# The Scan Matchers Research and Comparison: Monte-Carlo, Olson and Hough

ETU

The Academic University

Authors:
Kirill Krinkin
Artyom Filatov
Anton Filatov
Artur Huletski
Dmitry Kartashov

2016

# A problem definition
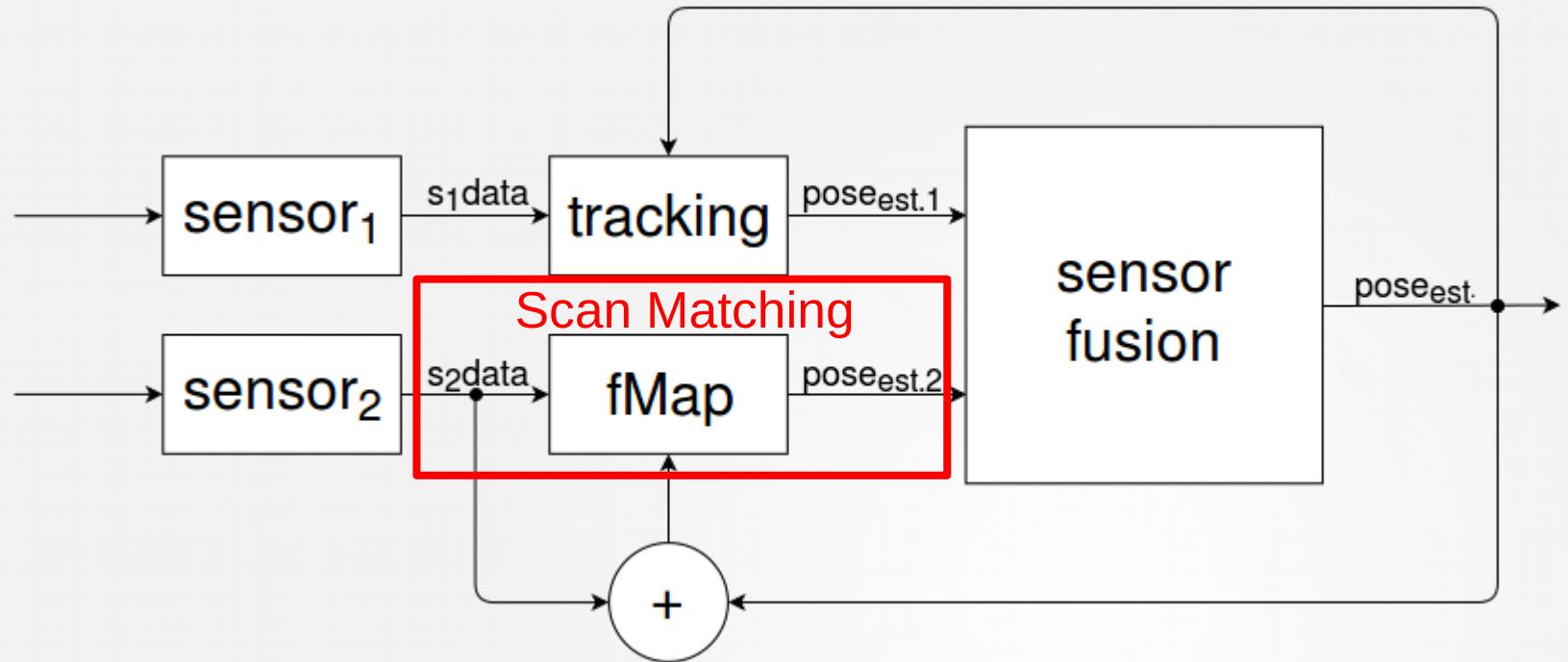
Fig. 1. Typical SLAM scheme

The problem of choosing scan matcher algorithm.

Is it possible to classify SMs?

# 2D Scan matching

| Input | | Output |
|---|---|---|
| 1) The map (prebuilt) | 2) The laser view (from rangefinders) | 1) The pose estimation |
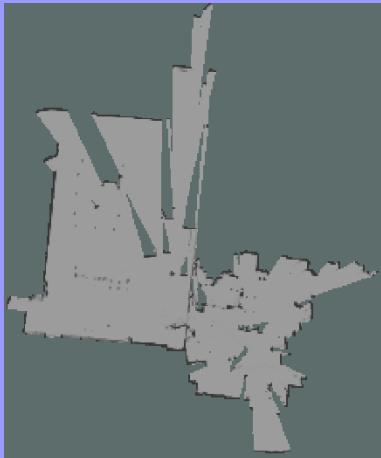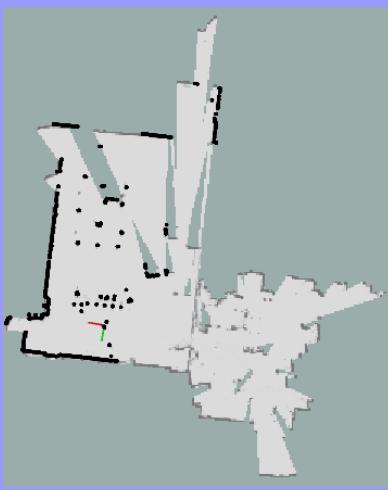


