CISC 3060 Introduction to Robotics

Lab Assignment #1

Step 1: Write a ROS node using rospy that sends the turtlesim robot to a series of waypoints stored as a python list:

waypoints = [(x1,y1), (x2,y2), …, (xn,yn)]

You must allow for any length of list. The node should terminate when the last waypoint is reached.

Make sure you test this thoroughly before proceeding to the next steps.

Step 2: Add code to calculate and maintain a running estimate of the average accuracy with which waypoints are being reached when processing a waypoint list. Test this with a list of 10 waypoints.

Vary the termination threshold in the while loop of of the goto node using the following values [1, 0.5, 0.25, 0.1, 0.05, 0.01]. For each, record the value of the accuracy.

Plot a graph of the average accuracy against the termination threshold, making sure to include axis labels and a graph caption.

Explain the relationship shown in this graph, considering the goto_node while loop.

Step 3: Using a waypoint list with just 1 waypoint, generate a graph of the velocities generated on each loop of the algorithm for each of the loop termination values in Step 2.

Plot all the graphs overlayed on the same axis. Remember to label axis and caption the graph.

Explain the relationship shown in this graph, considering the goto_node while loop.

Step 4: Set the termination value to 1.0, and conduct a series of movements from one waypoint to a second and back, where you vary the angular gain to the values [3, 4, 5] for each movement. For example, repeat the motion from (1,1) to (5,5) and then back.

Capture a separate screen dump showing the trace of the motion for each case.

Explain the behavior you observed, considering the goto_node while loop.

Step 5: Repeat the experiment varying the linear velocity [0.5, 1.5, 3] (set the termination threshold to 1.0 and the angular velocity gain to 4.0).

Explain the behavior you observed, considering the goto_node while loop.

Step 6: Repeat the experiment varying the sample rate between [2,5,10,20]] (set the termination threshold to 1.0, the linear velocity gain to 1.5 and the angular velocity gain to 4.0).

Explain the behavior you observed, considering the goto_node while loop.