Home Service Robot Project Starter Code

Abhay Luna

The objective of this project is a full home service robot capable of navigating to pick up and deliver virtual objects.

How to run the program with your own code

Go to Desktop and open a terminal.

For the execution of your own code, we head to the Project Workspace. For this setup, catkin_ws is the name of the active workspace. If your workspace name is different, change the commands accordingly.

Install ROS Navigation system.

```
sudo apt-get update
sudo apt-get install ros-kinetic-navigation
```

If you do not have an active workspace, you can create one. You can launch it by running the following commands first.

```
cd /home/workspace/
mkdir -p catkin_ws/
```

Clone the required repositories to the `/home/workspace/catkin_ws/` folder

```
cd /home/workspace/catkin_ws/
git clone https://github.com/Abhaycl/RoboND-Home-Service-Robot-2P5.git src
```

Clone the required repositories to the ~/catkin_ws/src folder. Note that this repository already includes official ROS packages compatible with this repository: gmapping, turtlebot_teleop, turtlebot_rviz_launchers, and turtlebot_gazebo. Their dependencies must be installed to succesfully use this repository.

(Optional)

- https://github.com/turtlebot/turtlebot_apps.git
- This repository contains the turtlebot_navigation package which is a turtlebot dependency.
- This will give you some room to tweak navigation and some SLAM behaviors.

Add required ROS packages as git submodules.

```
cd ~/catkin_ws/src
git submodule add https://github.com/ros-perception/slam_gmapping.git
git submodule add https://github.com/turtlebot/turtlebot.git
git submodule add https://github.com/turtlebot/turtlebot_interactions.git
git submodule add https://github.com/turtlebot/turtlebot_simulator.git
```

Install ROS packages dependancies.

```
cd ~/catkin_ws/src
sudo rosdep -i install gmapping -y
sudo rosdep -i install turtlebot_teleop -y
sudo rosdep -i install turtlebot_rviz_launchers -y
sudo rosdep -i install turtlebot_gazebo -y
```

Once copied everything, it's important to give permissions, reading and/or execution to the files necessary for the proper functioning.

Build the project:

```
cd /home/workspace/catkin_ws
catkin_make
source devel/setup.bash
```

Catkin Workspace Structure

Should look something like this:

```
catkin_ws/src
    |-- add_markers
        |-- src
        |-- ...
    |-- misc_images
        |-- ...
    |-- pick_objects
        |-- src
        |-- ...
    |-- RvizConfig
        |-- ...
    |-- ShellScripts
        |-- ...
    |-- slam_gmapping
        |-- gmapping
        |-- slam_gmapping
        |-- ...
    |-- turtlebot
        |-- turtlebot
        |-- turtlebot_bringup
        |-- turtlebot_capabilities
        |-- turtlebot_description
        |-- turtlebot_teleop
        |-- ...
    |-- turtlebot_apps
        |-- turtlebot_navigation
        |-- ...
    |-- turtlebot_interactions
        |-- turtlebot_dashboard
        |-- turtlebot_interactions
        |-- turtlebot_interactive_markers
        |-- turtlebot_rviz_launchers
        |-- ...
    |-- turtlebot_simulator
        |-- turtlebot_gazebo
        |-- turtlebot_simulator
        |-- turtlebot_stage
        |-- turtlebot_stdr
        |-- ...
    |-- wall_follower
        |-- src
        |-- ...
    |-- World
        |-- ...
```

The summary of the files and folders within repo is provided in the table below:

File/Folder	Definition
add_markers/*	Folder that contains all the node that model the object with a marker in rviz.
pick_objects/*	Folder that contains all the node that commands your robot to drive to the pick-up and drop-off zones.
RvizConfig/*	Folder that contains all the customized rviz configuration files.
ShellScripts/*	Folder that contains all the shell scripts.
slam_gmapping/*	Folder that contains all the files that perform SLAM and build a map of the environment with a robot equipped with laser range finder sensors or RGB-D cameras.
turtlebot/*	Folder that contain the keyboard_teleop.launch file that you can manually control a robot using keyboard commands. the keyboard_teleop.launch file that you can manually control a robot using keyboard commands.
turtlebot_apps/*	Folder that contain the turtlebot_navigation package which is a turtlebot dependency.
turtlebot_interactions/*	Folder that contain the view_navigation.launch file that you can load a preconfigured rviz workspace. It will automatically load the robot model, trajectories, and map for you.
turtlebot_simulator/*	Folder that contain the turtlebot_world.launch file that you can deploy a turtlebot in a gazebo environment by linking the world file to it.
wall_follower/*	Folder that contains all the wall_follower node that will autonomously drive your robot around to perform SLAM.
World/*	Folder that contains all the gazebo world file and the map generated from SLAM.
misc_images/*	Folder containing the images of the project.
CMakeLists.txt	Contains the System dependencies that are found with CMake's conventions.
README.md	Contains the project documentation.
README.pdf	Contains the project documentation in PDF format.

