Feature-Based Approach to Fuse fMRI and DTI in Epilepsy Using Joint Independent Component Analysis

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functional magnetic resonance imaging (fMRI) and structural MRI (sMRI) provide complementary information. Signal processing and statistical models may be used to fuse neuroimaging data across different imaging modalities. In this paper, we present a data driven method for fusing resting state fMRI and diffusion tensor imaging (DTI) data at feature level. The features are amplitude of low frequency fluctuations (ALFF) and fractional anisotropy (FA) extracted from fMRI and DTI datasets of epilepsy and healthy controls, respectively. We discuss main issues associated with group independent component analysis (ICA) as a fusion method. We address our proposed approach for combining two modalities across subjects and back reconstruction of independent components for each group and each subject. Our results indicate that connectivity of regions in default mode network depends on integrity of white matter that connects the two hemispheres (corpus callosum). The proposed signal processing and statistical methods facilitate evaluation of brain connectivity using different modalities. Separate analysis of data modalities does not reveal results of joint analysis.

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