground. People want to get information rapidly and compactly. They require logical determining to help and guide their conduct. As we know that Heart is an important part in the human body. In the present situation heart or cardiovascular diseases are the exceptionally a major problem in healthcare industry globally (Raju & Schumacker, 2016). With the proper diagnosis of heart disease at an early stage can reduce the death rate. It is one of the complicated tasks to develop an automatic diagnosis system which can detect the disease accurately at an early stage (Gandhi & Singh, 2015). For the diagnosis of cardiovascular diseases
(CVD), electrocardiograms (ECG) are generally utilized as a vital non-intrusive apparatus by cardiologists. Usually, cardiologists analyze different cardiovascular arrhythmias concurring brief time ECG motions by visual identification (Mohapatra & Mohanty, 2018a).

In the past decade, several feature extraction methods of ECG signal have been proposed in the literatures such as morphological features (De Chazal, O’Dwyer, & Reilly, 2004), temporal intervals (Inan, Giovangrandi, & Kovacs, 2006), wavelet transform (Martis, Acharya, & Min, 2013), and statistical features (Gautam & Giri, 2016; Kampouraki, Manis, & Nikou, 2008). In order to have the classification with high precision the ECG signal must be removed noise components by the filter. Here in this work we have used the wavelet filter for extracting the R-peak and QRS segmentation from the noisy ECG signals. The ECG signals has been characterized by five peaks like P, Q, R, S and T as presented in Figure 1.

Automated analysis of ECG signal detection is a prime factor where QRS envelope has a major role. Wavelet transform is an episodic scale illustration that has been utilized successfully as a part of a large range of utilizations, exclusively signal compression. Discrete wavelet transform (DWT) is one of the domains which can be implemented for finding the normal and abnormal heart rhythm (Thuy, Nghia, Binh, Hai, & Hung, 2017). In this paper for the analysis of the ECG signal we have used the radial basis function (RBFN) which is a new method in neural network technology.

The paper is organized as follows: Section-2 presents proposed method for the experiment and the experiment result has been placed in Section-3. Conclusion of the paper has been placed in the final section.

**METHODOLOGY**

In our work we have used the MIT-BIH Arrhythmia Database in which the ECG signals can be exported in different formats like .dat, .mat, .csv etc. Here in our work .mat files is taken from the data base which is implemented in Matlab. In order to test the process in genuine situations, the genuine Clinical ECG signals and the BW signals are considered in the simulation. The BW signals

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Figure 1. Representation of normal ECG signal

![Figure 1. Representation of normal ECG signal](image)
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