Active cut based 4D pathological anatomy modeling: A TBI imaging study

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Abstract

1 Introduction

2 Methods

2.1 Graph cuts

Graph Cuts global optimization: We define the objective function of graph cuts optimization as

$$\mathbf{E}(\alpha) = \gamma \sum_{(m,n)} \psi(\alpha_n, \alpha_m) \exp\left(-\beta_0 \|\boldsymbol{x}_n - \boldsymbol{x}_m\|^2\right) + \sum_{n}^{N} \mathbb{E}_{p(\mathbf{z}|\mathbf{x})} \log p(\boldsymbol{x}_n, \boldsymbol{z}_n; \theta(\alpha)),$$

$$\mathbb{E}_{p(\mathbf{z}|\mathbf{x})} \log p(\boldsymbol{x}, \boldsymbol{z}; \theta(\alpha_n)) = \sum_{k=1}^{K} z_{nk}(\log \pi_{nk} + \log \mathcal{N}(\boldsymbol{x}_n; \theta(\alpha_n))) + \beta \sum_{m \in \mathcal{N}(n)} \langle \boldsymbol{z}_n, \boldsymbol{z}_m \rangle - \log \mathcal{C}$$

where $\psi = 1$ if $\alpha_n \neq \alpha_m$, otherwise $\psi = 0$, and β_0 is estimated from data by taking expectation over image sample [1, 2]. The smoothness constraint depends on the data term, so it is a conditional random field. When building the graph, we set the T-link by the second term, and the N-link by the first term in the above equation.

3 Experiments

References

[1] Yuri Boykov, Olga Veksler, and Ramin Zabih. Fast approximate energy minimization via graph cuts. *IEEE PAMI*, 23(11):1222–1239, 2001.

[2] Carsten Rother, Vladimir Kolmogorov, and Andrew Blake. Grabcut: In-teractive foreground extraction using iterated graph cuts. In *ACM TOG*, volume 23, pages 309–314, 2004.