Pointcloud map cleaning task #3419

Unanswered **davutcanakbas** asked this question in **Ideas**

davutcanakbas on Apr 12, 2023

Dynamic Object Removal for SLAM using Point Clouds

Introduction

In this task, we aim to develop a method for removing dynamic objects from point clouds captured by a lidar sensor. The goal is to provide cleaned map results and a more accurate representation of the environment for Simultaneous Localization and Mapping (SLAM) algorithms.

Objectives

Developing an algorithm that can effectively segment dynamic objects from static objects in point cloud data.
Implementing the algorithm in ROS as a node that subscribes to the /points_raw topic and takes in objects from the lidar_centerpoint node.
Process the point cloud data in real-time and publish the static point cloud data on the /static_points_raw topic.
Evaluate the performance of the algorithm by comparing the resulting map generated by SLAM with and without dynamic object removal.

Methodology

The task will be divided into the following stages:

1. Data Collection: Collect a large dataset of point cloud data that contains both static and dynamic objects.
2. Sync topics: Synchronize to delete the received object in topic over the same cloud.
3. Object detection: Integrate lidar_centerpoint to detect dynamic objects in point cloud data.
4. ROS Integration: Implement the algorithm in ROS as a node that subscribes to the /points_raw topic and takes in objects from the lidar_centerpoint node. The node should process the point cloud data in real-time and publish the static point cloud data on the /static_points_raw topic.
5. Performance Evaluation: Evaluate the performance of the algorithm by comparing the resulting map generated by SLAM with and without

Category

Ideas

Labels

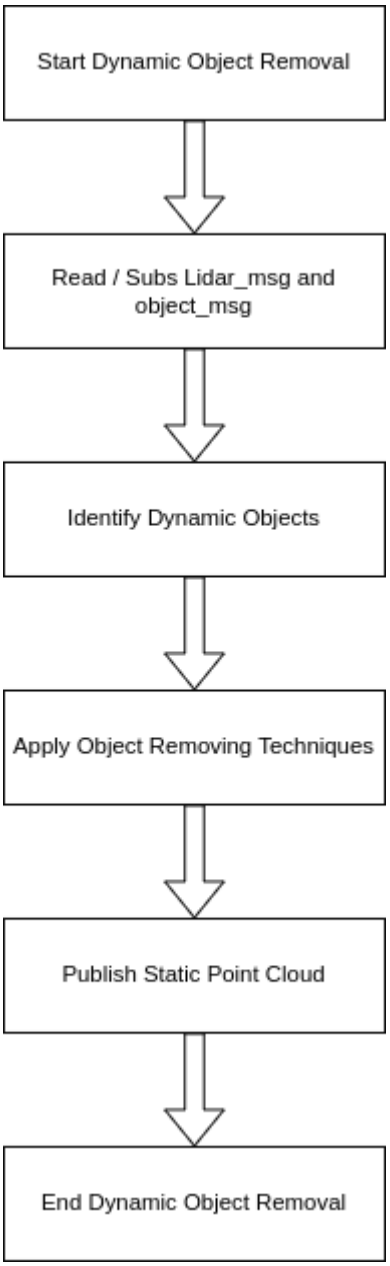
component:map

3 participants

dynamic object removal.
This could involve comparing maps by an operator.

Implementation Details

The algorithm for object detection/segmentation can be implemented in Cpp using libraries such as OpenCV, PCL, or TensorFlow.
The ROS node will be implemented using the PCL library in Cpp and will subscribe to the /points_raw and objects topics.
The dynamic object removal algorithm will be applied to the point cloud data in real-time, and the resulting static point cloud data will be published on the /static_points_raw topic.



Expected Results

The expected results of this task are:

- A functional algorithm that can effectively remove dynamic objects from point cloud data.
- A ROS node that integrates the algorithm and can process point cloud data.

- Better map generated by SLAM algorithms when using the dynamic object removal algorithm.

