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SLAM with Vertical Plane Segmentation for Lifelong Indoor Mapping

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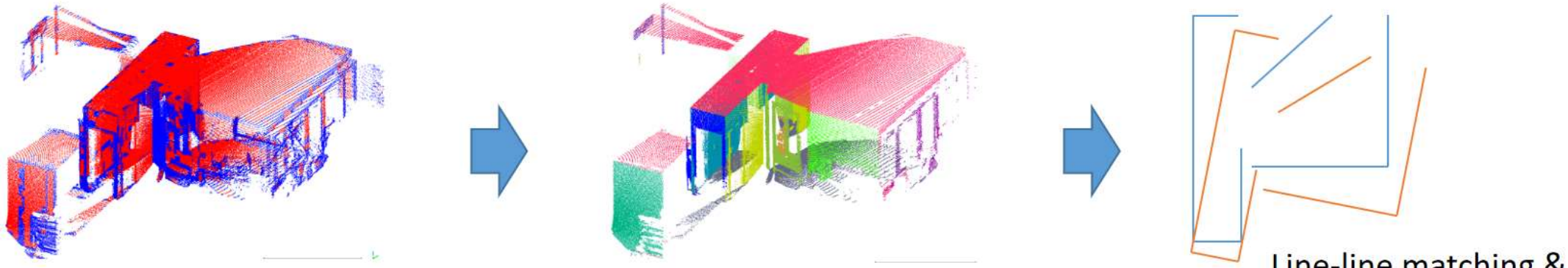
Outline

- Motivation
- Method
- Experiments
- Results
- Conclusion

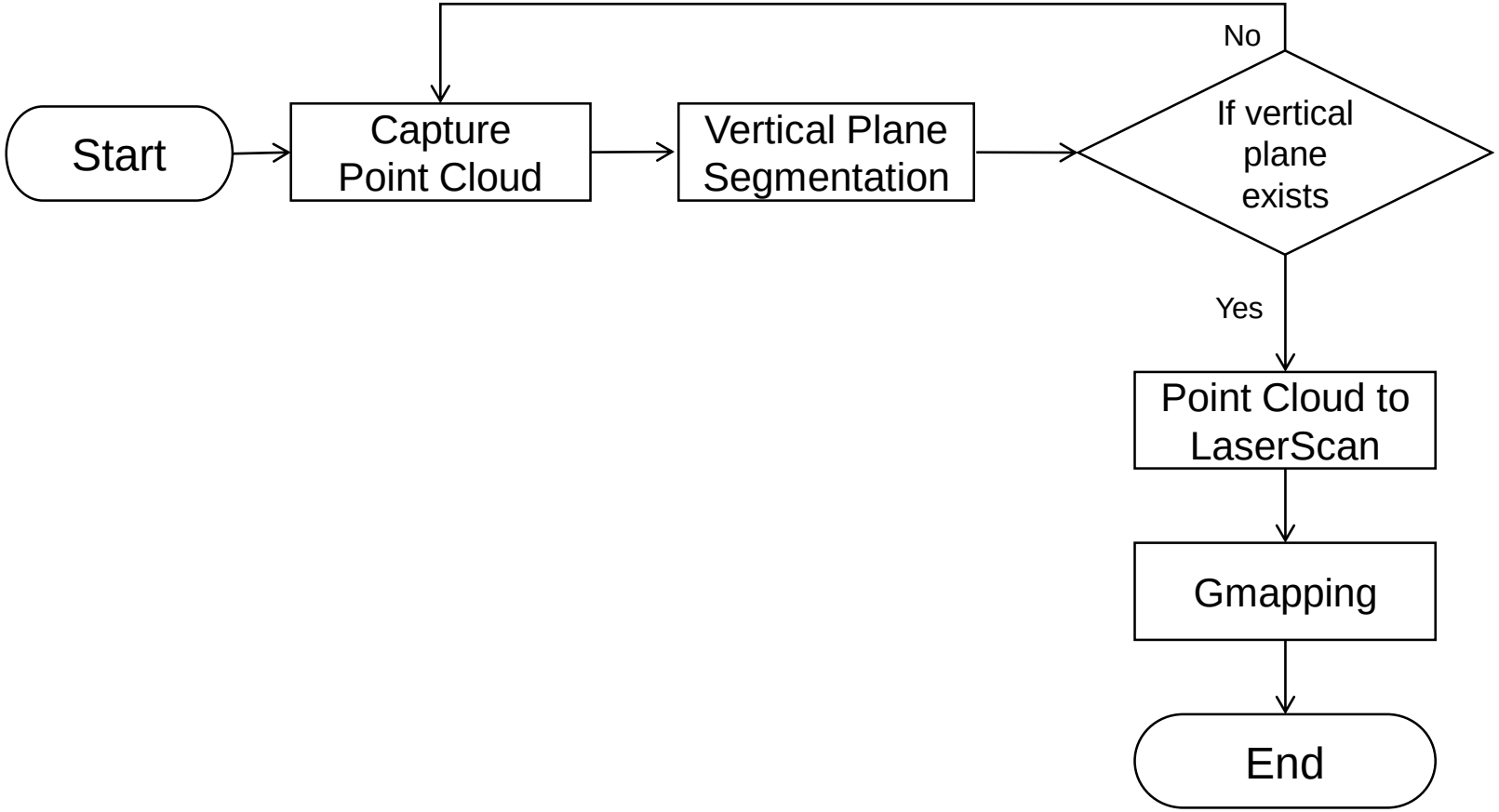
Motivation

- Assumptions
  - Lidar in indoor environment
  - Plane segmentation algorithm
  - Vertical direction is given
  - SLAM with projection of vertical planes onto horizontal plane

