Third assignment

Subtask 1/3 (50%)

- Perform Nearest-neighbor search using kd-trees!
  (you may use nanoflann or any other library for the task)
- Choose an appropriate representation of rotation, method to estimate rotation:
  - SVD
  - Quaternion
  - Etc.
- Implement ICP
- Implement Tr-ICP

Subtask 2/3 (50%): Evaluation

- Input:
  - Use inputs with various overlaps and/or synthetically generate point clouds.
    - At least 3 different overlaps / pairs of point clouds.
  - Test various misalignments: apply initial rotation and translation differences.
    - At least 4 different misalignments, e.g., 0°..5°..10°..20° rotational differences.
  - Test various noise levels (add gaussian noise to 3D point locations, synthetically)!
    - At least 3 noise levels, from 0.
- Measure / evaluate:
  - Alignment precision (angular: rotation error, euclidean: translaton error)!
  - Measure runtime, and nr. of iterations!
  - Compare ICP to Tr-ICP and to the ground truth.
- Plot your results! (diagrams)

Subtask 3/3 (Extra +10...+50%): Application.

Choose one:

A. Comparing rotation representations
   - Evaluate and compare SVD, Quaternion, etc. for motion estimation.

B. Driving scenario
   - From the KITTI dataset, get a sequence of LIDAR measurements, and try to reconstruct the car's trajectory and orientation. Visualize it.

C. 3D Reconstruction scenario
   - From an RGB-D dataset get a series of recordings, that try to capture an object. (e.g., see: http://www.michaelfirman.co.uk/RGBDdatasets/)
   - Try to align the recordings as a series of point clouds using (Tr-)ICP to re-create a single object.