

Statistical and Learning Techniques in Computer Vision

Homework 5: Due Thursday, October 19, 2006

This homework assignment involves two parts, each longer than anything you have had to work on thus far. As a result you have two weeks to complete the assignment.

In terms of your final semester grade, we are dispensing with the distinction between categories of assignments. Instead, we will be assigning points at different levels based on the length, difficulty and importance of the assignments. Your numerical grade for the semester will be computed by summing the total points you earned and dividing by the total possible points.

1. **(50 points)** Implement the BP stereo algorithm as described in the paper by Felzenszwalb and Huttenlocher we covered in class. More credit will be given for implementing more of the acceleration techniques presented. You may find test data at

<http://cat.middlebury.edu/stereo/data.html>

You are welcome to use C, C++ or Java as opposed to Matlab, in part to make the program faster and in part to handle data structure issues more comfortably. Make sure, though, that whatever you use has image input and output capabilities. Your submission should include your source code, a brief written summary of your implementation, timing results, and output images.

2. **(50 points)** (Please work on this question alone, not in consultation with other students.) As we discussed in class, the introduction of the belief-propagation and the graph-cuts algorithms has had a major impact on the use of MRFs in problems such as stereo matching. Another relatively-recent development has had a similar impact on stereo matching — the introduction of the quantitative comparison tool at Middlebury. See

<http://cat.middlebury.edu/stereo/>

If you look carefully at this page, you will note that the best algorithms listed at this sight are not the ones we discussed in class. Instead, the combination of the availability of quantitative tests and the major change in thinking brought about by BP and graph cuts have led to rapid development of new and (at least on the test suite) better algorithms. Your assignment is to choose one of the top algorithms listed on the site, read the referenced publication (and any other publication necessary to understand the algorithm), and summarize, in about two pages, the innovations that led to the improved results. Include in your discussion some analysis of how well you think the algorithm will work on other stereo data sets that are somehow different from the ones on the Middlebury site.