Technische Universität München
Fakultät für Informatik
PD Dr. Slobodan Ilic

WS 18/19
Exercise Sheet 2
November 15, 2018

Exercises in Tracking & Detection

Task 2 Pose estimation with PnP

After the last exercise we have SIFT keypoints corresponding to the tea box and their 3D locations on the model. Now object detection and pose estimation can be automatized.

For each image in the folder **images/detection** you are required to detect the object and estimate its pose. Given an image, you need to compute SIFT keypoints and match them to the database of SIFT keypoints computed in the previous exercise. For matching of the keypoints you should use VLFeat function *vl_ubcmatch*. Those matches will provide 2D-3D correspondences, which can be used for PnP to estimate object's pose. Unfortunately, PnP cannot be applied directly since there are some wrong matches which will worsen the estimated pose. This problem can be overcome by using the RANSAC algorithm already presented in the lecture. The following high-level pseudocode is based on RANSAC description in "Multiple View Geometry" by Richard Hartley and Andrew Zissermann.

i Randomly select a sample of **4** data points from S and estimate the pose using PnP.

ii Determine the set of data points S_i from all 2D-3D correspondences where reprojection error (Euclidean distance) is below the threshold t. The set S_i is the consensus set of the sample and defines the inliers of S.

iii If the number of inliers is greater than we have seen so far, re-estimate the pose using S_i and store it with the corresponding number of inliers.

iv Repeat the above mentioned procedure for N iterations.

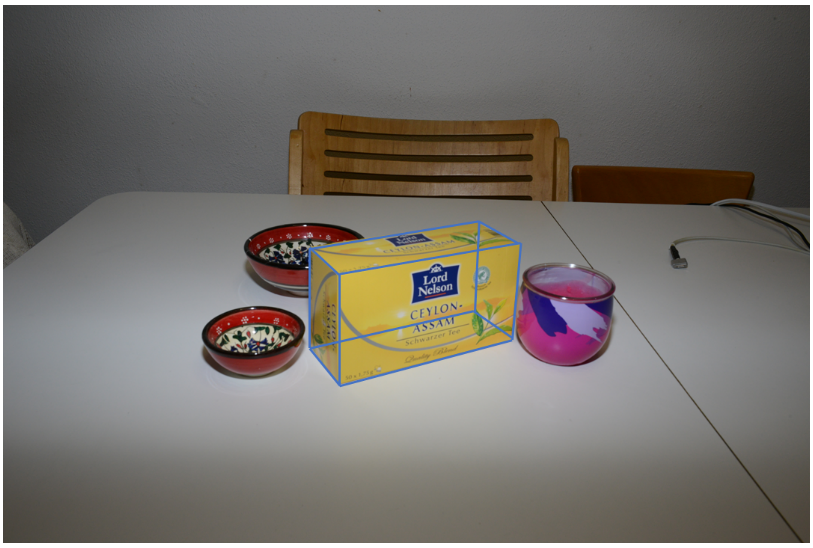

Figure 1: Visualization of the bounding box for the estimated pose

Implement this algorithm such that threshold t and number of iterations N can be selected by the user.

For each image from the test sequence you are required to provide visualization of 3D bounding boxes for the detected object as shown in Figure 1.