Introduction to ROS Simulators

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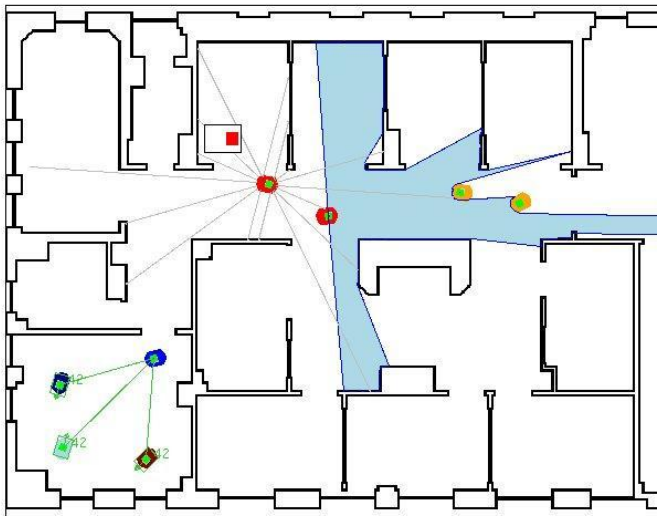
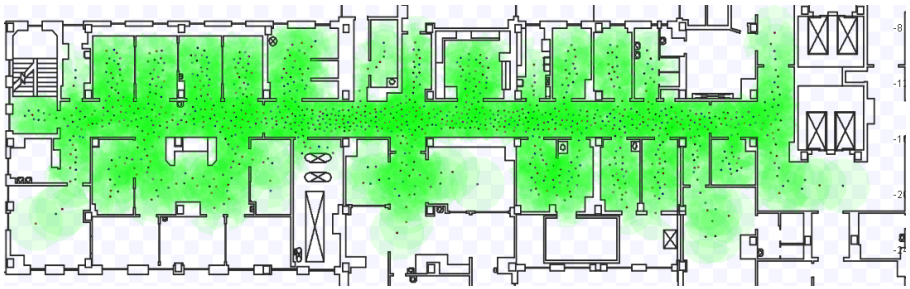
Stage Simulator

- The Player Project (formerly the Player/Stage Project)
- Free software for research into robotics and sensor systems
- The Stage simulator is a 2D multiple-robot simulation environment
- Stage provides a basic simulation environment





Installing and Running stageros

Install

```
$ sudo apt-get install ros-hydro-stage-ros
```

- So, we first need to run a 'roscore' in terminal

Try

```
$ roscore
```

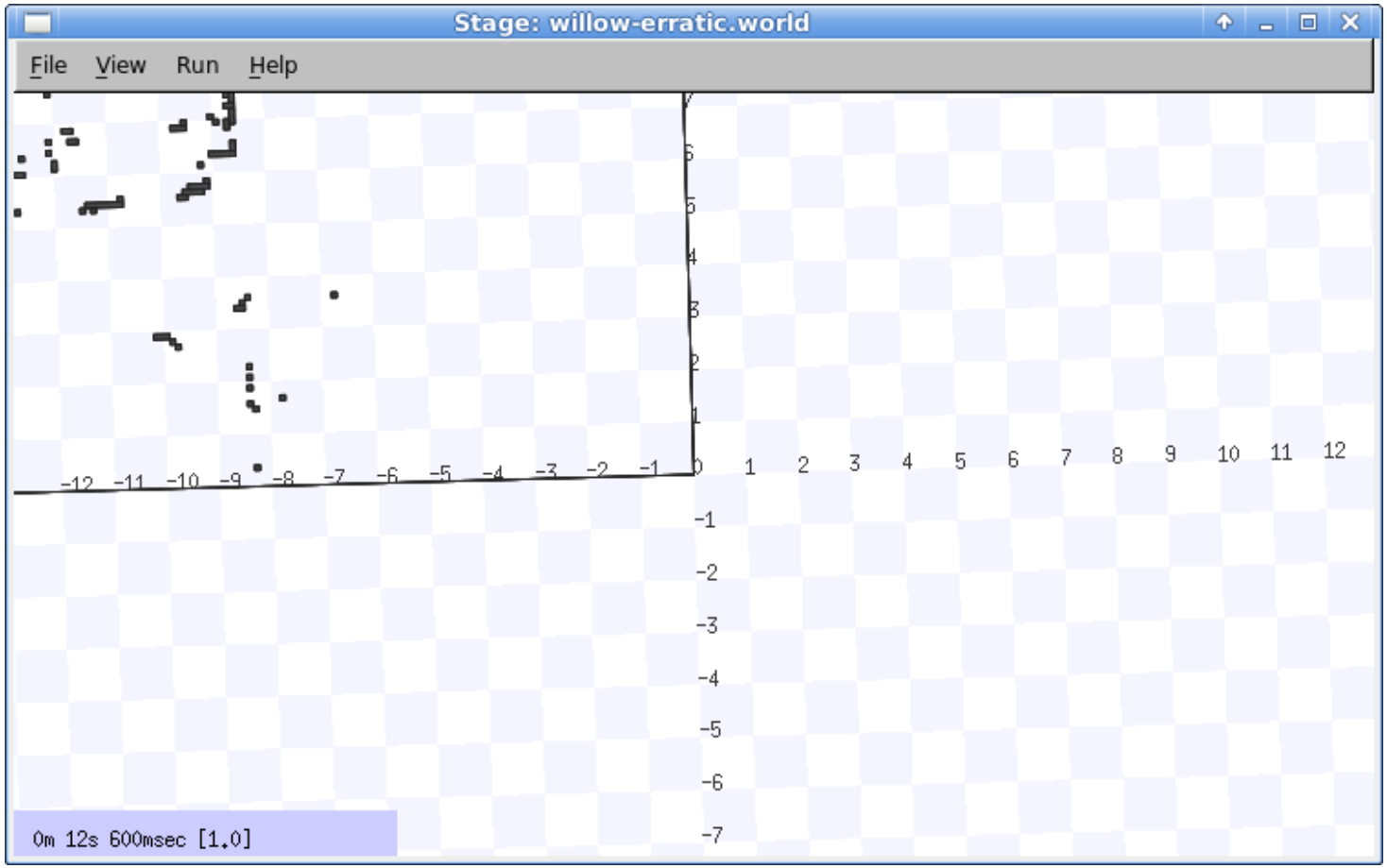
- Then we will run stageros with a sample world, in a new terminal

