

Point cloud operations

Exercise 1 – Wall-following with laser scanning - MANDATORY :

The overall purpose of the exercise is to extract range and angle data from scanning data of a wall from the Turtlebot (in Gazebo) – this is important in many localisation methods and object detection/avoidance. Afterwards, the method should be used to follow a wall to a corner.

First, capture range data with the Turtlebot – you may choose either the Laserscan (2D) message from ROS or manipulate the 3D depth map (NOTE: Can be little more tricky and not all simulators give access to the 3D scan topic!). You should place the Turtlebot with know distance to a wall and at fixed angle to the wall (try at least a couple of different angles and distances).

Develop an algorithm that can extract range-angle coordinates (ie. range from robot to wall and angle between robot heading and wall) from the range data and compare to the true values. You could put the algorithm in a function that returns range-angle data.

Test the range-angle function by making a new small algorithm, that can allow the robot to drive along a wall and then stop when it comes to 90 degree corner (an “end-wall”). In other words, start with fixed distance to wall and drive step-by-step until coming to the 90 degree corner where the robot should stop.

Optional : Make the algorithm more robust with methods like kmeans-clustering or Hough transform, to only fit line/plane to “largest” wall area (e.g. not fit to a corner).