SECOND ROBOTICS PROJECT

ROBOTICS

Map creation

Autonomous navigation

Multiple sensors

Skid steering robot, with footprint: 0.6m x 0.4m

DATA

Format: ROS Bag files

play the bags with the command:

rosbag play --clock first.bag

Data:

- /scan: data from a single plane scanner
- /t265/odom: odometry data
- /velodyne_points: data from 3d laser

- Create a ROS package called *second_project*
- Create a ROS node to convert the odometry topic into tf:
  - node called *tf_publisher*
- Convert the 3D lidar data to a 2D laser scanner:
- Create a map of the environment with 2D laser data
- Create a map of the environment with 3D laser data, converted to 2D
- Use the map to setup a "realistic" stage simulation (similar size/fov)

- To create the map you can use **any mapping algorithm** (e.g., gmapping, slam-toolbox, etc. Specify it in the readme)
- Navigate the simulation (to do so **you will need to localize** in it, use amcl to localize with the lidar data form stage)

- Navigate the simulation:
  - node called *navigation*
  - write a node that given a set of waypoint from a csv file read them and publish the first goal, movebase handle the movement to it, when reached the next goal is published, etc. (set proper global and local planners)

- If additional nodes are needed you can add them

Allowed minimal manual post-processing of the computed map to use it for the simulation (remove noisy points)

Provide also the original maps

Provide your waypoints.csv file (I'll test on a different one, but I'll use it for reference). Min. 3 waypoints in the provided file

Launch file to start the mapping process:

- start all the required nodes + rviz (with proper config file). Do not start bag file (these are started autonomously)

Launch file to start the autonomous navigation:

- start all the required nodes (stage, navigation, movebase, amcl, …) + rviz (with proper config file)

File structure

- second_project
  - cfg
  - launch
  - src
  - srv
  - map_raw -> map from the mapping pipeline without postprocessing
  - stage -> stage simulation
  - waypoints.csv -> the list of waypoints
  - config_mapping.rviz
  - config_nav.rviz

Provide all 4 reconstructed maps:

- 2 maps with single plane (1 from first bag, 1 from second bag)
- 2 maps with multi plane (1 from first bag, 1 from second bag)

You will also have a map inside the stage folder (choose one from the 4 above)

Waypoints csv file:
pose1.x, pose1.y,heading1

pose2.x, pose2.y,heading2

...

Other info

~~assume tf O O O between odometry and lasers~~

static tf provided in the bag file (if needed add them to the launch file)

bags without static tf provided if needed

File txt must contain only the group names with this structure

codice persona;name;surname

File readme with info on the employed node/plugins (what have you used for mapping, which local planner, which global planner, etc.)

Map image with markers on the position of your testing waypoints, used only for reference

Deadlines and requested files

Deadline: 7 July (1 month)

Max 3 student for team

Questions:

-write to me via mail (simone.mentasti@polimi.it)

- do not write only to Prof. Matteucci