Supplement: Space-Time Localization and Mapping

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1. Robustness of Registration to Observation Overlap



Figure 1. Registration accuracy of our method (STSLAM) compared to (ICP) [1] and joint registration (JRMPC) [2] measured by average closest point distance (Top), rotation angle error (middle), and translation error (bottom).

2. Laboratory Datset



Merged laboratory scans from a single time point. Different observations are marked as different colors



Merged laboratory scans from a single time point.



Figure 2. An example of a 3D observation at a single time (top) and ground-truth object instance segmentation colored by category (bottom)

3. Kitchen Dataset

Visualization of estimated transformation, occlusion and temporal extents.



3D Observation $(\boldsymbol{y}_{.4})$ 3D Observation $(\boldsymbol{y}_{.5})$ Merged Observation $(\bigcup_{t=1}^{5} \phi_t(\boldsymbol{y}_{.t}))$ Figure 3. Individual observations of the Kitchen scene at 5 time points and the union of all 5 observations across time based on the estimated transformation.







Existent Patches ($e_{tk} = 1$) Yellow=Visible ($v_{tk} = 1$) Blue=Occluded ($v_{tk} = 0$)

Non-Existent Patches ($e_{tk} = 0$)

4. Bedroom Dataset: Visualization of 4D probability density predicted by the model.



References

- [1] P. J. Besl and N. D. McKay. A method for registration of 3-d shapes. *IEEE TPAMI*, 14(2):239–256, Feb. 1992.
- [2] G. D. Evangelidis, D. Kounades-Bastian, R. Horaud, and E. Z. Psarakis. A generative model for the joint registration of multiple point sets. In *ECCV*, 2014.