SPATIOTEMPORAL DECORRELATED ACTIVITY PATTERNS IN FUNCTIONAL MRI DATA DURING REAL AND IMAGERY MOTOR TASKS. Dawei W. Dong[1*], J. A. Scott Kelso[1], W. Dale Wilke[2], Fred Steinberg[12]. [1] Center for Complex Systems and Brain Sciences, Florida Atlantic University, [2] University MRI of Boca Raton, Boca Raton, FL 33431.

We present a new method for separating multiple task-related events and other physiological and physical events revealed by functional MRI (fMRI) signals. Each event is a three-dimensional spatial pattern of brain activation and an associated time-course. The method separates fMRI signals into different events by minimizing the spatial and temporal correlations between events. We derived a closed-form solution which does not assume any spatial or temporal structure of an event, and works well for Gaussian and non-Gaussian distribution of different event signal sources.

The method was used to analyze fMRI data sets from subjects performing 5-minute trials composed of alternating 30-sec motor (real or imagery) and control task blocks. fMRI maps were collected every 3-sec, thus 100 spatial maps for each trial. The separated time courses of four leading events with maximum signal power are shown in the figure below for one specific trial. We found not only the activation in primary motor cortex during real motion (the left most time course) and in supplementary motor area during imagery motion but also other task-related as well as unrelated events. For example, we found an activation in auditory area (the time course second to the left) which was consistent with the time course of the auditory instructions given to the subject. We also found other events such as slow changes probably associated with head drifts (the two time courses on the right). (Supported by NIMH)