SE498 Introduction to Autonomous Vehicle System
Laboratory Assignment 5: Simulator of Jackal Robot

Goals for this Lab Assignment:

1. Learn about ROS structure & ROS package
2. Learn about Jackal robot simulator

Exercise 1 – ROS Structure & ROS Package

(1) Create ROS Package

$ cd ~/ros_ws/src

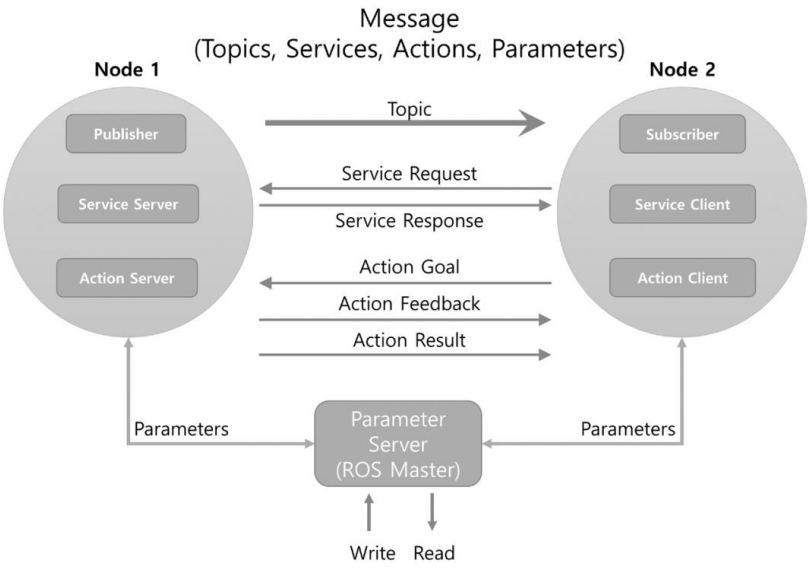
$ **catkin_create_pkg** <package_name> [dependency1] [dependency2] …

dependencies: roscpp, rospy, message_generation, std_msgs, actionlib_msgs, actionlib, etc

$ **catkin_create_pkg** <package_name> roscpp rospy std_msgs

```
catkin_ws                  -- WORKSPACE
    CMakeLists.txt         -- Top level CMake file (no need to modify)
    build/                 -- created automatically when use catkin_make (no need to modify)
    devel/                 -- created automatically when use catkin_make (no need to modify)
    src/                   -- SOURCE SPACE
        ros_package_1/
            CMakeLists.txt -- CMake file for package_1   (created automatically when use catkin_created_pkg)
            package.xml    -- Pkg manifest for package_1 (created automatically when use catkin_created_pkg)
        …
        ros_package_n/
            CMakeLists.txt -- CMake file for package_n   (created automatically when use catkin_created_pkg)
            package.xml    -- Pkg manifest for package_n (created automatically when use catkin_created_pkg)
```

(2) ROS System Structure



(3) ROS Package Structure

ros_package/

include/package_name (C++ include headers)

src/ (*.cpp files)

scripts/ (*.py files)

launch/ (*.launch files)

package.xml (pakage info & dependencies)

CMakeLists.txt (catkin build file)

README.md

Exercise 2 – Jackal Robot Simulator

(1) Installation

$ sudo apt-get install libpcap-dev

$ ros-kinetic-jackal-desktop ros-kinetic-jackal-gazebo ros-kinetic-navigation ros-kinetic-jackal-simulator