3) The pose on the previous step
4) The odometry

# Working without Scan matching

Without SM
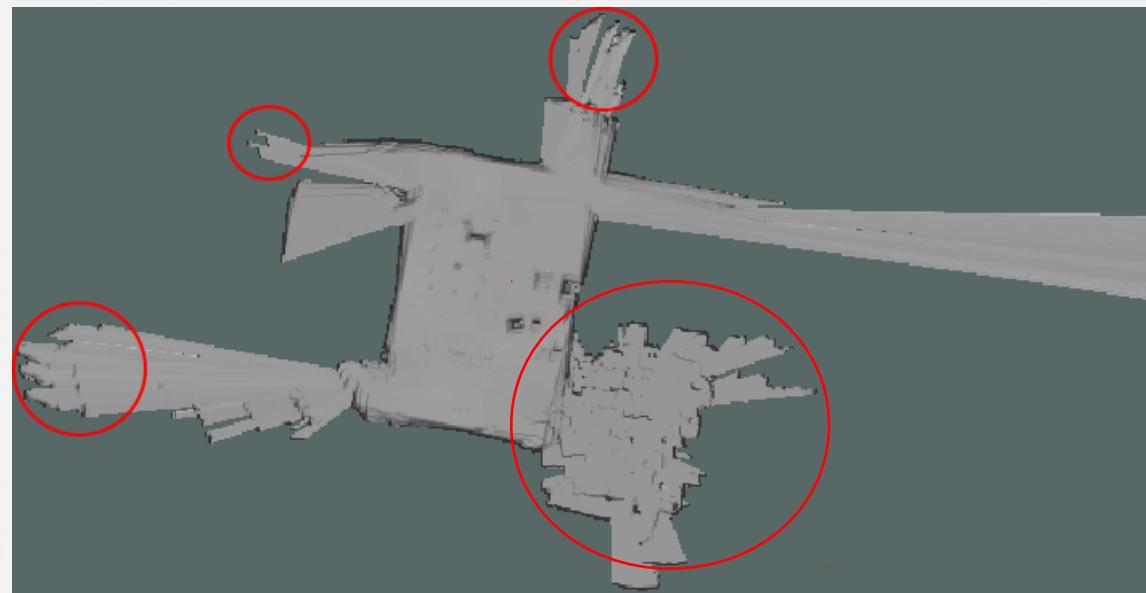


The absotute
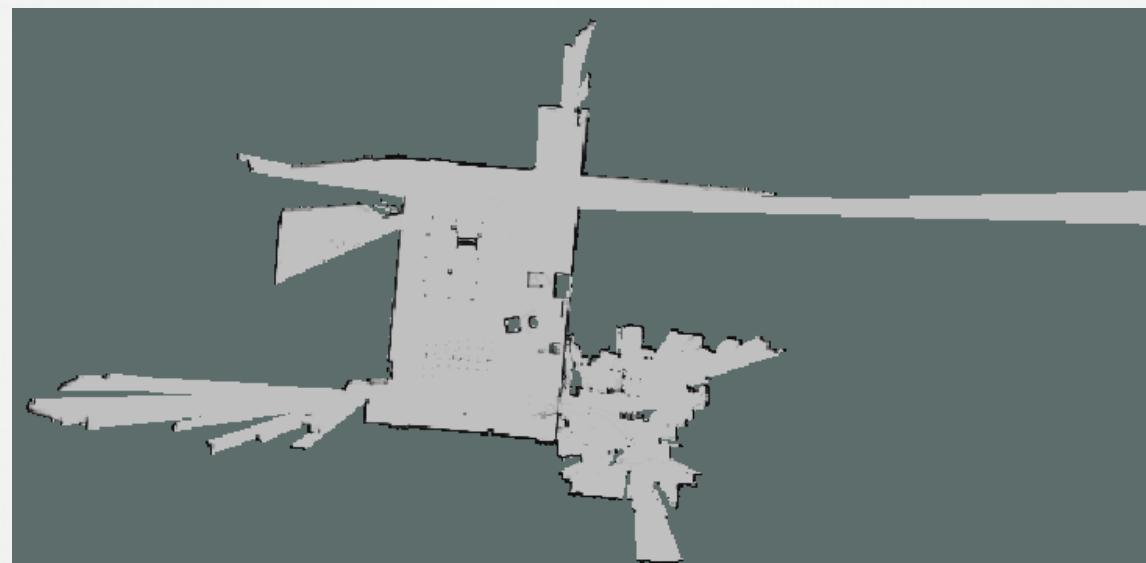
# Tested Scan Matchers

## Monte-Carlo (stochastic)
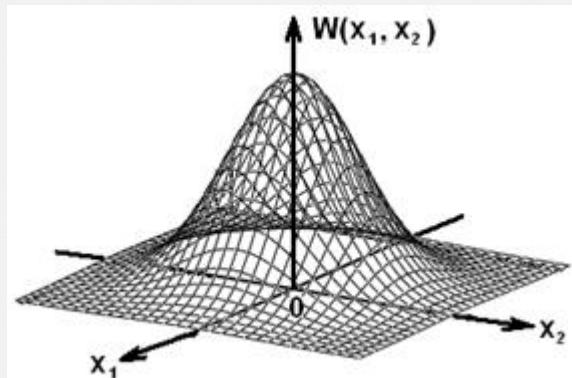


## Olson (brute-force)
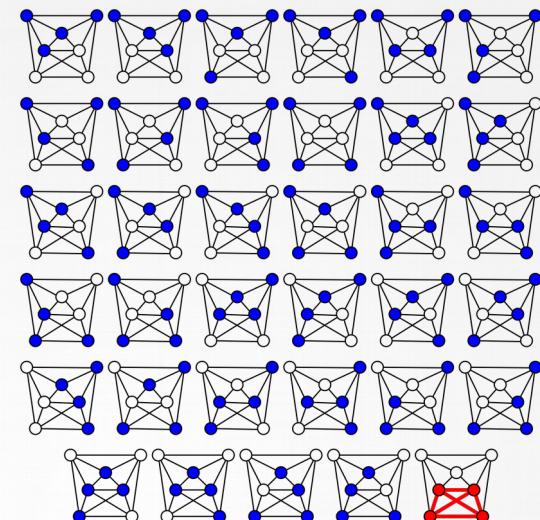


## Hough (analysis-oriented)
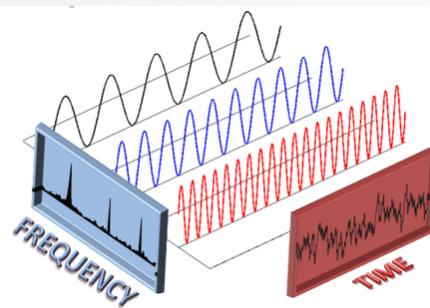
# The environment
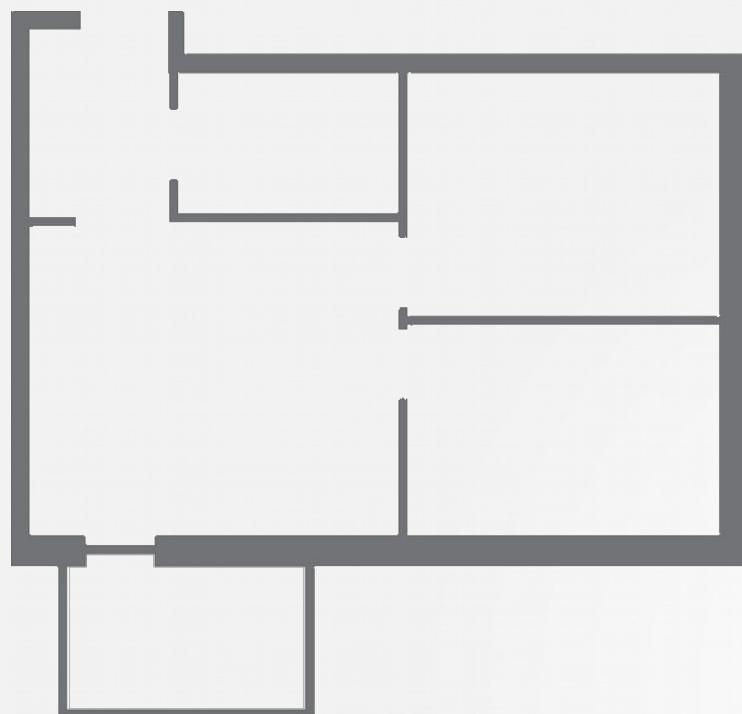
a) The room-like world    b) The random world
