Comments on :

"Low-drift and real-time lidar odometry and mapping"

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Abstract

This paper explain how LOAM algorithm is working, and present some results. This method, coupled with IMU, try to achieve both low drift in motion estimation and low computational complexity.

I. Introduction

The problem addressed here is to achieve SLAM without accurate pose estimation (as GPS). They don't consider Loop Closure, as they consider it unnecessary for mapping floor of a building. They are dividing SLAM problem into 2 algorithms :

- Odometry estimation at high frequency (but low fidelity)
- Registration of Point Cloud (lower frequency)

They are presenting their work in a high level of details.

They said that when the lidar scanning rate is high compared to this motion, motion distortion is neglectable and ICP [2] can be used. Other methods exists for removing motion distortion [3] and [4] vor velodyne lidar. Using IMU can be usefull too

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II. Methods

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III. Results

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IV. Discussion

i. Current state

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ii. Possibles enhancements

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References

[1] J. Zhang and S. Singh, "Low-drift and real-time lidar odometry and mapping", *Autonomous Robots*, vol. 41, no. 2, pp. 401–416, Feb. 2017, ISSN: 0929-5593, 1573-7527. DOI: 10.1007/s10514-016-9548-2. [Online]. Available: http://link.springer.com/10.1007/s10514-016-9548-2 (visited on 05/15/2017).

[2] F. Pomerleau, F. Colas, R. Siegwart, and S. Magnenat, "Comparing ICP variants on real-world data sets: Open-source library and experimental protocol", *Autonomous Robots*, vol. 34, no. 3, pp. 133–148, Apr. 2013, ISSN: 0929-5593, 1573-7527. DOI: 10.1007/s10514-013-9327-2. [Online]. Available: http://link.springer.com/10.1007/s10514-013-9327-2 (visited on 05/15/2017).

[3] S. Hong, H. Ko, and J. Kim, "VICP: Velocity updating iterative closest point algorithm", in *2010 IEEE International Conference on Robotics and Automation*, May 2010, pp. 1893–1898. DOI: 10.1109/ROBOT.2010.5509312.

[4] F. Moosmann and C. Stiller, "Velodyne SLAM", in *2011 IEEE Intelligent Vehicles Symposium (IV)*, Jun. 2011, pp. 393–398. DOI: 10.1109/IVS.2011.5940396.