(2) Install Jackal Robot Simulator

Copy jackal_drive and jackal_simulator to ~/catkin_NetID/src/

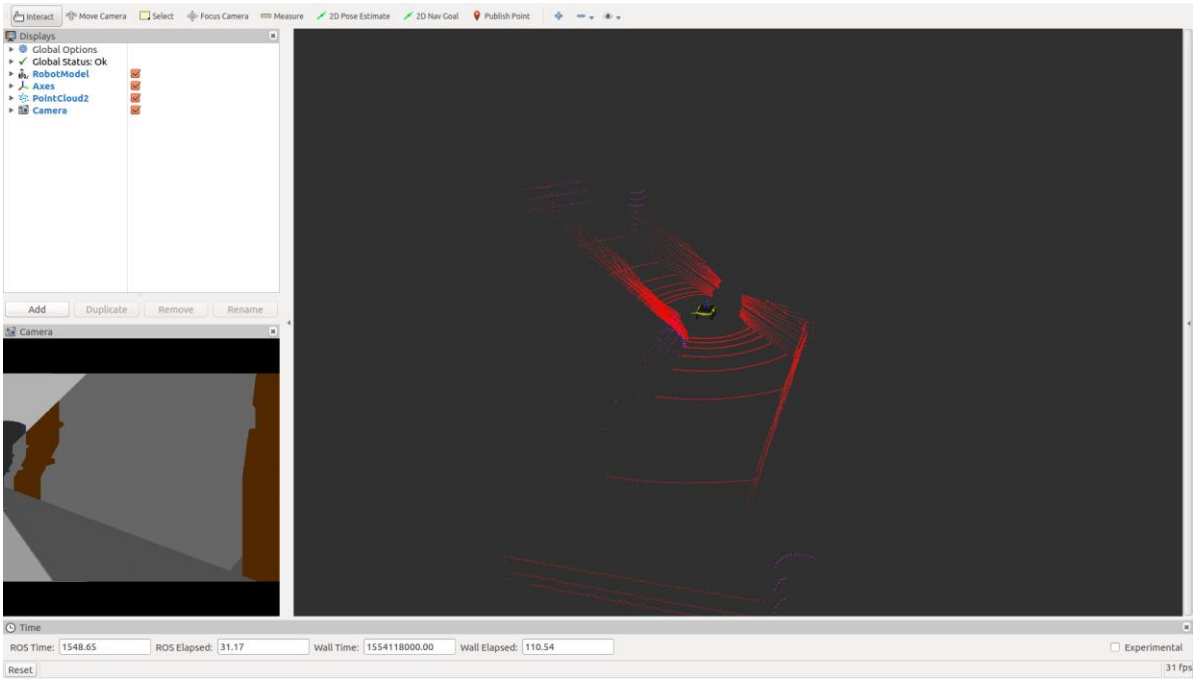
$ cd ~/catkin_NetID

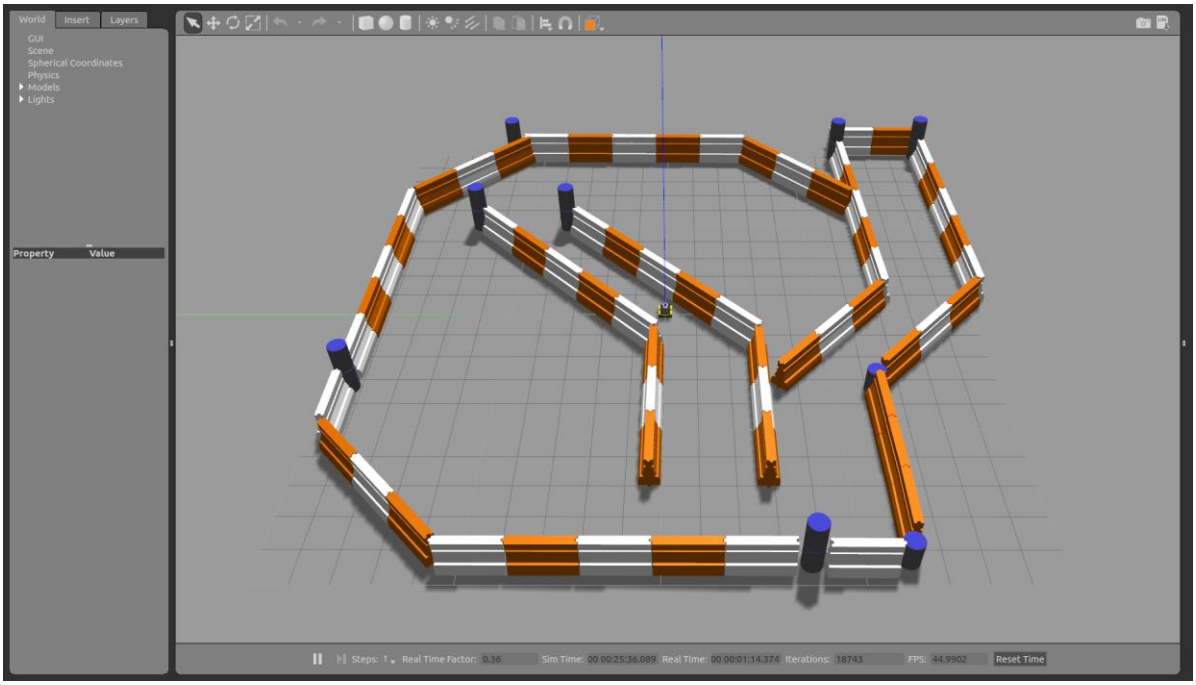
$ chmod -R 777 src/

$ catkin_make

$ roslaunch jackal_drive jackal_drive.launch

$ rosrun teleop_twist_keyboard teleop_twist_keyboard.py





Exercise 3 – Drive Jackal Robot

Check-off: create a ROS publisher under jackal_drive package (*.cpp file with ROS node named jackal_drive_node) to drive the robot around. You can either to move the robot forward, backward, turning, etc. At this time, you don't need to subscribe sensors' data for feedback in order to drive the robot. You can change the simulation environment of the Jackal robot in file /jackal_drive/launch/jackal_drive.launch

Hint: make sure which ROS topic to publish in order to drive the robot around. Why you can use the keyboard to drive the robot around?

