Multichannel ABR

MOTIVATION

The ABR (Auditory Brainstem Response) is widely used as a tool to assess the integrity of the first stages of the auditory system, clinically and in human and animal research. The measured signal is tiny relative to noise, and requires averaging over many trials. Furthermore, responses from different auditory processing sites are overlapped and are distinguishable only by their latency. Multichannel recording and analysis may overcome these limits.

THE DSS ALGORITHM

The DSS algorithm (Denoising Source Separation) finds the optimal linear combination of sensor or electrode waveforms, specific to some criterion (Särelä & Valpola 2005; also known as Common Spatial Patterns, CSP, Koles et al 1990). Here, the criterion to be optimized is repeatability over trials (de Cheveigné & Simon 2007).

In Matlab:

```matlab
% Data preprocessing
% (1) remove mean over initial 300ms to avoid HP filter glitch,
% (2) HP filter, 50 Hz cutoff,
% (3) cut into epochs,
% (4) subtract stimulus artifact,
% (5) remove outlier trials based on excentricity from mean,
% (6) remove mean.

% Electrode sensitivity analysis
% (1) normalized cross-correlation with best DSS,
% (2) leave-one out, measure best score

% Results

CONCLUSIONS

Multichannel ABR can:
- improve signal-to-noise ratio and reduce recording time,
- potentially help separate responses from different sources in the brainstem.

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References: