

Exercises in 3D Computer Vision

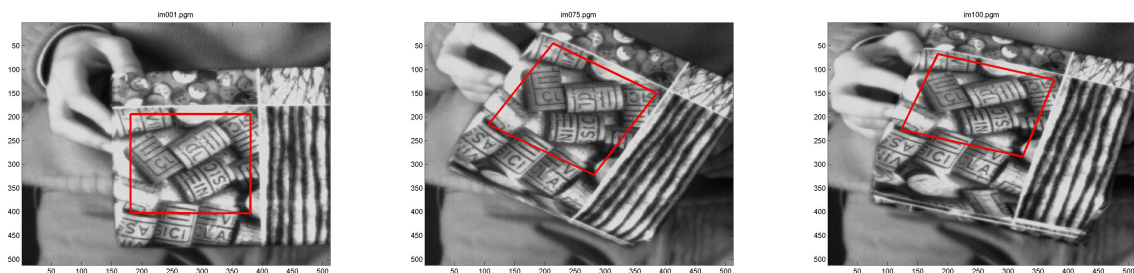
Exercise 14 (P) Template-based tracking and MEX files

In this exercise, we see another approach to do markerless tracking: *template-based tracking*. You have to complete some parts of a Matlab file corresponding to a basic implementation of the following paper:

S. Benhimane and E. Malis, Real-time image-based tracking of planes using Efficient Second-order Minimization *IEEE/RSJ International Conference on Intelligent Robots and Systems, vol. 1, pp. 943-948, Sendai, Japan, October 2004.*

Having a sequence of images, we select in the first image I^* a (planar) reference template to track. Supposing that we have an approximation $\hat{\mathbf{H}}$ of the correct homography between the image I^* and the current image I , the objective is to find an incremental homography $\mathbf{H}(\mathbf{x})$ such that the difference between the region of the image I warped with the composition $\hat{\mathbf{H}}\mathbf{H}(\mathbf{x})$ and the corresponding region in the image I^* is equal to zero.

- a) To complete the Matlab file, you can use functions you implemented previously. Here are some excerpts of the program on the sequence *Corke*:



- b) Matlab offers the opportunity to use Matlab Executables or a MEX files. These are files that are dynamically linked subroutines produced from C or C++ source code that can be used in the same way as normal M-files. It is then possible to call existing C routines from MATLAB and/or to improve the efficiency of bottleneck computations (like for-loops).

Here, in order to introduce you to the usage of MEX files, write a MEX file (based on C++) that replaces the function *Jacobian*.

You can find guidelines for MEX-files creation in this address:

<http://www.mathworks.com/support/tech-notes/1600/1605.htm>.