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Gazebo in Textbook Pages 60-74

roslaunch turtlebot_gazebo turtlebot_world.launch

```
harman@D104-45931:~$ roslaunch turtlebot_gazebo turtlebot_world.launch
```

rosnode info gazebo

```
harman@D104-45931:~$ rosnode info gazebo
```

```
-----  
Node [/gazebo]  
Publications:  
* /camera/depth/camera_info [sensor_msgs/CameraInfo]  
* /camera/depth/image_raw [sensor_msgs/Image]  
* /camera/depth/points [sensor_msgs/PointCloud2]  
* /camera/parameter_descriptions [dynamic_reconfigure/ConfigDescription]  
* /camera/parameter_updates [dynamic_reconfigure/Config]  
* /camera/rgb/camera_info [sensor_msgs/CameraInfo]  
* /camera/rgb/image_raw [sensor_msgs/Image]  
* /camera/rgb/image_raw/compressed [sensor_msgs/CompressedImage]  
* /camera/rgb/image_raw/compressed/parameter_descriptions  
[dynamic_reconfigure/ConfigDescription]  
* /camera/rgb/image_raw/compressed/parameter_updates [dynamic_reconfigure/Config]
```

- * /camera/rgb/image_raw/compressedDepth [sensor_msgs/CompressedImage]
- * /camera/rgb/image_raw/compressedDepth/parameter_descriptions [dynamic_reconfigure/ConfigDescription]
- * /camera/rgb/image_raw/compressedDepth/parameter_updates [dynamic_reconfigure/Config]
- * /camera/rgb/image_raw/theora [theora_image_transport/Packet]
- * /camera/rgb/image_raw/theora/parameter_descriptions [dynamic_reconfigure/ConfigDescription]
- * /camera/rgb/image_raw/theora/parameter_updates [dynamic_reconfigure/Config]
- * /clock [roscpp_msgs/Clock]
- * /gazebo/link_states [gazebo_msgs/LinkStates]
- * /gazebo/model_states [gazebo_msgs/ModelStates]
- * /gazebo/parameter_descriptions [dynamic_reconfigure/ConfigDescription]
- * /gazebo/parameter_updates [dynamic_reconfigure/Config]
- * /joint_states [sensor_msgs/JointState]
- * /mobile_base/events/bumper [kobuki_msgs/BumperEvent]222222
- * /mobile_base/events/cliff [kobuki_msgs/CliffEvent]
- * /mobile_base/sensors/imu_data [sensor_msgs/Imu]
- * /odom [nav_msgs/Odometry]
- * /rosout [roscpp_msgs/Log]
- * /tf [tf2_msgs/TFMessage]

Subscriptions:

- * /clock [roscpp_msgs/Clock]
- * /gazebo/set_link_state [unknown type]
- * /gazebo/set_model_state [unknown type]
- * /mobile_base/commands/motor_power [unknown type]
- * /mobile_base/commands/reset_odometry [unknown type]
- * /mobile_base/commands/velocity [geometry_msgs/Twist]

Services:

- * /camera/rgb/image_raw/compressed/set_parameters
- * /camera/rgb/image_raw/compressedDepth/set_parameters
- * /camera/rgb/image_raw/theora/set_parameters
- * /camera/set_camera_info
- * /camera/set_parameters
- * /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

contacting node <http://D104-45931:45614/> ...

Pid: 4377

Connections:

- * topic: /rosout
 - * to: /rosout
 - * direction: outbound
 - * transport: TCPROS
- * topic: /clock
 - * to: /gazebo
 - * direction: outbound
 - * transport: INTRAPROCESS
- * topic: /clock
 - * to: /depthimage_to_laserscan
 - * direction: outbound
 - * transport: TCPROS
- * topic: /clock
 - * to: /cmd_vel_mux
 - * direction: outbound
 - * transport: TCPROS
- * topic: /clock
 - * to: /rosout
 - * direction: outbound
 - * transport: TCPROS
- * topic: /clock
 - * to: /robot_state_publisher
 - * direction: outbound
 - * transport: TCPROS
- * topic: /clock
 - * to: /mobile_base_nodelet_manager
 - * direction: outbound
 - * transport: TCPROS
- * topic: /clock

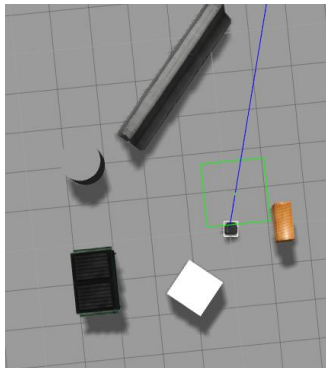
- * to: /bumper2pointcloud
- * direction: outbound
- * transport: TCPROS
- * topic: /clock
- * to: /laserscan_nodelet_manager
- * direction: outbound
- * transport: TCPROS
- * topic: /clock
- * to: /gazebo_gui
- * direction: outbound
- * transport: TCPROS
- * topic: /joint_states
- * to: /robot_state_publisher
- * direction: outbound
- * transport: TCPROS
- * topic: /clock
- * to: /gazebo (<http://D104-45931:45614/>)
- * direction: inbound
- * transport: INTRAPROCESS
- * topic: /mobile_base/commands/velocity
- * to: /mobile_base_nodelet_manager (<http://D104-45931:35173/>)
- * direction: inbound
- * transport: TCPROS

harman@D104-45931:~\$

Gazebo Screenshot vs Screenshot app.