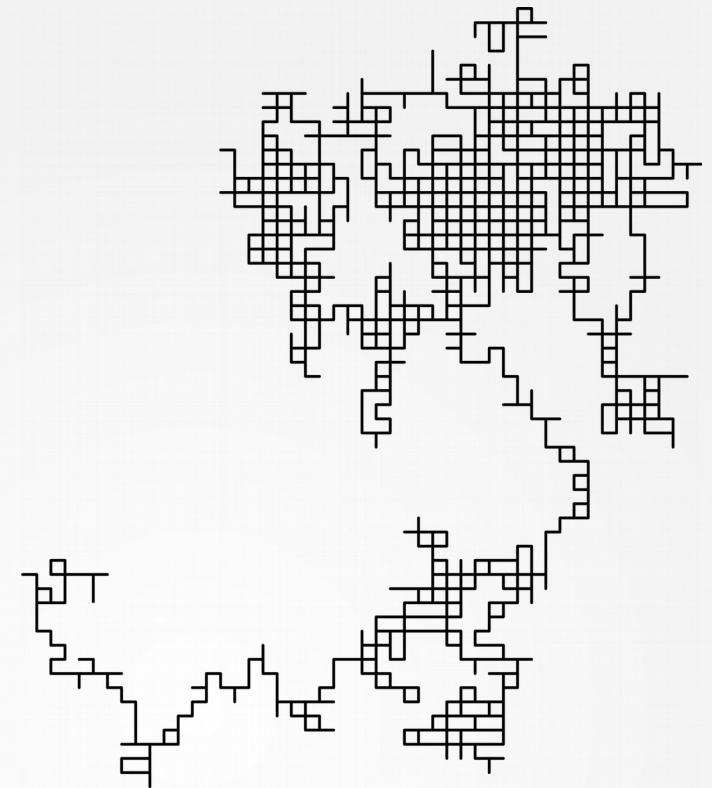
c) Also tests were completed on a real data

# Results

Table II. The quantitive SM estimation

| The scan matcher | The indoor world | | The random world | |
|---|---|---|---|---|
| | Time, s | Error, m | Time, s | Error, m |
| Monte-Carlo | 0,02 | Δx=0,011 Δy=0,009 Δθ=0,02 | 0,3 | Δx=0,08 Δy=0,09 Δθ=0,05 |
| Olson | 0,3 | Δx=0,001 Δy=0,001 Δθ=0,001 | 2,7 | Δx=0,0005 Δy=0,0004 Δθ=0,001 |
| Hough | 0,1 | Δx=0,01 Δy=0,01 Δθ=0,008 | 0,8 | Δx=0,02 Δy=0,02 Δθ=0,016 |