Conclusion

This task aims to cleaned map, reduce operator workload and provide fast commissioning time and can improve the accuracy of SLAM algorithms by developing an algorithm for dynamic object removal in point cloud data. The resulting algorithm can be used in various applications, such as autonomous vehicles, mobile robotics, and 3D mapping. By removing dynamic objects, the resulting map generated by SLAM algorithms will be more accurate, which can lead to better navigation and localization. Overall, this task is a valuable contribution to the field of autonomous cars and robotics and can have real-world impact. By removing dynamic objects, which can reduce operator workload and provide fast commissioning time, the resulting map generated by SLAM algorithms can be better, which can lead to better navigation and localization. The algorithm developed in this task can be used in various applications, such as autonomous vehicles, mobile robotics, and 3D mapping.

↑ 5

4 comments · 1 reply

Oldest | Newest | Top

n-patiphon on Apr 12, 2023 Collaborator

Thank you for volunteering to do the task!

As I already mentioned in the Mapping WG, I believe that noise removal can be performed offline. This would likely be easier for you, as you wouldn't have to work under strict time constraints as you would with online processing.

Also, just to get you started. I think this project might be of your interest.
https://github.com/LimHyungTae/ERASOR

↑ 1

1 reply

davutcanakbas on Apr 26, 2023 Author

In fact, it can be done both ways. As we talked about at the meeting, there are advantages and disadvantages, we can make it applicable parametrically for offline at the conclusion stage.

yvzksgl on Apr 18, 2023 Collaborator

edited

I wish you success and ease in your task.

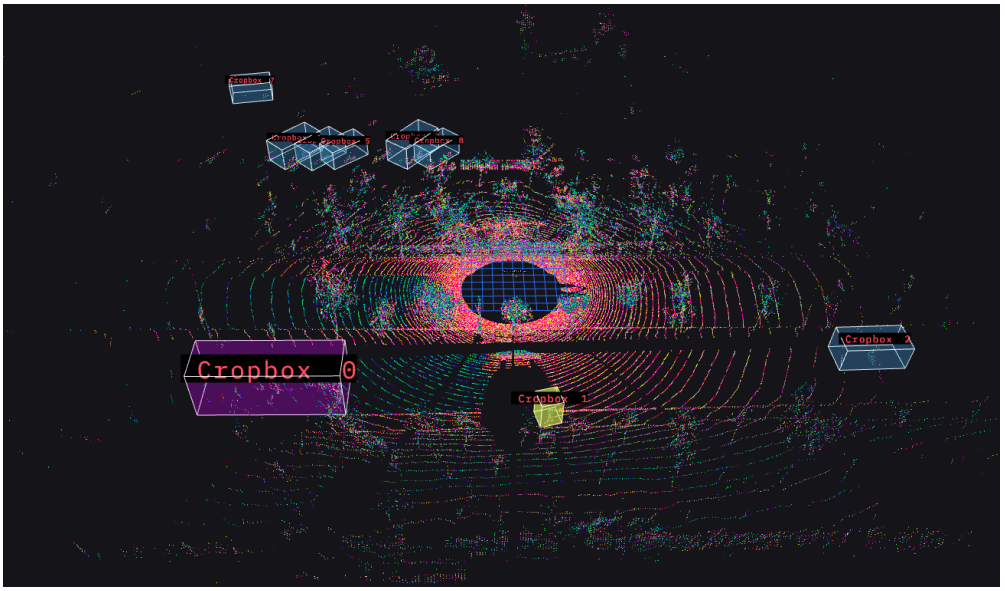
We have a project that has similar purpose to yours. Main idea is using public perception models to detect objects, then removing the points of detected objects from Point Cloud data object publish it to the any SLAM algortihm. We have made some progress and we will be happy from exchanging views. Lasty, https://github.com/autowarefoundation/autoware.universe/tree/main/perception/lidar_apollo_instance_segmentation this model used in our project in case you may want to look at it.

