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Sudden Cardiac Death (SCD) Prediction Using Empirical Mode Decomposition (EMD) and Minimum-Risk Bayesian Classifier

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Abstract

Sudden cardiac death (SCD) is one of the most widespread reasons for death around the world. A precise and early prediction of SCD can improve the chance of survival by administering cardiopulmonary resuscitation (CPR). Hence, there is a vital need for an SCD prediction system. In previos works, the aim was to minimize the detection error and the misdetection of SCD and normal persons have the same priority. But, as we know misdetection of SCD persons as normal persons is most harmful. Therefore, in thi paper we present a method to reduce the classification risk in which our aim is to reduce the number of SCD persons that wrongly detected as healthy persons. The ECG signal is segmented into intervals with one minute length and then the heart rate variability (HRV) signal is calculated. In order to feature extraction, HRV is decomposed using discrete wavelet transform (DWT) and emporocal mode decomposition (EMD). From the outputs of DWT and EMD, six and 14 features are calculated respectively which results in 20 features for each ECG signal. In order to detect SCD event, a minimum-risk Bayesian classifier is used. The results show that the proposed method reduce the probability of misdetection of SCD samples as normal samples, while achieves the good classification accuracy. We also, analyze the SCD prediction for 30 munites before its occurrence and achive good results.

Keywords: sudden cardiac death (SCD), minimum-risk classifier, ECG, EMD, DWT