

Multimedia Attachment to: Past, Present, and Future of Simultaneous Localization And Mapping: Towards the Robust-Perception Age

Cesar Cadena, Luca Carlone, Henry Carrillo, Yasir Latif,
Davide Scaramuzza, José Neira, Ian Reid, John J. Leonard

TABLE I: Datasets and Sensors for SLAM.

IMU (Inertial Measurement Unit), GPS (Global Positioning System), LABELS (Human-annotated labels), 2D/3D LIDAR (Light Detection And Ranging), LOC (Localization ground truth), MAP (map ground truth), RGB (color images), RGBD (color & depth images), Stereo (Bi/trinocular stereo images).

| Topic | References | Data | | | | | | | | | |
|--|-------------|------|-----|--------|---------|---------|-----|-----|-----|------|--------|
| | | IMU | GPS | Labels | LIDAR2D | LIDAR3D | LOC | MAP | RGB | RGBD | Stereo |
| Front-ends and back-ends in small / medium scale scenarios | [20] | ✓ | | | | | ✓ | | | ✓ | |
| | [23] | | | | | | ✓ | ✓ | | ✓ | |
| | [14] | ✓ | ✓ | | ✓ | | ✓ | ✓ | | | |
| | [19] | | ✓ | | ✓ | | ✓ | | | | ✓ |
| | [10, 15] | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | | |
| | [8, 21, 22] | ✓ | ✓ | | | | | | | | ✓ |
| | [6] | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | | ✓ |
| | [2] | ✓ | | | | | ✓ | ✓ | ✓ | | ✓ |
| | [16] | ✓ | ✓ | | | ✓ | | | | ✓ | ✓ |
| Back-ends in small / medium scale scenarios | [3, 11] | | | ✓ | | | ✓ | | | | |
| Front-ends and back-ends in synthetic scenarios | [9] | | | | | | ✓ | ✓ | | ✓ | |
| Loop-closures | [7, 18] | | ✓ | | | | | | ✓ | | |
| | [13] | | | ✓ | | | | | ✓ | | |
| | [17] | | | ✓ | ✓ | | ✓ | | ✓ | | |
| Long-term SLAM | [1, 5] | | | ✓ | ✓ | | | | ✓ | | |
| | [17] | | | ✓ | ✓ | | ✓ | | ✓ | | |
| Semantic SLAM | [4] | | ✓ | ✓ | | | ✓ | | ✓ | | |
| | [17, 24] | | | ✓ | ✓ | | ✓ | | ✓ | | |
| Multi-robot SLAM | [12] | | | ✓ | | | ✓ | | | | |

REFERENCES

- [1] P. Biber and T. Duckett. Experimental analysis of sample-based maps for long-term SLAM. *The International Journal of Robotics Research (IJRR)*, 28(1):20–33, 2009.
- [2] M. Burri, J. Nikolic, P. Gohl, T. Schneider, J. Rehder, S. Omari, M. W. Achtelik, and R. Siegwart. The EuRoC Micro Aerial Vehicle Datasets. *The International Journal of Robotics Research (IJRR)*, 2016.
- [3] L. Carlone. Pose graph optimization datasets. <http://www.lucacarlone.com/index.php/resources/datasets>, June 2016. MIT.
- [4] M. Cordts, M. Omran, S. Ramos, T. Rehfeld, M. Enzweiler, R. Benenson, U. Franke, S. Roth, and B. Schiele. The Cityscapes Dataset for Semantic Urban Scene Understanding. In *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 2016.
- [5] F. Dayoub, G. Cielniak, and T. Duckett. Long-term experiments with an adaptive spherical view representation for navigation in changing environments. *Robotics and Autonomous Systems (RAS)*, 59(5):285–295, 2011.
- [6] A. Geiger, P. Lenz, C. Stiller, and R. Urtasun. Vision Meets Robotics: The KITTI Dataset. *The International Journal of Robotics Research (IJRR)*, 32(11):1231–1237, 2013.
- [7] A. J. Glover, W. P. Maddern, M. J. Milford, and G. F. Wyeth. FAB-MAP + RatSLAM: appearance-based SLAM for multiple times of day. In *Proceedings of the IEEE International Conference on Robotics and Automation (ICRA)*, pages 3507–3512. IEEE, 2010.
- [8] R. Guzman, J. B. Hayet, and R. Klette. Towards Ubiquitous Autonomous Driving: The CCSAD Dataset. In *Conference on Computer Analysis of Images and Patterns (CAIP)*, pages 582–593. Springer, 2015.
- [9] A. Handa, T. Whelan, J. McDonald, and A. J. Davison. A Benchmark for RGB-D Visual Odometry, 3D Reconstruction and SLAM. In *Proceedings of the IEEE International Conference on Robotics and Automation (ICRA)*, pages 1524–1531. IEEE, 2014.
- [10] A. S. Huang, M. Antone, E. Olson, L. Fletcher, D. Moore, S. Teller, and J. J. Leonard. A High-rate, Heterogeneous Data Set From The DARPA Urban Challenge. *The International Journal of Robotics Research (IJRR)*, 29(13):1595–1601, 2010.
- [11] Y. Latif. Dataset for Robust SLAM backend Evaluation. <https://github.com/ylatif/dataset-RobustSLAM>, June 2016. Universidad de Zaragoza.
- [12] K. Y. K. Leung, Y. Halpern, T. D. Barfoot, and H. H. T. Liu. The UTIAS multi-robot cooperative localization and mapping dataset. *The International Journal of Robotics Research (IJRR)*, 30(8):969–974, 2011.
- [13] M. J. Milford and G. F. Wyeth. SeqSLAM: Visual route-based navigation for sunny summer days and stormy winter nights. In *Proceedings of the IEEE International Conference on Robotics and Automation (ICRA)*, pages 1643–1649. IEEE, 2012.
- [14] P. Oettershagen, T. Stastny, T. Mantel, A. Melzer, K. Rudin, P. Gohl, G. Agamennoni, K. Alexis, and R. Siegwart. Long-Endurance Sensing and Mapping Using a Hand-Launchable Solar-Powered UAV. In *Proceedings of International Conference on Field and Service Robotics (FSR)*, pages 441–454. Springer, 2016.
- [15] G. Pandey, J. R. McBride, and R. M. Eustice. Ford Campus vision and LIDAR data set. *The International Journal of Robotics Research (IJRR)*, 30(13):1543–1552, 2011.
- [16] F. Pomerleau, M. Liu, F. Colas, and R. Siegwart. Challenging data sets for point cloud registration algorithms. *The International Journal of Robotics Research (IJRR)*, 31(14):1705–1711, 2012.
- [17] A. Pronobis and B. Caputo. COLD: The CoSy Localization Database. *The International Journal of Robotics Research (IJRR)*, 28(5):588–594, 2009.
- [18] Rawseeds. Rawseeds. <http://www.rawseeds.org/home/>, Jun 2016. Rawseeds.
- [19] M. Smith, I. Baldwin, W. Churchill, R. Paul, and P. Newman. The New College Vision and Laser Data Set. *The International Journal of Robotics Research (IJRR)*, 28(5):595–599, 2009.
- [20] J. Sturm, N. Engelhard, F. Endres, W. Burgard, and D. Cremers. A Benchmark for the Evaluation of RGB-D SLAM Systems. In *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pages 573–580. IEEE, 2012.
- [21] M. Warren, D. McKinnon, H. He, A. Glover, M. Shiel, and B. Upcroft. Large Scale Monocular Vision-only Mapping from a Fixed-Wing sUAS. In *Proceedings of International Conference on Field and Service Robotics (FSR)*, pages 495–509. Springer, 2012.
- [22] M. Warren, D. McKinnon, H. He, and B. Upcroft. Unaided Stereo Vision based Pose Estimation. In G. Wyeth and B. Upcroft, editors, *Australasian Conference on Robotics and Automation (ACRA)*, Brisbane, 2010. Australian Robotics and Automation Association.
- [23] O. Wasenmuller, M. Meyer, and D. Stricker. CoRBS: Comprehensive RGB-D benchmark for SLAM using Kinect v2. In *IEEE Winter Conference on Applications of Computer Vision (WACV)*, pages 1–7. IEEE, 2016.
- [24] S. W. Yang, C. C. Wang, and C. Thorpe. The annotated laser data set for navigation in urban areas. *The International Journal of Robotics Research (IJRR)*, 30(9):1095–1099, 2011.