CS460: Assignment 3 Localization and Mapping

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1 analysis

Given the map of the corresponding world, the robot's initial location, the odometry and the scan data, you are asked to provide your own implementation of the Sequential Importance Resampling algorithm for a particle filter approach to the localization problem. In particular, build a software package that is able to load the map of the world, the scan data and visualize the robot's location (2D - could be just images) over time. Report on the accuracy of the approach against the ground truth data. Run experiments for different levels of noise by using the available software to generate a variety of scan data examples and corresponding ground truth. Provide graphs that show the performance of the method (in terms of accuracy) as the noise level increases, as well as for differe. As noise increases, the sensor data and odometry are disturbed. The distance from actual robot location to the predicted location is shown to have further value. However, as number of particle increases, the accuracy also increases. Even though on some occasions, the accuracy is not guaranteed because samples are ramdomly generated.
From our observation, the run time of Localization program increseases exponentially when the number of particles increases. This is because turtlebot sensor is required to observe the sensor data for all the particles.

1.1 comparison data

sensor noise level	Accuracy by distance
0.1	0.57 cm
0.5	0.91cm
1.0	1.54cm

Table 1: 100 particles

sensor noise level	Accuracy by distance
0.1	0.59cm
0.5	0.87cm
1.0	1.01cm

Table 2: 500 particles

sensor noise level	Accuracy by distance
0.1	0.37cm
0.5	0.67cm
1.0	0.32cm

Table 3: 1000 particles