

Computer Graphics and Computer Vision

Self-study exercise - Stereo vision for depth estimation

The images obtained by the stereo camera are left.jpg and right.jpg.
The 3D position of the points on the plate used for calibration are given in the file *calibration_points3.txt*. They are listed in the order of the numbering in image *calibration_pointnumbering.jpg*



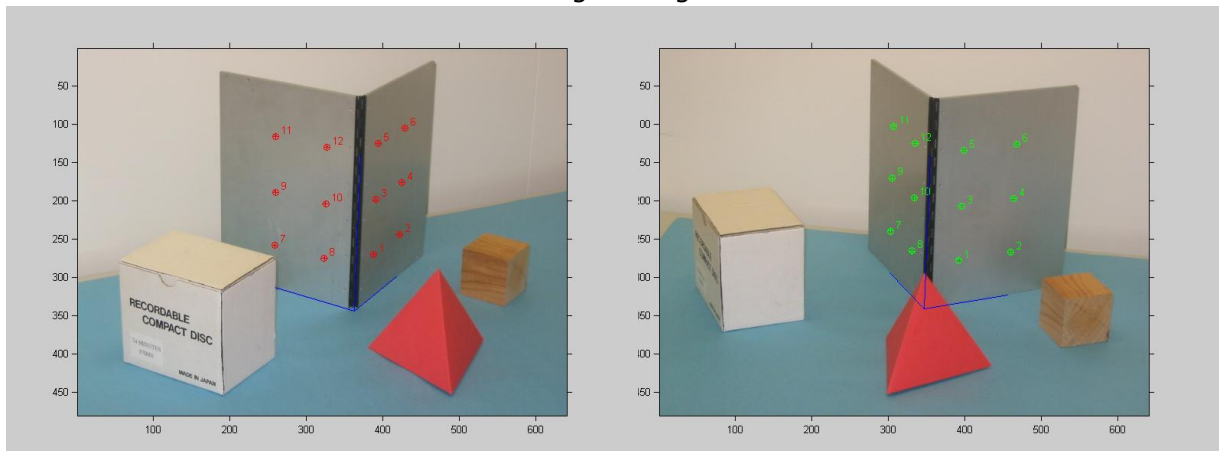
a. Calibration

Select the points for calibration from these image figures manually.

hint: use the matlab ginput command to select them in the same order!

Calculate the projection matrix M for left and right image (see theory on 'image formation, geometric model'). Get the extract intrinsic and extrinsic parameters and order them in matrices A and C .

Visualize the world axes in both left and right image:



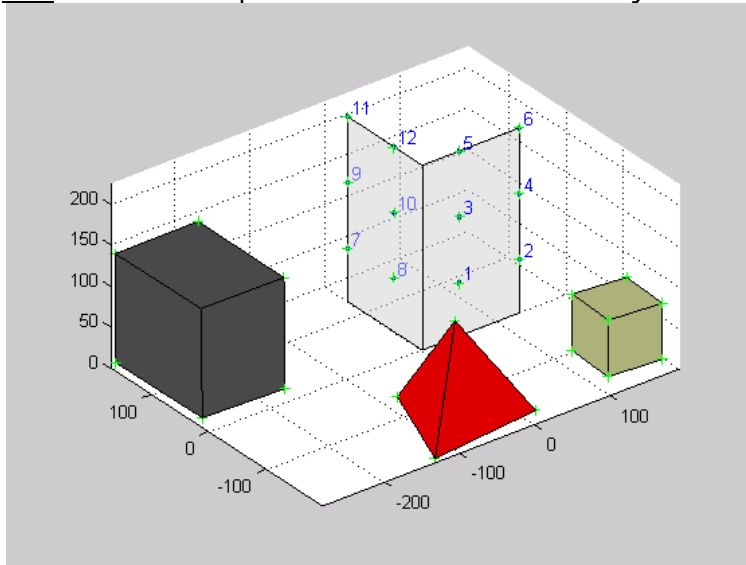
b. Reconstruct the 3D world

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.

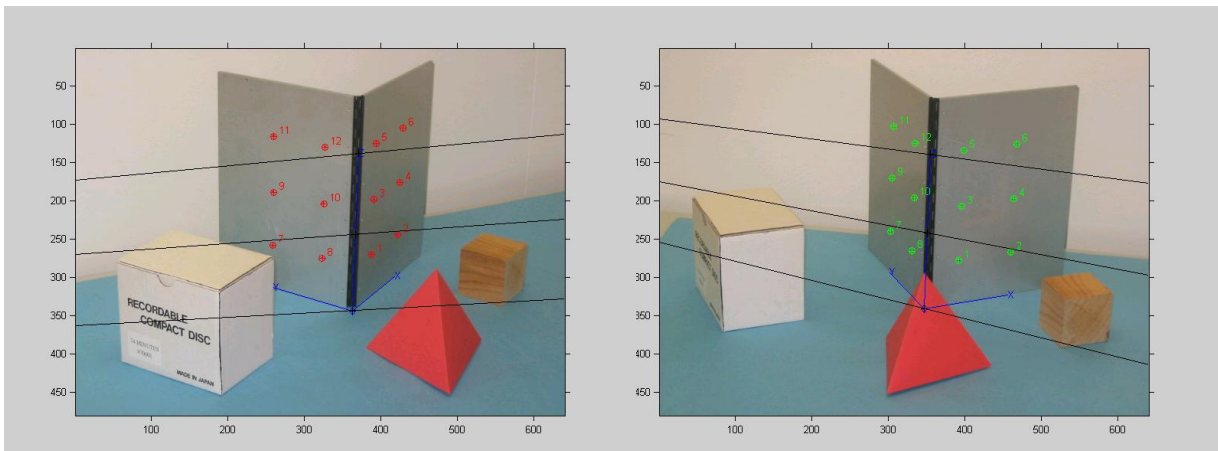
hint: use lines or patches to reconstruct the objects.



c. Epipolar lines

Visualize a set of epipolar lines in both images. Start from a the world coordinates of some points of which you know that their projection lies in both images.

hint: First make an analytical formula and see which lines actually fall inside the images!



Apply rectification to the images

Check that the epipolar lines are now parallel