

RIS Lab 1 - Fall 2022

Project Instructions

Prof. Dr. Francesco Maurelli, Jacobs University Bremen
TA: Assylbek Sakenov - a.sakenov@jacobs-university.de

You will be using some of the `uuv_simulator` packages for this project. Run the commands below to install:

- `roscd`
- `cd ../src`
- `git clone https://github.com/my-name-is-D/uuv_simulator.git`
- `cd ..`
- `catkin build`

You will then likely run into some errors about missing packages when you try to run the launch files. You can solve these by simply finding the name of the package in the error message, finding its repository on github and cloning it, similar to how you cloned the `uuv_simulator` packages. Please then complete the tasks below and submit your solutions. Please write the % contribution of each group member next to each exercise and the estimated amount of time needed.

1. Launch `uuv_gazebo/rexrov_default.launch` and inspect the nodes, topics, services it launches and the message/service types they use to communicate.
 - (a) Write a short report describing these nodes, topics, services and messages including screenshots of rqt or the terminal output from which you collected this information. (15 pts)
 - (b) Include the commands you used to retrieve this information and write down what these commands do. (10 pts)
2. Controlling the robot using `teleop_twist_keyboard`:
 - (a) Write a launch file that launches the `rexrov` in `uuv_gazebo/rexrov_default.launch` into the world spawned by `uuv_gazebo_worlds/empty_underwater_world.launch` and the `teleop_twist_keyboard` node in such a way that you can use the `teleop` node to control the simulated ROV. Please include comments in this launch file to explain what each line is doing. (15 pts)
 - (b) Log the topic `teleop_twist_keyboard/cmd_vel` using `rosbag`, move the vehicle around with your keyboard while `rosbag` is recording. Stop `teleop_twist_keyboard` and control the robot by replaying the generated `rosbag`. Create a plot of the traced trajectory of the ROV, and attach a screen shot of `rqt_graph` while the bag is playing (5 pts)
3. In this exercise you need to create a node that outputs forces and torques as input to control the AUV in `uuv_gazebo/rexrov_wrench_control.launch` based on this input. Please download this launch file from the page linked into `catkin_ws/src/uuv_simulator/uuv_gazebo/launch/rexrov_demos` and launch it into the world spawned by `uuv_gazebo_worlds/empty_underwater_world.launch`
 - (a) Write a node similar to `teleop_twist_keyboard` that publishes forces and torques to control the AUV. Your node must publish to the topic `/rexrov/thruster_manager/input` (15pts)
 - (b) Write a launch file similar to the one in exercise 2 that launches the AUV and your node. (5 pts)
4. Creating and controlling your own robot.
 - (a) Create a urdf file that describes a simple ROV of your own design using the default geometric shapes (or design your own robot in Blender) (10 pts)
 - (b) Decide on the placement of thrusters for this ROV and give your reasoning. (5 pts)
 - (c) Write your own node that takes in forces and torques as input and publishes thrust commands for your ROV. The conversion from forces/torques to thrust commands has to be called as a service. (10 pts)
 - (d) Write a launch file that (10 pts)
 - i. load this robot into `uuv_gazebo_worlds/empty_underwater_world.launch` in gazebo
 - ii. starts the node you created in exercise 3 to publish force/torque data
 - iii. starts the node you created in part c that publishes thrust commands to your vehicle