CSE252 – Computer Vision – Assignment #4

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`http://www-cse.ucsd.edu/~sjb/classes/sp02/cse252`

Target Due Date: Tue. May. 28, 2002.

1. Implement the `CONSTANT_FLOW` algorithm from T&V, which is based on Lucas and Kanade (1981). Demonstrate it on the pair of frames provided on the course web page. Show how the eigenvalues of $A^T A$ allow one to identify the regions with reliable optical flow. Note: the images have already been smoothed, so you can skip steps 1 and 2.

   Matlab hints: `quiver`.

2. This problem refers to Bookstein's 1989 PAMI paper, which is linked on the course webpage.

   (a) Reproduce Fig. 4, which illustrates the exact Thin Plate Spline mapping between the given pointsets. You do not need to reproduce the principal warps part (i.e. the signed segments or the little table), but you do need to show the interpolated grid points and the integral bending norm.

   (b) Repeat the above process using regularization, i.e. replace K by $K + \lambda I$, and demonstrate the effect of varying λ.

3. Download and run the script `make_pointset.m` to produce the pointset shown in class consisting of an annulus and an off-center clump. Apply the Normalized Cuts algorithm to partition this into two clusters. Use affinities based on Gaussian weighted Euclidean distance (i.e. proximity) by defining $w_{ij} = e^{-(d_{ij}/\alpha)^2}$. Run your algorithm with several choices of α and discuss the resulting partitions.