

Comments on :

# “Comparing ICP variants on real-world data sets”

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## Abstract

*Description of ICP test protocols and experiments on several open Data sets. Discuss about ICP problems and solutions. Optimisation of ICP parameters.*

## I. INTRODUCTION

They highlight the need for a protocol for comparing ICP variants, due to the huge number of "cooking" variants and the actual difficulty to implement/test/compare them without re-doing the whole job. They present the Iterative closest point algorithm, who consist in matching two sets of points to deduce the transformation between them and the 6 DOF motion of the sensor.

## II. METHODS

They created a modular ICP chain, decoupling different tasks:

- data filtering,
- matching,
- Outlier Filtering
- Error minimisation

This chain is available in their library hosted on Github :ethz-asl/libpointmatcher. They also provide standardized interfaces between each step. They use Stop and Scan technique.

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\*A thank you or further information

## III. RESULTS

### i. Overlap sensitivity

Through experiments, they highlight the registration sensitivity to scan overlap. More the overlap between scan is important, better will be the result. ICP is working well when several scans are made in the same room, but is encountering some difficulties when scan is taken from an opening area like a door.

### ii. ICP parameters

There is a lot of parameters all along the ICP chain whatever the types of treatments chosen, often depending on the sensor. For example, if we choose to keep only close points, we need to determine which distance is the relevant one for discrimination. Another example, if we choose to randomly sub-sampling pointClouds, we need to determine how many points are sufficient for good registration, allowing to reduce computation requirements. It's possible to optimize those parameters in a fixed project.

### iii. Point-to-point vs point-to-plane

Point to plane variant seems to be more efficient in interior/structured buildings. How-

ever, in natural/unstructured environment, the point-to-plane is not that relevant.

#### iv. Number of points

Depending on the sensor/algorithm, there is a number of points where additional points will only cost more computation time for a very low gain in precision.

### IV. DISCUSSION

#### i. Current state

Their library seems quite complete, i really need to do some testing on it.

#### ii. Possibles enhancements

Find a way to choose relevant points instead of a random selection can be a real improvement. Maybe working on new types of landmarks, like more complex/recognizable can allow better precision.

Using more complex primitives (like basic geometric shapes) is an interesting track. Learning to recognize relevant points/structures in a pointcloud can maybe improve the whole process.

### REFERENCES

- [1] 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).