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(Research Article)

Automatic classification of normal and abnormal cardiac sounds by combining features based on wavelet transform and capstral coefficients extracted from PCG signals

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Abstract

Cardiac sounds are produced by the mechanical activities of the heart and provide useful information about the function of the heart valves. Due to the transient and unstable nature of the heart's sound and the limitation of the human hearing system, it is difficult to categorize heart sound signals based on what is heard from a stethoscope. Therefore, providing an automated algorithm for primary diagnosis of heart disease by analytic use of heart sound signals is very valuable. In this paper, an automated method for classifying cardiac sounds using signals recorded from a phonocardiogram is presented. In the proposed method, the Mel frequency cepstral coefficients along with wavelet-based features are extracted from the heart sound signals. In the next step, the most informative features are selected using the Sequential Forward Floating Search (SFFS) algorithm. Finally, the selected feature set is fed into the classifier, support vector machines, to classify heart sounds. The performance of the proposed method was evaluated using a public dataset presented by the organizers of the the PhysioNet/CinC Challenge 2016. The proposed method provided an average MAcc of 88.15%, an average sensitivity of 92.74% and an average specificity of 83.56% in the classification of cardiac sounds. The results show that the proposed method has better performance than the best available methods and is a suitable tool in the analysis of heart sounds.

Keywords: Heart sound signal, MFCC coefficients, Wavelet transform, Entropy features, SVM classifier.

pp. 1-12 (In Persian)

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