

Chapter 2 Gazebo 09/28/18

A Look At Simulators Gazebo, V-Rep, etc.

https://en.wikipedia.org/wiki/Robotics_simulator

A Series of Tutorials from Beginner to Advanced User

<http://gazebosim.org/tutorials>

In the Book:

1. \$ gazebo Page 61 <http://gazebosim.org/tutorials>

Good Tutorials to Begin:

http://gazebosim.org/tutorials?cat=get_started

My version Gazebo multi-robot simulator, version 7.0.0 Copyright (C) 2012-2016

on Open Source Robotics Foundation.

Alienware Released under the Apache 2 License. <http://gazebosim.org>

Build a World

http://gazebosim.org/tutorials?tut=build_world&cat=build_world

Write a Plugin

http://gazebosim.org/tutorials?cat=write_plugin

Make some Physics such as Friction

<http://gazebosim.org/tutorials?cat=physics>

Start Book Examples Page 62

1. \$ roslaunch gazebo_ros empty_world.launch

2. \$ <http://gazebosim.org/hotkeys> View Hotkeys and Mouse

3. Play with the Environment toolbar (Pg64)

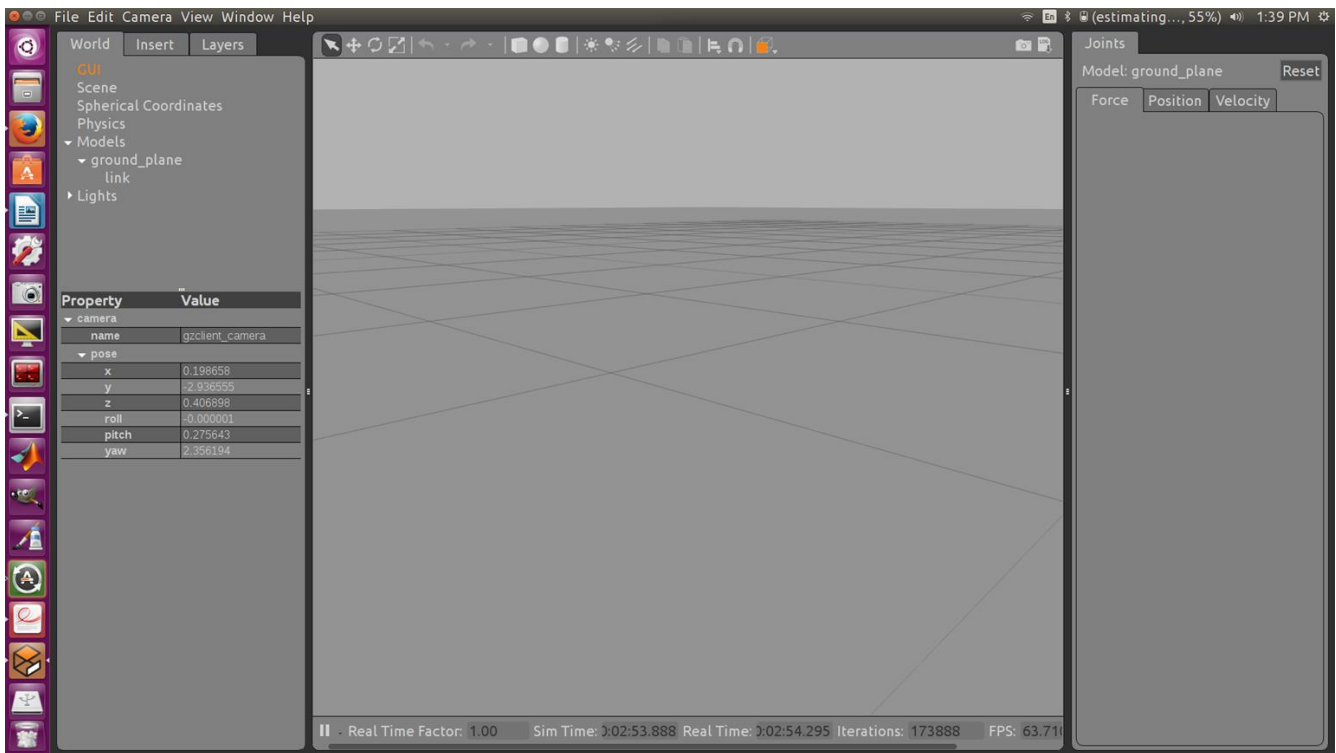
Screenshot or Log Date – Upper Right corner icons