Try

```
$ rosrun stage_ros stageros willow-erratic.world
```

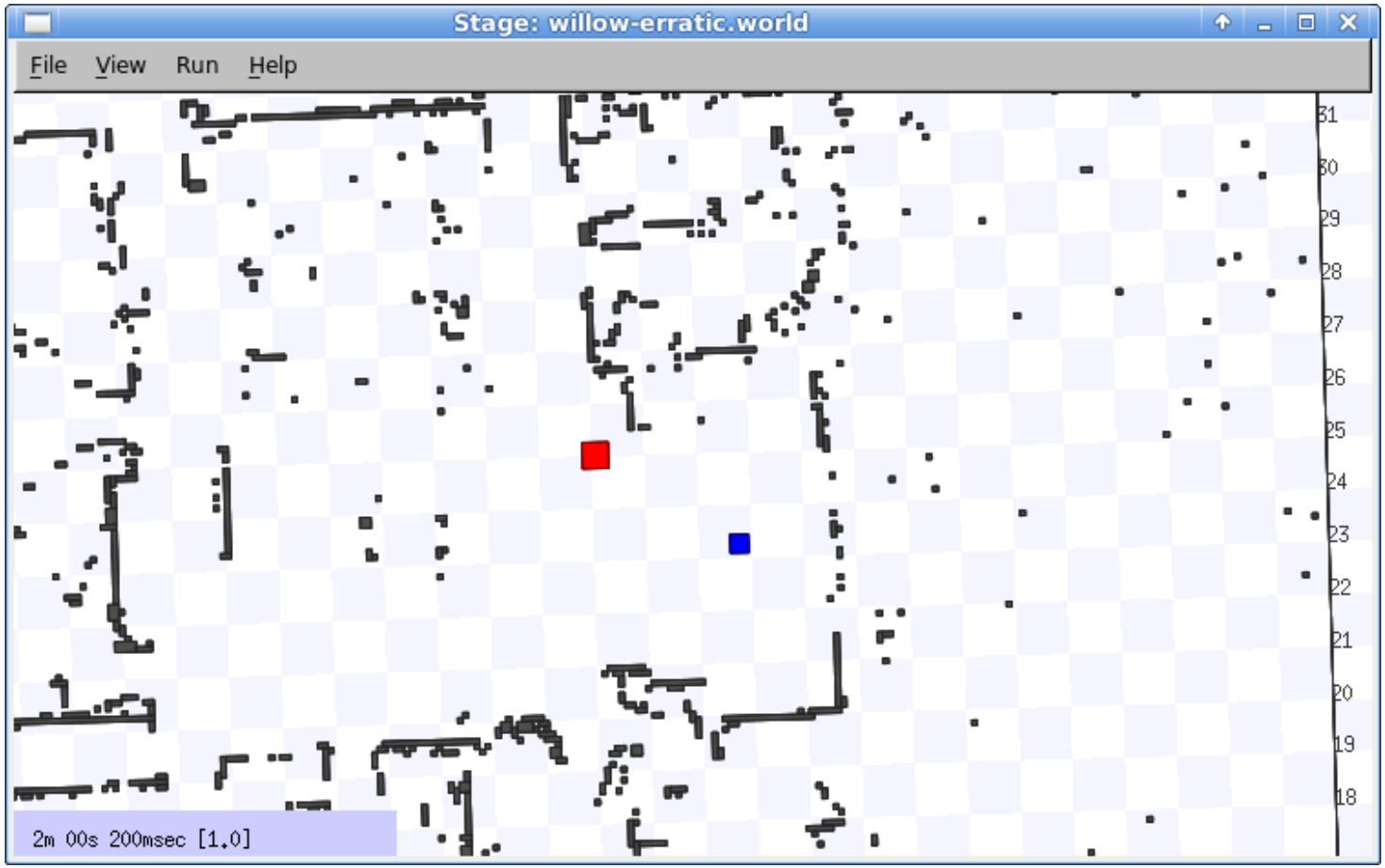
Running stageros

- And we will get a window like this



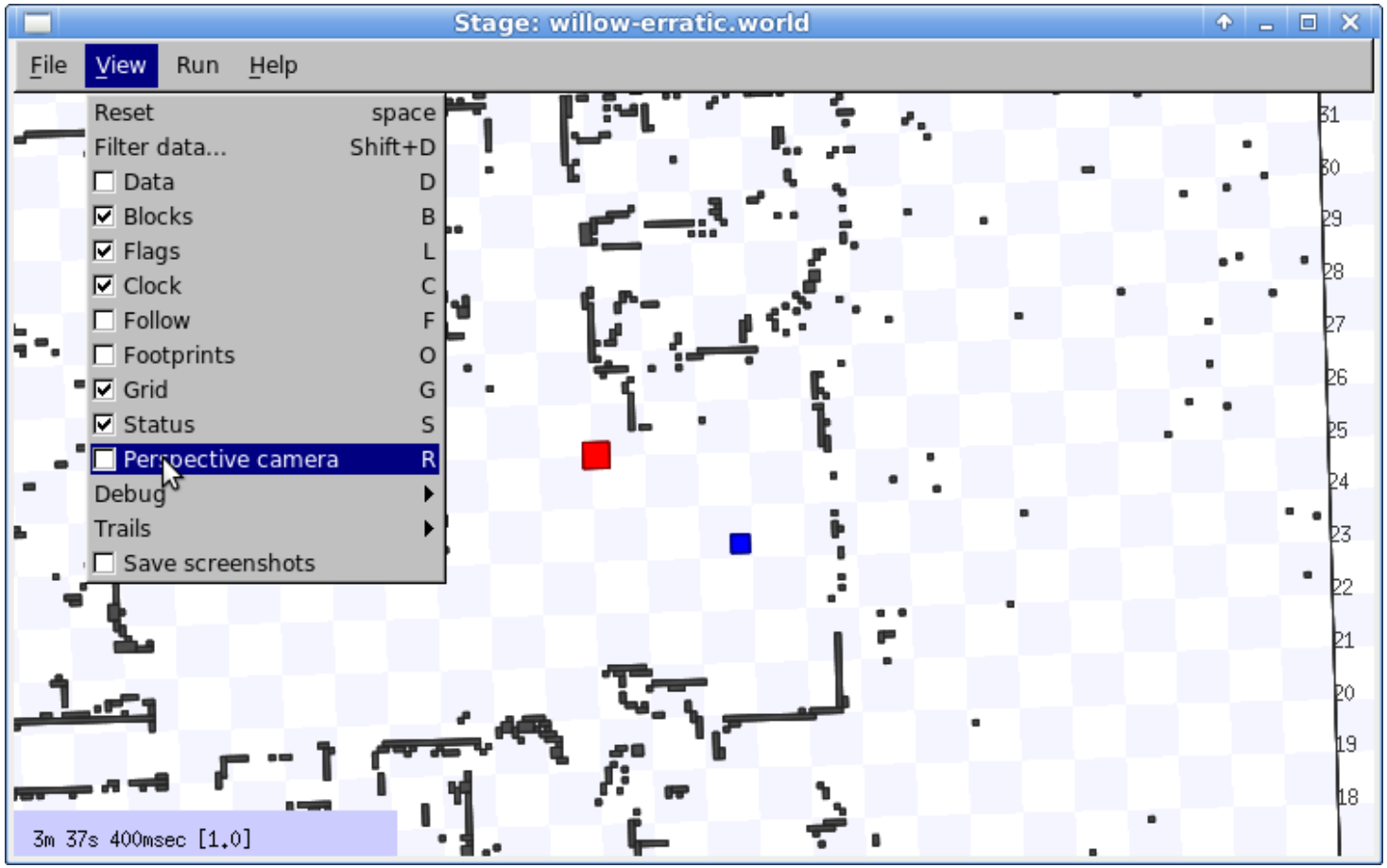
Running stageros

- Redragging we will be able to see the a basic robot (blue) with example moveable object (red)



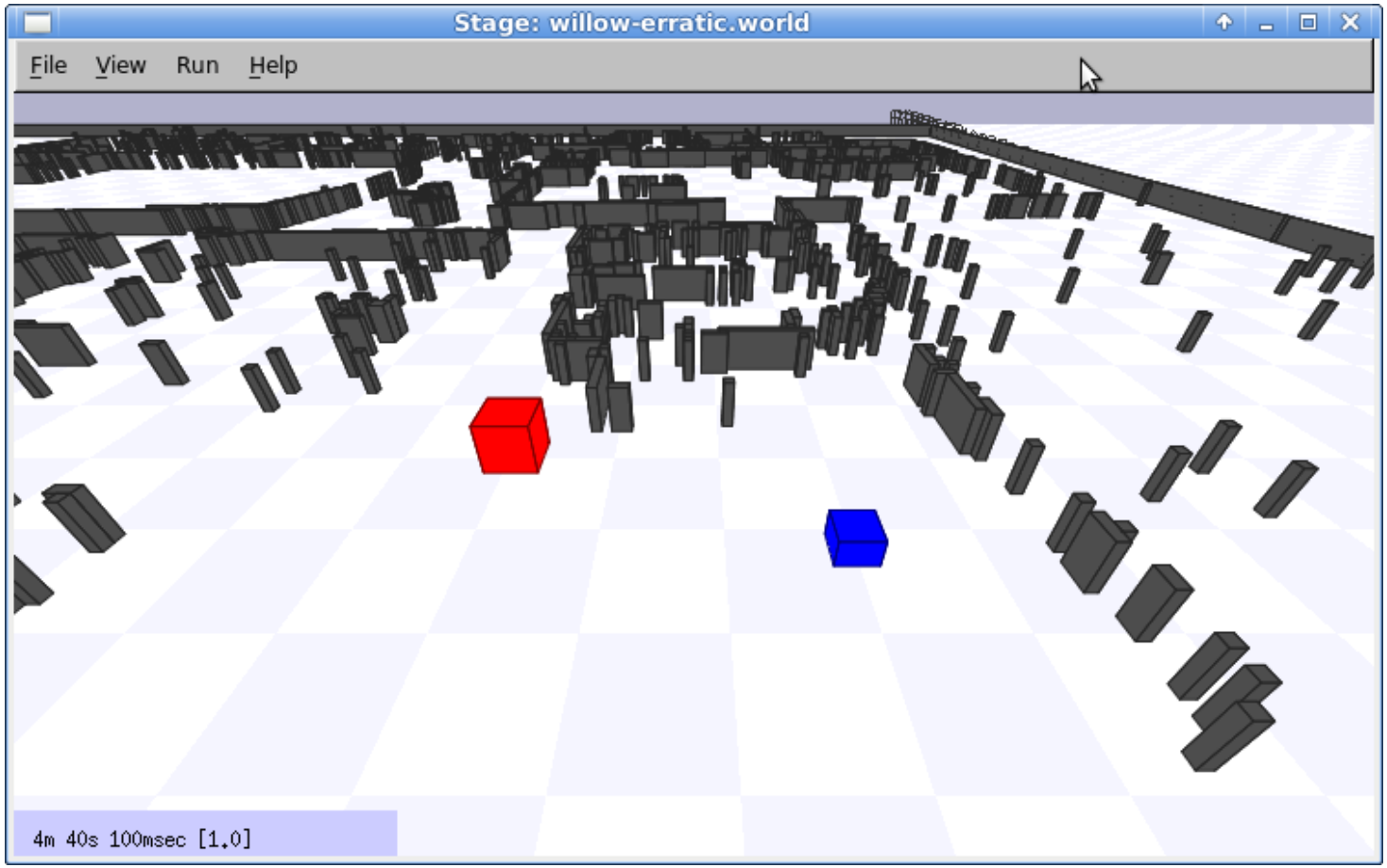
Running stageros

- Now, we can change the perspective to get a more realistic angle



Running stageros

- And it will look like this



Teleoperation of stageros Robot

- In order to move around the robot, we will need to install some additional packages

Install

```
$ sudo apt-get install ros-hydro-turtlebot-teleop
```

- Download the keyboard_teleop_stage.launch from the Moodle and place it somewhere convenient

