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Comparison of Basic Linear Filters in Extracting Auditory Evoked Potentials

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Abstract: In the present study, the performances of two well-known linear filtering techniques are compared for extraction of auditory Evoked Potential (EP) from a relatively small number of sweeps. Both experimental and simulated data are filtered by the two algorithms into two groups. Group A consists of Wiener filtering (WF) applications, where conventional WF and Coherence Weighted WF (CWWF)) have been assessed in combination with the Subspace Method (SM). Group B consists of the well-known adaptive filtering algorithms Least Mean Square (LMS), Recursive Least Square (RLS), and one-step Kalman filtering (KF). Both groups are tested with respect to signal-to-noise ratio (SNR) enhancement by comparing to the traditional ensemble averaging (EA). We observed that KF is the best method among them. The application of the SM before filtering improves the performance of the LMS and the assessments of WF where the CWWF works better than the conventional WF in that case. In conclusion, most of the linear filters show definitely better performance compared to EA. KF effectively reduces the experimental time (to one-fourth of that required by EA). The SM that has recently been revealed in EP estimation is found to be a meaningful pre-filter as it significantly reduces the noise level of EEG raw data.

Key Words: Adaptive filtering, Wiener filtering, auditory evoked potential, EEG

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