JDL Fusion Model for ECG Arrhythmia Detection

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Abstract

In this paper a novel quick automatic method is proposed for electrocardiogram (ECG). Signal classification to three classes include: the normal heart beats from the left bundle branch block (LBBB), right bundle branch block (RBBB), and paced beats. After noise reduction using wavelet threshold, appropriate features are extracted from the time-voltage waves including P, Q, S, and T waves in ECG signals. Novelty of this work is utilization of fast decision based on non-parametric statistical classifier and Multi Features Data Fusion (MFDF) strategy. Two stages of MFDF include feature classification into normal and abnormal categories. Based on decision template, first stage, and second part are voting and weighting the procedure. Post processing block is added for impulsive noise reduction in order to improve the results. We emphasized on the performance and efficiency of the optimized presented algorithm and minimum cost of system learning. The accuracy of final results is reliable and well performed.

Keywords: electrocardiogram (ECG), wavelet thresholding, Otsu thresholding, Multi Features Data Fusion

1. Introduction

The electrocardiogram (ECG) is a low cost, and effective test for arrhythmia analysis that has become the standard diagnostic tool. A crucial step toward identifying an arrhythmia is the classification of heartbeats. The classification of an electrocardiogram (ECG) into diverse disease categories is a complex pattern recognition task. Classification of heartbeats can be very time-consuming. Hence, any automated processing of the ECG that works with this process is the focus of this study. And also would be assisting this research.

Conventionally, a typical heart beat is identified from the ECG. The component waves of the QRS, T, and possibly P waves are characterized in using measurements such as magnitude, duration, and area. Datasets using for heart diseases involve different features. Some of them are based on laboratory experiments, while others include clinical symptoms. However, one of the most popular and useful databases is the MIT-BIH.

Automated classification of heartbeats has been previously reported by other researchers. Several methods have been proposed for the classification of ECG signal. Classifiers employing methods include linear discriminate [1], back propagation neural networks [2-3], self-organizing maps with learning vector quantization [4], and self-organizing networks.