Estimation of the Individual Evoked Potential by Wavelet filtering and Bootstrap method

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Abstract

A new method to improve the signal-to-noise ratio of single evoked potentials (EP) measurements is presented, in which, contrary to already existent methods, no a priori assumptions about the signal characteristics are necessary. This method is based on the wavelet filtering combined with the bootstrap method.In a first step, several sweeps are recorded. Each sweep is decomposed in L detail levels, from D1 to DL and an approximation level AL. In a second step, the mean values of the coefficients across trials are calculated, for each instants. For each level, the empirical distribution of coefficients is estimated by a random permutation of horizontal row of coefficients matrix. One then computes the marginal mean value for each permutation of the matrix. The empirical distribution of the mean of the coefficients is obtained and from there, one computes the inferior and the superior thresholds correspondent to a limit confidence set to 0.05. One applies a thresholding on the coefficients of each original detail matrix. Only the coefficients which are out of this confidence interval will be kept, while others are set to zero. Once thresholding has been applied on the coefficients of each detail matrix from D1 to DL, one can compute the inverse wavelet transform, and then obtain the denoised signal. The performance of the method is evaluated with simulation and the method is applied to real data.

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