
Feature Sensitive Label Fusion With Random Walker for Atlas-Based Image Segmentation

Abstract:

In this paper, a novel label fusion method is proposed for brain magnetic resonance image segmentation. This label fusion method is formulated on a graph, which embraces both label priors from atlases and anatomical priors from target image. To represent a pixel in a comprehensive way, three kinds of feature vectors are generated, including intensity, gradient, and structural signature. To select candidate atlas nodes for fusion, rather than exact searching, randomized k-d tree with spatial constraint is introduced as an efficient approximation for high-dimensional feature matching. Feature sensitive label prior (FSLP), which takes both the consistency and variety of different features into consideration, is proposed to gather atlas priors. As FSLP is a non-convex problem, one heuristic approach is further designed to solve it efficiently. Moreover, based on the anatomical knowledge, parts of the target pixels are also employed as the graph seeds to assist the label fusion process, and an iterative strategy is utilized to gradually update the label map. The comprehensive experiments carried out on two publicly available databases give results to demonstrate that the proposed method can obtain better segmentation quality.