In the previous tutorial you met the TurtleBot and explored some services. Now we will explore the nodes and topics associated with the TurtleBot simulation.

Before you proceed, start the Gazebo simulation for the TurtleBot like you did in the previous hands on tutorial (in case you stopped it. If it's already running, nothing to do, you are fine.)

ROS Nodes

Start a new CCS and source the workspace setup files, Then type the following command to list all running ROS nodes:

```
$ rosnode list
```

Question 1

1 point possible (ungraded)
Which of the following nodes is active?
There is one correct answer

- ○ /depthimage_to_laserscan

- ○ /turtlebot_teleop_keyboard

Submit

Question 2

1 point possible (ungraded)
The node `/cmd_vel_mux` seems interesting. To get information about a ROS node you can try the `info` key word. For example:

```
$ rosnode info /cmd_vel_mux
```

What are the topics to which this node publishes?

There are two correct answers

☐ /rosout [rosgraph_msgs/Log]

☐ /hrwros/mobile_base_vel [hrwros_msgs/Twist]

☐ /tf [tf2_msgs/TFMessage]

☐ /mobile_base_nodelet_manager/bond [bond/Status]

Submit

The information about the nodes or topic is interesting, but at the moment we don't really know how to make the robot move.

However, after a quick search on the web, we found the **turtlebot_teleop** package, let's try it!

Start a new CCS, source the workspace setup files, and run the following command:

```
$ roslaunch turtlebot_teleop keyboard_teleop.launch
```

You will see some information about how to Control Your Turtlebot on the CCS.

Press the `'i'` button on your keyboard, remember you need to have the **CCS you just started active**, The teleoperation will not work if the active window is the Gazebo simulation or any other program.

Observe how the robot moves. Try different buttons as seen on the CCS. In order to prevent the shell window from going to the background, you can right-click on the window bar and select *"Always on Top"* option. Once you are done with this tutorial, clear the *"Always on Top"* option or just close the CCS.

Question 3

1 point possible (ungraded)

If you try to view all the active nodes again, you will find that the `/turtlebot_teleop_keyboard` node is now active. Get the info about this node, and find out to which of the following topics does this node subscribe?

There is one correct answer.

[ ] /clock [rosgraph_msgs/Clock]

[ ] /sensor_info

[ ] /turtlebot_move

Submit

Odometry is the usage of data from motion sensors to estimate the change in position over time. In a **new CCS** run the following command:

```
$ rostopic echo /odom
```

Let's move around with the TurtleBot using the keyboard teleoperation and see where we are in the environment. Notice that you can now actively view the positons and velocities of the TurtleBot in all directions.

Now we will focus only on the velocity of the Turtlebot, did you know that you can echo only one section of the topic, let's try it. Stop, the previous command, and run this one instead.

```
$ rostopic echo /odom/twist
```

Now you will see only the twist part of the odometry, it has two components, linear and angular, keep moving the turtlebot to see how they change.

Question 4

1 point possible (ungraded)
After running the last command, if you press the only the 'j' key, which value of the /odom/twist message changes?
There is one correct answer.

- [ ] linear: x

- [ ] linear: y

- [ ] linear: z

- [ ] angular: x

- [ ] angular: y

- [ ] angular: z

Submit

Now let's take a close look at ROS topics. The `/odom` gave us a lot of information about the position and velocity of the TurtleBot. Now try to see which nodes publish on this topic.

Try this command to get information about the topic:

```
$ rostopic info /odom
```

Question 5

1 point possible (ungraded)

Which node are publishing to the topic `/odom` ?

- ◯ /gazebo

- ◯ /mobile_base_nodelet_manager

- ◯ /keyboard_teleop

Submit