feature detector / describe on images ?

RANSAC → extension to multiple sensors to ICP

on interest points → should be easily distinguishable and identified

(usually, in dry regions where gradient varies substantially)

description of these points → should be invariant to rotation, translation, scale, viewpoint, ...

vector in multi-dimensional space = f (neighborhood interest point)

≈ mini-image around interest point

typically # good correspondences. traditional heuristics << # total correspondences

⇓

leads to high error / outliers / wrong correspondences

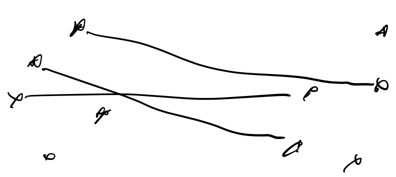
How to prevent this?

3D pt registration w/ unknown correspondences and unknown initial guess → too complicated in this formulation ....

↓ brute force / greedy approach very slow

- what if we know a minimal set of decent correspondences?
- how many minimum set?

(3D ⇓ 3 points are sufficient ↳ in general)



→ determine a crude solution and align the point clouds

⇓

inliers → we have n potential solutions

+

drop outliers

how to select a pair of points?

Random Sample Consensus = sampling approach

complete random or exploit invariant of the data

e.g. pointcloud invariant on the distance

(distance between points in the 2 diff clouds are alike)

count inliers:

- $\chi^2_{correspondence}$
- distance nearest neighborhood
- ...

solution that does not depend on the initial guess → Linear Regression to determine equilibrium (ICP case)

before feeding RANSAC, one might want to prune correspondences (and the generation phase) instead of a completely random one

How many rounds for RANSAC?

- ∞
- if constantly selecting same solution (due to outliers)
- probability
  - inlier ratio (one of correspondence is correct)
  - how many points needed to compute the solution → ICP = 3 pts, 8-point algorithm = 8 pts

5 pts is the reality

minimum point!

main goal: is to find solution that registers with minimum number of points