

Computer Vision

Exercise Sheet 7

Prof. Dr. Dr. Lars Schmidt-Thieme, Hanh Nguyen
Information Systems and Machine Learning Lab
University of Hildesheim

May 24, 2017
Submission until May 30, 14.00 via learnweb

Exercise 1: DLT (20 points)

- a) What is the Direct Linear Transformation Algorithm? What are its 4 most important tasks? (4 points)
- b) Given following points, extracted from two images with SURF feature detector and extractor, use the classic DLT algorithm to compute the homography transformation matrix H .

$\mathbf{x} (x,y,1)$	$\mathbf{x}' (x',y',1)$
(974.64,84.79)	(1010.37,81.95)
(1002.11,81.85)	(1151.48,75.10)
(938.91,60.76)	(973.68,58.05)
(940.81,55.39)	(975.28,52.61)
(982.48,48.33)	(1018.36,53.09)

Table 1: points

Useful methods:

- Matrices should be stored as a numpy array. To convert a list of python to an array of numpy: `numpy.asarray(A)`
- To multiply 2 matrices: `numpy.dot(A,B)`
- To transpose a matrices: `A.T`
- To compute the SVD: `cv2.SVDdecomp(src)`: `src` decomposed matrix; the function will return `w` calculated singular values, `u` calculated left singular vectors, `vt` transposed matrix of right singular values.

Hint: Pay attention to matrix dimensionalities.

(10 points)

- c) How should the code be modified to use the normalized DLT algorithm? Explain how the normalization matrices are computed, how and when this normalization is applied to the data. Why is the normalization important?

(6 points)