↑ 1 ❤️ 1 0 replies

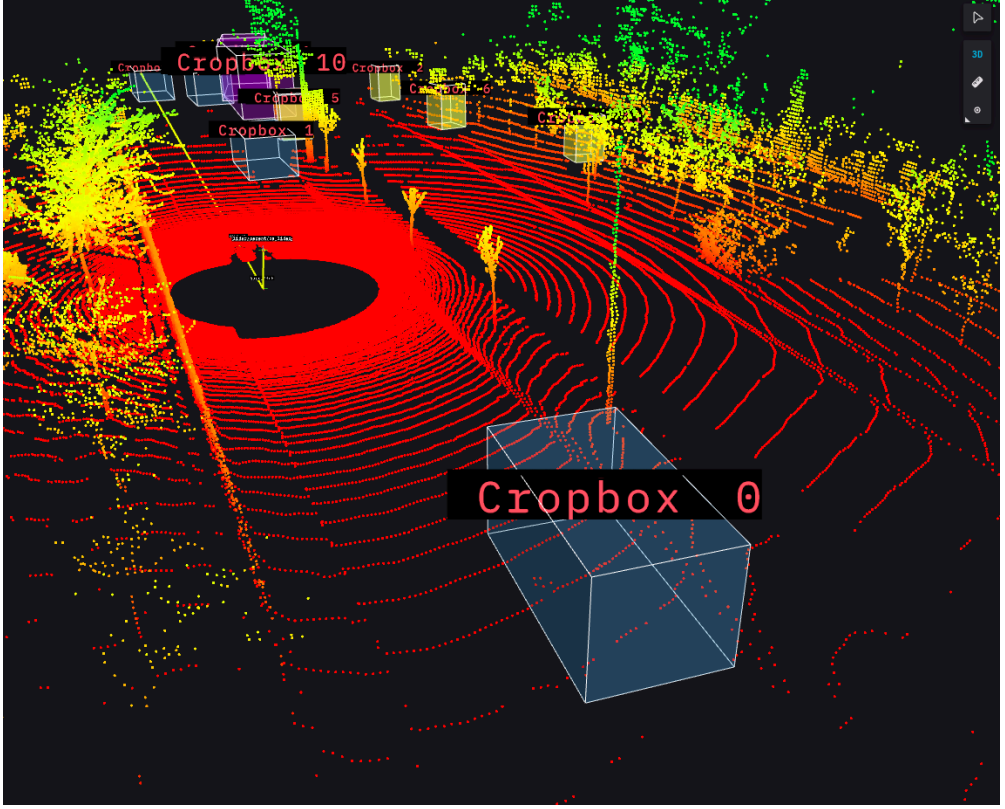
davutcanakbas on Jun 14, 2023 Author edited

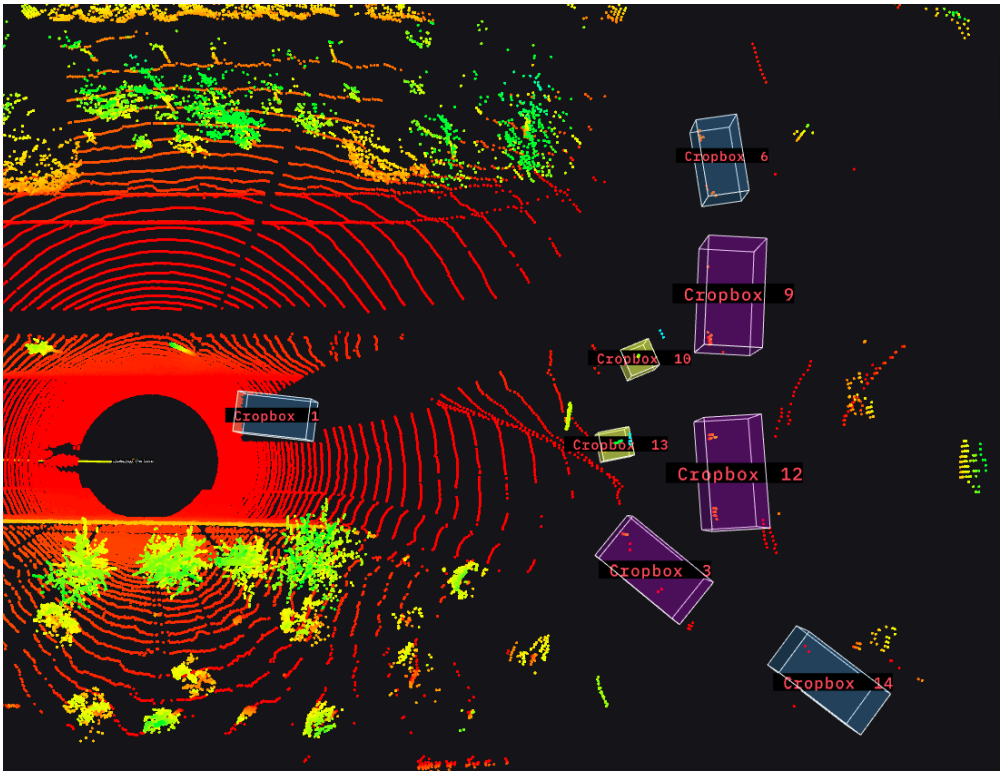
Here are the task list and current status:

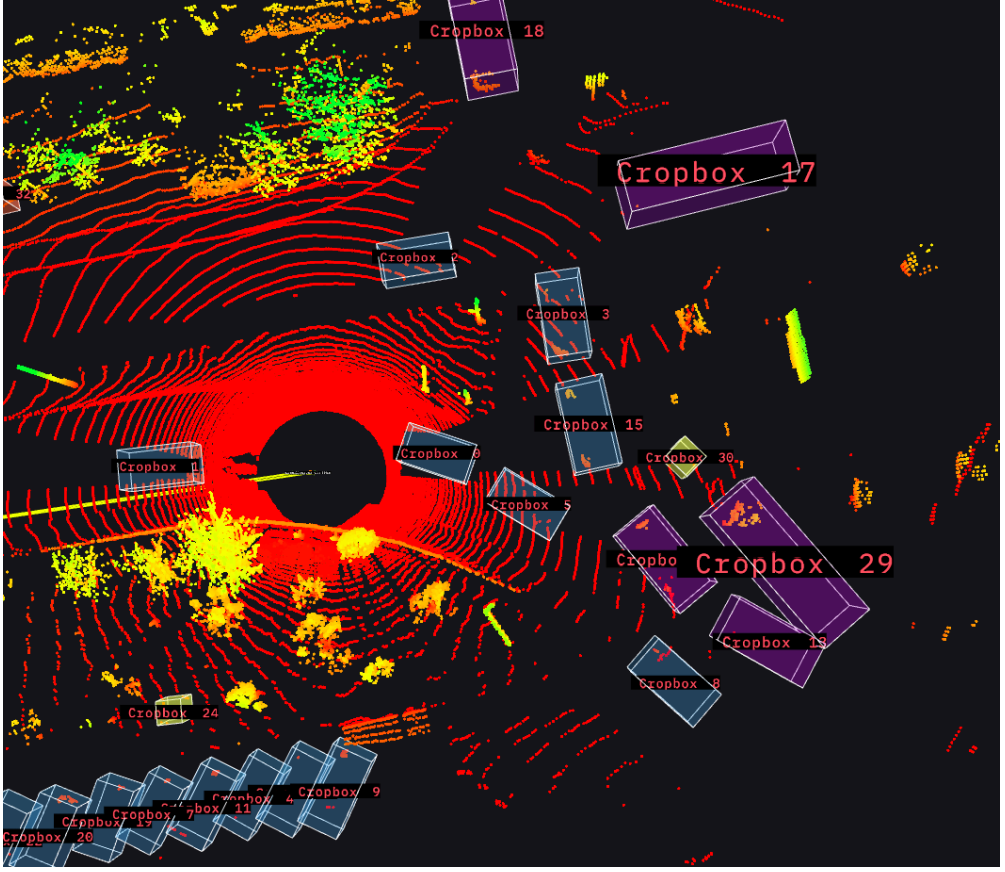
- [x] Prepare the System and get the requirement
- [x] Data Collection
- [x] Prepare Launch of needed nodes
- [x] Subscribe to topics and make them synced
- [x] Visualize the objects in rviz to validate
- [x] Identify dynamic objects
- [ ] Apply object removing techniques (In progress)
- [ ] Publish the cleaned, static point cloud data (In progress)
- [ ] Fine-tuning and documentation