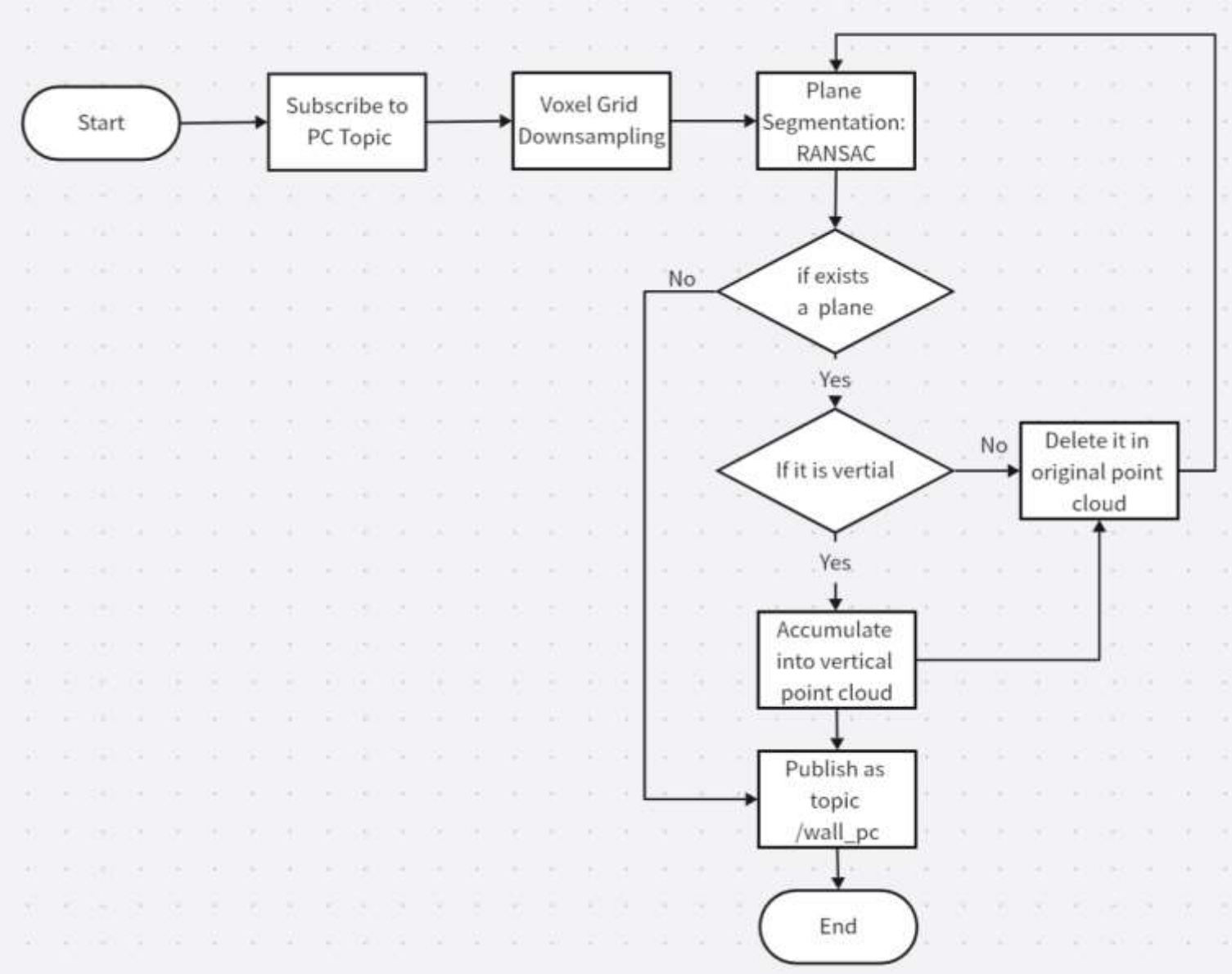


Line-line matching & registration

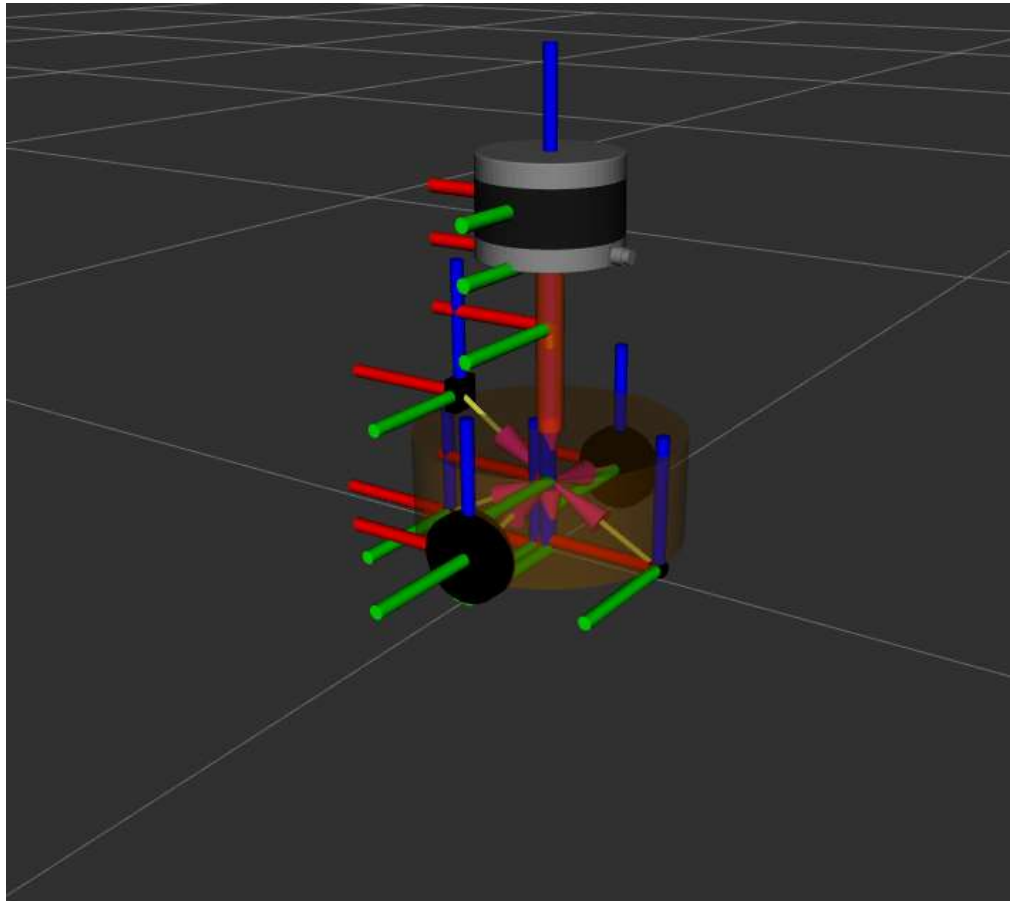
Method

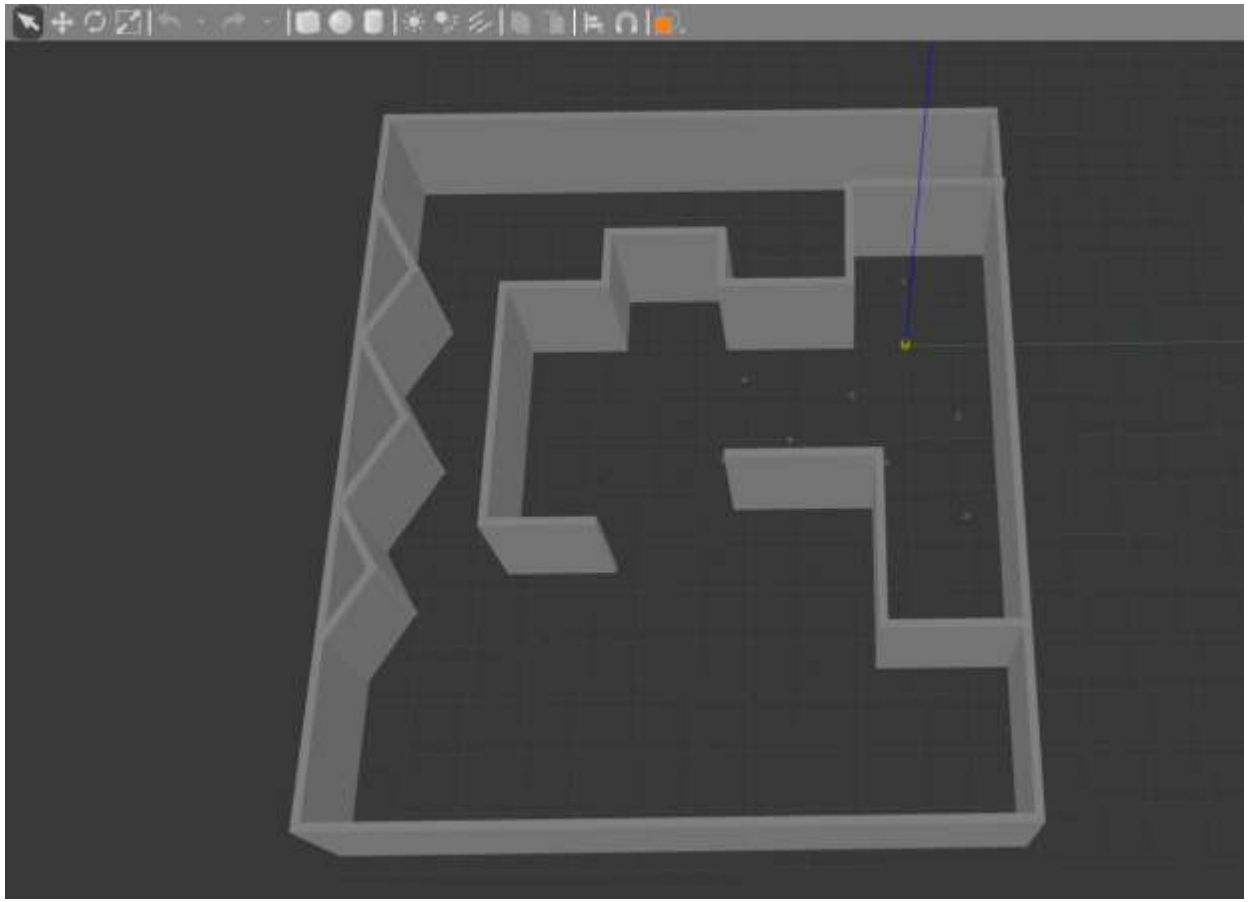

Start
Capture Point Cloud