Try

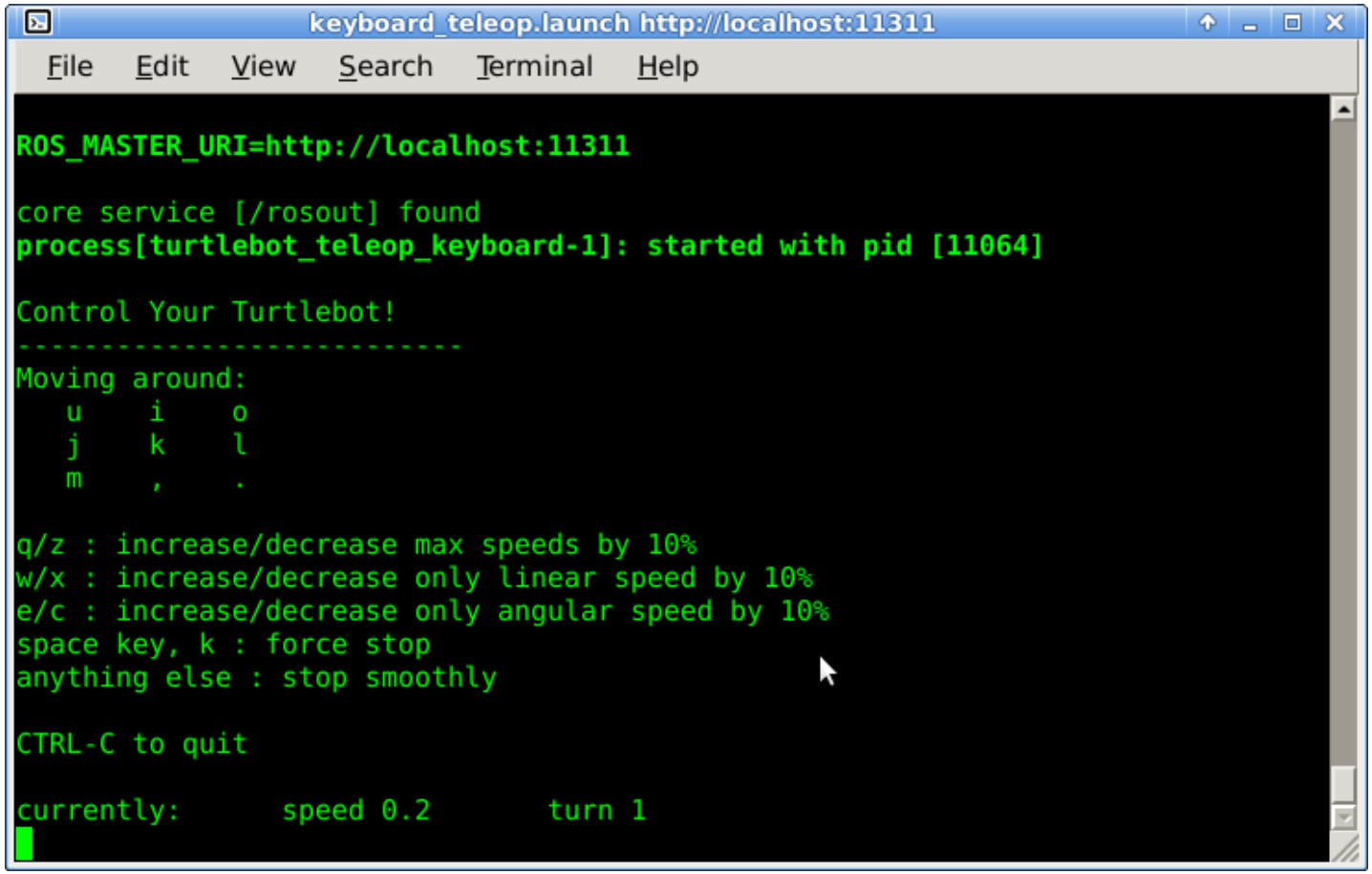
```
$ wget http://goo.gl/uvDkc2
```

- Then in order to run the launch file

Try

```
$ roslaunch keyboard_teleop_stage.launch
```

Teleoperation of stageros Robot



stageros Topics

- There are a number of topics publishing that we can look at

Try

```
$ rostopic list
```

Example (Would return)

```
/base_pose_ground_truth
/base_scan
/clock
/cmd_vel
/odom
/rosout
/rosout_agg
/tf
```

- Now let's look at a few of these

cmd_vel

Try

```
$ rostopic echo /cmd_vel
```

Example (Would return)

```
---
linear:
  x: -0.2
  y: 0.0
  z: 0.0
angular:
  x: 0.0
  y: 0.0
  z: -1.0
---
```