Reference: Lab1, Lab2, Lab3

Exercise 4 – ROS Launch File

Check-off: explain jackal_drive.launch file to your TA. You can use <!-- your comments --> for comments.

Exercise 5 – Jackal Robot Drive Through

In this exercise, you will write your own code to drive the Jackal robot through two pillars. You can use either image topic or laser topic.

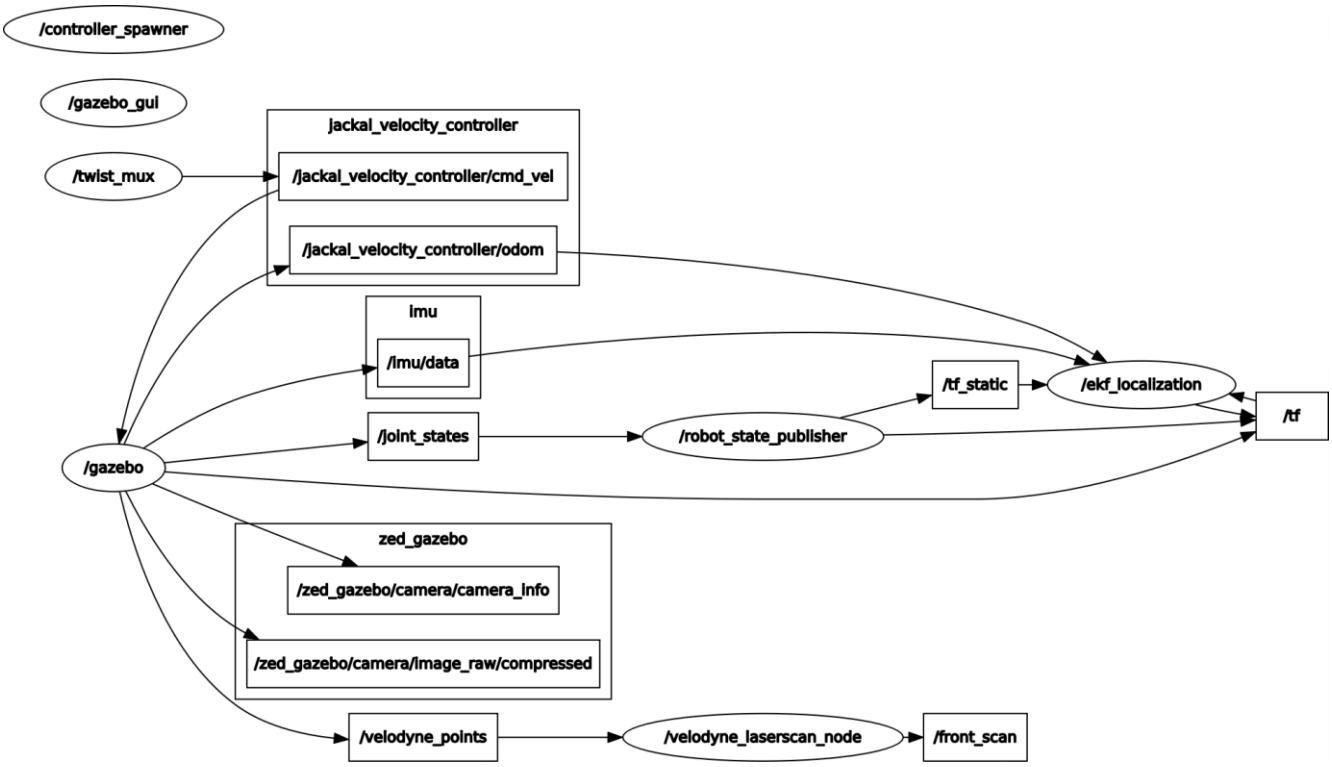
Image topic: /zed_gazebo/camera/image_raw

Laser topic: /front_scan or /velodyne_points

/front_scan topic is a 2D laser topic (1 ring) with 1875 sample points/per ring.
/velodyne_points is a 2D laser topic (8 rings) with 1875 sample points/per ring.

It will be easier for you to use /front_scan topic.

The rqt graph is shown as below.



The Rviz screenshot is shown as below.