3D GeoInfo 2018 October 1–2, 2018 @ Delft, Netherlands

Assessing the quality of imperfect point clouds for indoor mapping and modeling

Jorge Chen, Ph.D. Postdoctoral Researcher Department of Geography University of California, Santa Barbara October 1, 2018

Problem statement

- Growing availability of cheap 3D indoor remote sensing tools
- Challenge: Poor quality with noise and drift



- Question: How can we assess their performance?
- Approach: Assess global and local measurements using cuboid-shaped room

Prerequisites

- Cuboid-shaped room with solid walls, few openings, no clutter
- ► High precision laser/LiDAR scanner for ground truth
- Test scanner

General approach: 3 steps

- 1. Perform multiple scans at different stations
 - e.g., 3 LiDAR + 3 test scans
- 2. Global analysis



General approach: 3 steps

3. Local analysis



- Discretize into grids and perform statistical analysis
 - Accuracy: Mean out-of-plane deviations from GT
 - Precision: For each cell, mean absolute deviation (MAD) of points from overall mean deviation

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Three considerations

1. EGI: Mean, median, or mode? Answer: Mode for GT



Three considerations

- 2. Rotation: Projection or best fit? Answer: Best fit
 - Imperfections in room geometry and errors in normals



3. Watch point densities for iterative closest point (ICP) alignment



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Thank you!

Chen, J., Mora, O. E. and Clarke, K. C.: Assessing the accuracy and precision of imperfect point clouds for 3D indoor mapping and modeling. In: *ISPRS Annals of Photogrammetry, Remote Sensing and Spatial Information Sciences*, IV-4/W6, 3–10, 2018.

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Acknowledgements

This research was supported by the

National Geospatial-Intelligence Agency Academic Research Program Grant # HM0476-17-1-2002