base_scan

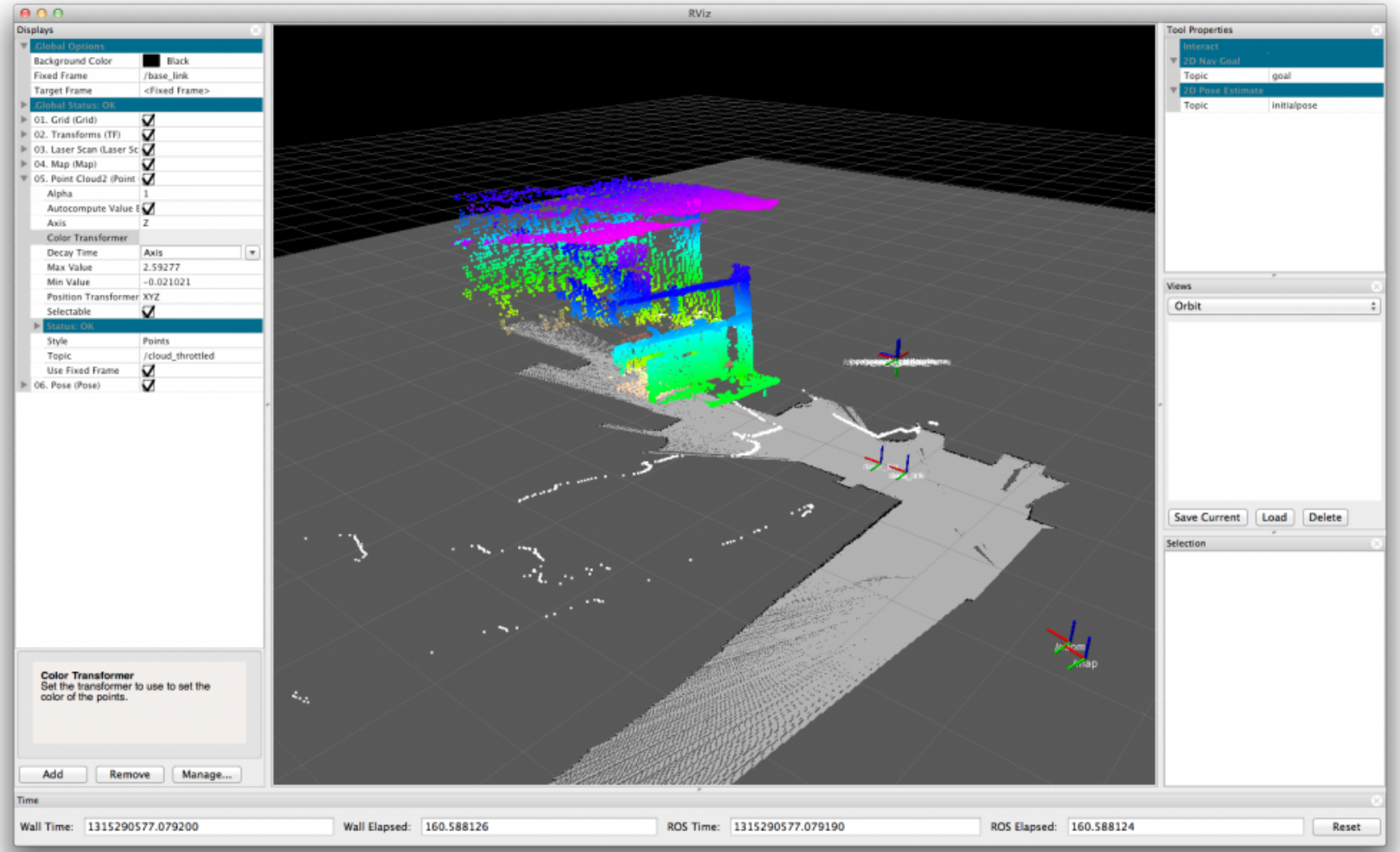
Try

```
$ rostopic echo /base_scan
```

Example (Would return)

```
---
header:
  seq: 4008
  stamp:
    secs: 400
    nsecs: 900000000
  frame_id: base_laser_link
angle_min: -2.35837626457
angle_max: 2.35837626457
angle_increment: 0.00436736317351
time_increment: 0.0
scan_time: 0.0
range_min: 0.0
range_max: 30.0
ranges: [11.382292747497559, 11.374547958374023, 11.36703109741211,
11.359740257263184, 11.352675437927246, 11.345834732055664, 11.33922004699707, 11.3328275680542,
11.326659202575684, 11.32071304321289, 11.314988136291504, 11.30948543548584, 11.304203987121582,
11.299141883850098, 11.294300079345703, 11.289677619934082, 11.285274505615234, 1.889115810394287,
1.8884515762329102, 1.8878237009048462, 1.8872323036193848, 1.8866772651672363, 1.8861584663391113,
1.8852295875549316, 1.8848193883895874, 1.884445309638977, 1.8766807317733765, 1.8838053941726685,
1.8835394382476807, 1.8833096027374268, 1.883115530014038, 1.8829575777053833, 1.8828355073928833,
1.882749319076538, 1.8826991319656372, 1.8826848268508911, 1.8827064037322998, 1.8827638626098633,
```

