Individual Lab Report 7

Team: H

Name: Steve Zhu

Date: 09/26/2019

Team Member: Akshit Gandhi

Shubham Garg

Parv Parkhiya

1. Individual Progress:

I mainly worked on open door detection. In last two weeks, we have implemented the open window detection, where we directly employed openCV's function "find_contour()", which automatically finds all the encompassing areas in the image, and return the borders for each area as a potential open window object. This works fine with the window object as the window has very clear four borders.

However, when it comes to the open door detection, the bottom border is not clear. The bottom part is a gradually changing depth, as shown by the image below:

To tackle this issue, the method we proposed is as follows: first, we detect the two vertical borders which align with the wall, and are easy to detect. Once we locate the vertical borders, we explore the areas around

the bottom part of these two borders. The door bottom is able to detect because: for instance, for the left vertical border, the left part of it is the wall, which has a quite uniform depth, while the right part of it is the ground, and we are able to observe the gradual change of depth as the distance moves further. Based on the above observation, we detect the bottom line point where the depth of one side keeps constant while the other side continues changing.

After we get obtain the bottom border of the door, we get all four borders, and we can continue using the code for window detection to draw a circle indicating the spatial center of the door.

2. Team Work

We together mounted the realsense cameras on the Husky, and didi DJI front stereo disparity computation. Individually, I mainly worked on open door detection, Akshit worked on Drone's opening alignment in simulator, and Shubham and Parv worked on UGV's point cloud stitching, and trajectory following using local planner.

3. Challenge

The challenge for my part is that the door detection algorithm is not very robust. Sometimes, the bottom border is still very hard to detect, as we might have encounter lots of noise and artifacts on the ground. Other challenges are like Adding the cameras to the URDF and TF trees (basically figuring out the exact xyz & rpy for 4 cameras), and Replicating the build on total of 2 Manifold 2Cs.

4. Future Work

1. Output of combined pc is 2Hz hence we need to work on getting a higher frequency output
2. Tracking camera and IMU integration with Robot_Localization

3. Drone actually going through a window
4. Range testing for the WiFi and selection of the proper WiFi router
5. Setup of communication between the robots using WiFi
6. Setup of a database with proper db schema for the information that will be shared