

Assignment 4

The objective of this assignment is for you to expand your familiarity with Turtlebot 2 robot, develop some basic behaviours and identify the accuracy of different odometric schemes. This assignment is also a team assignment.

1. Develop basic behaviours [20%].

Implement three functions *translate(double d)*, *rotate_rel(double angle)*, and *rotate_abs(double angle)*. The translate function takes one argument the distance to be travelled in meters. The relative/absolute rotate functions take one argument the angle of rotation. Use the time needed times the commanded velocity to calculate how much you have travel. See, as in assignment 3:

<http://www.cse.sc.edu/~jokane/teaching/574/notes-turtlebot.pdf>

In particular ensure you have installed the *robot_pose_ekf* node, and subscribe both to *odom* and *odom_combined* messages.

2. Odometry Study 80%

For this question each team should implement different test patterns:

- Straight line (1 m)
- Rotation (relative) (+/- 30)
- Square (side 1 m) extra rotation to end at the same orientation

Then run the robot several times for each pattern and manually estimate distance travelled and actual rotation. This will provide enough information to characterize the noise of the motion model.

Report:

- Actual distance travelled (manual measurement), commanded distance travelled, odom estimate, and odom_combined estimate.
- Actual angle rotated (manual measurement), commanded distance travelled, odom estimate, and odom_combined estimate.
- Estimate, mean error, and variance.

3. Bonus question 20%

Use the Kinect sensor to estimate motion. Use flat surfaces (wall) to recover lines (or planes). Measure distance to the line before and after, together with relative orientation.

Evaluation:

I will arrange with every team to see a demo of the test pattern behaviours. In addition write a report discussing your findings, problems encountered, and the distribution of work among the team members.