ELEE 4200/5200: Autonomous Mobility Robotics

Term I, 2018

Homework 2: Move Robot with Feedback

Note:

- The aim of this assignment is to go one step beyond Homework 1 by driving the robot using feedback.
- Guidelines:
  - Due date: Thursday, September 27, 2018 by 12 Noon.
  - You are permitted to work in groups of no more than two students. State the full names and T# of the students in the group on the cover page of every document that you submit.
  - Submit the report by responding to this assignment posting in Blackboard.
  - The submission should at least include the following documents, bundled together into a single zip file with the name *YourNameHW2* (use one of the group member names).
    - The main report (following the template provided).
    - The main report in 'pdf' form.
    - The MATLAB program code.
  - A hard copy (printout) of the 'pdf' report with MATLAB code; staple all pages together and follow the TA's instructions on how to submit.
  - Each group must work on its own in completing this assignment! Feel free to consult with others in developing solution ideas, but the final implementation code must be your work product alone. Refer to the Syllabus, where the policy on academic integrity is clearly outlined, our classroom discussion on this topic, and consult with me if you have any questions!

Goal: Drive the robot along a triangular path that is an isosceles triangle with angles of 45^0, 90^0 & 45^0, with the equal sides being 4 meters each in length.

Specific requirements:

a) Investigate how you can get a sense of time in your programming environment (and explain this in your report).
b) Use timing to drive the robot along the sides of the triangle and turn through the necessary angles.
c) Then drive using odometry feedback.
d) Repeat by using the "model state" topic as feedback, instead of odometry.
e) Comment on the various paths traced and compare them.

Note: Issues that you may have to consider – drive fast or slow, turn fast or slow?

References:

Use the classroom discussion entitled “Introduction to ROS” and the demonstrations as a starter. Then, go to the following site which pertains to MATLAB R2018a (or the equivalent site for MATLAB R2017a):

https://www.mathworks.com/help/robotics/getting-started-with-robotics-system-toolbox.html

Then, look at the first link within this page - “Get Started with ROS”. After that, follow up with the links listed below which can be accessed at the bottom of each page.

- “Connect to a ROS Network”
- “Exchange Data with ROS Publishers and Subscribers”
- “Work with Basic ROS Messages”
- “Get Started with Gazebo and a Simulated TurtleBot”
- “Get Started with a Real Turtlebot” (for those interested in hardware implementation after the simulation phase)

The above documents contain enough information for you to finish Homework 1. While not all of the information is necessary for this homework, it is to your understanding of the MATLAB-ROS interface in general.