4. Play with the World and Insert Tabs (Pg 66)

Physics: Will have $g=9.8 \text{ m/s}^2$

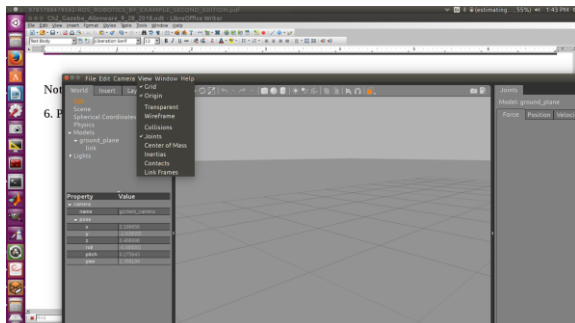
Insert: Turtlebot or a submarine

5. Joints Panel = Drag the three marks on the right edge toward the center



Not much happening on the Joints Panel yet.

6. Play with the Main Menu Bar Pg 68



7. Modifications to the robot URDF Page 68-72

Gazebo expects the robot model file to be in SDF format. SDF is similar to the URDF, using some of the same XML descriptive tags. With the following modifications, Gazebo will automatically convert the URDF code into an SDF robot description. The following sections will describe the steps to be taken.

8. Work with Gazebo and dd_robot in ros_robotics package

```
harman@D104-45931:~/catkin_ws/src/ros_robotics $ ls
CMakeLists.txt launch package.xml scripts urdf urdf.rviz worlds
```

```
harman@D104-45931:~/catkin_ws/src/ros_robotics/launch$ ls
ddrobot_gazebo.launch ddrobot_rviz.launch turtlesim_teleop.launch
(See launch file on Page 70)
```

```
harman@D104-45931:~/catkin_ws/src/ros_robotics/launch$ cd ..
harman@D104-45931:~/catkin_ws/src/ros_robotics$ ls
CMakeLists.txt launch package.xml scripts urdf urdf.rviz worlds
```

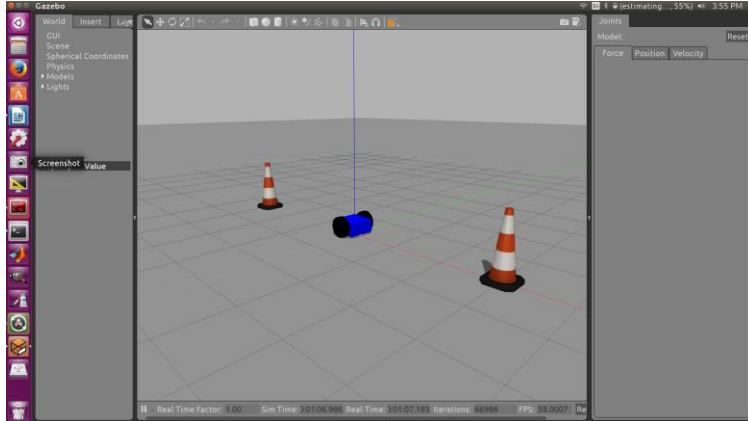
8a. Look at the World file Page 71

```
harman@D104-45931:~/catkin_ws/src/ros_robotics$ cd worlds/
harman@D104-45931:~/catkin_ws/src/ros_robotics/worlds$ ls
ddrobot.world
harman@D104-45931:~/catkin_ws/src/ros_robotics/worlds$ gedit ddrobot.world
```

```
<?xml version="1.0" ?>
<sdf version="1.4">
  <world name="default">
    <include>
      <uri>model://ground_plane</uri>
    </include>
    <include>
      <uri>model://sun</uri>
    </include>
    <include>
      <uri>model://construction_cone</uri>
      <name>construction_cone</name>
      <pose>-3.0 0 0 0 0 0</pose>
    </include>
    <include>
      <uri>model://construction_cone</uri>
      <name>construction_cone</name>
      <pose>3.0 0 0 0 0 0</pose>
    </include>
  </world>
</sdf>
```

