

Computer Vision Self-study exercise - Stereo vision

Figure 1 illustrates the two given images (left.jpg and right.jpg) obtained by the stereo camera. Figure 2 shows the 3D positions of the points on the plate used for calibration, given in the file calibration_points3.txt and listed in the same numbering order as depicted in the image (calibration_pointnumbering.jpg).

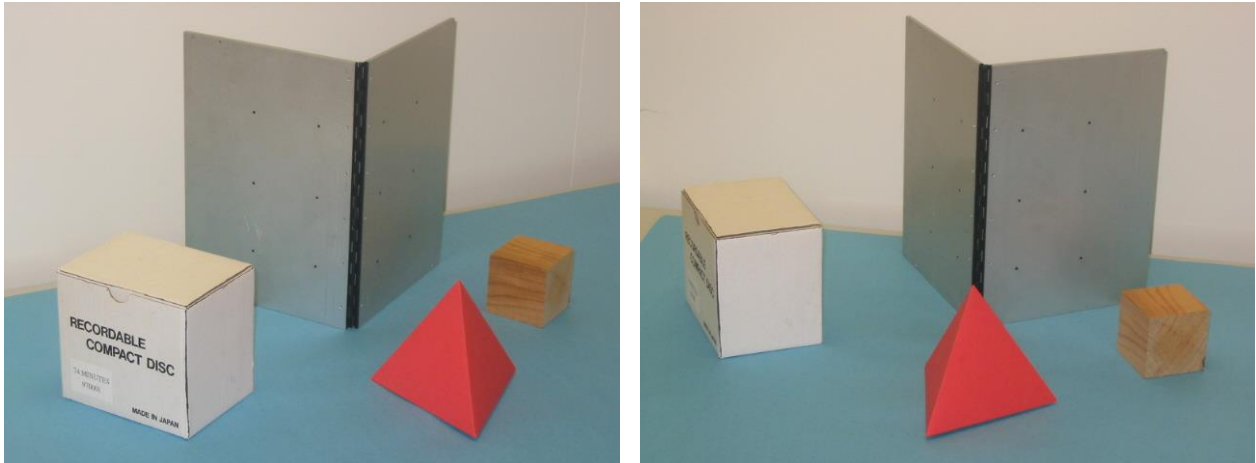


Figure 1. Reference left.jpg and right.jpg images.



Figure 2. Ordered points in calibration_pointnumbering.jpg.

1) Calibration.

- Select the points for calibration from these image figures manually. (Same order)
Hint: in MATLAB, use the ginput command to select them. In OpenCV, one can use the mouse events. (Select in the same order)
- Calculate the projection matrix M for left and a right image (see theory on 'image formation, geometric model'). Get the intrinsic and extrinsic parameters and order them in matrices K , R and T .
- Visualize the world axes in both left and right images.

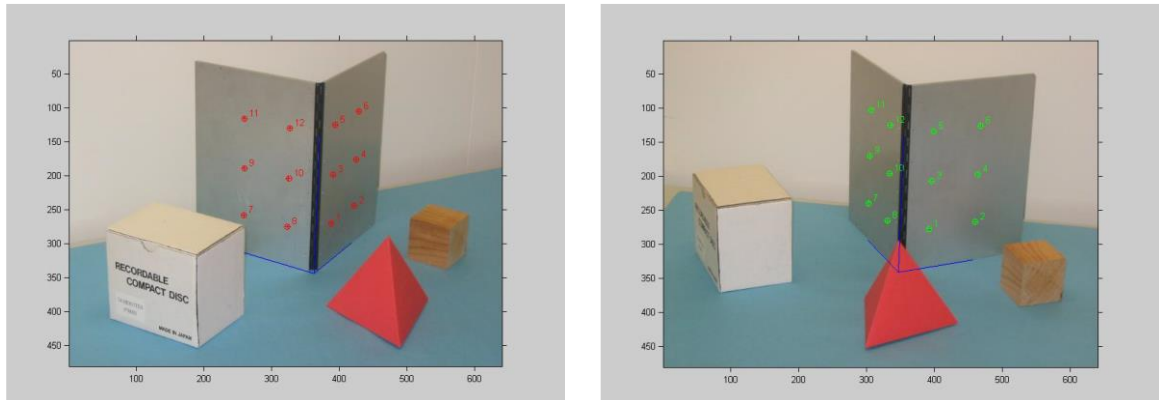


Figure 3. Visualization example.

