Color Perception of Diffusion Tensor Images Using Hierarchical Manifold Learning

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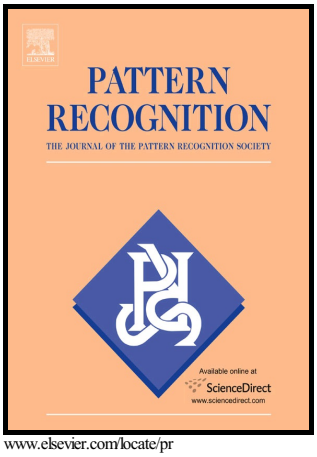

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Abstract

The color perception of Diffusion Tensor Images (DTI) by using voxel-based statistical analysis suffers from high computational cost and vague regional structure. To address these issues, we therefore propose a novel approach for color perception of DTI based on hierarchical manifold learning. First, the selection of the representative nodes as seeds within similar region to build them into the bottom-to-up hierarchical structure is derived from the algebraic multigrid and multi-scale graph partitioning. Next, the low-dimensional coordinates of the top-layer seeds are calculated using manifold-based techniques with a new distance metric and mapping of these coordinates into the RGB color space. Last, the color perception of DTI is obtained through interpolating the seeds to the bottom layer of all nodes. The experimental results demonstrate that the proposed algorithm can reduce the computation complexity from $O(N^3)$ (based on algorithms in the literature [9]) to $O(N^2)$ and highlight the different regional structures of the brain via color perception of variation.

Keywords: Diffusion tensor images; High dimensional data; Nonlinear dimensionality reduction; Color perception; Algebraic multigrid; Multi-scale graph partitioning