rviz

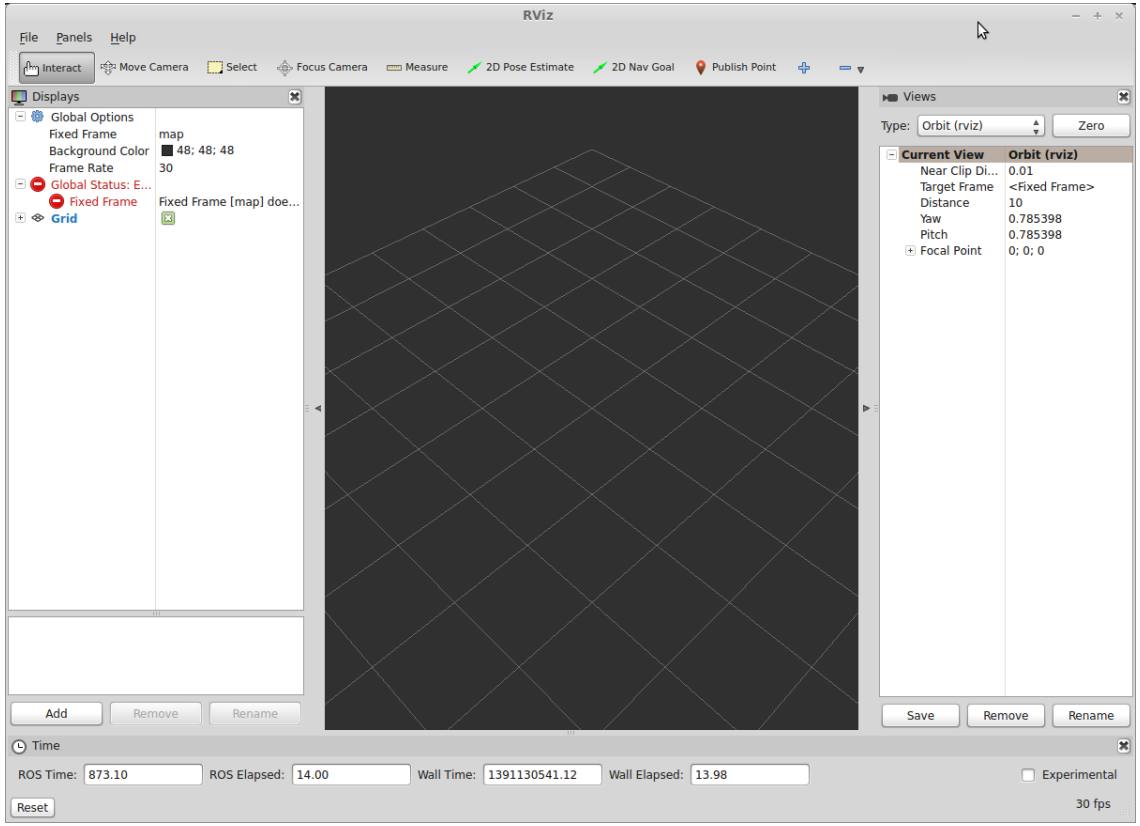

RViz
Displays
Global Options
Background Color
Black
Fixed Frame
/base_link
Target Frame
<Fixed Frame>
Global Status: OK
01. Grid (Grid)
02. Transforms (TF)
03. Laser Scan (Laser Sc
04. Map (Map)
05. Point Cloud2 (Point
Alpha
1
Autocompute Value E
Axis
Z
Color Transformer
Decay Time
Axis
Max Value
2.59277
Min Value
-0.021021
Position Transformer
XYZ
Selectable
Status: OK
Style
Points
Topic
/cloud_throttled
Use Fixed Frame
06. Pose (Pose)
Color Transformer
Set the transformer to use to set the color of the points.
Add
Remove
Manage...
Tool Properties
Interact
2D Nav Goal
Topic
goal
2D Pose Estimate
Topic
initialpose
Views
Orbit
Save Current
Load
Delete
Selection
Time
Wall Time:
1315290577.079200
Wall Elapsed:
160.588126
ROS Time:
1315290577.079190
ROS Elapsed:
160.588124
Reset

