CSE 803: Homework Set #4 Fall 2009 Rev 20 Oct
Individual work; due Sunday, 1 Nov. 5PM either method.

Report answers to the following questions. In each of the problems, you may do part of the work by hand/eye and part of the work using programming.

1. Exercise 9.7 Page 267 of S&S.

2. Exercise 9.8 only part (b) page 267 of S&S.

3. Given below are two points for each of eight time instants. Partition these points into two paths (say squares versus circles) or (A1,A2, ..., A8 versus B1, B2, ..., B8) such that the total smoothness computed by formula 9.6 is maximum. (You can intuitively apply operations of the greedy exchange algorithm without any programming of it. You are welcome to use computer programs to help in any stepwise fashion.)

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<td>70</td>
<td>150</td>
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4. Enhance your programming work to address the problem of finding the best match of an N x N block of image B in image A, assuming that both images are taken from approximately the same scene at approximately the same time. The exercise is to see if we can compute how some neighborhoods moved from A to B.

   (a) The program[s] should input two images, A and B, and a list (array) of centers C = (Cr, Cc) j of a few blocks in image B. Images A and B will have approximately the same size and will be from approximately the same scene – with some motion between them. (You may make the images the same size using an image tool, if necessary for your programming work.) The centers C should be ”interesting points” that you may find by hand/eye using your favorite image tool on the images.

   (b) The program should output image B with the following graphics overlaid in some noticeable colors. (a) Each center in list C, should be specially colored in image B. (b) Show a specially colored bounding box R in image B that locates the best matching block **in image A** for each center C. Note that the center C will not be the center of the bounding box! It is optional that you do any displays with actual image A.

   (c) The student should test two block sizes, say, 7 x7 or 15 x 15, or 31 x 31, etc. An odd number is used for symmetry about the center point C.

   (d) You should include at least 5 interesting cases in your report. For each case, output a quantitative match value between the best match of the block from B to A. Make sure you discuss these results in your report.

   (e) Obtain your own image pair, A and B, from the web or your own collection, etc. and report on your results.

   (f) About a week before the due date, two sets of test images will be given – you should report on your test results with these. They will be named hw4test1A.pgm, hw4test1B.pgm, hw4test2A.pgm, hw4test2B.pgm.