ON ROS TOPICS

MOBILE ROBOTICS COURSE
POLITECNICO DI BARI
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Problem

In this assignment you are going to experiment with ROS nodes, publisher, and subscribers. The goal is to implement a ROS application to simulate the generation of a point cloud from a fake LiDAR sensor, a node that based on the point cloud generated by the fake LiDAR sensor implements a rotation of α degrees around the Z axis and publishes the output of this computation to a topic, and a consumer that subscribes to the topics generated by the previous node.

Specifications. You are required to implement all the nodes as part of a single ROS package that will be called `fakelidar`.

The package will host three nodes defined as follows:

- `fakelidar.py`: This node outputs a point cloud using the message[1] `sensor_msgs/PointCloud.msg`. The point cloud holds (x_i, y_i, z_i) points for $i = 0, \dots, N-1$ (N is a parameter set in the ROS param server in the variable named `fakelidar_points`). The points should draw a circle of radius R (R is a parameter in the ROS param server stored in the variable named `fakelidar_radius`) parallel to the XY plane at a constant Z (i.e. $z_i = Z$, for all $i = 0, \dots, N-1$) to which it is superposed a zero mean gaussian noise with a standard deviation equal to $R/10$. The N points should be published on the topic `/fakelidar_pc`.
- `fakelidar_process.py`: This node subscribes to the `/fakelidar_pc` topic and computes all the points in the point cloud in order to produce a new point cloud that is rotated of a given angle α (whose value is stored in the param server in the variable `alpha`) around the Z axis. The rotated point clould should be published to a new topic named `/fakelidar_pc_rot`.
- `fakelidar_consumer.py`: This node subscribes to `/fakelidar_pc_rot` and prints to the screen the data produced by this topic (hint this is very similar to the `chatter` node).

[1] http://docs.ros.org/en/api/sensor_msgs/html/msg/PointCloud.html