



一种基于Graph Cuts的多尺度乳腺肿块分割方法

作者：吴相颖, 徐伟栋, 厉力华, 刘伟, 张娟, 邵国良, Bin Zheng

单位：杭州电子科技大学自动化学院

基金项目：肿瘤早期诊断与治疗中的信息处理问题研究

摘要：

本文提出一种基于Graph Cuts的多尺度乳腺肿块自动分割方法。首先，应用区域统计融合方法对图像进行粗分割，将得到的粗轮廓作为后续Graph Cuts分割的初始轮廓。在迭代优化阶段，引入多尺度分析方法，以高斯金字塔分解得到的多尺度图像序列代替固定尺度的原始图像序列估计高斯混合模型（GMM）参数，将粗糙尺度的易分割性与精细尺度的精确性互补，使得算法以较少样本快速确定GMM参数以执行Graph Cuts分割。另外，为了提高算法的分割速度，采用分水岭算法产生一个区域邻接图，以较少样本代替像素邻接图。将本文方法、交互式Graph Cuts算法以及GrabCut方法应用于110例肿块病灶图像时，分别获得1.57、3.46和5.01的平均误分率。结果表明，相比于传统分割方法，本文提出的多尺度方法具有更高分割精度和鲁棒性。

关键词：肿块分割；graph cuts；多尺度；乳腺X线图像

Breast Mass Segmentation Using Iterated Graph Cuts Based on Multi-scale Smoothing

Author's Name:

Institution:

Abstract:

This paper proposes a novel scheme for mass segmentation in mammography, which is based on Graph Cuts algorithm and multi-scale analysis. Mammogram is segmented by statistical region merging firstly, and the obtained rough contour is used as the initial contour for Graph Cuts segmentation. In iterative optimization stage of the algorithm, multi-scale analysis method is introduced to estimate the Gaussian Mixture Model (GMM) parameters with pyramidal decomposing serial images instead of fix-scale original image. The algorithm estimates GMM parameters rapidly with fewer samples by utilizing the complementarities between segmentation accuracy of fine scale and segmentation easiness of coarse scale. In order to improve efficiency of the proposed approach, watershed algorithm is utilized to produce a region adjacency graph, replacing pixel adjacency graph with fewer samples. The proposed method, interactive Graph Cuts and GrabCut were simultaneously applied for mass segmentation on 110 mammographic ROIs, and the achieved average ratios of misclassification error are 1.57, 3.46 and 5.01 respectively. The results demonstrate that the proposed method achieves a better performance in accuracy and robustness.

Keywords: mass segmentation; graph cuts; multi-scale; mammography

投稿时间：2011-06-02

[查看pdf文件](#)