Vision Aided Navigation 2022 – Exercise 3

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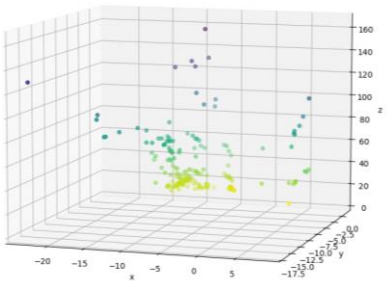
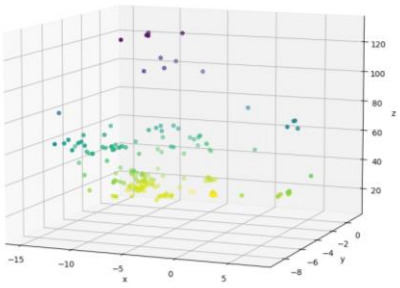
https://github.com/chayamushka/slam_project.git

2.1

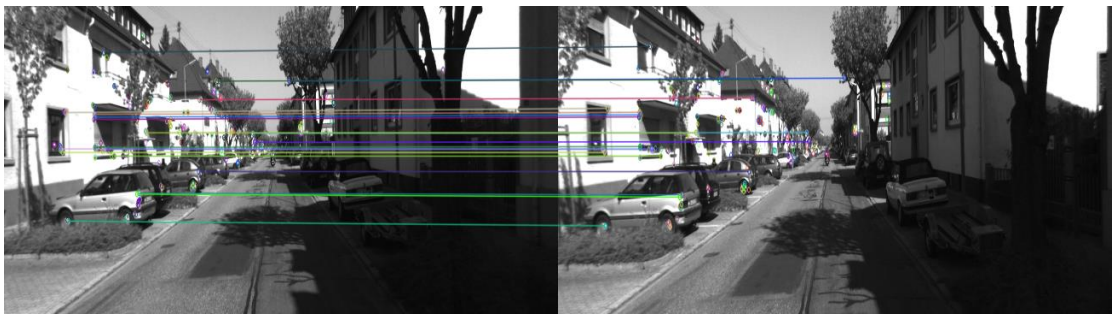
Two 3D point clouds, one for pair 0 (from exercise 2) and one for pair 1.





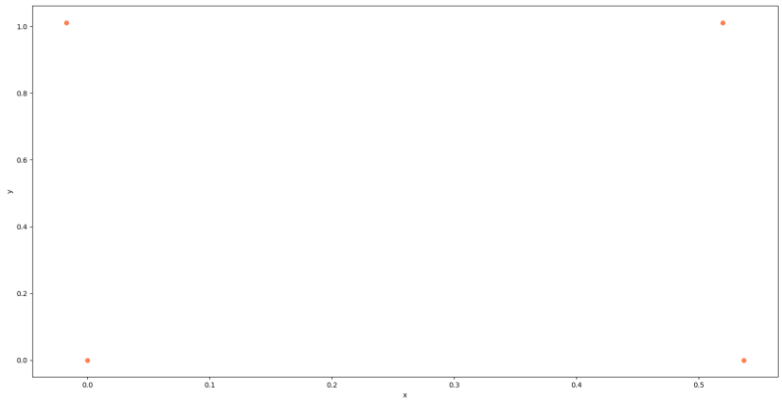
2.2

Match features between the two left images (left0 and left1)



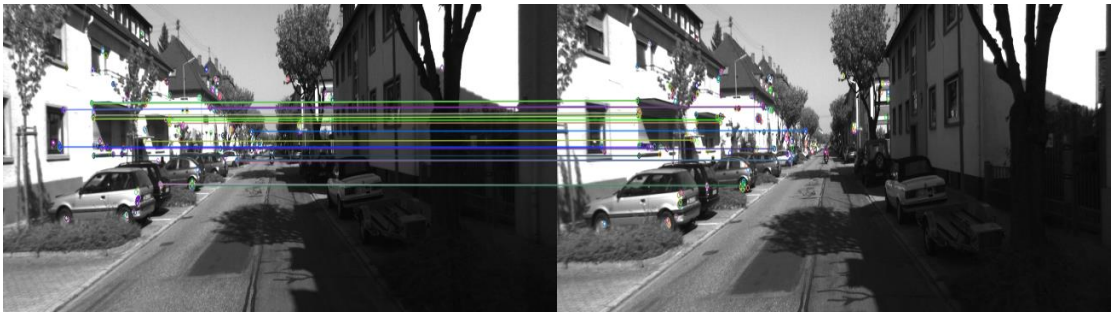
2.3

- We define a transformation T that transforms from left_0 coordinates to left_1 coordinates like this: $T(x_0, y_0, z_0) = R \cdot \begin{bmatrix} x_0 \\ y_0 \\ z_0 \end{bmatrix} + t$
- For three cameras A, B, C: If camera A has extrinsic matrix $[I|0]$, transformation $T_{A\to B}(x) = R_1 x + t_1$ transforms from the coordinates of A to the coordinates of camera B and transformation $T_{B\to C}(x) = R_2 x + t_2$ transforms from the coordinates of B to the coordinates of camera C. So we get that:
$$T_{A\to C}(x) = R_2(R_1(x) + t_1) + t_2$$
- For a camera with extrinsic matrix $[R|t]$, the location of the camera in the global coordinate system is $R \begin{bmatrix} x \\ y \\ z \end{bmatrix} + t$
- The relative position of the four cameras (from above)

