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论文与报告

基于高斯超像素的快速Graph Cuts图像分割方法

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摘要

提出了一种交互式的快速图像分割方法. 该方法通过使用高斯超像素来构建Graph cuts模型以实现加速. 首先, 利用融合了边缘置信度的快速均值漂移算法, 将原始图像高效地预分割为多个具有准确边界的同质区域, 并将这些区域描述为超像素, 用于构建精简的加权图. 然后, 使用区域的彩色高斯统计对超像素进行特征描述, 并在信息论空间中对高斯距离度量进行设计. 另外, 为了准确而精炼地对先验知识进行参数化学习, 本文还使用了分量形式的期望最大化混合高斯(Component-wise expectation-maximization for Gaussian mixtures, CEMGM)算法对用户交互进行聚类. 最后, 在改进的加权图模型中应用Graph cuts方法, 获得最终的分割结果. 通过使用不同的彩色图像进行分割实验比较, 仿真结果表明本文的方法在准确性和高效性方面都具有很好的性能.

关键词 图像分割 图切分 超像素 高斯模型 均值漂移 期望最大化算法

分类号

Gaussian Super-pixel Based Fast Image Segmentation Using Graph Cuts

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Abstract

This paper proposes a fast interactive image segmentation method. To achieve acceleration, the method constructs the graph cuts model using Gaussian super-pixels. The fast mean shift algorithm embedded with edge confidence is first applied to efficiently pre-segment the original image into homogenous regions with precise boundary, and these regions are described as super-pixels to construct the compact weighted graph. The feature of super-pixel is then represented by the Gaussian statistics of color information in the corresponding region, and the dissimilarity measure of Gaussians is designed in the space of information theory. Additionally, in order to learn the parameters of priori knowledge accurately and compactly, the component-wise expectation-maximization for Gaussian mixtures (CEMGM) algorithm is used to cluster the user interactions in this paper. Finally, the graph cuts algorithm is applied to the improved weighted graph model to achieve the final segmentation. Through the comparison of different color image segmentation experiments, simulation results demonstrate the superior performance of the proposed method in terms of segmentation accuracy and computation efficiency.

Key words Image segmentation graph cuts super-pixel Gaussian model mean

shift expectation-maximization algorithm
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