

ROS Task Documentation – Exercises

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Exercise 1:

1.)

- Created ~/git and ~/Workspaces directories.
- Under ~/Workspaces directory, created a directory called smb_ws -> src.
- Extracted the zip folder into ~/git directory.
- Created a symlink (ln -s) under the ~/Workspaces/smb_ws/src directory.

```
swaminathan@swaminathan-ASUS-TUF-Dash-F15-FX517ZM-FX517ZM:~$ mkdir Workspaces
swaminathan@swaminathan-ASUS-TUF-Dash-F15-FX517ZM-FX517ZM:~$ ls
catkin_ws  Documents  Music      Public  Templates  Workspaces
Desktop    Downloads  Pictures   snap    Videos
swaminathan@swaminathan-ASUS-TUF-Dash-F15-FX517ZM-FX517ZM:~$ cd Workspaces
swaminathan@swaminathan-ASUS-TUF-Dash-F15-FX517ZM-FX517ZM:~/Workspaces$ mkdir smb_ws/src
mkdir: cannot create directory 'smb_ws/src': No such file or directory
swaminathan@swaminathan-ASUS-TUF-Dash-F15-FX517ZM-FX517ZM:~/Workspaces$ mkdir -p smb_ws/src
swaminathan@swaminathan-ASUS-TUF-Dash-F15-FX517ZM-FX517ZM:~/Workspaces$ ls
smb_ws
swaminathan@swaminathan-ASUS-TUF-Dash-F15-FX517ZM-FX517ZM:~/Workspaces$ cd smb_ws/
swaminathan@swaminathan-ASUS-TUF-Dash-F15-FX517ZM-FX517ZM:~/Workspaces/smb_ws$ ls
src
swaminathan@swaminathan-ASUS-TUF-Dash-F15-FX517ZM-FX517ZM:~/Workspaces/smb_ws$ cd ..
swaminathan@swaminathan-ASUS-TUF-Dash-F15-FX517ZM-FX517ZM:~/Workspaces$ cd .
swaminathan@swaminathan-ASUS-TUF-Dash-F15-FX517ZM-FX517ZM:~/Workspaces$ cd
swaminathan@swaminathan-ASUS-TUF-Dash-F15-FX517ZM-FX517ZM:~$ mkdir git
swaminathan@swaminathan-ASUS-TUF-Dash-F15-FX517ZM-FX517ZM:~$ ls
catkin_ws  Documents  git        Pictures   snap        Videos
Desktop    Downloads  Music      Public     Templates   Workspaces
```

Errors and Fixes:

Resources searched through:

<https://stackoverflow.com/questions/41234957/catkin-command-not-found>

<https://github.com/NelsenEW/eth-zurich-solution>

(For the latter link, I did not go through the rest of the solution. The link was strictly used for finding out the dependencies)

- catkin command was not recognized.

Fix: `sudo apt-get install python3-catkin-tools`

- hector_gazebo_plugins Cmake error.

Fix: Had to install a few dependencies -

```
sudo apt install -y ros-<distro>-hector-gazebo-plugins \
ros-<distro>-velodyne \
ros-<distro>-velodyne-description \
ros-<distro>-velodyne-gazebo-plugins \
ros-<distro>-pointcloud-to-laserscan \
ros-<distro>-twist-mux
```

NOTE: Forcing CMake to run for each package.

```
[build] Found 9 packages in 0.0 seconds.
[build] Updating package table.
Starting >>> catkin_tools_prebuild
Finished <<< catkin_tools_prebuild [ 1.0 seconds ]
Starting >>> hector_gazebo_plugins
Finished <<< hector_gazebo_plugins [ 12.0 seconds ]
Starting >>> smb_description
Finished <<< smb_description [ 1.3 seconds ]
Starting >>> smb_control
Finished <<< smb_control [ 1.2 seconds ]
Starting >>> smb_gazebo
Finished <<< smb_gazebo [ 8.4 seconds ]
[build] Summary: All 5 packages succeeded!
[build] Ignored: 5 packages were skipped or are skiplisted.
[build] Warnings: None.
[build] Abandoned: None.
[build] Failed: None.
[build] Runtime: 24.0 seconds total.
[build] Note: Workspace packages have changed, please re-source setup files to use them.
```