2) Reconstruct the 3D world.

- Reconstruct the calibration points (plot a 3D world).
- Estimate the error between the true coordinates and the reconstructed ones.
- Manually select in the left and right image the set of points shown in figure `correspondence_left.jpg` and `correspondence_right.jpg` to reconstruct them and show them also on the plot of the 3D world.

Hint: use lines or patches to reconstruct the objects.

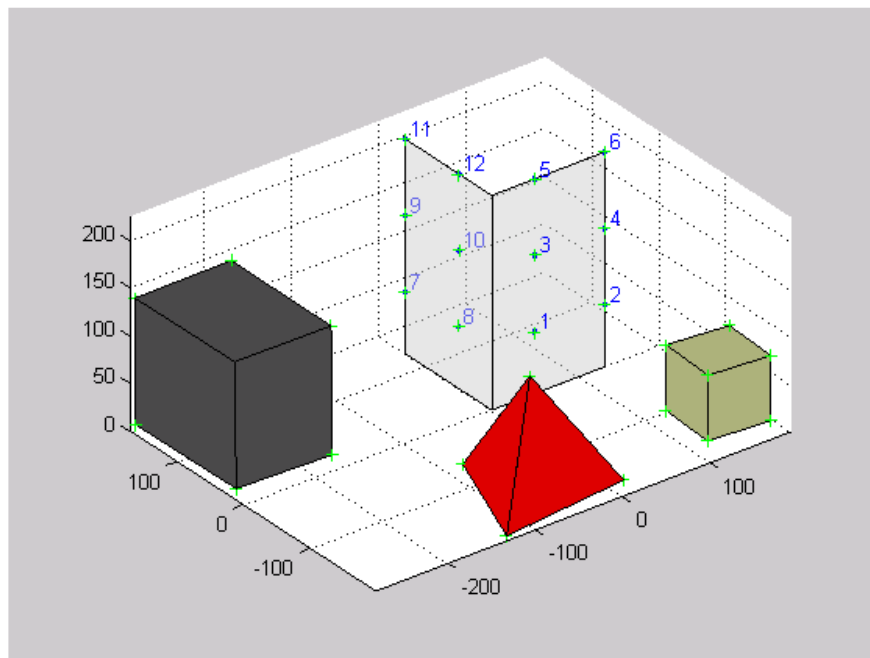


Figure 4. 3D reconstruction example.

The deadline for these assignments is on 16 December 2022. To submit your results, create a project folder containing a ReadMe.txt file to explain how to run your programs and the expected output, add the requirements.txt file with the necessary libraries and versions used (see below a project structure example). Compress the folder in a file, name it as follows: WPO1_yourfirtsname_yourlastname, and send the compressed file to aberengu@etrovub.be.

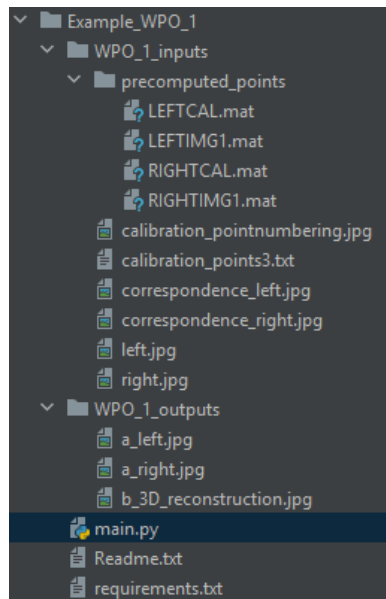


Figure 5. Project structure example