Exercise Sheet 4

THEORY:

* Exercise 1:

Image rectification simplifies the epipolar geometry. More specifically, after rectification corresponding points lie on the same row that is they have the same y-coordinate, leaving only the x-coordinate to be found. (for images, vertically rectified, switch the role of x and y)

* Exercise 2:

Converging cameras 🡪 “standard” triangulation 🡪 SVD

Rectification removes the need to perform SVD since the depth can be computed using similar triangles, i.e. classical Euclidean geometry.

* Exercise 3:

In general, in a multi-view scenario image rectification is not the best approach. This happens because there is too little overlap between neighboring images, significant change in viewpoint as well as severe occlusions.

However, if the scene/object is densely sampled, neighboring images tend to be similar and in this case rectification may be helpful.

IMPLEMENTATION:

Flowers

* Q1:

No. Due to high ambiguity of pixel-based cost function, matching becomes sensitive to image noise and illumination changes, leading to noisy reconstructions.

* Q2:

Yes. Window-based cost functions are less sensitive to noise and illumination changes.

Kitti:

* Q3:

No. See Q1 above.

* Task2.6:

Windows\_size = 5 pixels seems to be optimal.

* Q1:

Smaller windows yield better reconstructions in textured areas and better retain object boundaries. That is, they tend to preserve small details. However, in low textured areas, the reconstruction is considerably noisy. Larger windows are more robust to noise and deliver smooth reconstructions (in comparison to small windows) but details and object boundaries may be lost or oversmoothed.

* Q2:

Processing time is proportional to the size of the window.