rviz with base_scan

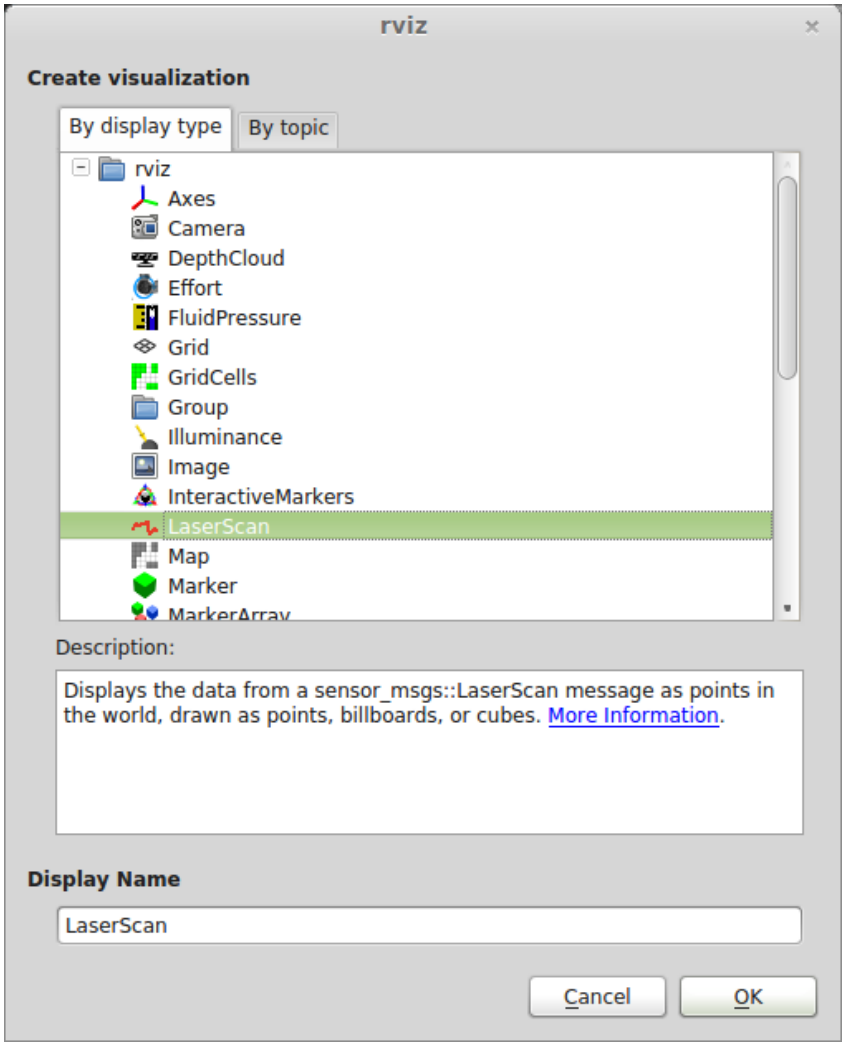
- Now let's get our base_scan visible

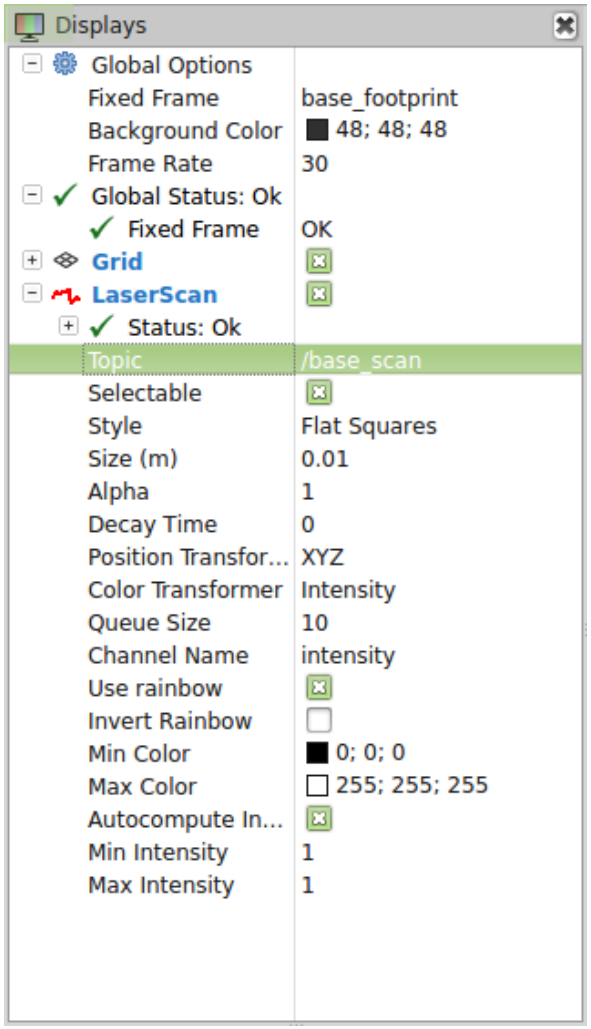
Try

```
$ rosrun rviz rviz
```

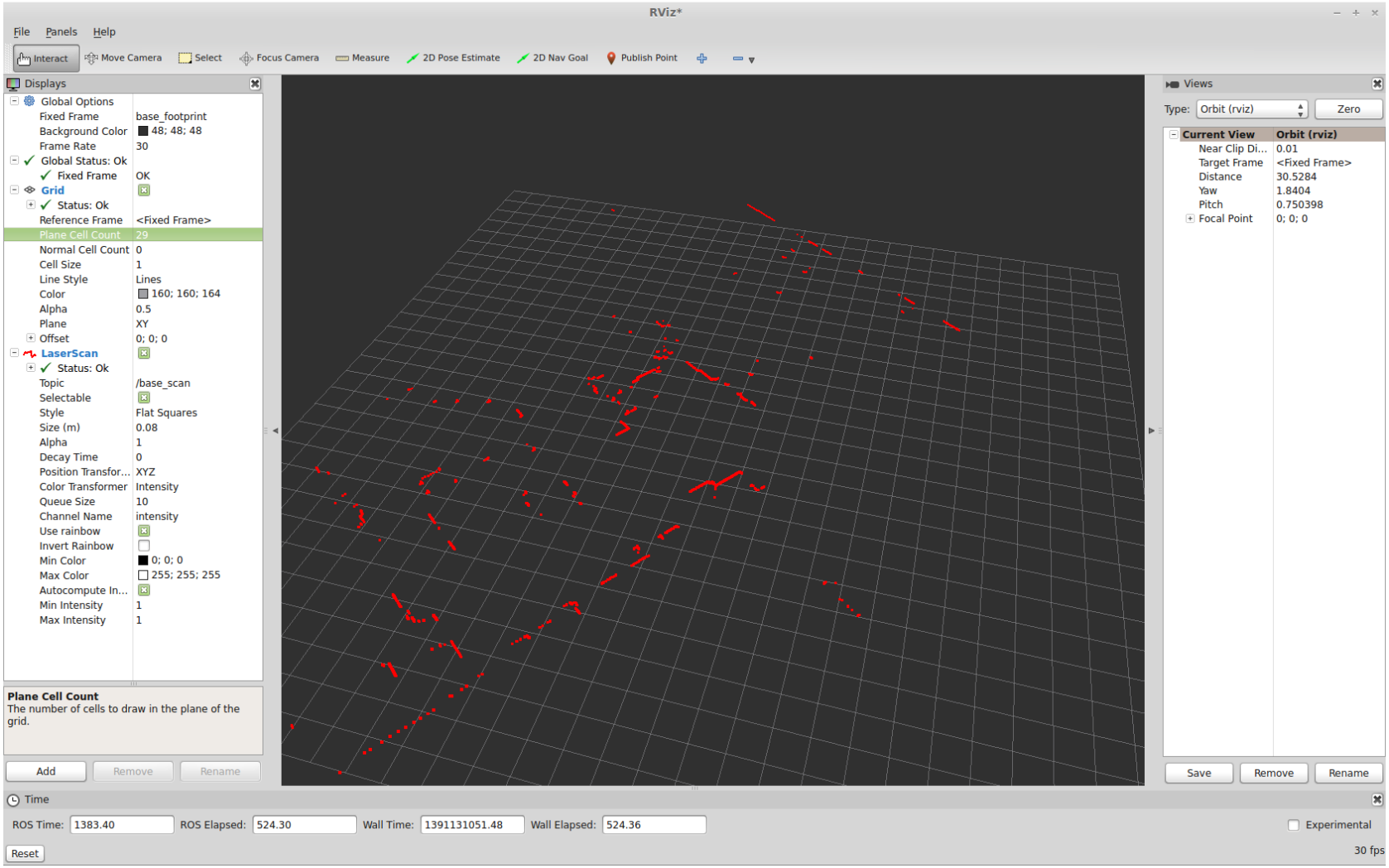


rviz with base_scan





rviz with base_scan



Installing and Running gazebo

Try

```
$ sudo apt-get install ros-hydro-turtlebot-simulator
