COMP0119: Acquisition and Processing of 3D Geometry

Coursework 1: Iterative Closest Point

This report will demonstrate the algorithm implemented for the Iterative Closest Point.

Task 1: Point-to-Point Alignment

The basic ICP algorithm can be a breakdown of following steps:

1. Select source points
2. Match points in the other mesh
3. Reject bad pairs
4. Compute rigid transform
5. Detect error and check if stop iteration

The first task does not require use ..

The results are provided below:

A picture containing yellow, indoor, orange, sky

Description automatically generated A picture containing yellow, artichoke, sky, orange

Description automatically generated

*(Result at iteration 1 and 50)*

A picture containing yellow, sky

Description automatically generated

*(Result at iteration 150)*

The results are…

Task 2: Rotation Matching

This task requires to produce a rotated version of M1, which can be simply done with the GUI interaction. The GUI provides three text fields for x, y, z axis rotation in degree, and our goal is to check how well the algorithm can handle different degrees of misalignments. For ease of demonstration, the model used for this task is “bun000.off” and the initial rotation degrees for x, y, z axis are 0, 0, 0 respectively. The result is provided below:

From the result, it can be noticed that the iterations required for a perfect alignment increases almost at the same as the rotation degrees increases either clockwise or anticlockwise.

Task 3: Adding Noise

bla

Task 4: Subsampling

bla

Task 5: Multiple Meshes Alignment

bla

Task 6: Point-to-Plane Alignment

Bla

Reference

Gelfand. N. et al. (2003). Geometrically Stable Sampling for the ICP Algorithm, *Forth International Conference on 3-D Digital Imaging and Modelling*, 260-267. doi: 10.1109/IM.2003.1240258

Low, K. (2004). Linear Least-Squares Optimization for Point-to-Plane ICP Surface Registration. Retrieved from <https://www.comp.nus.edu.sg/~lowkl/publications/lowk_point-to-plane_icp_techrep.pdf>

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