

Individual Lab Report 7

Progress Review 8

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Team F - Falcon Eye

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Individual Progress

I mainly contributed to segmenting out the relevant obstacles in front of the Husky. I worked on this along with Rahul.

Segmenting out the relevant obstacles out of the entire point cloud of Lidar

I primarily contributed to segmenting out the localized obstacles from velodyne Lidar's point cloud along with Rahul. We used PCL to process the Velodyne data cloud.

Removing outliers based on condition

Using the entire point cloud for segmenting out the obstacles was computationally very expensive. As we have i5 Mini-pc on-board Husky robot, which has limited computational power so we decided to reduce the point cloud before processing it to find obstacles. To start we reduced the size of point cloud by removing all the points which are beyond certain distance from the robot. We evaluated both the methods available in point cloud library which is outlier removal using conditional or radius outlier removal. Finally, we used Removing Outliers tutorial with a Condition tutorial from point cloud library to achieve this. http://pointclouds.org/documentation/tutorials/remove_outliers.php#remove-outliers

The useful and relevant points in the cloud were filtered out based on two condition, the field of view from 0 to 210 degrees in front of Lidar/Robot and points in vicinity of 10 meters around the robot. We removed all the point beyond these conditions as they were not helping us with the motion planning of the robot. Figure 1 shows complete point cloud whereas Figure 2 shows the reduced point clouds.

