Exercise 5 (8 points)

This exercise includes four tasks. Please prepare the task answers given the course content, related slides, and provided materials.

Task 1 (2 points): (1) Please list the steps/pipeline of stereo reconstruction and glue these steps together with simple descriptions for better clarity, given the course and related slide.

(2) please explain in detain how to rectify stereo images step by step, given the course and related slide.

Task 2 (2 points): Please explain in detail about how to solve the optical flow equation $I_x u + I_y v + I_t = 0$ using LUCAS-KANADE method.

Task 3 (2 points): Please implement LUCAS-KANADE optical flow, given provided video (see the OF_Single.mp4). It is ok to use OpenCV-python (https://pypi.org/project/opencv-python/) for implementation. It is allowed to use ready-made routines online.

1) Save your **result** (picture with mask) to be JPG format and submit it with your **code**.

2) Sparse optical flow methods like LUCAS-KANADE select some pixels of the image in our task video to track, but why other pixels are not selected for tracking. Moreover, some selected pixels are lost or changed in the tracking process. Please explain the **reason**.

Task 4 (2 points): Given provided video (see the OF_Dense.mp4), please run the ready-made dense optical flow method (Gunnar Farneback's algorithm based on OpenCV-python, link: https://docs.opencv.org/4.x/d4/dee/tutorial_optical_flow.html).

Save the **result** of dense optical flow to be JPG format and submit it with your **code**.

Note that all answers, results, and codes should be submitted in one PDF with your name and student number.

There will be an exercise session before your submission (every Wednesday 4:15) where you can ask questions related to the exercise tasks 1-4 if you cannot understand the tasks completely or there is something confusing.