

HOMEWORK ASSIGNMENT #2

DUE: October 7, 2014

CSCI 574: Computer Vision, Prof. Nevatia
Fall Semester, 2013

This is a programming assignment. You are asked to experiment with two methods implemented in the OpenCV library (v2.4.9). One is the Mean Shift based segmentor; another is Watershed segmentor. Details of the two are given below.

Part (a): Mean Shift Segmentor

Implement and test a *Mean Shift Segmentor*. The Mean shift algorithm is given by the function **PyrMeanShiftFiltering**. Following link provides the declaration of the function in OpenCV documentation:

<http://docs.opencv.org/modules/imgproc/doc/filtering.html?highlight=pyrmeanshiftfiltering#cv.PyrMeanShiftFiltering>

Note 1: Unlike the traditional RGB color space, **CIELAB color space** is designed to be approximate to human vision and perceptually uniform. We will do the image segmentation based on LAB color space in this problem.

Note 2: You only need to use a level-1 pyramid for this assignment with different spatial window radius and different color window radius.

Part (b): Watershed Segmentor

Implement and test a marker-based image segmentation using *Watershed Segmentor*. The Watershed algorithm is given by the function **watershed**. Following link provides the declaration of the function in OpenCV documentation:

[http://docs.opencv.org/modules/imgproc/doc/miscellaneous_transformations.html?highlight=watershed#void watershed\(InputArray image, InputOutputArray markers\)](http://docs.opencv.org/modules/imgproc/doc/miscellaneous_transformations.html?highlight=watershed#void watershed(InputArray image, InputOutputArray markers))

Note: One of the input, “markers” map, is the initialization of the “seeds” for the image regions. You can define it manually.

You will need to write code to invoke the functions given above, and to display and print the results. Apply your segmentors to examples given on the DEN website for this assignment. Please identify the various key parameters involved in the two algorithms, and describe their effect on the segmentation result. You are also required to perform a qualitative comparison between the algorithms with the ground truth boundaries.

Image Data:

Three images and their corresponding ground truth boundaries are provided with the assignment.

What to Submit?

You should turn in the following in hardcopy (remote students may submit an electronic version):

- 1 A brief description of the programs you write (include the source listing). Each module should be **well commented**.
- 2 Test results on the given images with a few different values of the applicable parameters. Obviously, one can easily create hundreds of results by varying parameters; to save printer paper, just include a few that you think illustrate the key differences.
- 3 An analysis of your test results. This should include a comparison of the results obtained using the mean-shift and watershed segmentors, as well as a discussion of the effects of the choice of relevant parameters and how one might make a good choice of these parameters. Base your conclusions on your test results rather than on the observations made by the instructor or the authors of the books and papers.