- Sourced the setup file.
- cd to the smb_commons directory through src/
- roslaunch smb_gazebo smb_gazebo.launch

2.)

roscd

```
swaminathan@swaminathan-ASUS-TUF-Dash-F15-FX517ZM-FX517ZM:~$ roscd list
/base_controller_spawner
/gazebo
/gazebo_gui
/pointcloud_to_laserscan
/rosout
/smb_robot_state_publisher
/twist_mux
```

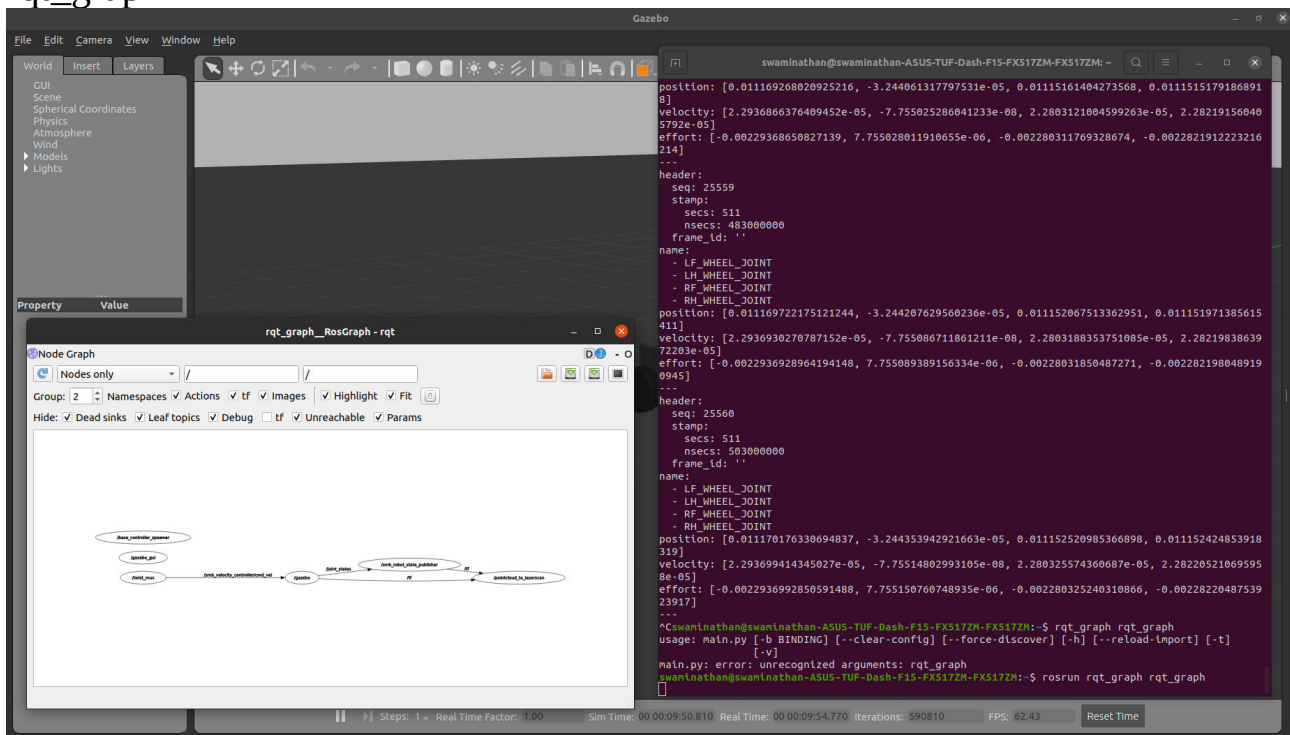
rostopic

```
swaminathan@swaminathan-ASUS-TUF-Dash-F15-FX517ZM-FX517ZM:~$ rostopic list
/clock
/cmd_vel
/diagnostics
/e_stop
/gazebo/link_states
/gazebo/model_states
/gazebo/parameter_descriptions
/gazebo/parameter_updates
/gazebo/performance_metrics
/gazebo/set_link_state
/gazebo/set_model_state
/gazebo_ros_control/pid_gains/LF_WHEEL_JOINT/parameter_descriptions
/gazebo_ros_control/pid_gains/LF_WHEEL_JOINT/parameter_updates
/gazebo_ros_control/pid_gains/LH_WHEEL_JOINT/parameter_descriptions
/gazebo_ros_control/pid_gains/LH_WHEEL_JOINT/parameter_updates
/gazebo_ros_control/pid_gains/RH_WHEEL_JOINT/parameter_descriptions
/gazebo_ros_control/pid_gains/RH_WHEEL_JOINT/parameter_updates
/gazebo_ros_control/pid_gains/RH_WHEEL_JOINT/parameter_updates
/gazebo_ros_control/pid_gains/RH_WHEEL_JOINT/parameter_updates
/gazebo_ros_control/pid_gains/RH_WHEEL_JOINT/parameter_updates
/gazebo_ros_control/pid_gains/RH_WHEEL_JOINT/parameter_updates
/tmu0
/tmu0/accel/parameter_descriptions
/tmu0/accel/parameter_updates
/tmu0/bias
/tmu0/rate/parameter_descriptions
/tmu0/rate/parameter_updates
/tmu0/yaw/parameter_descriptions
/tmu0/yaw/parameter_updates
/joint_states
/joy_teleop/cmd_vel
/odom
/rosout
/rosout_agg
/rslidar_points
/scan
/smb_velocity_controller/cmd_vel
/smb_velocity_controller/odom
/smb_velocity_controller/parameter_descriptions
/smb_velocity_controller/parameter_updates
/tf
/tf_static
/twist_marker_server/cmd_vel
```

