Exercises in Tracking & Detection

Exercise 1   Ferns

In this exercise we will implement the Ferns (M. Ozuysal, P. Fua, and V. Lepetit, *Fast Keypoint Recognition in Ten Lines of Code.* In Proceedings of Conference on Computer Vision and Pattern Recognition, 2007). First read the paper and understand it!

- Implement the Ferns where the number and the depth of the Ferns are parameters.

- Implement a read and save function (in order to save your Ferns once they are trained and to quickly read them back when necessary).

- Use image patches localized on the most robust Harris points within a rectangular pattern (which you are free to define yourself) defined in the first image of the provided image sequence. You are free to choose the size of the patches yourself (however we recommend to use sizes in the range from 30x30 to 50x50). For Harris you may take your own (well working) implementation or any provided implementation from the Web. The most robust Harris points are computed by warping the first image with different random transformations, detecting Harris points on the warped images and back-projecting them to the first image. The occurrences of all back warped Harris points are counted for a certain neighborhood and only the Harris points with the highest occurrence numbers are taken.

- Train the Ferns with randomly warped versions of your initial patches (a usually good number of training samples for each patch is 1000-5000). Use affine transformations for your warping (see Zisserman page 40 eq.2.12.). You can use the matlab warping functions. You can choose the number of Ferns and the depth of the Ferns yourself. Good numbers are: number of Ferns = 20. depth of the Ferns = 10.

- Do not forget to normalize the Ferns before you use them!

- Before you classify the patches around the Harris points with Ferns it might be good to smooth the image with a Mean or a Gaussian filter (e.g. a Gaussian Filter of size 5x5).

- Track the rectangular region defined in the first image throughout the sequence by using Harris Feature points, the Ferns, RANSAC and DLT.