# Built maps

Monte-Carlo
(blured)
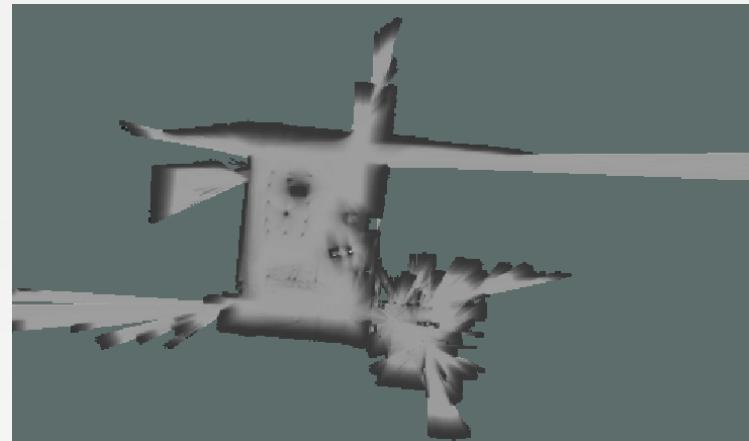


Olson
(weak blured)
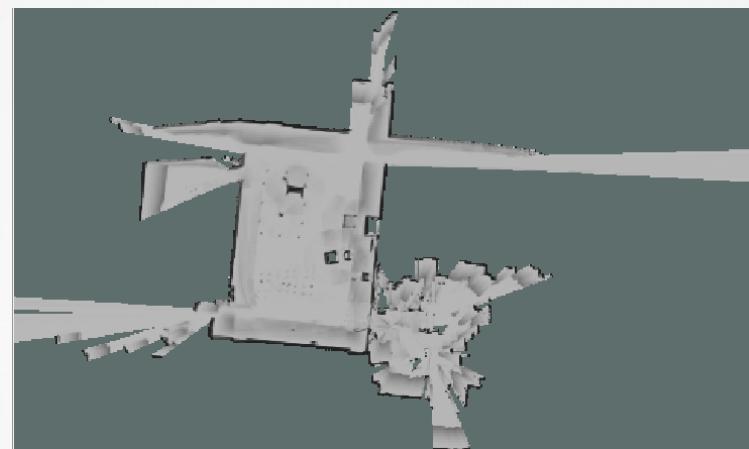