Vertical Plane Segmentation
If vertical plane exists
No
Yes
Point Cloud to LaserScan
Gmapping
End

Method

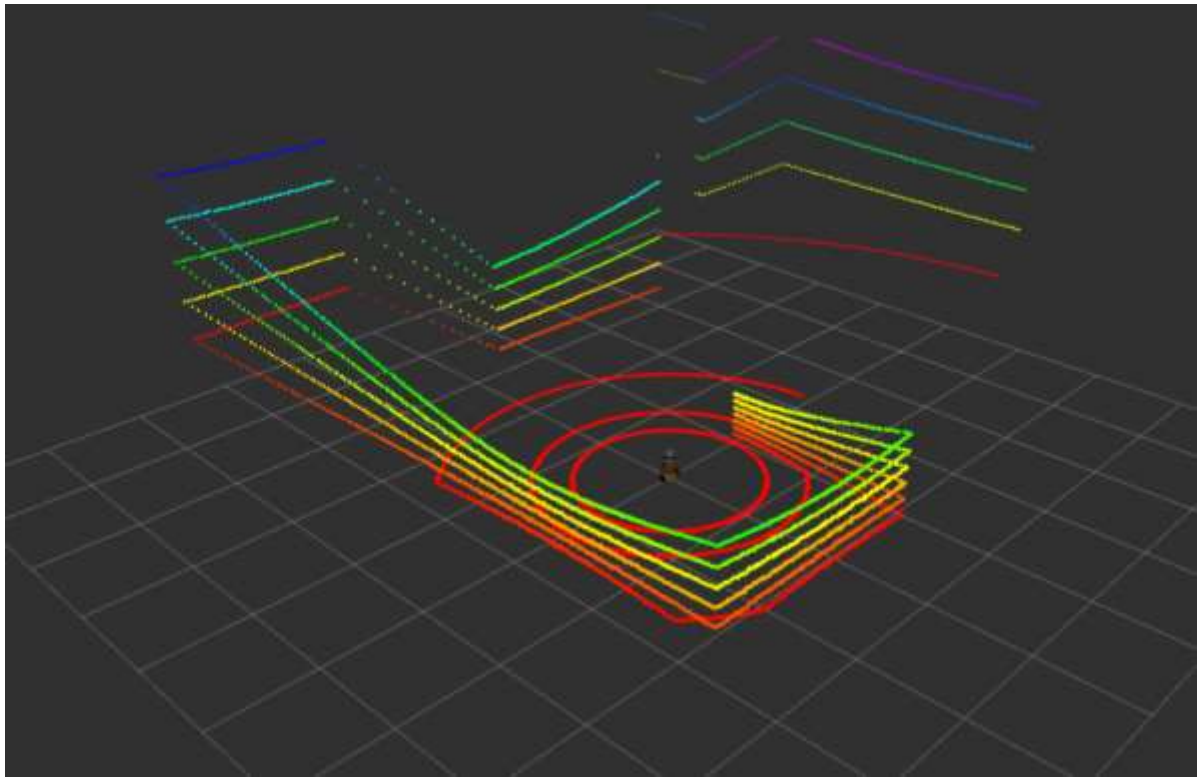

Start
Subscribe to PC Topic
Voxel Grid Downsampling
Plane Segmentation: RANSAC
if exists a plane
No
Yes
If it is vertial
No
Delete it in original point cloud
Yes
Accumulate into vertical point cloud
Publish as topic /wall_pc
End

