

Cross-wavelet estimators in horizontal apparent motion

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Introduction

Sampled-motion visual stimuli have been shown to activate extrastriate (V5) and striate (V1) cortex areas in close succession, which may suggest early parallel processing streams in the visual cortex. In order to verify this hypothesis, precise time and space charting of all essential activation sources in the visual cortex is necessary. We used single-trial magnetic visually evoked field (VEF) responses to localize time-space trajectories and matched common activation sources for flash and apparent motion stimuli.

Methods

During the experiments we used a CTF-64 channel whole-cortex biomagnetometer. Visual stimuli were projected on a screen and responses were recorded from -200 ms to +500 ms to each stimulus. Apparent motion stimuli were shown either near the center of the visual field or in the periphery - bright bars on a dark background appearing at two consecutive locations in the left visual field. In addition, flash stimuli appeared anchored at the same locations with the same random inter-stimulus intervals.

Cross-wavelet multiresolution decomposition (MRD) was applied to simultaneous motion-motion and flash-motion single-trial VEF in the theta band. We utilized recursive multiple source localization by simulated annealing and mapped the 4-D time-space trajectories.

Results

Our preliminary results clearly indicated early motion activation in the extrastriate and striate cortex areas. Responses increased in time at V5, while gradually decreasing at V1. Critical time points were charted for both motion-motion and flash-motion dependencies.

The presented method allows also single-trial evaluations of changes in time-space source trajectories over a range of trials, which might be useful for study of habituation, fatigue, learning and other time-dependent high-level neural processes.