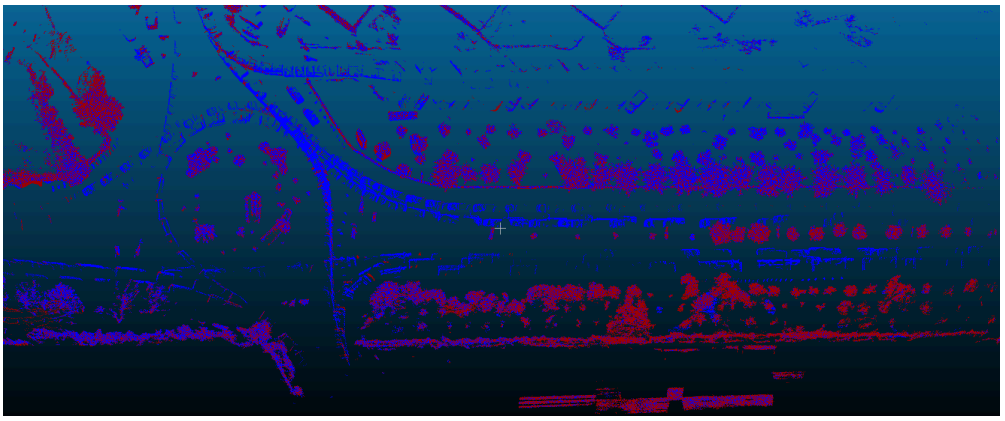


Current Status(05.07.2023):
There is only one bug. I know what causes the bug it's about the calculation equation of orientation. I am trying to fix it.


Cropbox 10
Cropbox 1
Cropbox 0


Cropbox 6
Cropbox 9
Cropbox 10
Cropbox 1
Cropbox 13
Cropbox 12
Cropbox 3
Cropbox 14