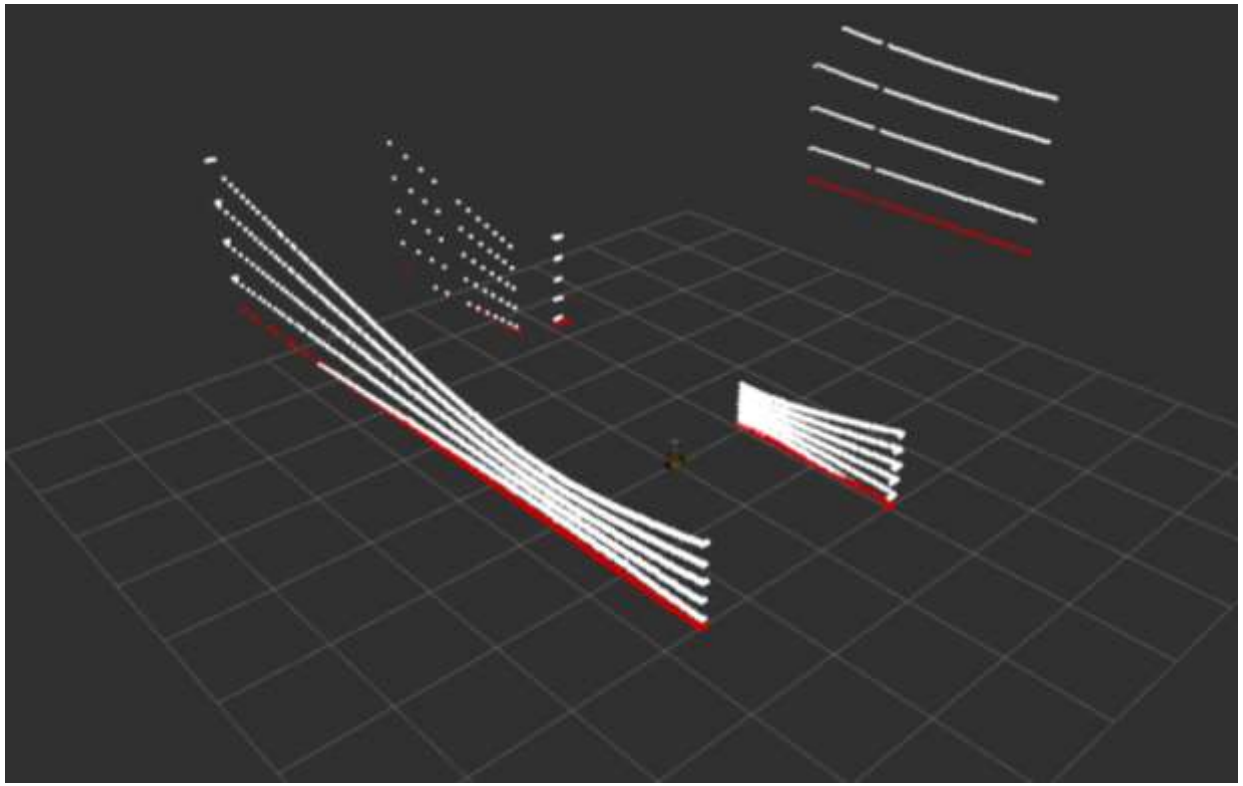
Experiments: Simulation



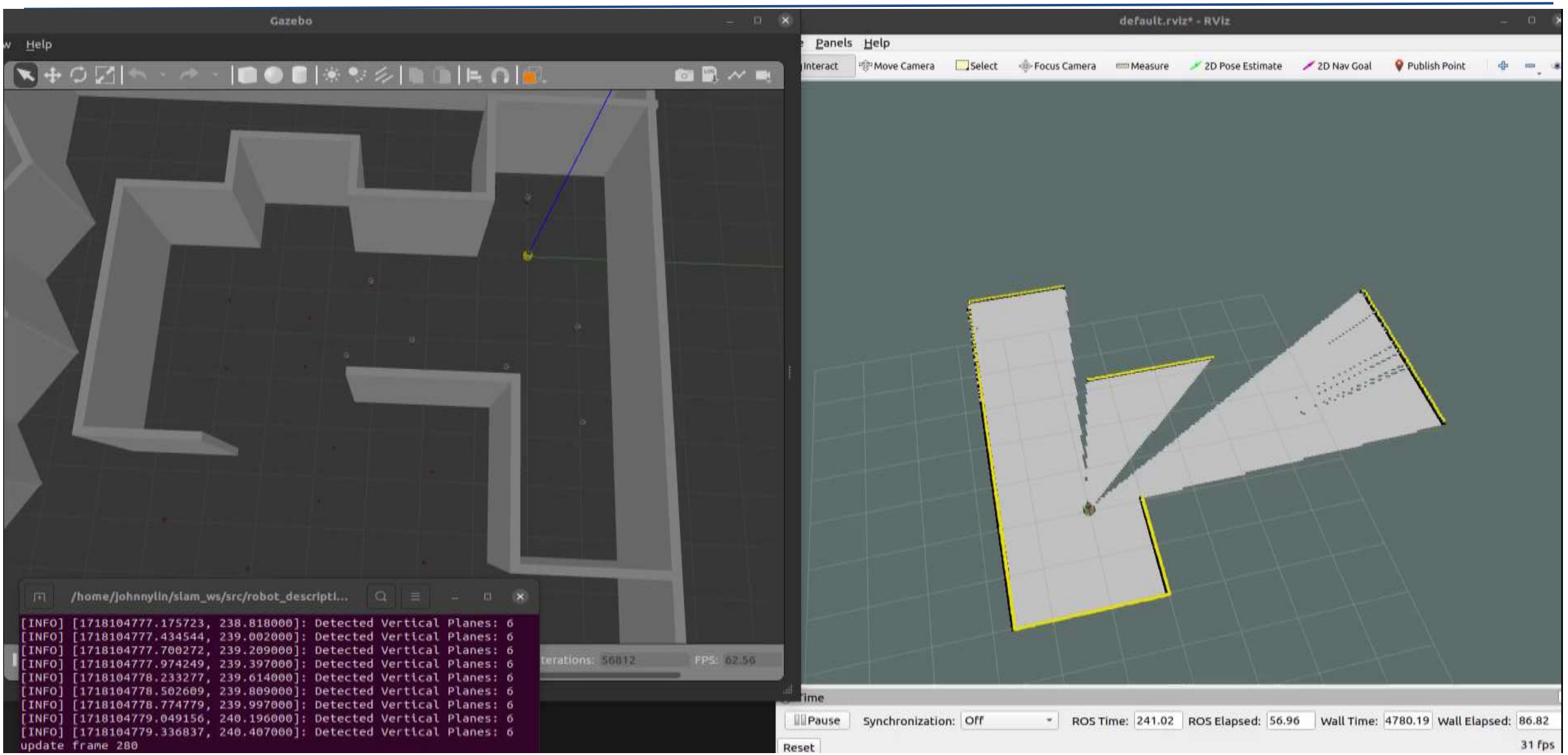


Experiments: Simulation

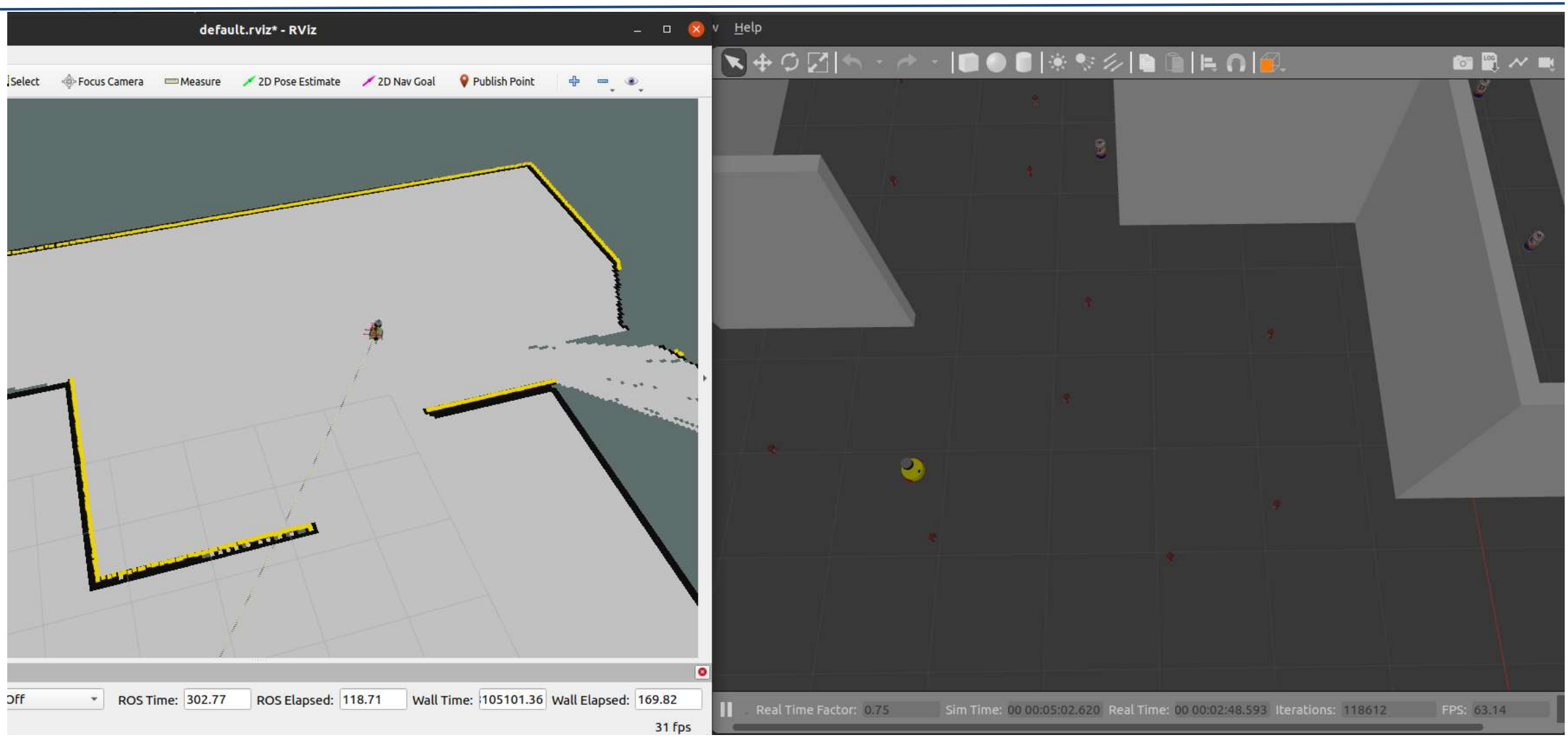




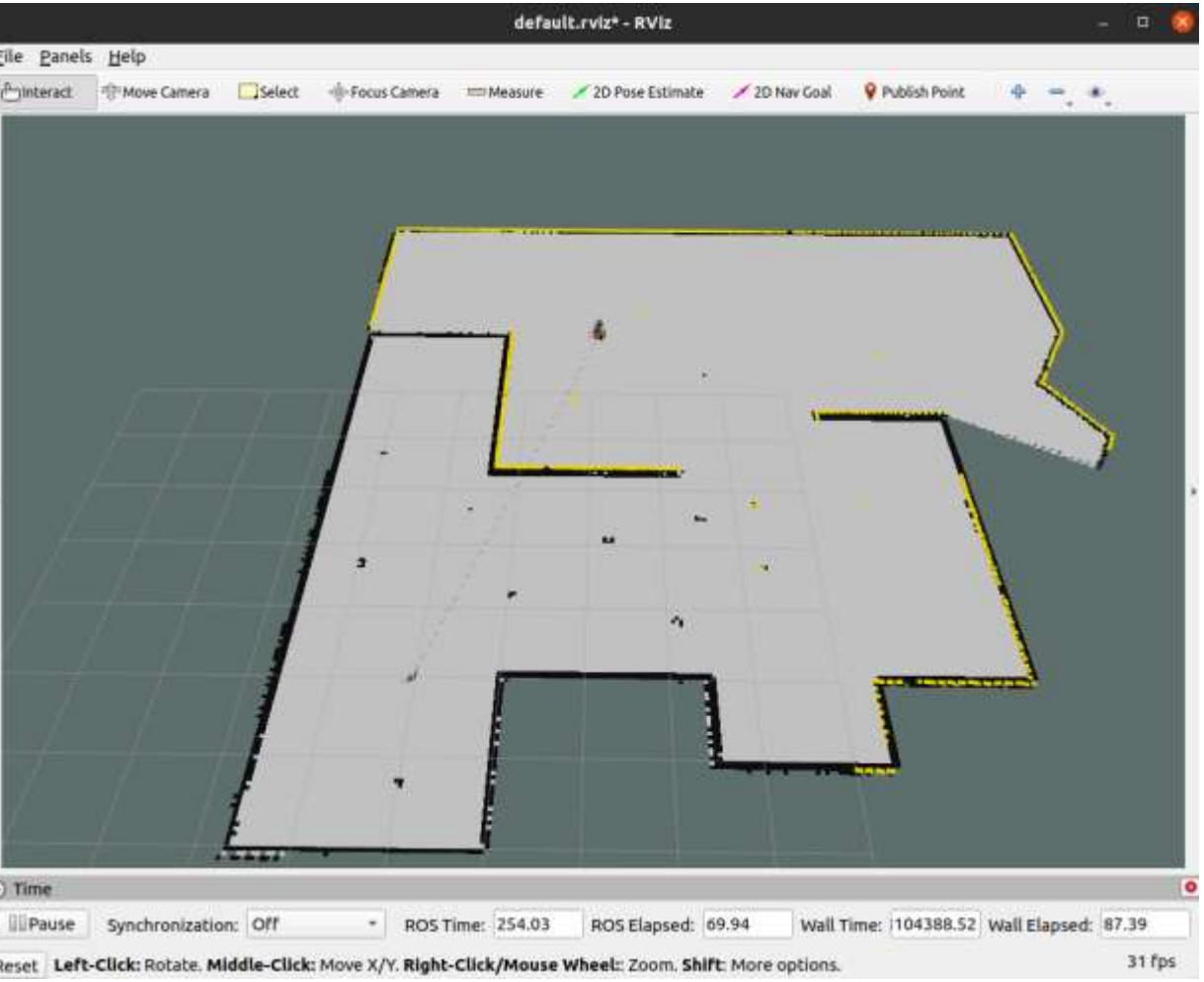
