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ECG BASELINE WANDERING REMOVAL BASED ON THE DISCRETE WAVELET TRANSFORM

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We present, in this paper, an ECG baseline wandering (BLW) suppression algorithm based on the discrete wavelet transform (DWT). The approach was to identify the approximation sequence, extracted from the DWT decomposition, the most correlated to the ECG signal baseline undulations, which will be subtracted from the original noisy ECG signal. First, an estimated reference ECG baseline undulations signal is obtained by interpolating the detected QRS onset points. Next, performing the DWT decomposition of the original ECG signal and computing the correlation value between the reconstructed approximation sequence, at successive decomposition levels, and the estimated reference ECG baseline undulations signal. The DWT decomposition processed is halted once the correlation value goes to decease, thus the approximation sequence, with the highest correlation value, is regarded as representing the ECG baseline undulations signal which will be subtracted from the original ECG signal allowing obtaining the iso-electric ECG signal. The algorithm was tested on two sets of ECG signals extracted from the MIT-BIH Arrhythmia Database: real noisy ECG signals and iso-electric signal added to simulated baseline wandering noise. The evaluation of the performance of the algorithm is carried out on the calculus of the correlation and the mean value standard deviation of the difference between the original iso-electric ECG signal and the restituted one afterwards the base line wandering suppression. The comparative study shows the superiority of the performance of the algorithm compared to the averaging method and the low pass Butterworth filtering. The obtained results, when applying the different approaches, are summarized as follows: the correlation value of 0.9810, for our algorithm, versus 0.4342 and 0.7097 for the averaging and filtering techniques respectively.

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