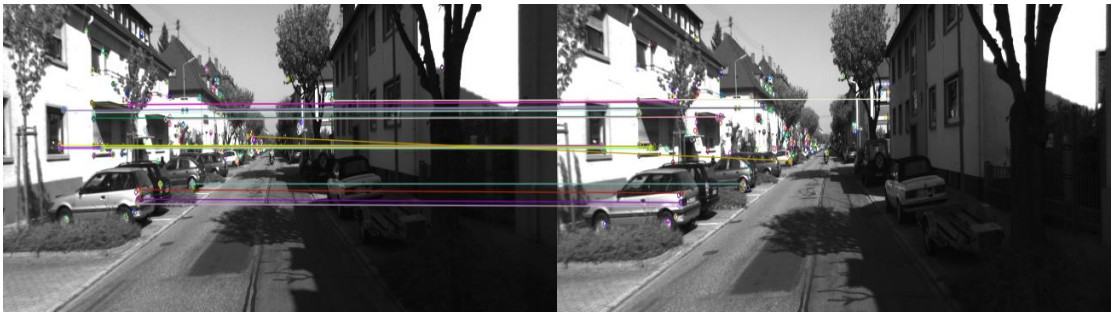


2.4

Good matches:



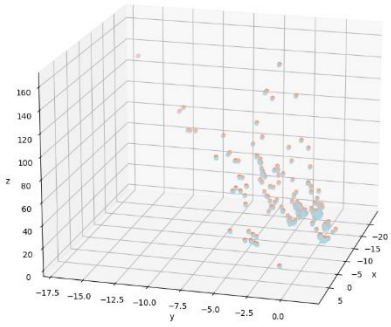
Bad Matches:



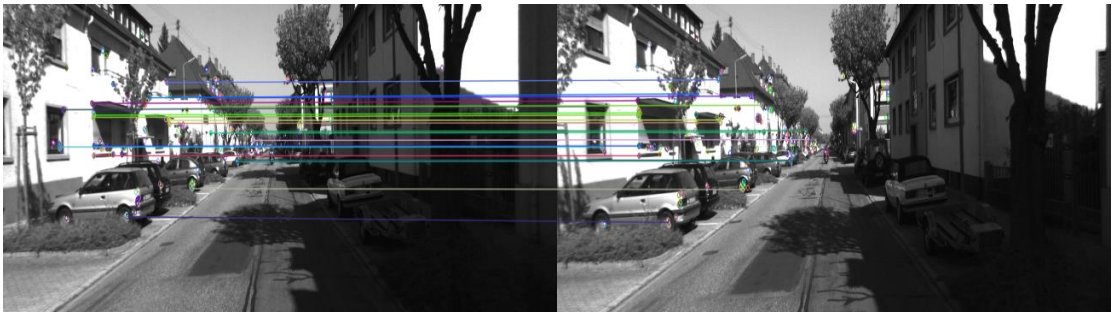
key points, supporters in orange, others in blue: left0 and left1

2.5

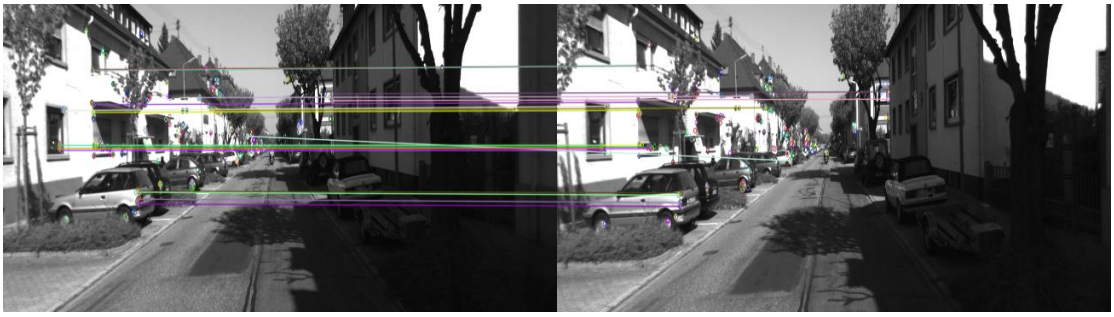
- In orange: the first cloud before T, in blue: the cloud after transition



- After RANSAC:
  Inlier Matches:



  Outlier Matches:

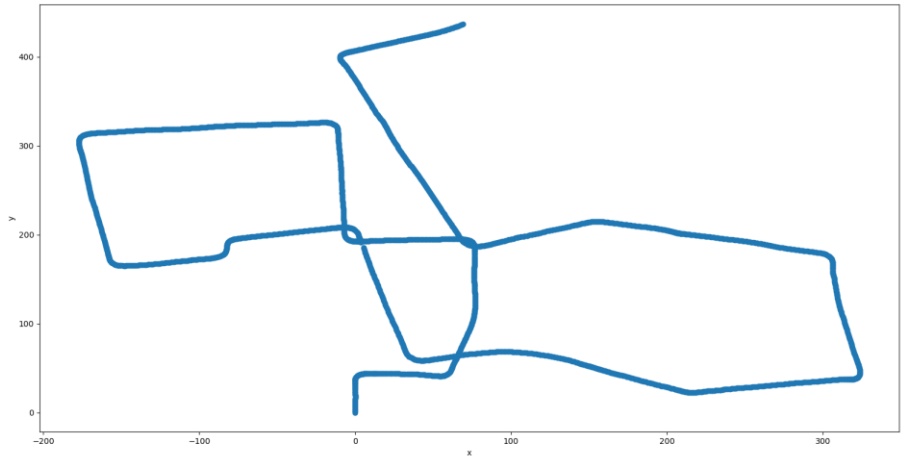


  Accepted and rejected key points: (Supporters in orange), left0, left1

2.6 – next page

2.6

- The tracking took **30 minutes**
- A trajectory of all the left camera locations in the coordinates of camera left0, as viewed from above.



- ground-truth added to the plot the ground truth locations