Experiments: Simulation

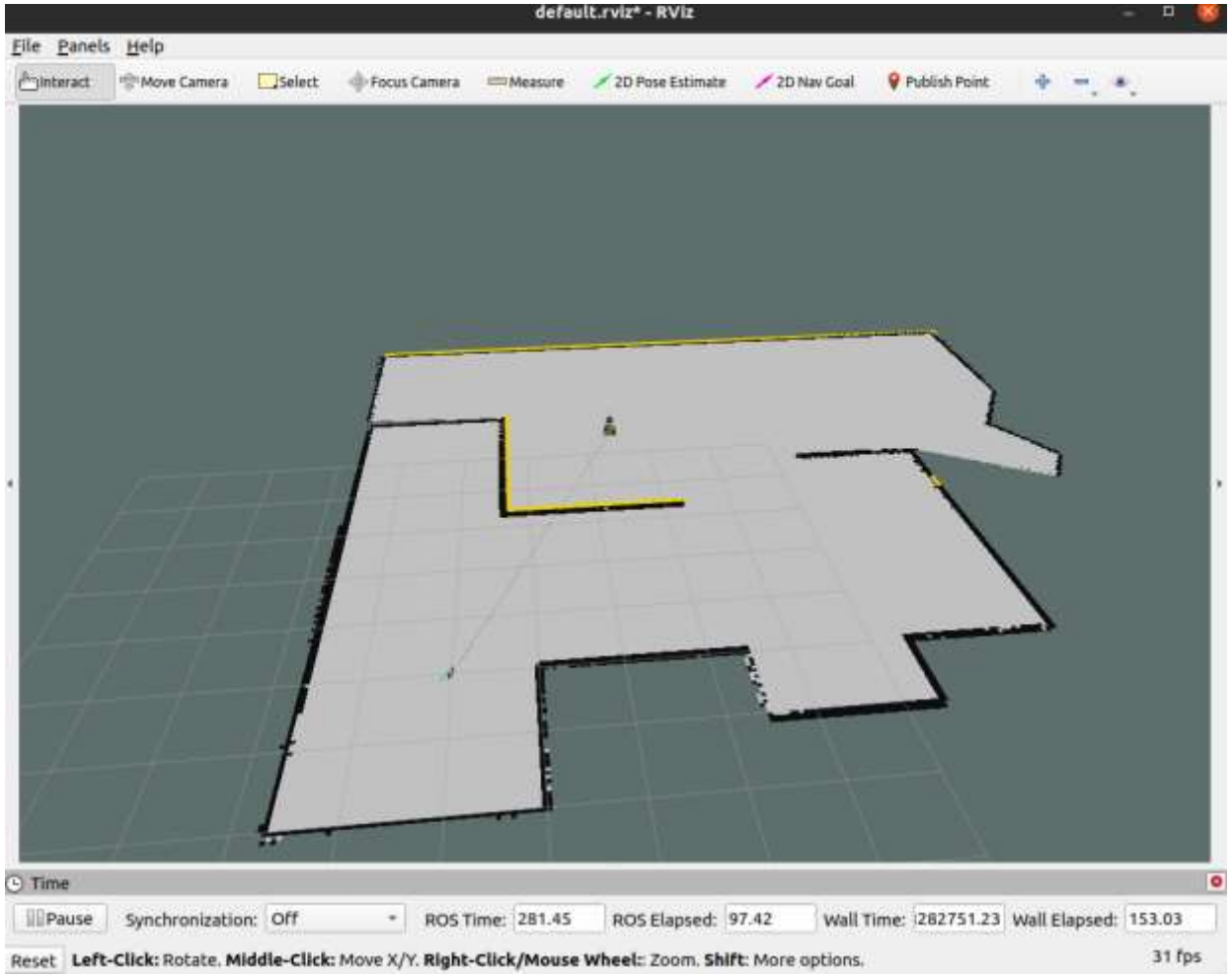


Experiments: Simulation



Experiments: Simulation





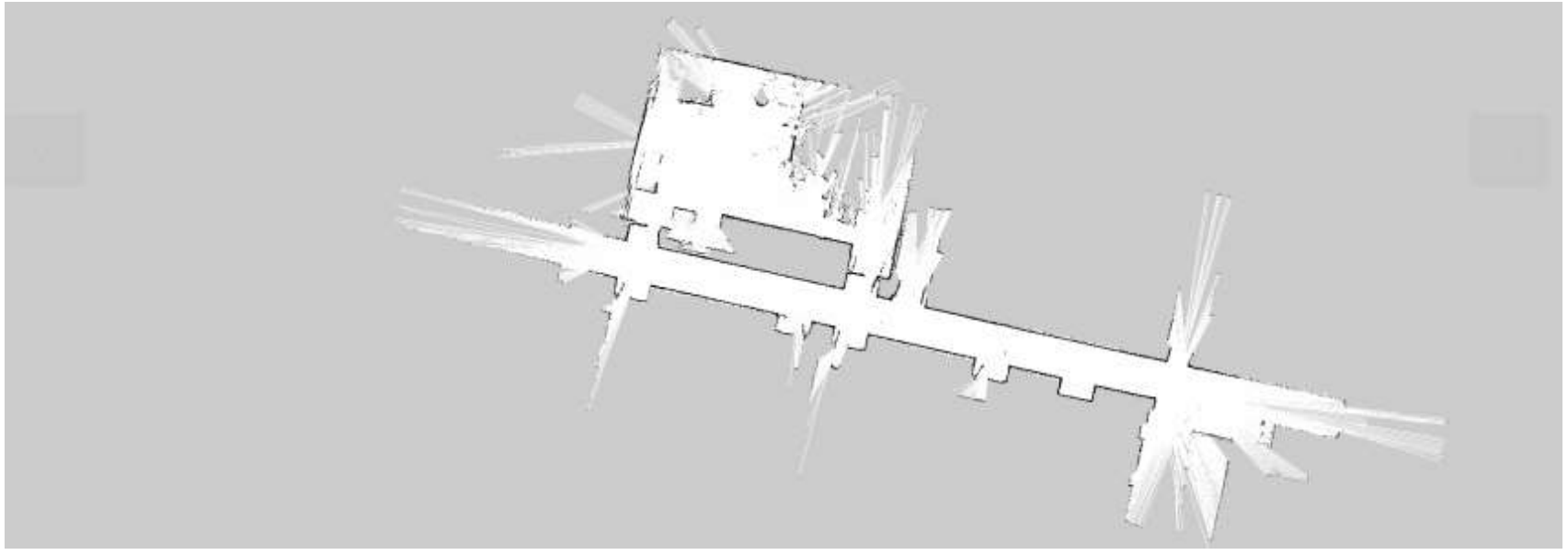
Experiments: Real World

- AgileX HunterBase: Ackerman Car
- Hesai PandarQT
- SIST 1D-2nd Floor
- Full of Chairs and trashbins

Result

Original Case:

Ours:



Conclusion & Looking Forward

Application

- Perminant Obstables in Indoor environment: Wall
- life-long indoor map
- good for navigation stack: global planning

Drawbacks & Limitations

- Only suitable for indoor environment, otherwise lose track
- Better Algorithm: Improment on RANSAC or other plane segmentation method....

Thanks for your attention!