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 in multimodal system can compensate intermittent GPS [5].

IMU and loop closure alows to build large indoors maps in underground mines : [6].

They used 4 different lidars for testing purposes.

*A thank you or further information

II. Methods

i. Lidar odometry

i.1 feature point extraction

They select feature point on sharp edges and planar surfaces patches. they evaluate smoothness of local surface, then sort them, considering smoother points as planar and sharpest points as edges.

i.2 Feature point correspondence

When adding more points to the pointcloud, they try to find ones in features region as lines and planar areas.

i.3 Motion estimation

They estimate a geometric relationship between a point and his feature line/planar area. And Computing the sum of all geometric transformations give the estimated motion of the lidar.

i.4 lidar odometry

produces distortion-free pointclouds and estimates velocity.

III. Results

Works better on manufactured environnement, in consequence of using lines and flat area, who are more suited for human buildings.

- 1% drift in interior
- 2.5% drift in exterior

Their motion estimation is quite good for slow/linear motions, adding the IMU allows to perform better with nonlinear motion.

IV. Discussion

i. Current state

Working quite well according to the paper, a lot less according to the tests of distributed software. (Without IMU).

ii. Possibles enhancements

Loop Closure

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