rostopic echo clock

```
^Cswaminathan@swaminathan-ASUS-TUF-Dash-F15-FX517ZM-FX517ZM:~$ rostopic echo clock
clock:
  secs: 378
  nsecs: 126000000
---
clock:
  secs: 378
  nsecs: 127000000
---
clock:
  secs: 378
  nsecs: 128000000
---
clock:
  secs: 378
  nsecs: 129000000
---
clock:
  secs: 378
  nsecs: 130000000
---
```

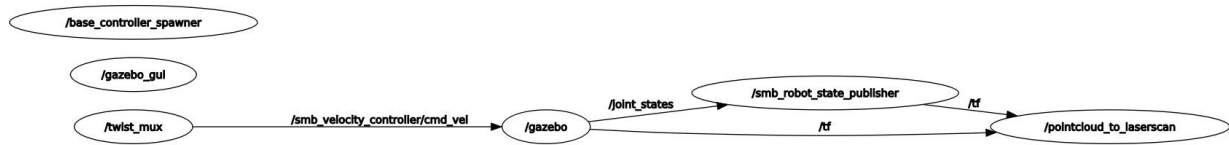
rqt_graph



The screenshot shows the Gazebo simulation environment with the rqt_graph window open. The rqt_graph window displays a ROS node graph with nodes like Base_controller_publisher, Base_controller_subscriber, and Base_controller. The terminal window shows the output of the rqt_graph command, displaying the position, velocity, and effort of the robot's joints.

```
position: [0.011169268020925216, -3.244061317797531e-05, 0.01115161404273568, 0.01115151791868918]
velocity: [2.2936066376409452e-05, -7.755025206041233e-08, 2.2803121004599263e-05, 2.282191560405792e-05]
effort: [-0.00229368650827139, 7.755028011910655e-06, -0.002280311769328674, -0.0022821912232316214]
---
header:
  seq: 25559
  stamp:
    secs: 511
    nsecs: 483000000
  frame_id: ''
name:
  - LF_WHEEL_JOINT
  - LH_WHEEL_JOINT
  - RF_WHEEL_JOINT
  - RH_WHEEL_JOINT
position: [0.011169722175121244, -3.244207629560236e-05, 0.011152067513362951, 0.011151971385615411]
velocity: [2.2936930270787152e-05, -7.755086711861211e-08, 2.2803180353751005e-05, 2.2821983863972203e-05]
effort: [-0.0022936928964194148, 7.755089389156334e-06, -0.00228031850487271, -0.0022821980489190945]
---
header:
  seq: 25560
  stamp:
    secs: 511
    nsecs: 503000000
  frame_id: ''
name:
  - LF_WHEEL_JOINT
  - LH_WHEEL_JOINT
  - RF_WHEEL_JOINT
  - RH_WHEEL_JOINT
position: [0.011170176330694837, -3.244353942921663e-05, 0.011152520985366898, 0.011152424853918319]
velocity: [2.293699414345027e-05, -7.75514802993105e-08, 2.280325574360687e-05, 2.282285210695958e-05]
effort: [-0.0022936992850591488, 7.755150760748935e-06, -0.002280325240310866, -0.0022822948753923917]
---
```

