Superpixel Merging Software User Guild

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Introduction

This software is designed to perform superpixel merging. It is developed using Microsoft visual studio C++. This is an academic software, and commercial use is prohibited.

There are 7 parameters:

index	Parameters	description
1	The path of source image file.	
2	The path of superpixel file.	An int32 image file. The value of each pixel denotes the superpixel label of this pixel. This file can be obtained using a superpixel segmentation algorithm, such as SLIC, watershed, SCoW, Seeds, etc.
3	The path of result file.	An int32 image file that storages the final merged superpixel labels. You need to visualize the superpixels in other software.
4	The merging criterion (0-3)	Four merging criteria are provided: ***(1) Baatz &Schape：*** $$C_{i,j} = w_{color} \cdot \Delta h_{color} + w_{shape} \cdot \Delta h_{shape}.$$ $$\Delta h_{color} = \sum_c w_c \cdot \left(n_{i\cup j} \cdot \sigma^c_{i\cup j} - n_i \cdot \sigma^c_i - n_j \cdot \sigma^c_j\right),$$ $$\Delta h_{shape} = w_{compt} \cdot \Delta h_{compt} + w_{smooth} \cdot \Delta h_{smooth},$$ $$\Delta h_{smooth} = n_{i\cup j} \cdot \frac{l_{i\cup j}}{b_{i\cup j}} - n_i \cdot \frac{l_i}{b_i} - n_j \cdot \frac{l_j}{b_j},$$ $$\Delta h_{compt} = n_{i\cup j} \cdot \frac{l_{i\cup j}}{\sqrt{n_{i\cup j}}} - n_i \cdot \frac{l_i}{\sqrt{n_i}} - n_j \cdot \frac{l_j}{\sqrt{n_j}},$$ ***Reference:*** *M. Baatz and A. SchApe, "Multiresolution segmentation: an optimization approach for high quality multi-scale image segmentation,"*Angewandte Geographische Informationsverarbeitung XII*, pp. 12–23, 2000.* ***(2) Full Lambda:*** $$C_{i,j} = \frac{N_i \cdot N_j}{N_i + N_j}\left(\mu_i - \mu_j\right)^2 \cdot \frac{1}{l^{\lambda}}$$ *N is the area, u is the mean spectral value, l is the shared boundary of region i and j,* λ *is the shape parameter.* ***Reference:*** ***(3) Spectral Histogram:***

		$$C_{i,j} = \frac{N_i \cdot N_j}{N_i + N_j} \cdot G(i,j) \cdot \frac{1}{l^{\lambda}}$$ *G(i,j) is the G-Statistic value of two spectral histograms i and j.* *Reference: A. Wang, S. Wang, and A. Lucieer, "Segmentation of multispectral high resolution satellite imagery based on integrated feature distribution," Int.J. Remote Sens., vol. 31, no. 6, pp. 1471–1483, Feb. 2010.* ***(4) Color-Texture Model:*** $$C_{i,j} = \frac{N_i \cdot N_j}{N_i + N_j} \cdot (w_c G_c + w_T G_t) \cdot \frac{1}{l^{\lambda}}$$ *Gc is the G-Statistic value of two spectral histograms, Gt is the G-Statistic value of two LBP texture histograms; wc and wt are the corresponding weights, they are automatically estimated.* ***Reference:*** *(1) A Spatially-Constrained Color-Texture Model for Hierarchial VHR Image Segmentation. IEEE Geoscience and Remote Sensing Letters. 2013, 10(1), 120-124.* (2) 结合光谱纹理与形状结构信息的遥感影像分割方法. 测绘学报, 2013, 42(1), 44-50. (3) 基于区域的影像多尺度表达与应用研究，胡忠文，武汉大学博士论文，2013.
5	The number of regions after region merging.	An integer value. For example, 30 means there are about 30 regions after the region merging.
6	The shape parameter (0-1)	A float value. If the Baatz&Schape criterion is used, the parameters corresponds to w_{shape}. If the other three merging criteria are used, the parameter corresponds to λ.
7	The compact parameter (0-1)	A float value. This parameter is only used in Baatz & Schape merging criterion.

Other reference:

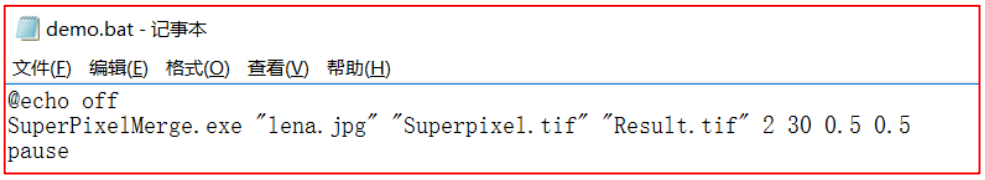
RAG-NNG:

Hybrid image segmentation using watersheds and fast region merging," *IEEE Trans. Image Process, 1998*

Hierarchical Region Merging:

Hierarchy in picture segmentation: A stepwise optimization approach," *IEEE Trans. Pattern Anal. Mach. Intell.*, 1989

A Demo is provided. The usage is provided in Demo.bat. You can edit it for your work.



Source image, superpixels, final results.

My other related works

(1) Watershed Superpixel. ***IEEE ICIP*** 2015.

(2) A Bi-level Scale-sets Model for Hierarchical Representation of Large Remote Sensing Images, ***IEEE TGRS***, 2016.

(3) Unsupervised Simplification of Image Hierarchies via Evolution Analysis in Scale-Sets Framework, ***IEEE TIP***,2017.

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http://www.viswtech.com/