Homework 1
Basic use of ROS and Gazebo (Max score: 4)

16-311: Introduction to Robotics (Fall 2017)

OUT: August 27, 2017

DUE: August 31, 2017 at 11:59pm - Available late days: 3

Instructions

Homework Policy

Homework is due on autolab by the posted deadline. As a general rule, you have a total of 8 late days, but cannot use more than 2 late days per homework. Exceptionally, for this first homework, you can use up to 3 late days, that will be counted as 2. No credit will be given for homework submitted after the late days. After your 8 late days have been used you will receive 20% off for each additional day late.

You can discuss the exercises with your classmates, but you should write up your own solutions. If you find a solution in any source other than the material provided in the course, you must mention the source.

All programming questions must be answered using Python.

Submission

Create a tar archive of the folder with your ROS package and submit it to Homework 1 on autolab. You should also have one PDF file in your archive, with an explaination of your findings regarding the experiments with the robot and the instructions for running the nodes, if any.

1 ROS

This first homework is indeed quite simple, but it requires that you carefully go through and understand the contents of the document "start-with-ros.pdf" provided in Piazza.

You are asked to replicate the package described in the documents and play/experiment with the different ROS commands.

Once done, you can start to focus on the real task of the homework, which is intended to test your basic knowledge of ROS. The task is the following:

- Create a package with *at least* two nodes. One node should be devoted to move the turtlebot robot in a Gazebo simulated world. The other node should be used to keep reporting relevant navigation data, including position estimation from robot odometry and ground truth (from Gazebo), and to measure the robot "performance", as explained below.
- Using the system topics and services described in the mentioned document, the two nodes should let a turtlebot robot moving following a *square path* in the *empty.world* world scenario of Gazebo.

  The square is centered in (0,0). The side of the square should be set to 3 meters, the linear speed of the robot to 0.9 m/s.
- The robot follows the square path 10 times. At the end of the run, measure (with a node) the deviation between the expected trajectory (the last one) and the currently realized one. Quantify the error, report it, and discuss your findings.
- Optional: show graphically the whole trajectory made by the robot over the 10 cycles (overlapping it with the expected one). Discuss the results.