Steps to complete the project:

1. Design a simple environment with the Building Editor in Gazebo.
2. Teleoperate your robot and manually test SLAM.
3. Create a wall_follower node that autonomously drives your robot to map your environment.
4. Use the ROS navigation stack and manually commands your robot using the 2D Nav Goal arrow in rviz to move to 2 different desired positions and orientations.
5. Write a pick_objects node that commands your robot to move to the desired pickup and drop off zones.
6. Write an add_markers node that subscribes to your robot odometry, keeps track of your robot pose, and publishes markers to rviz.

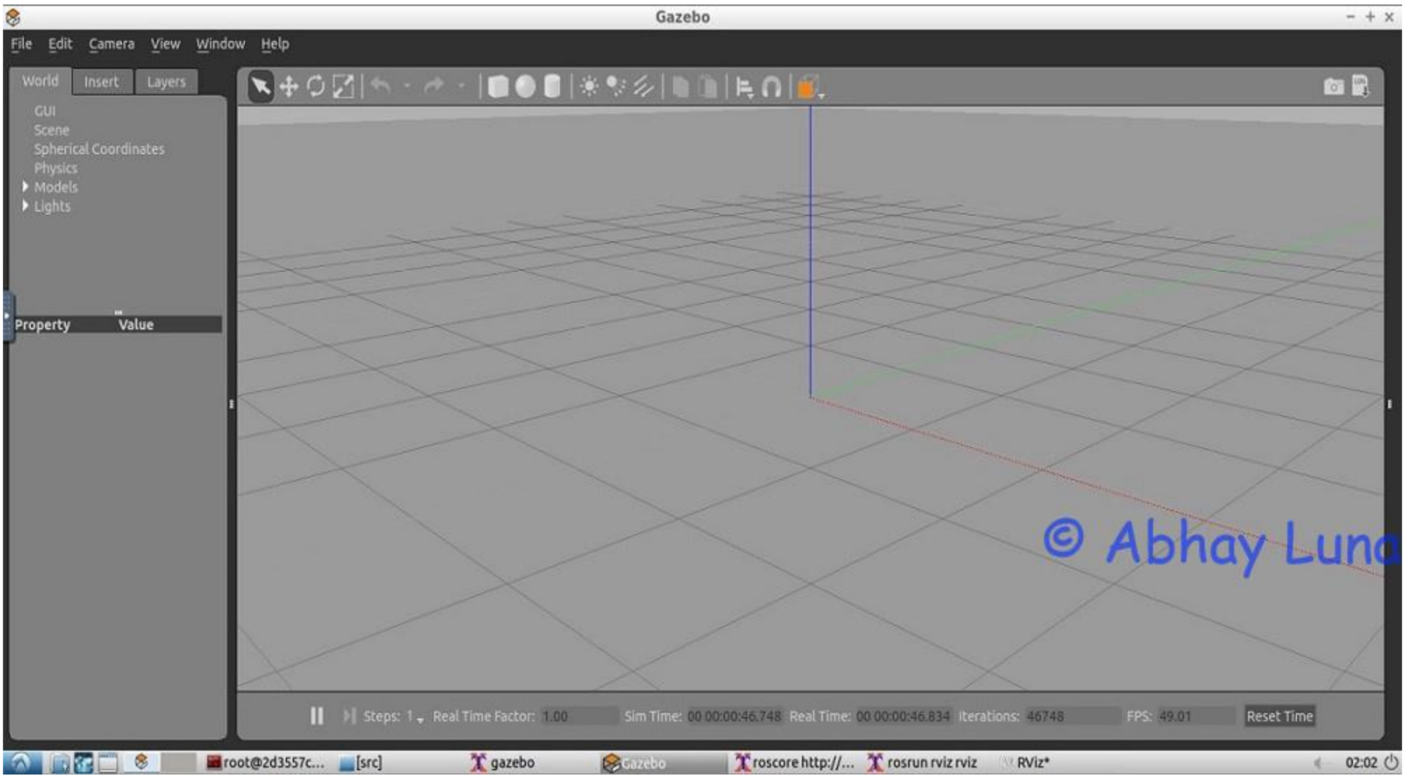
Rubric Points

Here I will consider the rubric points individually and describe how I addressed each point in my implementation.

Execution of the different shellscripts.

For run **launch.sh** open a terminal:

```
cd /home/workspace/catkin_ws/src/ShellScripts
./launch.sh
```



Steps: 1 Real Time Factor: 1.00 Sim Time: 00 00:00:46.748 Real Time: 00 00:00:46.834 Iterations: 46748 FPS: 49.01