rqt_graph enlarged



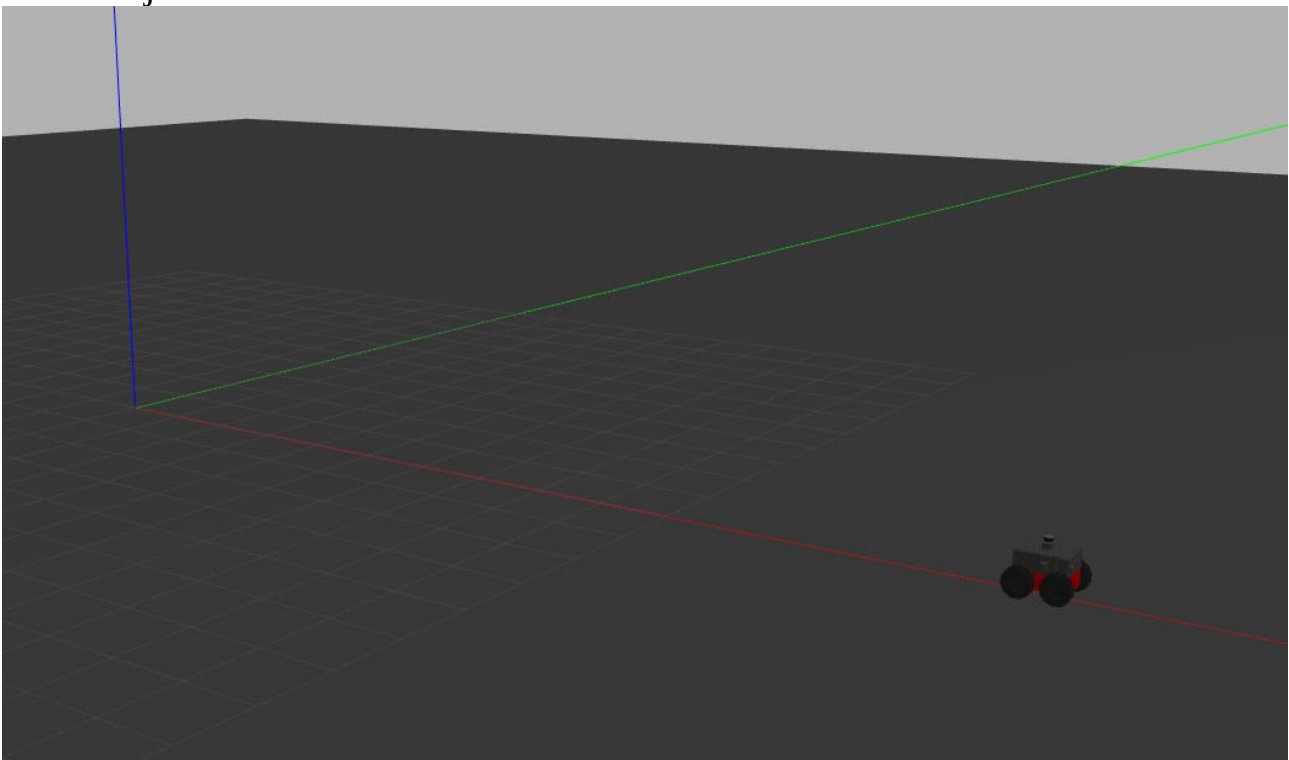
3.) Command a desired velocity:

```

swaminathan@swaminathan-ASUS-TUF-Dash-F15-FX517ZM-FX517ZM:~$ rostopic pub /cmd_vel geometry_msgs/Twist '[500.0 , 0.0 , 0.0]' '[5.0 , 0.0 , 0.0]'
publishing and latching message. Press ctrl-C to terminate
^Cswaminathan@swaminathan-ASUS-TUF-Dash-F15-FX517ZM-FX517ZM:~$ rostopic pub /cmd_vel geometry_msgs/Twist '[0.0 , 0.0 , 0.0]' '[5.0 , 0.0 , 0.0]'
publishing and latching message. Press ctrl-C to terminate
  