1

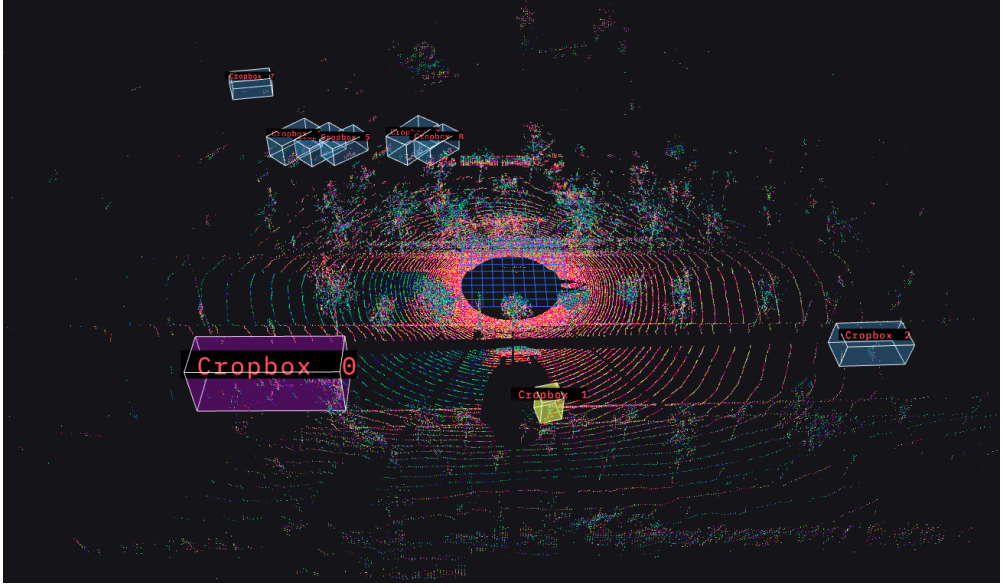
0 replies

davutcanakbas on Jul 19, 2023 Author

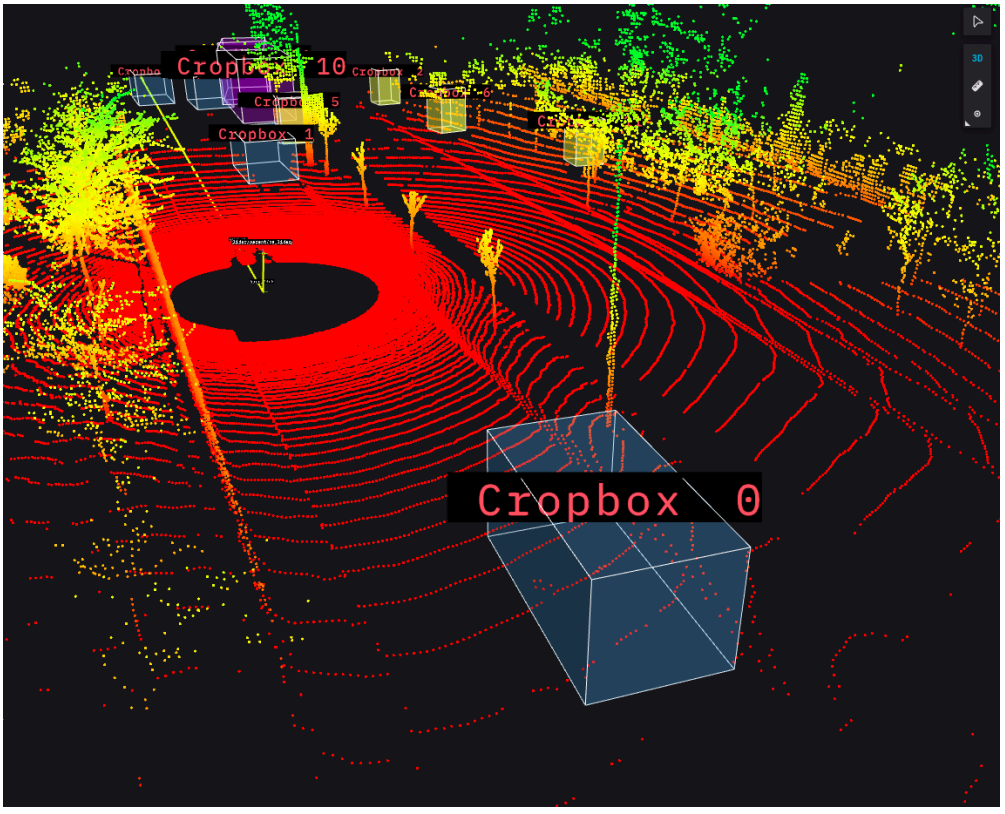
edited

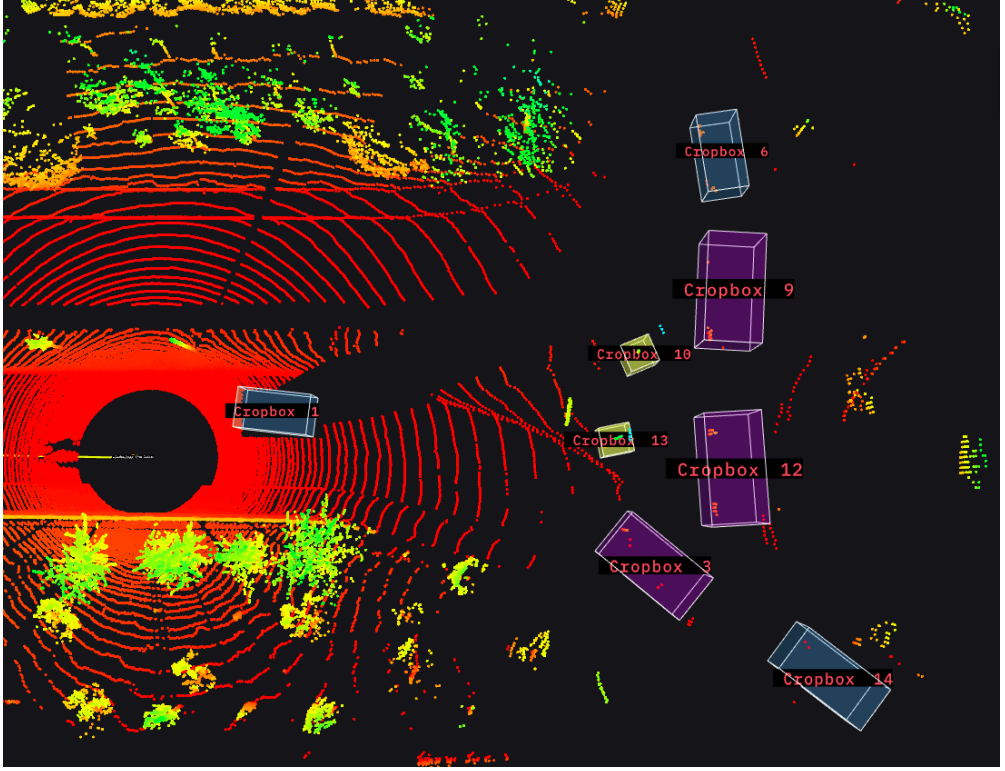
Here are the task list and current status:

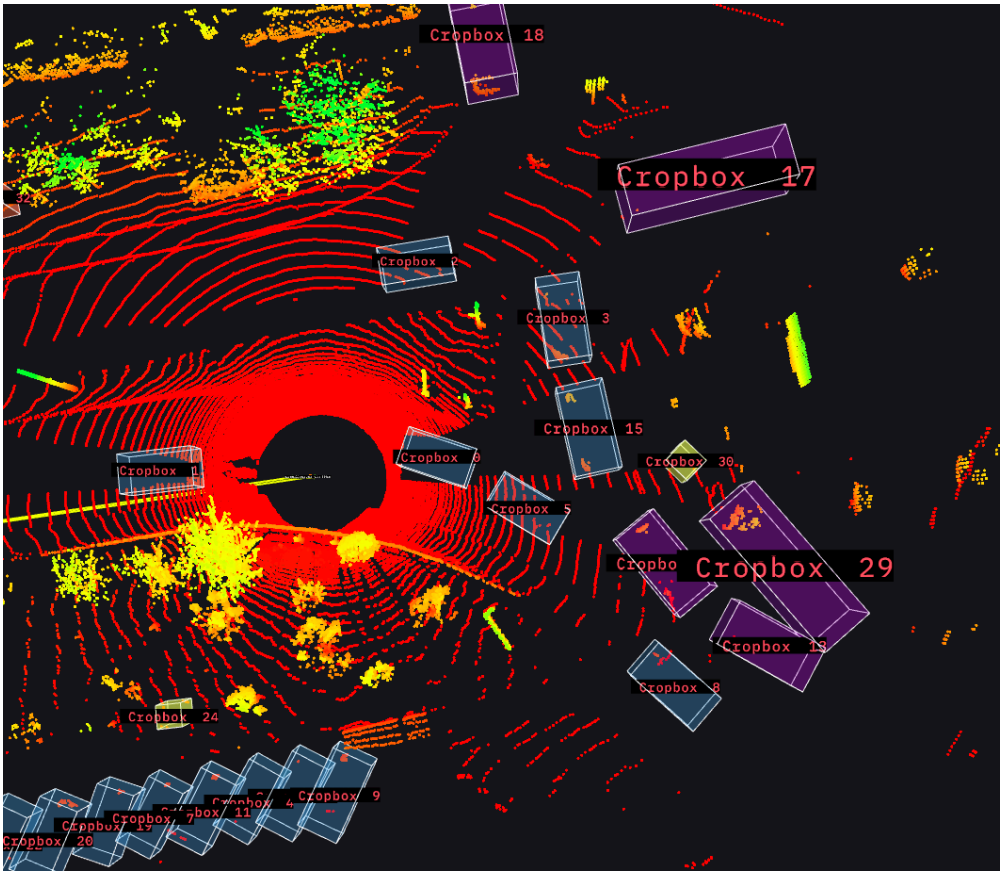
- [x] Prepare the System and get the requirement
- [x] Data Collection
- [x] Prepare Launch of needed nodes
- [x] Subscribe to topics and make them synced
- [x] Visualize the objects in rviz to validate
- [x] Identify dynamic objects
- [x] Apply object removing techniques
- [x] Publish the cleaned, static point cloud data
- [ ] Fine-tuning and documentation (In progress)
- [ ] Autoware.universe implementation (in progress)