9. Work with dd_robot model in Gazebo

```
$ roslaunch ros_robotics ddrobot_gazebo.launch
```



9a. Let's See what is available- topics, services, parameters:

```
harman@D104-45931:~$ rostopic list
```

```
/clock  
/gazebo/link_states  
/gazebo/model_states  
/gazebo/parameter_descriptions  
/gazebo/parameter_updates  
/gazebo/set_link_state  
/gazebo/set_model_state  
/rosout  
/rosout_agg
```

```
harman@D104-45931:~$ rosservice list
```

```
/gazebo/apply_body_wrench  
/gazebo/apply_joint_effort  
/gazebo/clear_body_wrenches  
/gazebo/clear_joint_forces  
/gazebo/delete_light  
/gazebo/delete_model  
/gazebo/get_joint_properties  
/gazebo/get_light_properties  
/gazebo/get_link_properties  
/gazebo/get_link_state  
/gazebo/get_loggers  
/gazebo/get_model_properties  
/gazebo/get_model_state  
/gazebo/get_physics_properties  
/gazebo/get_world_properties  
/gazebo/pause_physics  
/gazebo/reset_simulation  
/gazebo/reset_world  
/gazebo/set_joint_properties  
/gazebo/set_light_properties  
/gazebo/set_link_properties  
/gazebo/set_link_state  
/gazebo/set_logger_level  
/gazebo/set_model_configuration  
/gazebo/set_model_state  
/gazebo/set_parameters
```

```
/gazebo/set_physics_properties
/gazebo/spawn_sdf_model
/gazebo/spawn_urdf_model
/gazebo/unpause_physics
/rosout/get_loggers
/rosout/set_logger_level
```

9b. Try a few:

```
harman@D104-45931:~$ rostopic type /gazebo/model_states
gazebo_msgs/ModelState
```

```
harman@D104-45931:~$ rosmmsg show gazebo_msgs/ModelState
```

```
string[] name
geometry_msgs/Pose[] pose
  geometry_msgs/Point position
    float64 x
    float64 y
    float64 z
  geometry_msgs/Quaternion orientation
    float64 x
    float64 y
    float64 z
    float64 w
geometry_msgs/Twist[] twist
  geometry_msgs/Vector3 linear
    float64 x
    float64 y
    float64 z
  geometry_msgs/Vector3 angular
    float64 x
    float64 y
    float64 z
```

```
$ rostopic echo /gazebo/model_states
```

```
name: ['ground_plane', 'construction_cone', 'construction_cone', 'ddrobot']
```

```
pose:
```

```
-
```

```
position:      (Plane)
```

```
x: 0.0
```

```
y: 0.0
```

```
z: 0.0
```

```
orientation:
```

```
x: 0.0
```

```
y: 0.0
```

```
z: 0.0
```

```
w: 1.0
```

```
-
```

```
position:      (A cone -3 meters in x)
```

```
x: -3.0
```

```
y: 0.0
```

```
z: 0.0
```

```
orientation:
```

```
x: 0.0
```

```
y: 0.0
```

```
z: 0.0
```

```
w: 1.0
```

```
-
```

```
position:
```

```
x: 3.0
```

```
y: 0.0
```

z: 0.0
orientation:
x: 0.0
y: 0.0
z: 0.0
w: 1.0

-
position: (Robot In x direction- Click on robot and Translation mode on menu to see axes)
x: -0.528763541953
y: -0.00791687172471
z: 0.175000383616
orientation:
x: 1.13751374669e-05
y: -8.08458906783e-05
z: 0.145967318414
w: 0.989289409268
twist: (Not Moving)

-
linear:
x: 0.0
y: 0.0
z: 0.0
angular:
x: 0.0
y: 0.0
z: 0.0

-
linear:
x: 0.0
y: 0.0
z: 0.0
angular:
x: 0.0
y: 0.0
z: 0.0

-
linear:
x: 0.0
y: 0.0
z: 0.0
angular:
x: 0.0
y: 0.0
z: 0.0

-
linear: (Robot – these values are zero if truncated.)
x: -0.000256079363727
y: -7.41315335717e-05
z: -1.92383037593e-06
angular:
x: -0.00038935155502
y: 0.00129730885419
z: 0.000251979875957

Sometimes it is a bit touchy to get the Joints Panel Open. Keep trying! The Play with the values for Force, Position, and Velocity

Page 74 – We can move the robot with Joints Panel but it is better to add controllers as described in Chapter 5. Select the robot and choose mode in the Joints Panel.

```
Problem?      Sometimes this go Nuts!
harman@D104-45931:~$ rosnode list
/gazebo
/rosout
harman@D104-45931:~$ rosnode kill -a
killing:
* /gazebo
* /rosout
killed
harman@D104-45931:~$ rosnode list
```