```

Errors faced:

Looking at the rqt_graph, I had tried to publish to smv_velocity_controller/cmd_vel. However, apparently, publishing to cmd_vel does the job.



4.)

Resource: https://github.com/ros-teleop/teleop_twist_keyboard

- teleop_twist_keyboard was cloned
- it was compiled through catkin build in the workspace

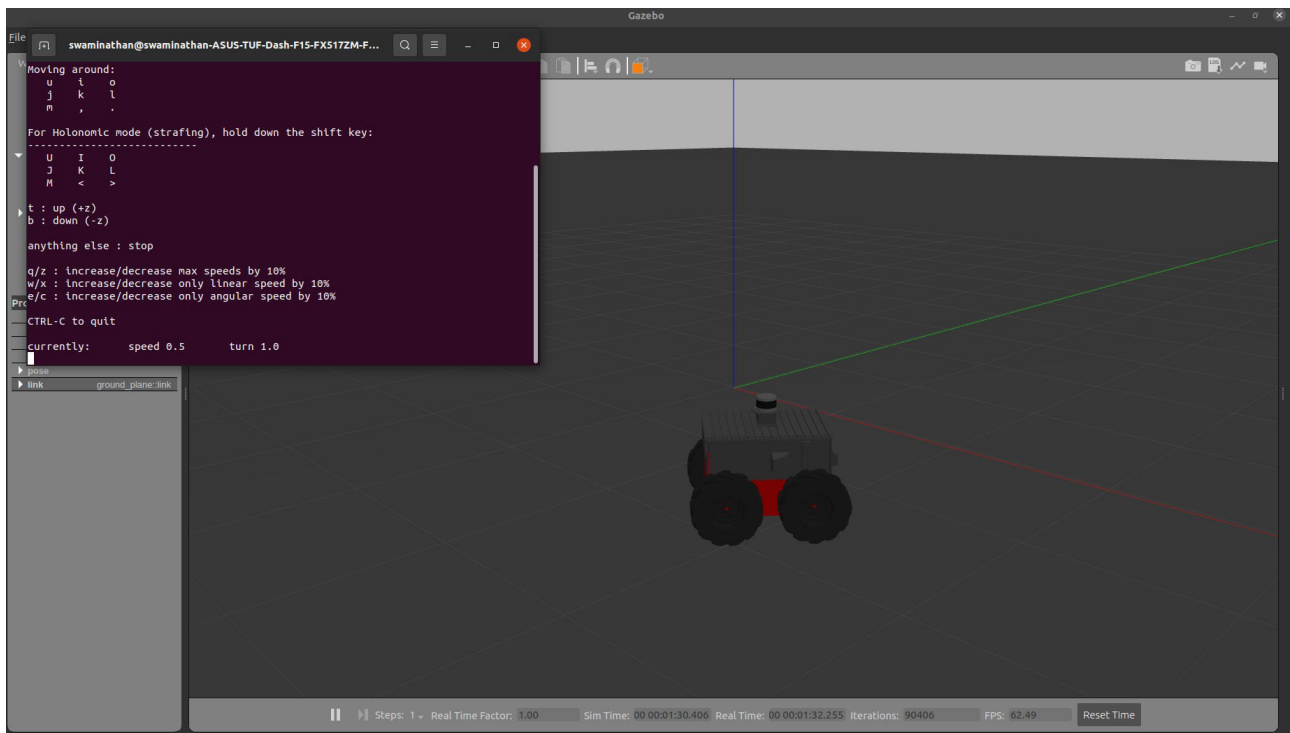
```

swaminathan@swaminathan-ASUS-TUF-Dash-F15-FX517ZM-FX517ZM:~/git$ git clone https://github.com/ros-teleop/teleop_twist_keyboard.git
Cloning into 'teleop_twist_keyboard'...
remote: Enumerating objects: 137, done.
remote: Counting objects: 100% (27/27), done.
remote: Compressing objects: 100% (19/19), done.
remote: Total 137 (delta 12), reused 14 (delta 8), pack-reused 110
Receiving objects: 100% (137/137), 29.33 KiB | 698.00 KiB/s, done.
Resolving deltas: 100% (70/70), done.
swaminathan@swaminathan-ASUS-TUF-Dash-F15-FX517ZM-FX517ZM:~/git$ cd ~/Workspaces
swaminathan@swaminathan-ASUS-TUF-Dash-F15-FX517ZM-FX517ZM:~/Workspaces$ ls
smb_ws
swaminathan@swaminathan-ASUS-TUF-Dash-F15-FX517ZM-FX517ZM:~/Workspaces$ cd smb_ws
swaminathan@swaminathan-ASUS-TUF-Dash-F15-FX517ZM-FX517ZM:~/Workspaces/smb_ws$ cd src
swaminathan@swaminathan-ASUS-TUF-Dash-F15-FX517ZM-FX517ZM:~/Workspaces/smb_ws/src$ ln -s ~/git/teleop_twist_keyboard/
swaminathan@swaminathan-ASUS-TUF-Dash-F15-FX517ZM-FX517ZM:~/Workspaces/smb_ws/src$ cd ..
swaminathan@swaminathan-ASUS-TUF-Dash-F15-FX517ZM-FX517ZM:~/Workspaces/smb_ws$ catkin build teleop_twist_keyboard
-----
Profile:                default
Extending:              [cached] /opt/ros/noetic
Workspace:              /home/swaminathan/Workspaces/smb_ws

