MODELING AXONAL CONNECTIVITY IN PRIMATE BRAIN FROM DIFFUSION-WEIGHTED MRI DATA

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Abstract

In previous meetings, we have described applications of Bayesian probability theory for modeling primate brain diffusion-weighted MRI data. From that analysis, the directional dependence of molecular displacement rates within each voxel has been inferred. In anisotropic regions of tissue, the directional dependence of diffusion conveys information about the cellular-scale tissue structure. Such measurements are of value for determining the orientations of axonal fiber tracts within white matter. In cases where fiber tracts pass through multiple voxels in the MRI data set, inter-voxel correlations in the least hindered direction of diffusion are observed. In this report, we extend the previously described voxel-wise Bayesian analysis to incorporate correlations between adjacent voxels. The resulting method provides a non-invasive means for detecting functional connections that link various regions within the brain.