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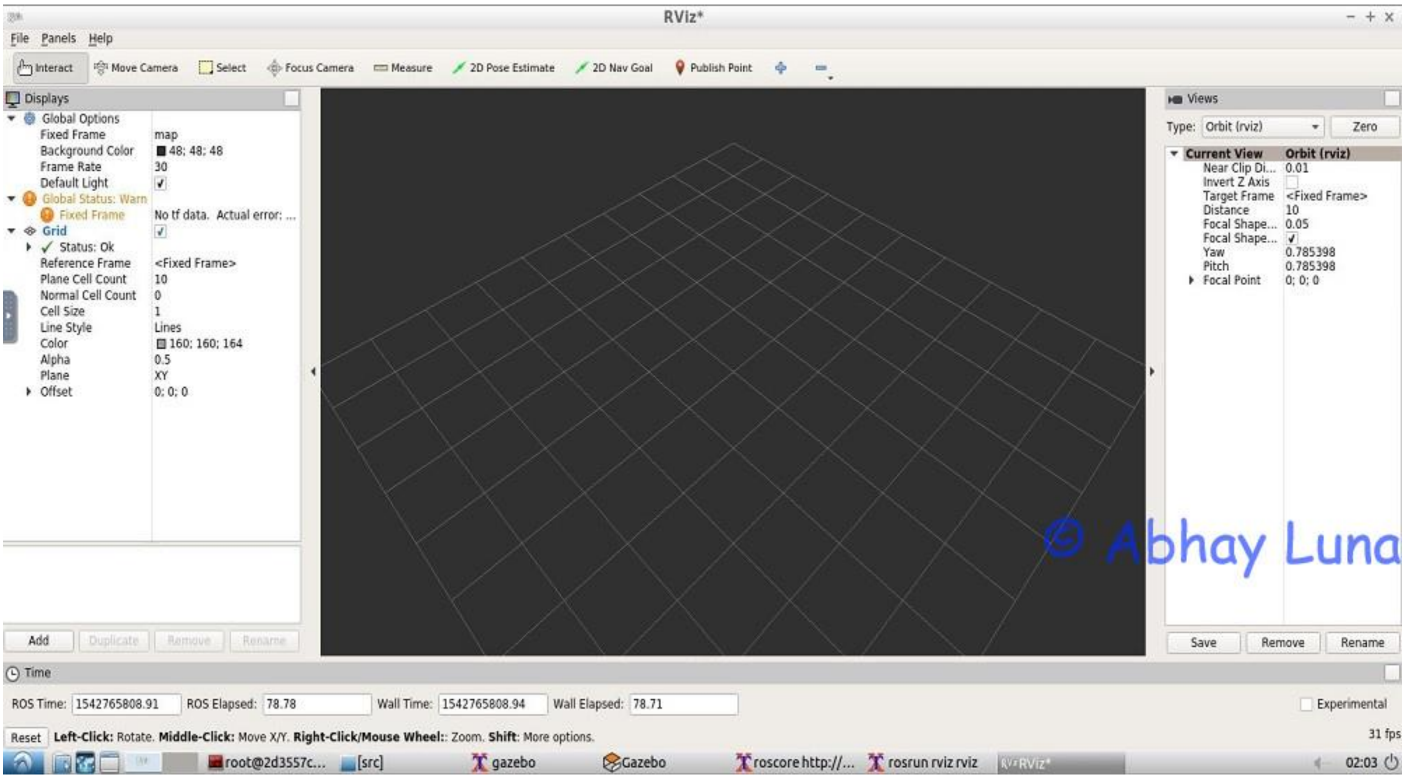


Global Options	
Fixed Frame	map
Background Color	■ 48; 48; 48
Frame Rate	30
Default Light	☑
Global Status: Warn	
Fixed Frame	No tf data. Actual error: ...
Grid	☑
✓ Status: Ok	
Reference Frame	<Fixed Frame>
Plane Cell Count	10
Normal Cell Count	0
Cell Size	1
Line Style	Lines
Color	▨ 160; 160; 164
Alpha	0.5
Plane	XY
Offset	0; 0; 0

Type: Orbit (rviz)

Current View	Orbit (rviz)
Near Clip Di...	0.01
Invert Z Axis	□
Target Frame	<Fixed Frame>
Distance	10
Focal Shape...	0.05
Focal Shape...	☑
Yaw	0.785398
Pitch	0.785398
Focal Point	0; 0; 0

ROS Time: 1542765808.91 ROS Elapsed: 78.78 Wall Time: 1542765808.94 Wall Elapsed: 78.71