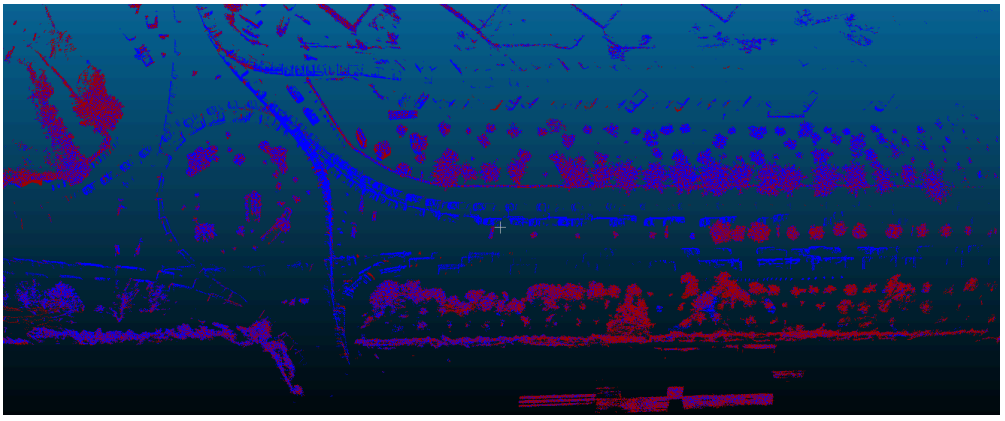


Current Status(05.07.2023):
There is only one bug. I know what causes the bug it's about the calculation equation of orientation. I am trying to fix it.

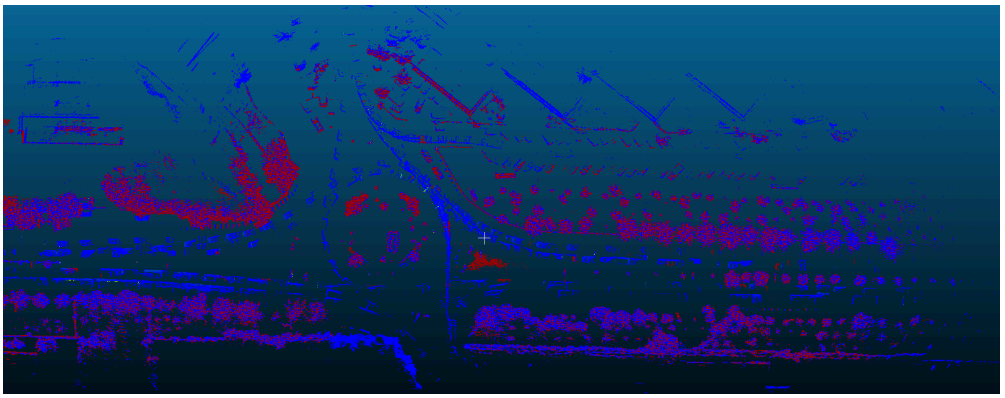



Cropbox 6
Cropbox 9
Cropbox 10
Cropbox 1
Cropbox 13
Cropbox 12
Cropbox 3
Cropbox 14


Cropbox 18
Cropbox 17
Cropbox 2
Cropbox 3
Cropbox 15
Cropbox 0
Cropbox 30
Cropbox 5
Cropbox 29
Cropbox 13
Cropbox 8
Cropbox 24
Cropbox 9
Cropbox 7
Cropbox 20



Current Status(19.07.2023):
Orientation bug fixed:
https://drive.google.com/drive/folders/1MmtmzEnq4ADh_MolT7fJH2jW2t0Bxnk_?usp=sharing



↑ 1

0 replies