LAB 5: DESCRIPTORS AND MATCHING

DUE: 13 DECEMBER.

Task 1 (20) Compute dominant orientation of features

Take the features from Lab 4 at the corresponding scale and compute the gradient take 41x41 patch. Compute a histogram of orientations having 36 bins, where the result in each bin is the sum of the magnitudes of the gradient. You should scale the gradient by a gaussian 1.5 times the scale of the keypoint. Check SIFT paper, section 5 for details.

Task 2 (50)

Compute the SIFT descriptor as a 16, 8 bin direction histograms. The coordinates of the descriptor need to be rotated accordingly to the orientation computed in Task 1. The resulting 128 feature vector needs then to be normalized, clip to 0.2 and renormalized. Check SIFT paper, section 5 for details. You can find more details here.

http://www.vlfeat.org/api/sift.html

http://mi.eng.cam.ac.uk/~cipolla/lectures/4F12/Slides/old/4F12-SIFT-extra-material.pdf

https://web.eecs.umich.edu/~silvio/teaching/EECS598/lectures/lecture10_1.pdf

Task 3 (30) Matching using NNDR

Use the Nearest Neighbor Distance Ratio to improve the matching, ordering your matches by confidence. Use the ground truth matches from the file to evaluate your descriptor and matching. Record some statistics about the Accuracy of the matching.

NOTES:

You have ground truth correspondences in a mallab file. Try your descriptor and matching with the ground truth before using your key point detector from Lab 4.

For the descriptor, you can start with a simple patch around the key point, and keep adding parts of SIFT progressively. Scale, rotation, several direction histograms, smoothing function, trilinear interpolation, etc.

If you prefer to use a different descriptor, such as GLOH.

In the latest stage, if your implementation of Lab 4 is poor, you can try with some detector from OpenCV.

Extra:

You can use some data structure to improve the search speed.