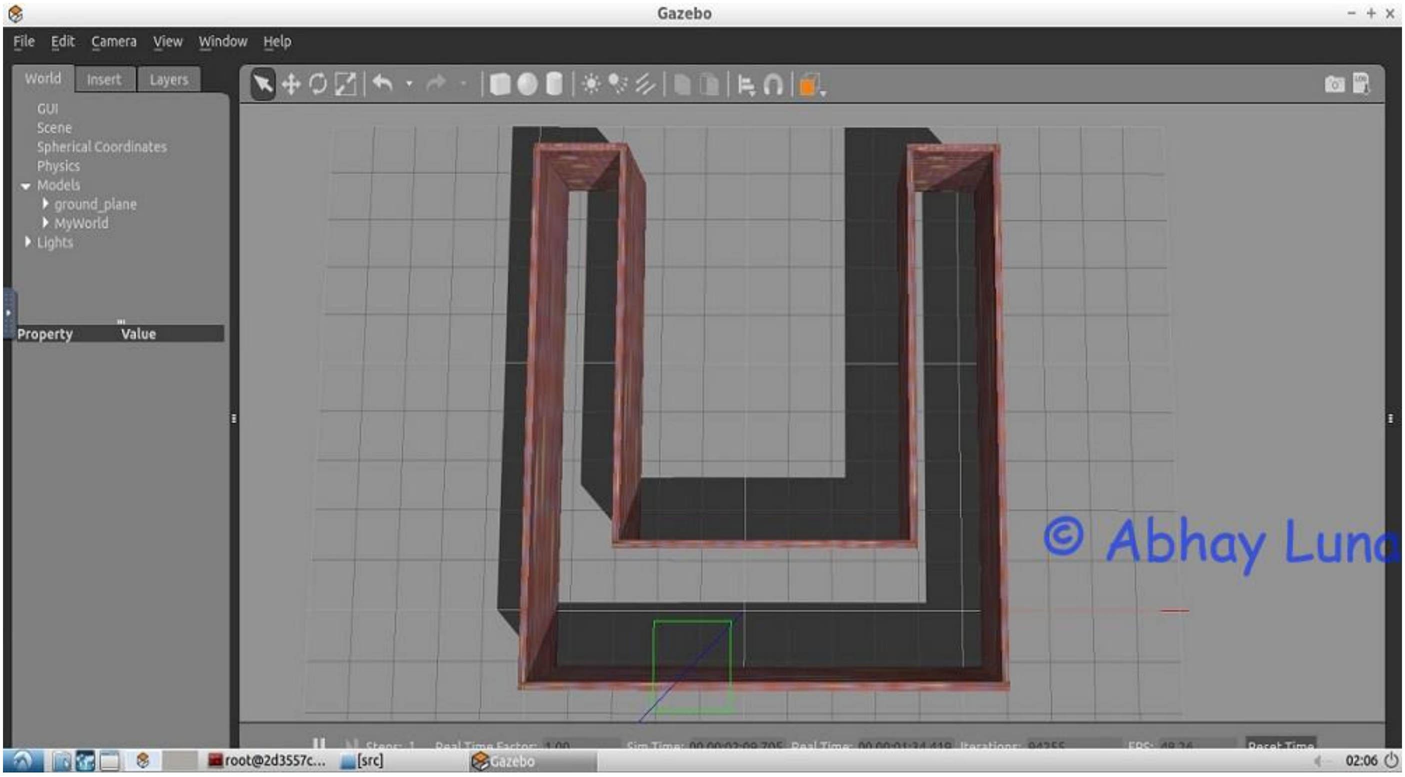
Left-Click: Rotate. **Middle-Click:** Move X/Y. **Right-Click/Mouse Wheel:**: Zoom. **Shift**: More options.

For create **my world** open a terminal:

```
cd /home/workspace/catkin_ws/src/World
gazebo MyWorld.world
```

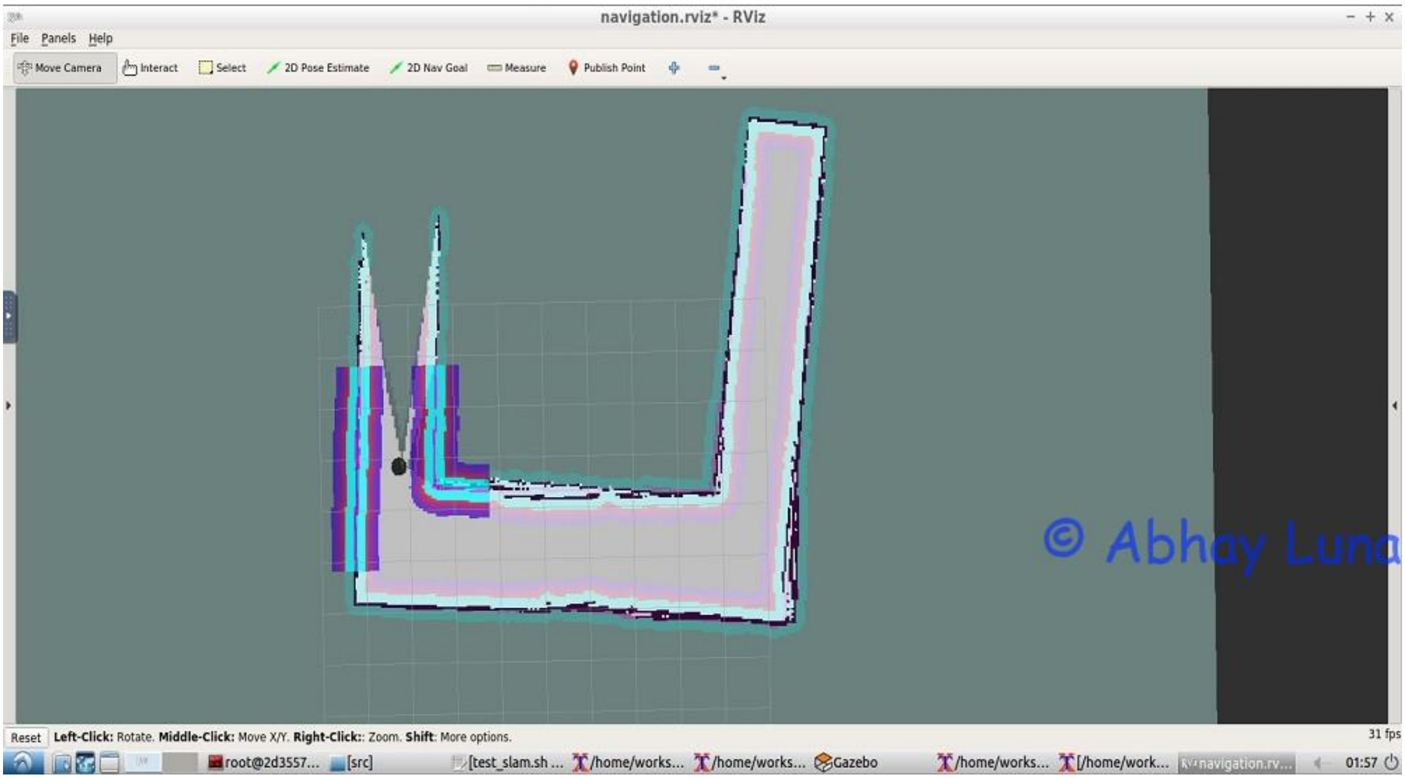
Design your environment.