Hough
(not blured)
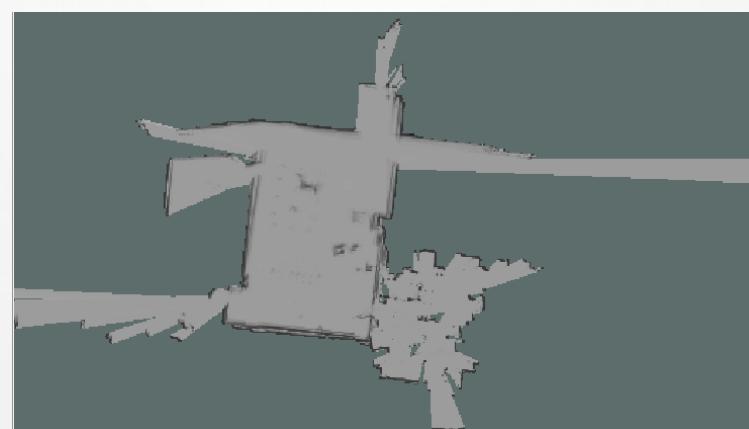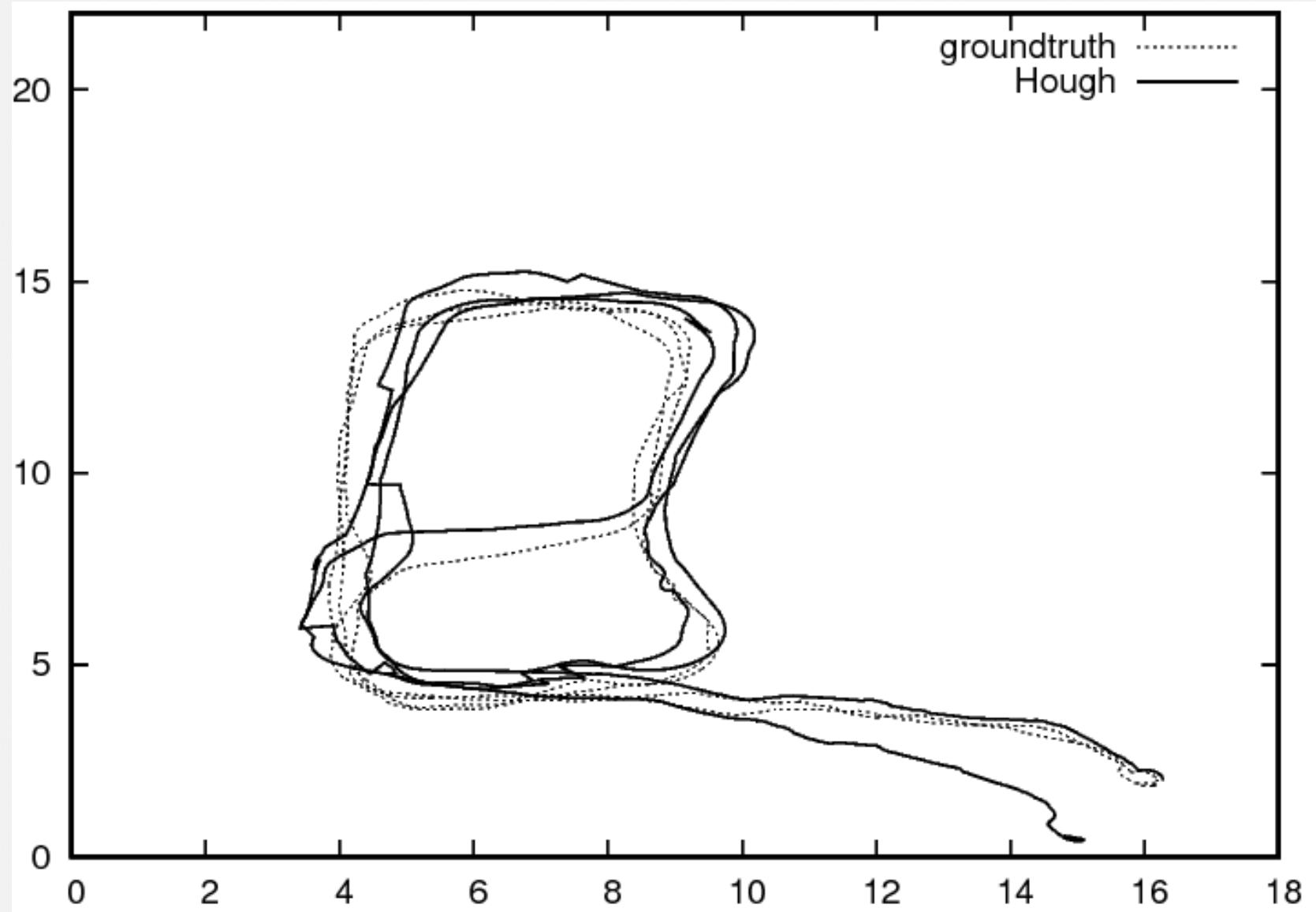
# The Hough Trajectory

