Team F: FALCON EYE

Individual Lab Report 7

Progress Review 8

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1 Individual Progress

My primary contribution to the progress was to integrate the previous work of segmenting out the obstacles with their respective maximum x and y positions into Husky's navigation stack and in enabling autonomous navigation of the husky avoiding obstacles in its path. These tasks we done alongside Pulkit.

1.1 Obstacle Segmentation from live pointcloud data

During the previous progress review we showed the segmentation from preloaded pcd data file from the husky's lidar. We now subscribed to the pointclouds live from velodyne hoping that the same code would work but it did not. We had the error of segmentation fault. It was because the husky PC was unable to keep up with the incoming data. Hence we wrote a custom frequency modulator that trims down the frequency at which the code receives the pointclouds for computation. This was done by dropping packets at certain predefined frequency making it possible for the husky PC to keep up with the computation. Dropping the packets does not affect our process as a whole as the frequency at which it currently receives is enough for the husky to operate in real-time. The current frequency of points is good enough to match the pointcloud as shown in fig.1.

1.2 Publisher and Subscriber

We wrote a custom publisher that publishes the minimum and maximum x and y coordinates of the segmented obstacles in vector format. Another subscriber from the husky node subscribes to this topic “/obsctacle points” and feeds them into a custom function used to compute the husky's future control signals. The frequency of publishing and subscribing is equal to keep the controls near real-time.

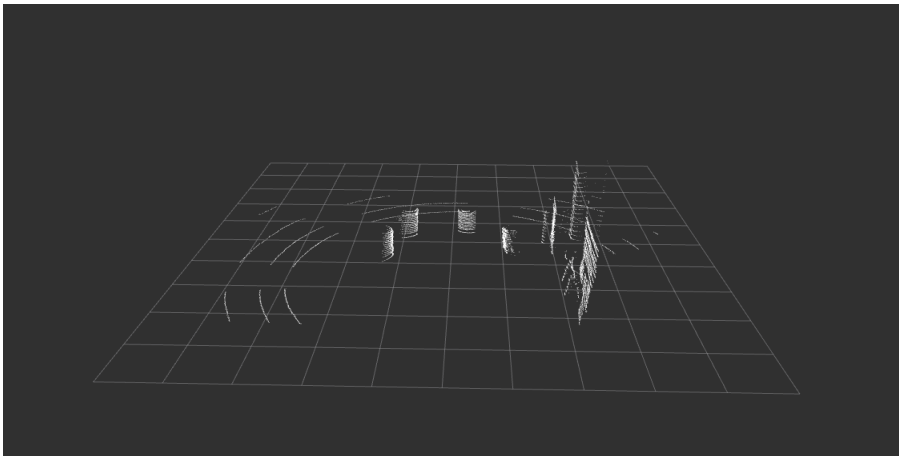

Fig.1 Visualization of Filtered (desired) pointcloud from Husky's LIDAR

1.3 Husky Obstacle avoidance

As we had clusters of point clouds corresponding to each obstacle with their their corresponding maximum x and y locations with respect to the Husky, we decided to write a reactive approach algorithm. There is a major requirement to perform suitable navigation around the obstacle and so we decided to use the relative distance between husky and Lidar to perform the same.

The algorithm does the following : If the distance of the obstacle is less than 2 meters from the husky, it changes it direction of traversal. The direction of traversal is changed such that it rotates away from the obstacle's positon with respect to lidar frame i.e. husky's body. If the obstacle is on the left frame, it turns right and vice versa as seen in Fig.3 (a) and (b)

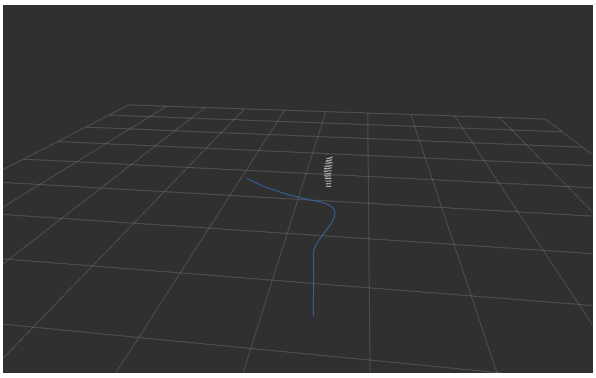

Fig.3.(a)

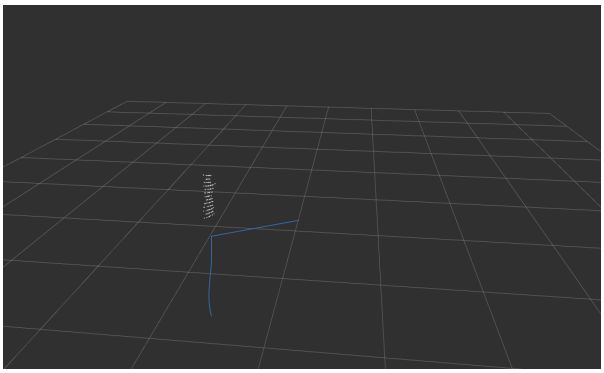

Fig.3.(b)

Fig.3 Visualization of Husky's movement

2 Challenges

Unexpected challenges was that we lost one of our backup drones. However, we were fortunate to had a backup drone ready for deployment. Also biggest challenge we faced was the weather for testing the system outside.

3 Teamwork

Pulkit and I worked on Lidar’s point cloud data processing for obstacle avoidance. Yuchi worked on developing a method to exploration algorithm using the drone and to relay the information back to the Husky. Pratibha and Danny worked to calibrate IMU and perform field testing.

4 Future plans

Pulkit and I will work on perfecting a better planning algorithm and test outdoors. Yuchi will continue working on improving the path exploration

algorithm for the Bebop. Danny and Pratibha will work on integration and drone side of the project