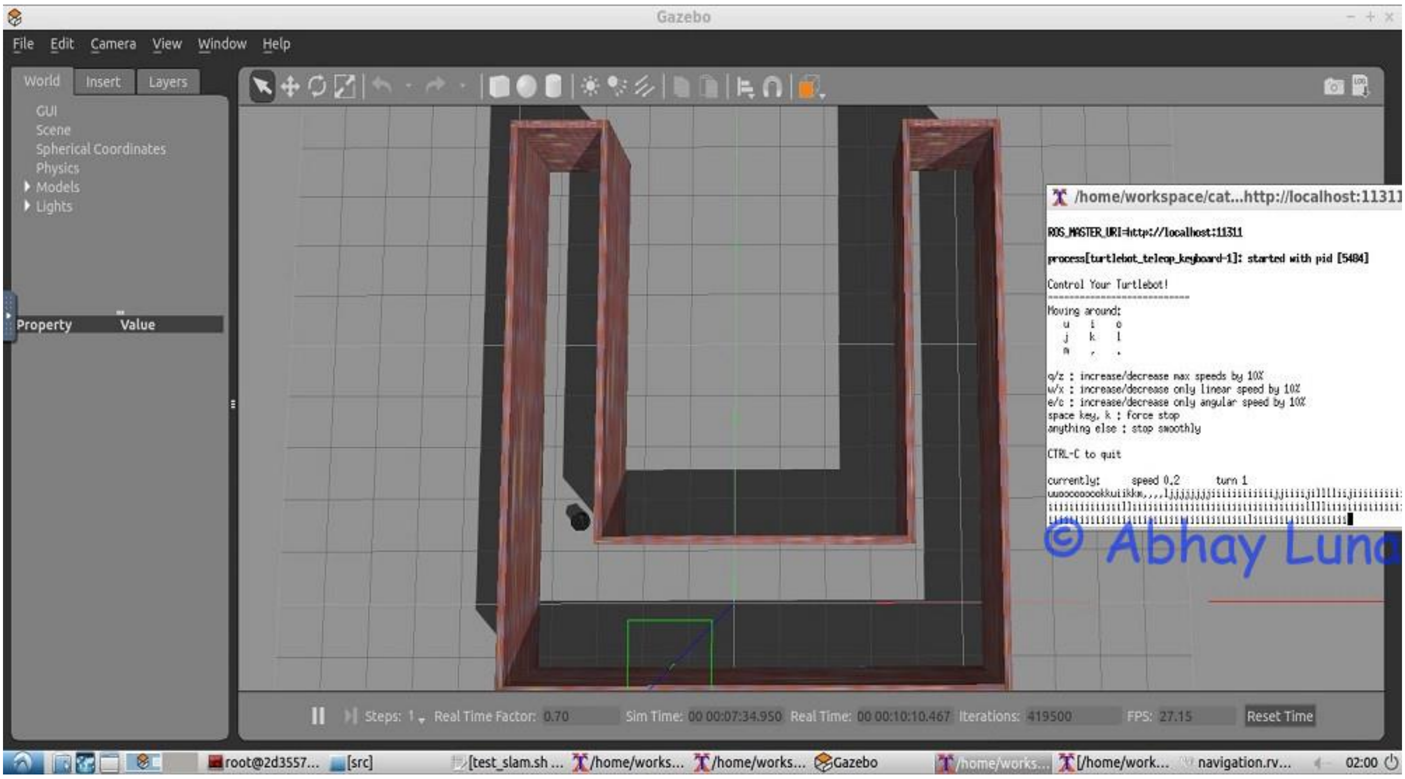
- Open a terminal and launch Gazebo.
- Click Edit and launch `Building Editor`.
- Design a simple environment.
- Apply textures or color.
- Save the building editor environment and go back to Gazebo.
- Save the Gazebo environment to the `World` directory under your `~/catkin_ws/src`.