$ . ~/.bashrc
$ roslaunch turtlebot_gazebo turtlebot_empty_world.launch
```

- Models can be downloaded from the Gazebo website
- `http://gazebosim.org/models/`

Try

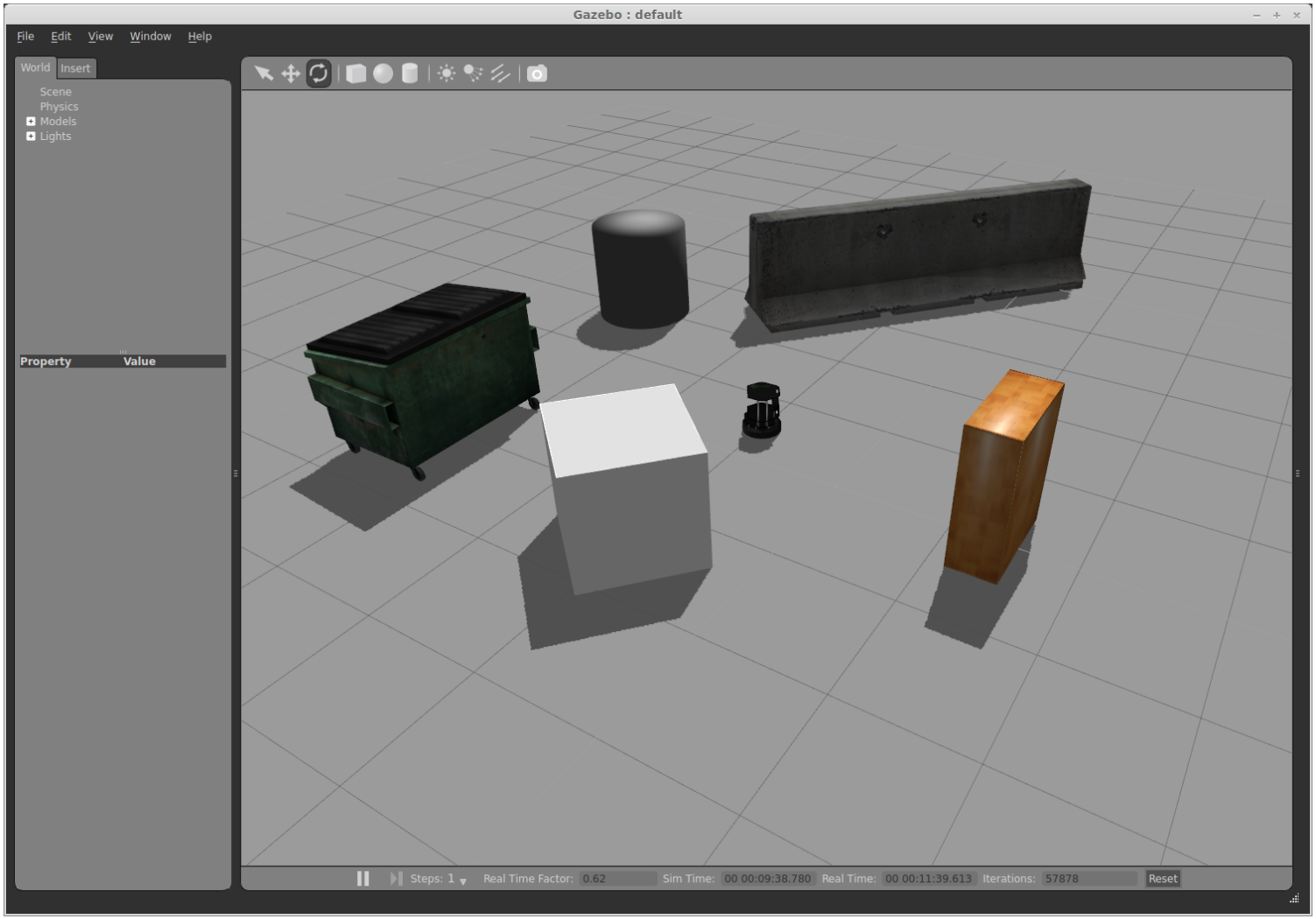
```
$ wget http://gazebosim.org/models/dumpster/model.tar.gz .
$ tar xvf model.tar.gz -C ~/.gazebo/models
```