```

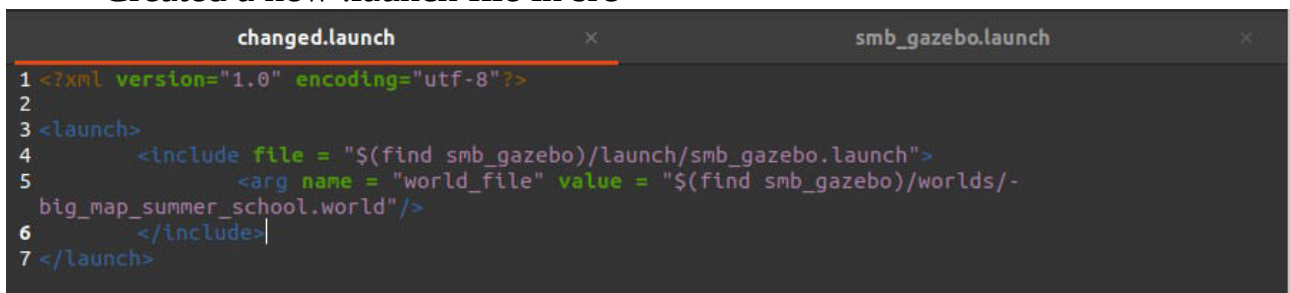
Errors and Fixes:

teleop_twist_keyboard was not recognized as a package. This is because while opening a new terminal, the setup.bash is not sourced. So we have to source it each time.



5.)

- Created a new .launch file in src



Errors and Fixes:

- The gazebo simulator for some reason (*) does not display world files that are out of the directory of src. (Even after providing the absolute path). So I have used the world file inside the worlds folder present in the src/smb_gazebo directory. World files can also be pasted here from other folders and run similarly.