For run **test_slam.sh** open a terminal:

```
cd /home/workspace/catkin_ws/src/ShellScripts
./test_slam.sh
```




Gazebo
File Edit Camera View Window Help
World Insert Layers
GUI
Scene
Spherical Coordinates
Physics
Models
Lights
Property Value
Steps: 1 Real Time Factor: 0.70 Sim Time: 00 00:07:34.950 Real Time: 00 00:10:10.467 Iterations: 419500 FPS: 27.15 Reset Time
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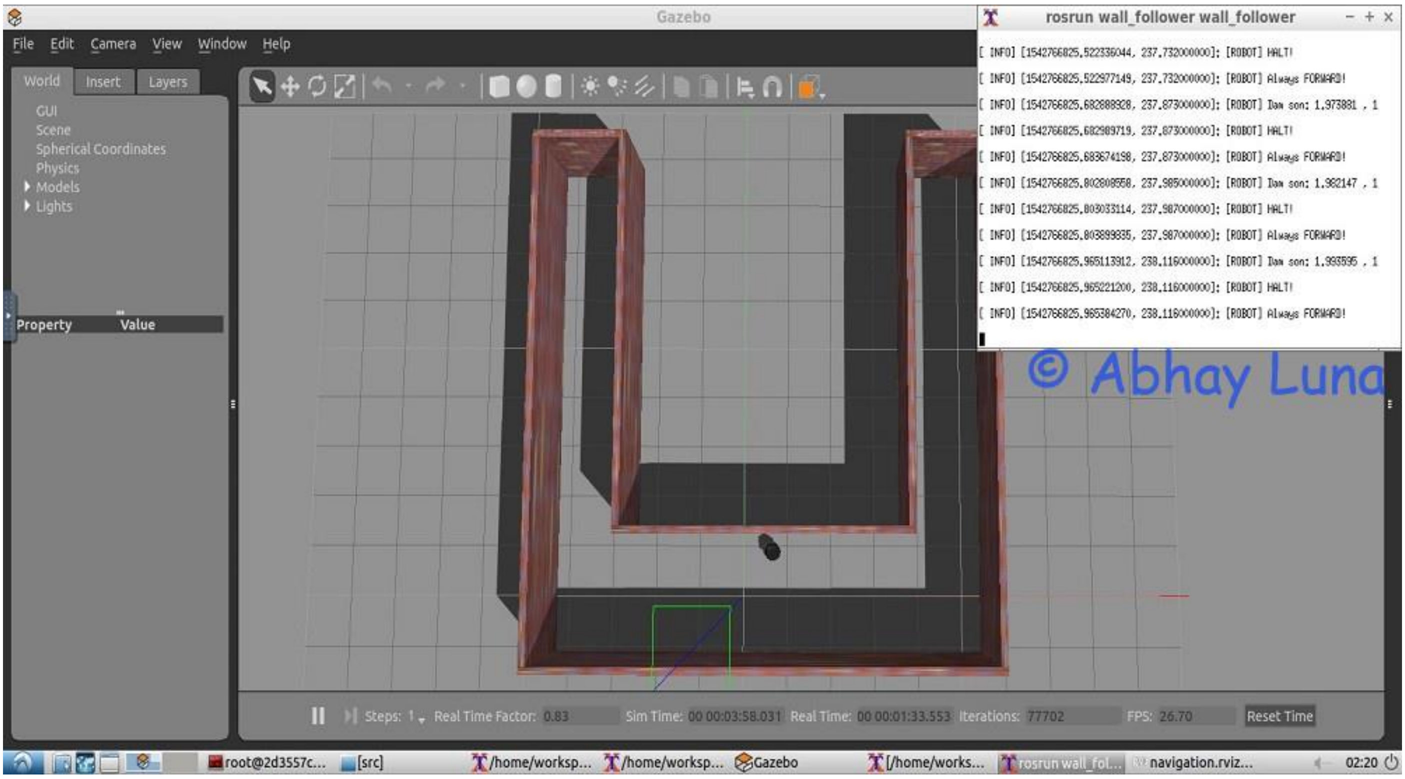
/home/workspace/cat...http://localhost:11311

```
ROS_MASTER_URI=http://localhost:11311

process[turtlebot_teleop_keyboard-1]: started with pid [5484]

Control Your Turtlebot!
---------------------------
Moving around:
   u    i    o
   j    k    l
   m    ,    .

q/z : increase/decrease max speeds by 10%
w/x : increase/decrease only linear speed by 10%
e/c : increase/decrease only angular speed by 10%
space key, k : force stop
anything else : stop smoothly

CTRL-C to quit

currently:      speed 0.2       turn 1
uuoooooooookkuiikkm,,,,ljjjjjjjjiiiiiiiiiiiijjiiiijilllliijiiiiiiiii
iiiiiiiiiiiiillliiiiiiiiiiiiiiiiiiiiiiiiiiiiiiilllliiiiiiiiiiiiiii
iiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiliiiiiiiiiiiiiiiiiii
```

For run **wall_follower.sh** open a terminal:

```
cd /home/workspace/catkin_ws/src/ShellScripts
./wall_follower.sh
```


