Lab1 writeup

6.1.2. What assumptions is this model making?

1. The noise of the states are following the Gaussian distribution.

2. The new states are only depended on the last states and current input.

6.1.3 Why are so many particles in a radius of the ground truth for the test 1 as opposed to the test 2/3?

Because the error given in test 2/3 are much bigger than the test 1.

6.2.2 What are the drawbacks of viewing each ray as conditionally independent?

If one ray hits a target, it is likely that its neighbor rays will also hit the target. Viewing each ray independently will decrease the probability.

6.2.3 What assumptions is this model making?

1. Given the map of the environment, these rays are conditionally independent of each other.

2. There are 4 noise model, Correct range with local measurement noise, Unexpected objects, Failure and Random measurements.

6.2.4 Why does the hallway heatmap not converge on one point?

If the car is on the hallway and far from the wall which is in the intersection part, the Lidar cannot scan the wall in front of the car, so it can only get the distance between the car and the wall beside it. Therefore, there would be many possible locations for the car. However, when the car is near the intersection, it can scan the wall in front of car, so the location of the car can be determined.

6.3.2 Why do the samples close to k get sampled more?

Because the possibility on the k is greater than the others.

6.4.2 The final median errors for all 3 files

Bag 1 circle

Median X Error: 0.000569609355242 Median Y Error: 0.000328881406299 Median Theta Error: 0.000396161937347

Bag 2 circle_2x

Median X Error: 0.00062031412078 Median Y Error: 0.000321575633319 Median Theta Error: 0.000337753575

Bag 3 full_2x

Median X Error: 0.0007528441101 Median Y Error: 0.00105565949549 Median Theta Error: 0.000700278550309

6.4.4 Where does the particle filter do well? Where does it fail? Why?

1. If particles equally distributed, no motion, no observation, all particles would migrate to one of the rooms because the resampling would increase the variance.

2. Particle starvation.

3. The observation model is too good.