Brain Perception System for Human Avoidance

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Goal: Avoid human present in the corridor.

Assumptions:

1. The only obstacle is human which is at 2m approximately always.
2. The camera is mounted and aligned perfectly on the bot.
3. The orientation of the cam or the bot does not change.
4. The camera on the robot is exactly at the center from all sides.
5. The vanishing point of image is assumed at the center. (3+4)
6. The height of the robot covers entire length of the human.
7. This allows me to check for distance only in specific area.

Approach:

1. Load the file in array.
2. Threshold at 4 meters.
3. Only consider the area where human is present.
4. Iterate through array and find lateral distances between all points.
5. Get maximum clearance (lateral distance) for each height.
6. Find minimum clearance amongst different heights.
7. This way one can stay safe assuming worst case.
8. Get the positions of pixels corresponding the final clearance we got in step 6 and return distance and the heading.

Discussion:

This code assumes many things. Also, I have taken the distance of corridor deliberately around 1.8m instead of 1.5m given because this is what depth information is giving me. Also, I have done some extra effort to get the 3d point cloud for a depth image in PCL. The next step would be to carry out plane segmentation and Euclidean clustering to find distance between human and the corridor. The results won't be good as we are assuming equal spacing between pixels. But I can get back to you with more if you require. Thank You.

Results:
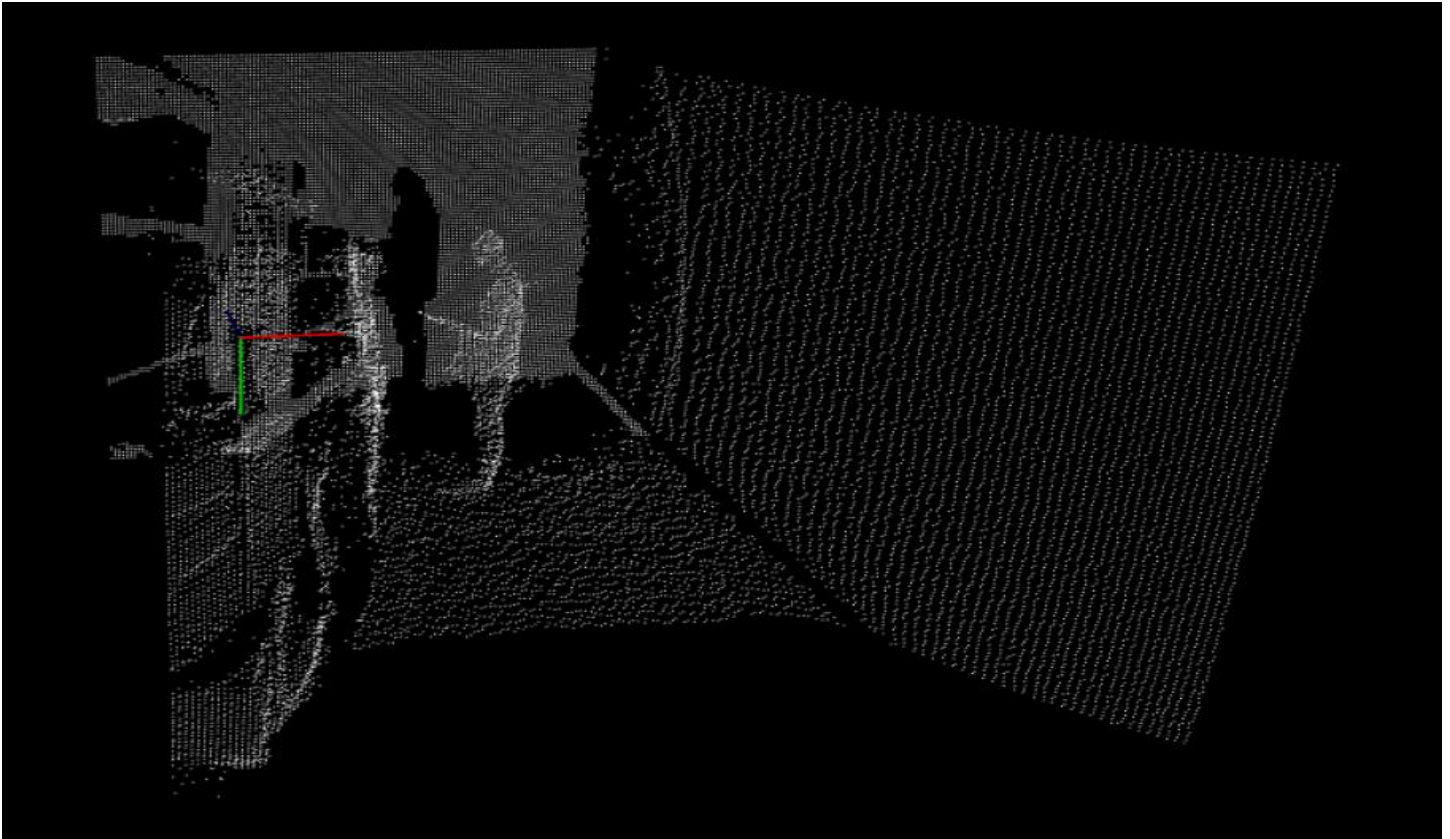
Point cloud for human_corridor_2.txt

Run: Modules used numpy, sys and math

> python3 find_clearance.py ./human_corridor_0.txt

Output: left 0.94

How to generalize:

- To generalize I would first discard the assumptions.
- Human could be present at any distance. In the code I would have to change the area (step 3), that I am considering for getting lateral distances, depending on the distance.
- For larger field of view, one could even take radial (lens distortion) in consideration.
- I would change the clearance distance based on the height and width of robot if given.