Note: Gazebo screen shot Saved to home/harman/.gazebo/pictures - just the gazebo image!
Use Screenshot app for the full screen image

Gazebo Image and Pose for mobile_base



▶ cube_20k
 ▼ mobile_base
 base_footprint

Property	Value
name	mobile_base
is_static	<input type="checkbox"/> False
self_collide	<input type="checkbox"/> False
▼ pose	
x	0.005180
y	0.037378
z	-0.001131
roll	0.000104
pitch	-0.007997
yaw	-0.102570
▼ link	mobile_bas...
name	mobile_bas...
self_c...	<input type="checkbox"/> False
gravity	<input checked="" type="checkbox"/> True
kinem...	<input type="checkbox"/> False
canon...	<input checked="" type="checkbox"/> True

Get Model State 84.)

mobile_base (Text Page

```
harman@D104-45931:~$ rosservice call gazebo/get_model_state '{model_name: mobile_base}'
```

header:

seq: 1

stamp:

secs: 270

nsecs: 100000000

frame_id: "

pose:

position:

x: 0.00518034339217

y: 0.0373775155039

z: -0.0011307412908

orientation:

x: -0.000152666211723

y: -0.00399585036482

z: -0.051262457145

w: 0.998677210294

twist: % meters/sec and rad/sec

linear:

x: 1.03185137938e-06

y: -0.000272356653012

z: -4.28014287603e-06

angular:

x: -0.00304955596171

y: 0.000206452469192

z: 0.000118807259034

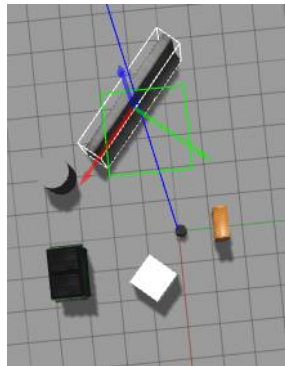
success: True

status_message: "GetModelState: got properties"

WHERE ARE THINGS?

rostopic echo -n 1 /gazebo/model_states

harman@D104-45931:~\$ rostopic echo -n 1 /gazebo/model_states



Use Translation to see axes Red is x and Green is y from models point of view.

name: [bookshelf, jersey_barrier,

ground_plane_0, unit_cylinder_1, Dumpster, cube_20k, mobile_base]

Pose: % bookshelf

position:

x: 0.0, y: 1.53026, z: 0.0

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

position: % jersey_barrier

x: -4.0 y: -1.0 z: 0.0

orientation: x: 0.0 y: 0.0 z: -0.342897807455 w: 0.939372712847

position: % ground_plane_0

X: 0.497681 y: 0.0 z: 0.0

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

-

position: % unit_cylinder_1

x: -2.00000000001

y: -3.48880000001

z: 0.499120000039

orientation:

x: -2.2266366729e-11 y: -2.27691339581e-11 z: -3.55329480371e-10 w: 1.0

position: % Dumpster

X: 0.999999641284 y: -3.44458003638 z: 0.000783506610574

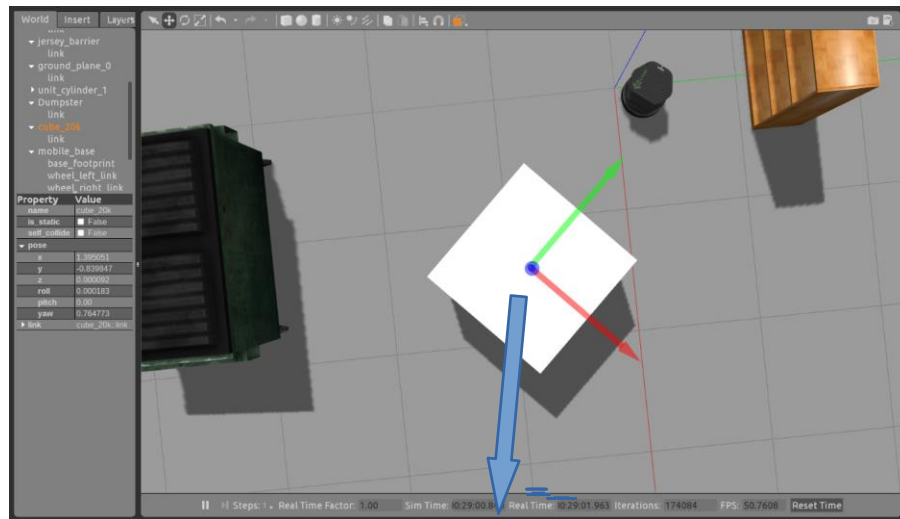
orientation:

x: 1.43255309656e-06 y: -0.00010197766021 z: 5.71694611267e-08 w: 0.999999994799

position: % cube_20k

x: 1.41040627081 y: -1.00006137362 z: -0.000289360614284

orientation: x: -0.000175326558986 y: 0.000189494727862 z: 0.433314079953 w: 0.901242942534