# The Olson Trajectory
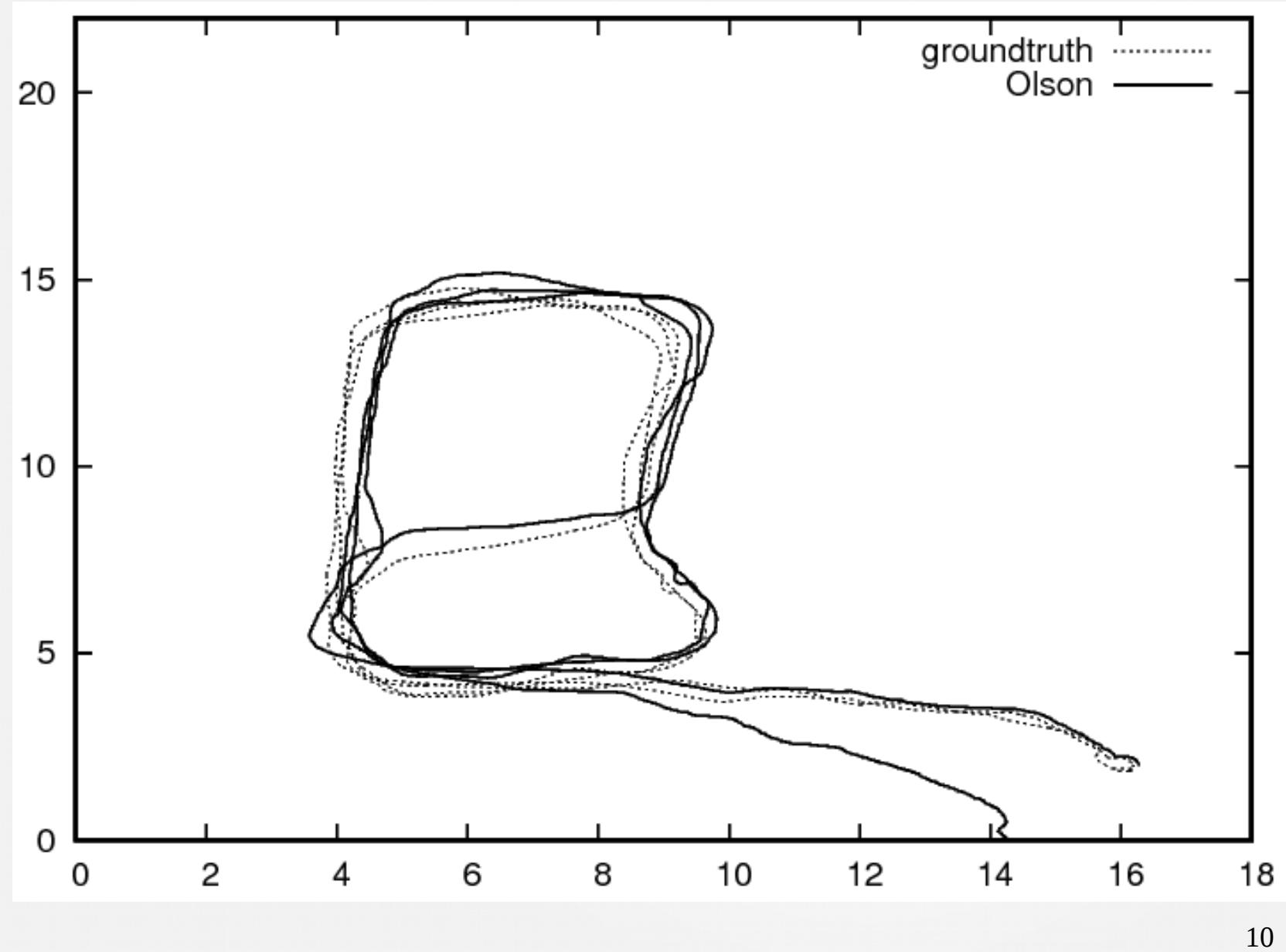
# The Monte-Carlo Trajectory
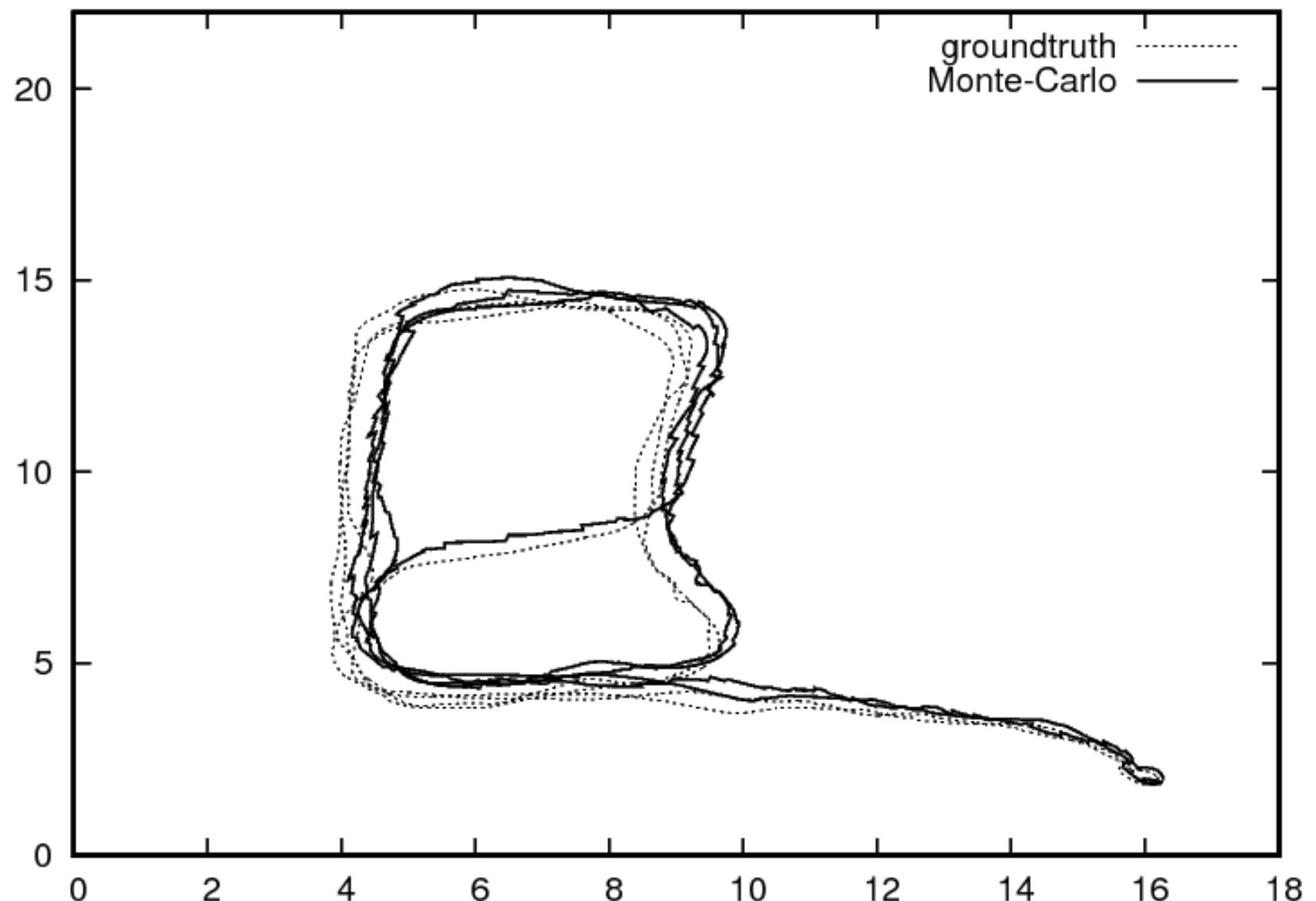
# Conclusion

Table III. SM comparison

|  | Monte-Carlo | Olson | Hough |
|---|---|---|---|
| Time | Fast | Slow | Moderate |
| Teoretical estimation | Stochastic, unpredictable | Accurate | Error & time trade off |
| Real aplication | Accurate with a blured world | Accurate with an own blured table | Accumulates error |

# Future work

- Include in SLAM constuctor
  github.com/OSLL/slam-constructor

- Apply to other SLAM algorithms

- Test on real robots

# Thank you!