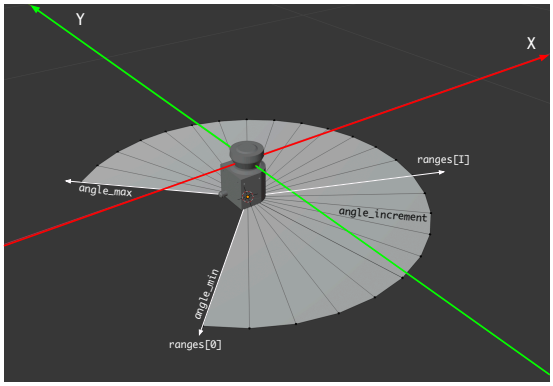
CSC752: Autonomous Robotic Systems, Fall 2020

Assignment 3

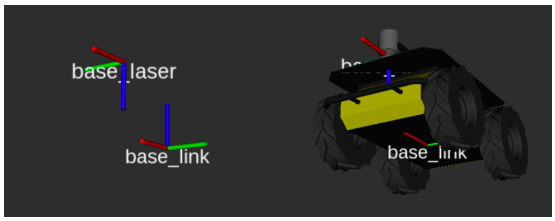
Due date: 09/21/2020

This assignment is worth 20 points and it is due on or before September 21st, 2020 before the class starts. The goal of this exercise is to create and entire control loop for the Husky robot. You will extract the position of an object in the scene from the laser scan and then control the robot such that it drives into that object.

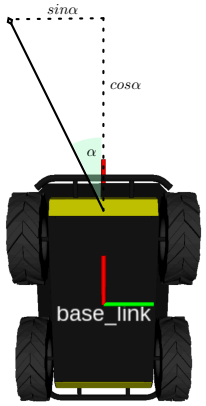
- Adapt the launch file from the last exercise such that:
  1. The teleop twist node is removed.
  2. `$(find husky_behavior_controller)/worlds/singleObject.world` is loaded as the world. You can download the `singleObject.world` file from our homepage and move it to that folder.
- Extract the position of the bookshelf from the laser scan with respect to the robot.
- Create a publisher on the topic `/cmd_vel` that allows you to send a twist to the Husky robot. You need to add `geometry_msgs` as a dependency to your `CMakeLists.txt` and `package.xml`.
- Write a simple controller that drives the Husky robot towards the bookshelf and stops 0.2m before it runs into the shelf. The controller adjusts velocity in proportion to the distance to the object. Write the code in the callback method of the laser scan topic.
- Add a RobotModel plugin to RViz to visualize the Husky robot.
- Add a TF display plugin to RViz.
- Implement a TF listener to transform the extracted point from the laser frame to the odom frame. Refer to figures 1a–1c for the visual explanation. Publish the point in the odometry frame as a RViz marker.
- Add and commit the complete directory "assignment3" with all necessary files to the repository.



(a) Angles for the Sick laser scanner of the Husky robot from angle_min to angle_max with its increments.



(b) The base_link coordinate system of the Husky robot. X (red) is forward, Y (green) is left and Z (blue) is up. The scanner_link is rotated!



(c) For twisting the robot you need to calculate angles. This figure shows

Figure 1: Material to better understand the TF system of the Husky robot.