Gazebo
File Edit Camera View Window Help
World Insert Layers
GUI
Scene
Spherical Coordinates
Physics
Models
Lights
Property Value
Steps: 1 Real Time Factor: 0.83 Sim Time: 00 00:03:58.031 Real Time: 00 00:01:33.553 Iterations: 77702 FPS: 26.70 Reset Time
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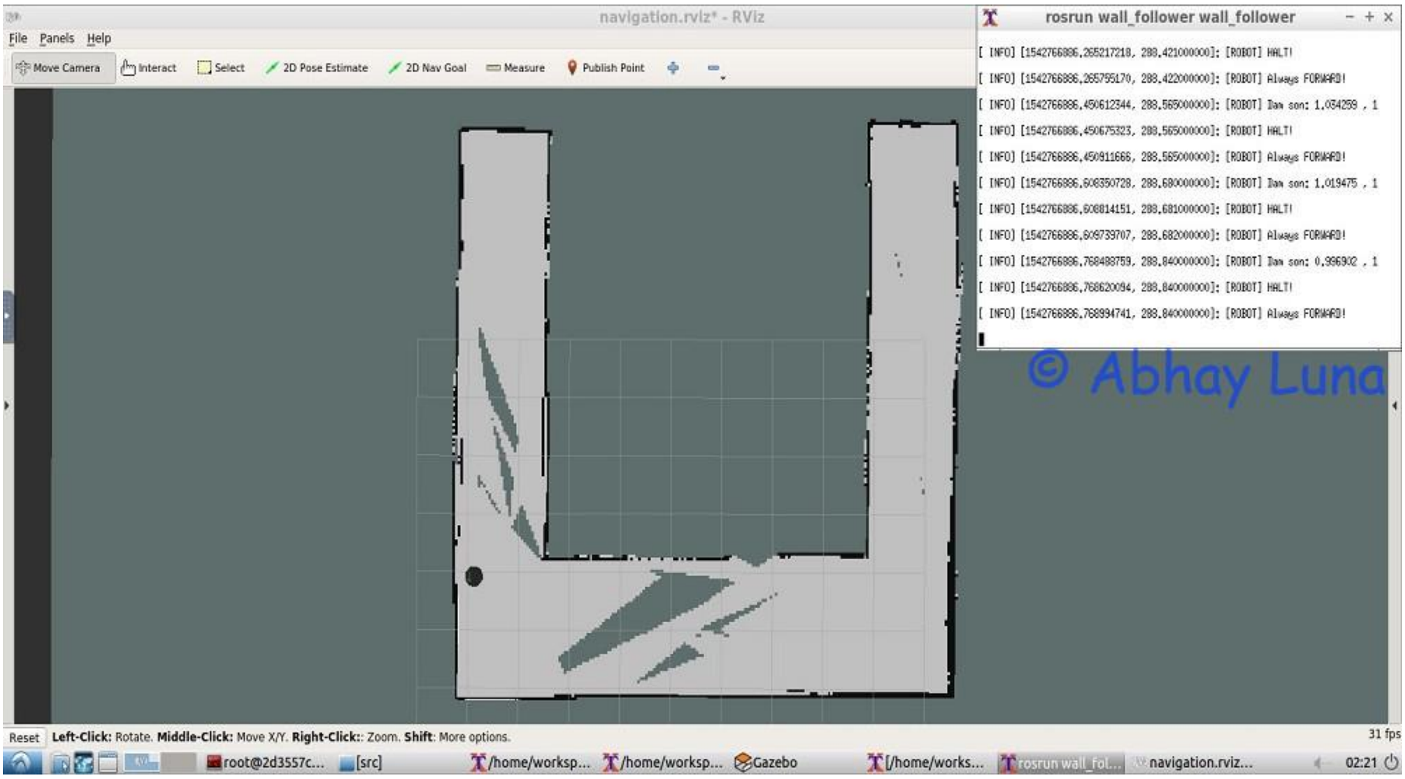
rosrun wall_follower wall_follower

```
[ INFO] [1542766825.522336044, 237.732000000]: [ROBOT] HALT!
[ INFO] [1542766825.522977149, 237.732000000]: [ROBOT] Always FORWARD!
[ INFO] [1542766825.682888928, 237.873000000]: [ROBOT] Dam son: 1.973881 , 1
[ INFO] [1542766825.682989719, 237.873000000]: [ROBOT] HALT!
[ INFO] [1542766825.683674198, 237.873000000]: [ROBOT] Always FORWARD!
[ INFO] [1542766825.802808558, 237.985000000]: [ROBOT] Dam son: 1.982147 , 1
[ INFO] [1542766825.803033114, 237.987000000]: [ROBOT] HALT!
[ INFO] [1542766825.803899835, 237.987000000]: [ROBOT] Always FORWARD!
[ INFO] [1542766825.965113912, 238.116000000]: [ROBOT] Dam son: 1.993595 , 1
[ INFO] [1542766825.965221200, 238.116000000]: [ROBOT] HALT!
[ INFO] [1542766825.965384270, 238.116000000]: [ROBOT] Always FORWARD!
```



```
[ INFO] [1542766886.265217218, 288.421000000]: [ROBOT] HALT!
[ INFO] [1542766886.265755170, 288.422000000]: [ROBOT] Always FORWARD!
[ INFO] [1542766886.450612344, 288.565000000]: [ROBOT] Iam son: 1.034259 , 1
[ INFO] [1542766886.450675323, 288.565000000]: [ROBOT] HALT!
[ INFO] [1542766886.450911666, 288.565000000]: [ROBOT] Always FORWARD!
[ INFO] [1542766886.608350728, 288.680000000]: [ROBOT] Iam son: 1.019475 , 1
[ INFO] [1542766886.608814151, 288.681000000]: [ROBOT] HALT!
[ INFO] [1542766886.609739707, 288.682000000]: [ROBOT] Always FORWARD!
[ INFO] [1542766886.768488759, 288.840000000]: [ROBOT] Iam son: 0.996902 , 1
[ INFO] [1542766886.768620094, 288.840000000]: [ROBOT] HALT!
[ INFO] [1542766886.768994741, 288.840000000]: [ROBOT] Always FORWARD!
```

