Autonomous Vehicles and Artificial Intelligence SoSe 2026

Assignment 2: Stereo Vision and Coordinate Transformations



Hand-In via Moodle: June 4, 12:00

The goal of this assignment is to implement stereo vision using a mono camera and two subsequently taken frames. You will then implement the appropriate coordinate transformation so you can visualize the detected points as coordinates in the map. As in the lecture, you can assume that the relevant frames will be given. Implement the following steps in the Jupyter Notebook provided with this assignment:

Stereo Vision

1. Preprocessing Camera Images

   Detect Keypoints and descriptors in the camera images

   Perform Stereo Matching of the Keypoints
2. Stereo Rectification

   Calculate the fundamental matrix that describes the epipolar geometry between the two images

   Draw the epipolar lines for this geometry

   Perform Stereo Rectification of the image pair
3. Calculate Disparity with StereoSGBM and generate the disparity map

Coordinate Transformation

1. Declare the car pose in the map frame
2. Convert yaw and build the rotation matrix
3. Build the homogeneous transform for the map frame
4. Transform the detected point into the map frame
5. Visualize the coordinate frames in the map

The notebook provides a short description of each step and some pointers to the relevant libraries and the literature required to implement the missing parts are given. We also provide four pairs of test images used for debugging your implementation.

Deliverables

- Your implementation on the jupyter notebook
- The disparity maps you created