Mobile Base position: % About at Zero

x: 0.000375606671918 y: 0.00666005247263 z: -0.00113059970066

orientation: x: -6.56956999686e-05 y: -0.00399750621972 z: -0.0105596446615 w: 0.999936252735

% OMITTED TWIST DATA – NOTHING MOVING!

GAZEBO FILES \$ roscd turtlebot_gazebo

harman@D104-45931:~\$ roscd turtlebot_gazebo

```

harman@D104-45931:/opt/ros/kinetic/share/turtlebot_gazebo$ ls -la

total 48

drwxr-xr-x  7 root root 4096 Sep 30 2020 .

drwxr-xr-x 466 root root 20480 Oct 25 17:04 ..

drwxr-xr-x  2 root root 4096 Sep 30 2020 catkin_env_hook

drwxr-xr-x  2 root root 4096 Sep 30 2020 cmake

drwxr-xr-x  3 root root 4096 Sep 30 2020 launch

drwxr-xr-x  2 root root 4096 Sep 30 2020 maps

-rw-r--r--  1 root root 1233 Sep 18 2017 package.xml

drwxr-xr-x  2 root root 4096 Sep 30 2020 worlds

```

opt/ros/kinetic/share/turtlebot_gazebo

```

harman@D104-45931:/opt/ros/kinetic/share/turtlebot_gazebo$ cd worlds/

harman@D104-45931:/opt/ros/kinetic/share/turtlebot_gazebo/worlds$ ls

corridor.world  empty.world  playground.world

harman@D104-45931:/opt/ros/kinetic/share/turtlebot_gazebo/worlds$ cd ..

harman@D104-45931:/opt/ros/kinetic/share/turtlebot_gazebo$ cd launch

harman@D104-45931:/opt/ros/kinetic/share/turtlebot_gazebo/launch$ ls

amcl_demo.launch  gmapping_demo.launch  includes  turtlebot_world.launch

harman@D104-45931:/opt/ros/kinetic/share/turtlebot_gazebo/launch$ gedit turtlebot_world.launch

```

Gazebo Launch file turtlebot_world.launch

Calls different files and packages to launch Simulation

```

<launch>

<arg name="world_file" default="$(env TURTLEBOT_GAZEBO_WORLD_FILE)"/>

<arg name="base" value="$(optenv TURTLEBOT_BASE kobuki)"/> <!-- create, roomba -->

<arg name="battery" value="$(optenv TURTLEBOT_BATTERY /proc/acpi/battery/BAT0)"/> <!-- /proc/acpi/battery/BAT0 -->

<arg name="gui" default="true"/>

<arg name="stacks" value="$(optenv TURTLEBOT_STACKS hexagons)"/> <!-- circles, hexagons -->

<arg name="3d_sensor" value="$(optenv TURTLEBOT_3D_SENSOR kinect)"/> <!-- kinect, asus_xtion_pro -->

<include file="$(find gazebo_ros)/launch/empty_world.launch">

  <arg name="use_sim_time" value="true"/>

  <arg name="debug" value="false"/>

  <arg name="gui" value="$(arg gui)" />

  <arg name="world_name" value="$(arg world_file)"/>

```



```

</include>

<include file="$(find turtlebot_gazebo)/launch/includes/$(arg base).launch.xml">
  <arg name="base" value="$(arg base)"/>
  <arg name="stacks" value="$(arg stacks)"/>
  <arg name="3d_sensor" value="$(arg 3d_sensor)"/>
</include>

<node pkg="robot_state_publisher" type="robot_state_publisher" name="robot_state_publisher">
  <param name="publish_frequency" type="double" value="30.0" />
</node>

<!-- Fake laser -->
<node pkg="nodelet" type="nodelet" name="laserscan_nodelet_manager" args="manager"/>
<node pkg="nodelet" type="nodelet" name="depthimage_to_laserscan"
  args="load depthimage_to_laserscan/DepthImageToLaserScanNodelet laserscan_nodelet_manager">
  <param name="scan_height" value="10"/>
  <param name="output_frame_id" value="/camera_depth_frame"/>
  <param name="range_min" value="0.45"/>
  <remap from="image" to="/camera/depth/image_raw"/>
  <remap from="scan" to="/scan"/>
</node>
</launch>

```