Exercise Session 3

Theory

- ROS publisher
- rqt User Interface
- TF Transformation System (Optional)
- Robot models (URDF) (Optional)
- Simulation descriptions (SDF) (Optional)

Exercise

The goal of this exercise is to close the control loop for the first time. You will extract the position of a pillar from the laser scan and then control the robot such that it drives into the pillar.

1. Adapt the launch file from the last exercise such that:
   a. The keyboard twist node is removed.
   b. `$(find husky_highlevel_controller)/worlds/singlePillar.world` is loaded as the world and thus copy the `singlePillar.world` file from the Zip provided on our RSL homepage to that folder.

2. Extract the position of the pillar from the laser scan with respect to the robot.

3. Create a publisher on the topic /`cmd_vel` to be able to send a twist to Husky.

4. Write a simple P controller that drives husky towards the pillar. Remember to use parameters for your controller gains! Write the code in the callback of the laser scan topic.

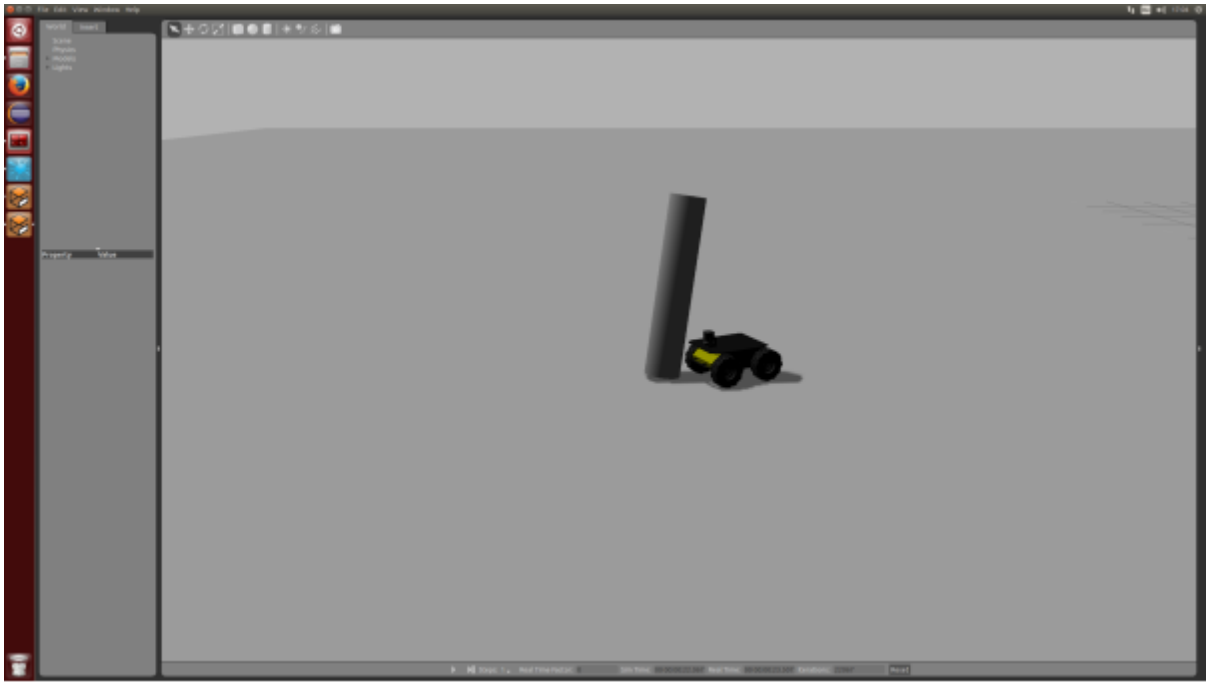
5. Add a Robot Model plugin to RViz to visualize the Husky robot.

6. Add a TF display plugin to RViz.

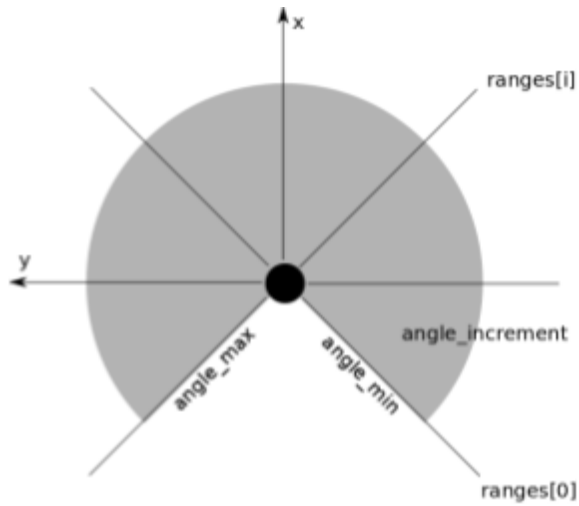
7. Publish a visualization marker for RViz that shows the estimated position of the pillar.
   (easy) Publish the point in the *laser frame* as a RViz marker. RViz will automatically transform the marker into the odom frame.
   http://wiki.ros.org/rviz/DisplayTypes/Marker

   OR

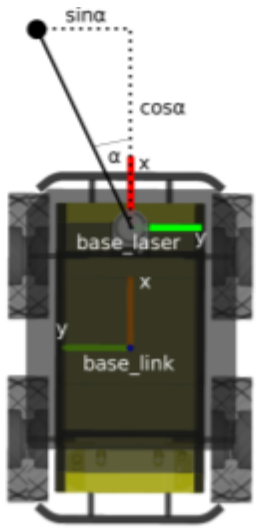
   (more difficult) Implement a TF listener to transform the extracted point from the laser frame to the odom frame.
   http://wiki.ros.org/tf/Tutorials/Writing%20a%20tf%20listener%20%28C%2B%2B%29
   Publish the point in the *odometry frame* as a RViz marker.
   http://wiki.ros.org/rviz/DisplayTypes/Marker



Husky drives into the pillar.



The angles of the single rays of a laser scanner range from angle_min to angle_max with an angle_increment. Each of this rays have a range measurement.



The base_link coordinate system of husky is aligned such that x is forward, y is to the left and z is up. Note the rotated frame of the laser!

Evaluation

- ❏ Start the launch file. Husky should drive into the pillar.
  - ❏ Husky drives [20%]
  - ❏ Husky hits the pillar [30%]
- ❏ Check the RViz configuration (TF's, Robot Model and Laser Scan shown). [20%]
- ❏ The visualization marker is correctly shown in RViz. [30%]