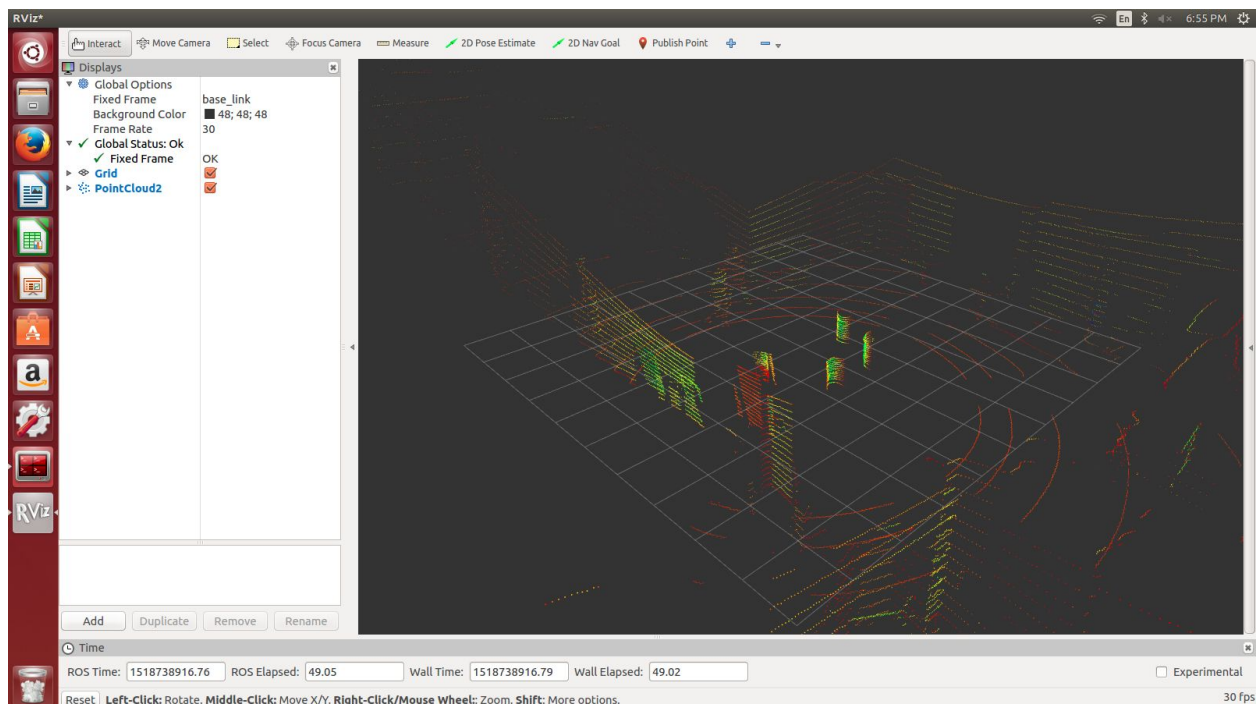


Fig 1. Complete point cloud

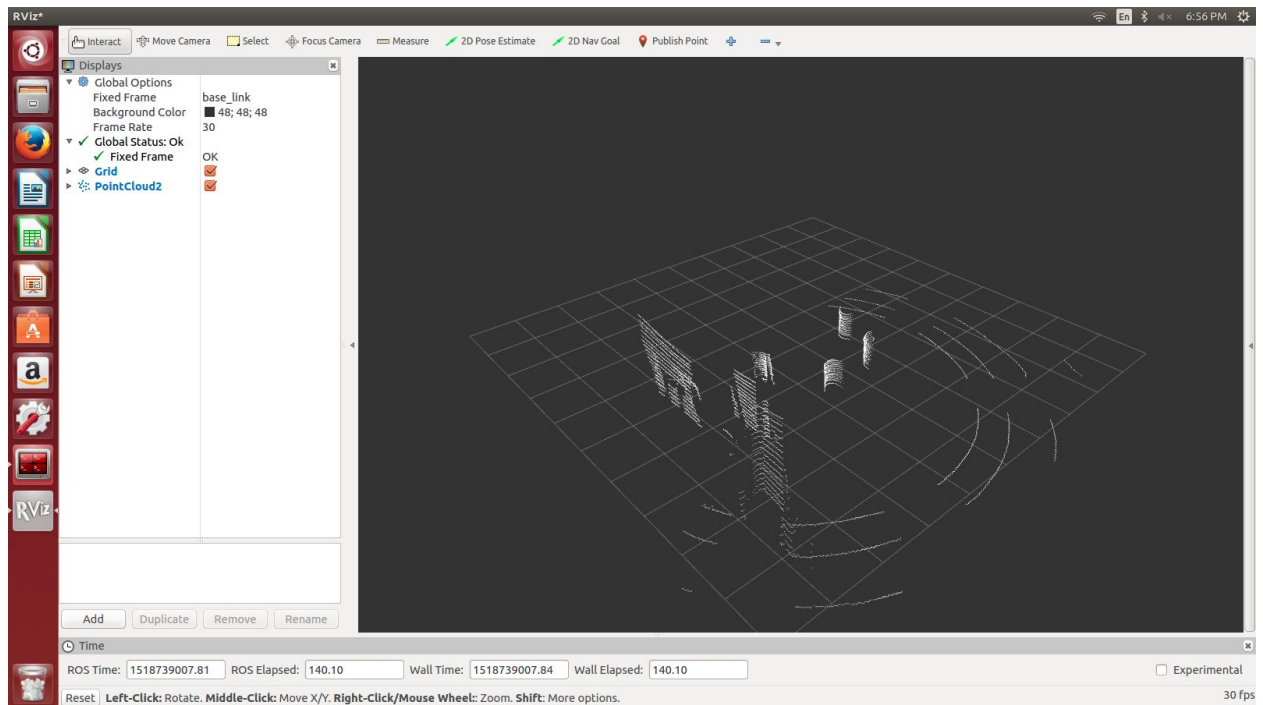


Fig2: Reduced Point cloud data

We then used the clustering method of Point Cloud library to cluster together points corresponding to one obstacle. The clustering was done using the euclidean distance wherein points which are close to each other or within the defined threshold value will be extracted out from the cloud and treated as a single obstacle. We used PCL library to segment out different point clouds corresponding to the obstacles present in the environment. We used conditional euclidean clustering method from PCL. As shown in figure 3 and 4, points corresponding to obstacles are extracted from the reduced point cloud.