- Do the same for `cube_20k`, `jersey_barrier`

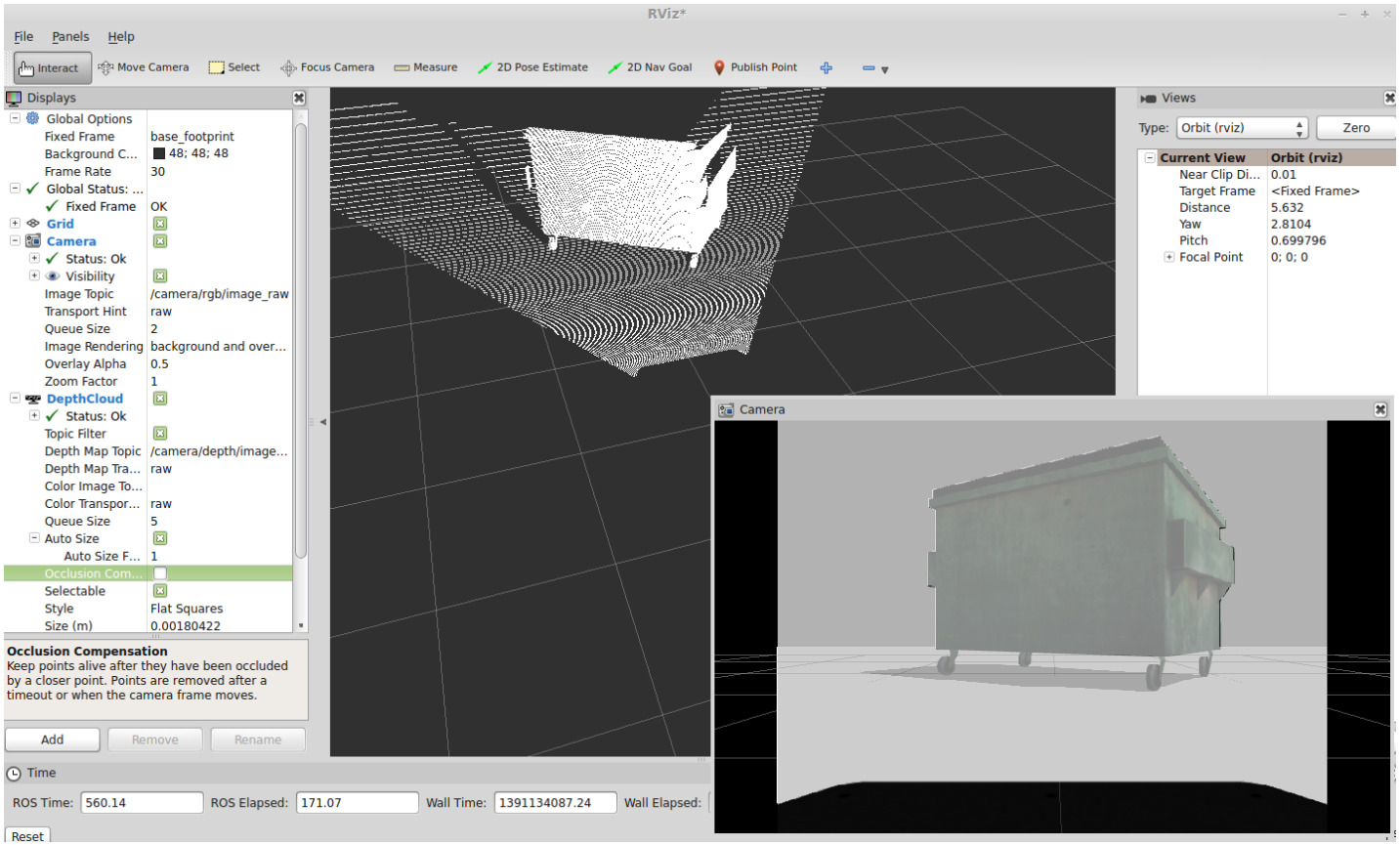
Try

```
$ roslaunch turtlebot_gazebo turtlebot_playground.launch
```

turtlebot_gazebo



turtlebot_gazebo with rviz



Teleop within turtlebot_gazebo

- Download the keyboard_teleop_gazebo.launch file for turtlebot_gazebo from the Moodle

Try

```
$ wget http://goo.gl/w9wGaJ
```

Try

```
$ roslaunch keyboard_teleop_gazebo.launch
```