

Abstract View

NONINVASIVE IMAGING OF INDEPENDENT CORTICAL FLOW PATTERNS.

[S.Makeig^{1*}](#); [T.J.Sejnowski²](#); [J.Anemuller³](#)

1. Inst. for Neural Computation, UCSD, La Jolla, CA, USA
2. The Salk Inst., La Jolla, CA, USA
3. Inst. for Neural Computation, UCSD, La Jolla, CA, USA

While independent component analysis (ICA) is useful for modeling brain and electroencephalographic (EEG) data, current ICA methods for EEG model signal sources as acting in perfect synchrony within spatially fixed domains. In contrast, invasive animal recordings have observed waves of neuronal activity propagating quickly across millimeters of cortex. We have incorporated spatial propagation of activity into the ICA model by assuming that activation of an effective signal source elicits a sequence of scalp potential maps with varying spatial topography, leading to a model of convolutive signal superposition. This mixing model may enable us to observe, in non-invasively recorded EEG data, stereotyped, temporally independent patterns of potential flow on the cortex. To apply the convolutive ICA model, we transform the recorded signals into the frequency-domain, then decompose them into independent components by a complex infomax ICA algorithm (Anemuller et al., 2003). Trajectories of activation flow on the scalp are obtained by projecting component activations back to the scalp electrodes and transforming the complex result into the real time-domain. We have analyzed data obtained from EEG recordings during a visual spatial selective attention task, deriving physiologically plausible components some of which had spatial flow characteristics. Inverse modeling resulted in physiologically plausible equivalent-dipole trajectories with low residual variance. Some component activities were strongly time locked to subject behavior. Quantitative analysis showed that complex frequency-domain components have a higher degree of independence than standard ICA components. By clustering complex components across different frequencies, clusters resembling clinically known frequency bands emerged.

Support Contributed By: The Swartz Foundation, Howard Hughes Medical Institute

Citation:

S. Makeig, T.J. Sejnowski, J. Anemuller. NONINVASIVE IMAGING OF INDEPENDENT CORTICAL FLOW PATTERNS. Program No. 401.16. 2003 Abstract Viewer/Itinerary Planner. Washington, DC: Society for Neuroscience, 2003. Online.



Site Design and Programming © ScholarOne, Inc., 2003. All Rights Reserved. Patent Pending.