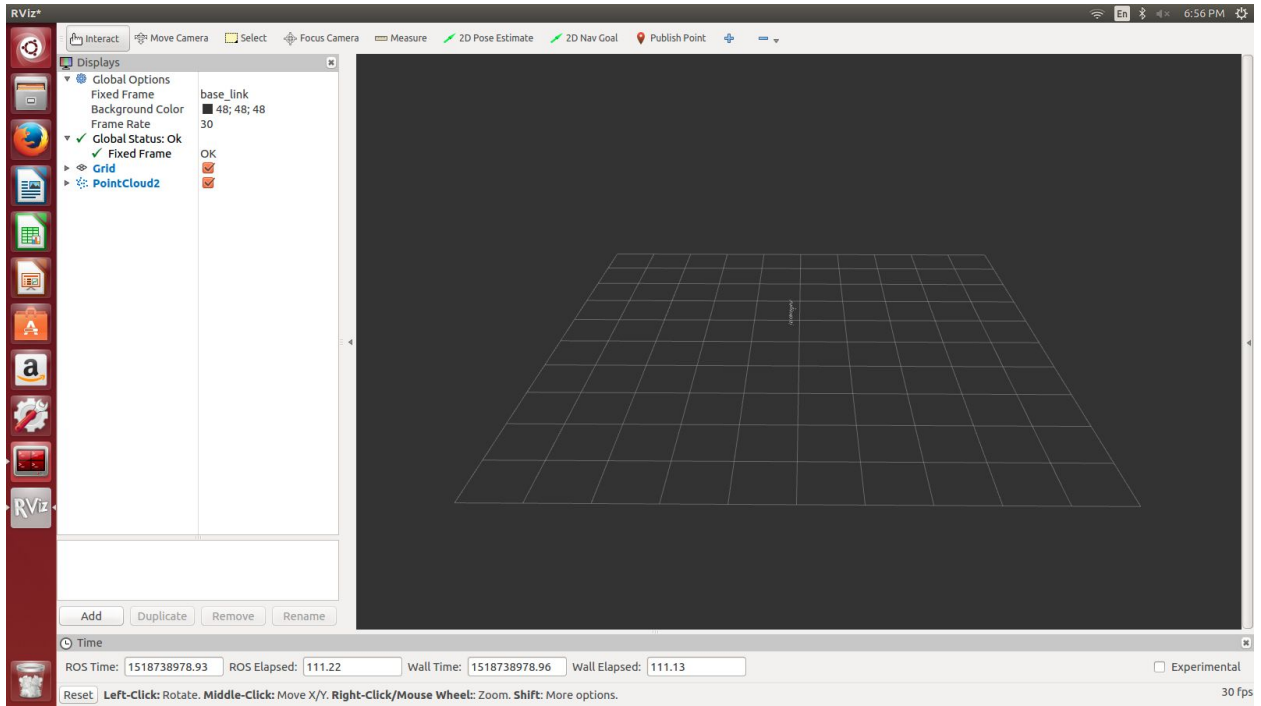


Fig3. Segmented Obstacle 1

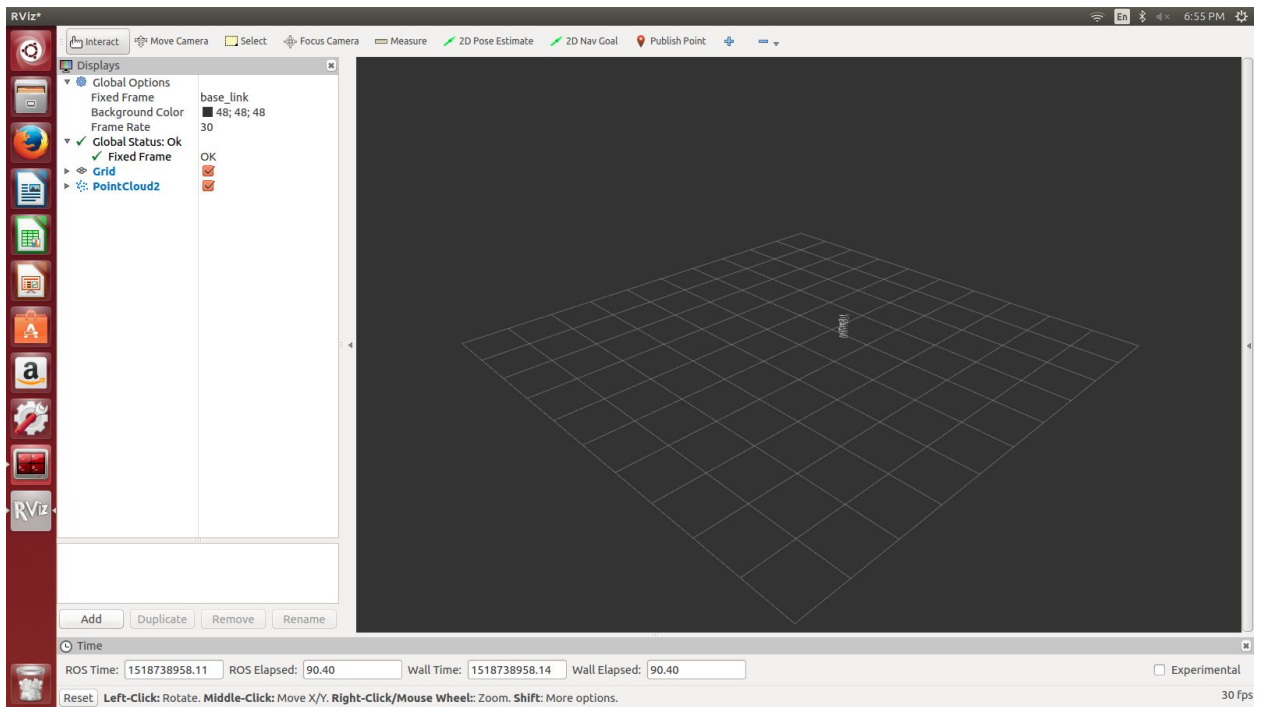


Fig. 4 Segmented Obstacle 2

Challenges

1. The conditions on which data is supposed to be filtered from the point cloud took a little long time, as we conducted experiments with the different parameters.
2. We are planning to remake the structure holding up LIDAR sensor, as the platform is vibrating when the husky moves

Teamwork

1. Danendra worked on setting up the WiFi-mesh network to cover the entire test area.
2. Pratibha worked on integrating the IMU with the ROS system of Husky.
3. Rahul worked on obstacle customization along with me.
4. Yuchi worked on removing the reflection issue being face while detecting the April tag. He used Matt paint. He also worked on improvising connection between different nodes of april tag.

Future Plans

We plan to successfully perform the mentioned tests in FVE. We specifically plan to work on the following tasks.

1. Incorporating the obstacle localization module in navigation stack of Husky.
2. Pratibha and Danendra will work on testing and tuning the IMU parameters for Husky.
3. Yuchi will work on developing the exploration algorithm for drone to find and connect different April Tags in the field.