Robust Arterial Blood Pressure Events Detection-Delineation via Segmentation of a Wavelet-Derived Stationary-Baseline Metric

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The major focus of this study is to describe the structure of a solution designed for robustly detecting and delineating the arterial blood pressure (ABP) signal events. To meet this end, first, the original ABP signal is pre-processed by application of a trous discrete wavelet transform (DWT) for extracting several dyadic scales. Then, a fixed sample size sliding window is moved on the appropriately selected scale and in each slid, six features namely as summation of the nonlinearly amplified Hilbert transform, summation of absolute first order differentiation, summation of absolute second order differentiation, curve length, area and variance of the excerpted segment are calculated. Then, all feature trends are normalized and utilized to construct a newly proposed principal components analyzed geometric index (PCAGI) (to be used as the segmentation decision statistic (DS)) by application of a linear orthonormal projection. After application of an adaptive-nonlinear transformation for making the DS baseline stationary, the histogram parameters of the enhanced DS are used to regulate the -level Neyman-Pearson classifier for false alarm probability (FAP)-bounded delineation of the ABP events. In order to illustrate the capabilities of the presented algorithm, it was applied to all 18 subjects of the MIT-BIH Polysomnographic Database (359,000 beats) and the end-systolic and end-diastolic locations of the ABP signal as well as dicrotic notch pressure were extracted and values of sensitivity and positive predictivity Se = 99.85% and P+ = 99.96% were obtained for the detection of all ABP events.