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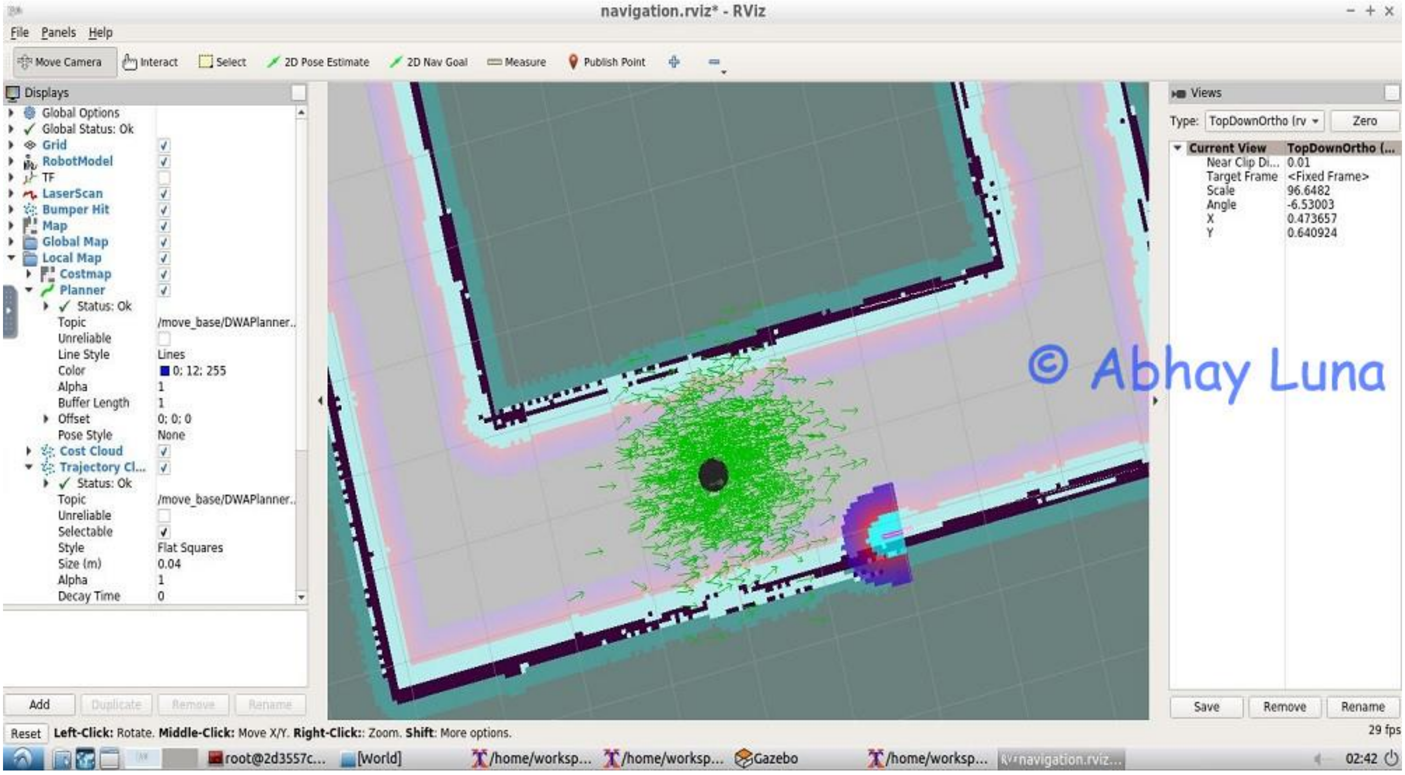
For run **test_navigation.sh** open a terminal:

```
cd /home/workspace/catkin_ws/src/ShellScripts
./test_navigation.sh
```



Global Options
Global Status: Ok
Grid ☑
RobotModel ☑
TF □
LaserScan ☑
Bumper Hit ☑
Map ☑
Global Map ☑
Local Map ☑
Costmap ☑
Planner ☑
Status: Ok
Topic /move_base/DWAPlanner..
Unreliable □
Line Style Lines
Color 0; 12; 255
Alpha 1
Buffer Length 1
Offset 0; 0; 0
Pose Style None
Cost Cloud ☑
Trajectory Cl... ☑
Status: Ok
Topic /move_base/DWAPlanner..
Unreliable □
Selectable ☑
Style Flat Squares
Size (m) 0.04
Alpha 1
Decay Time 0

Type: TopDownOrtho (rv

Current View	TopDownOrtho (...
Near Clip Di...	0.01
Target Frame	<Fixed Frame>
Scale	96.6482
Angle	-6.53003
X	0.473657
Y	0.640924

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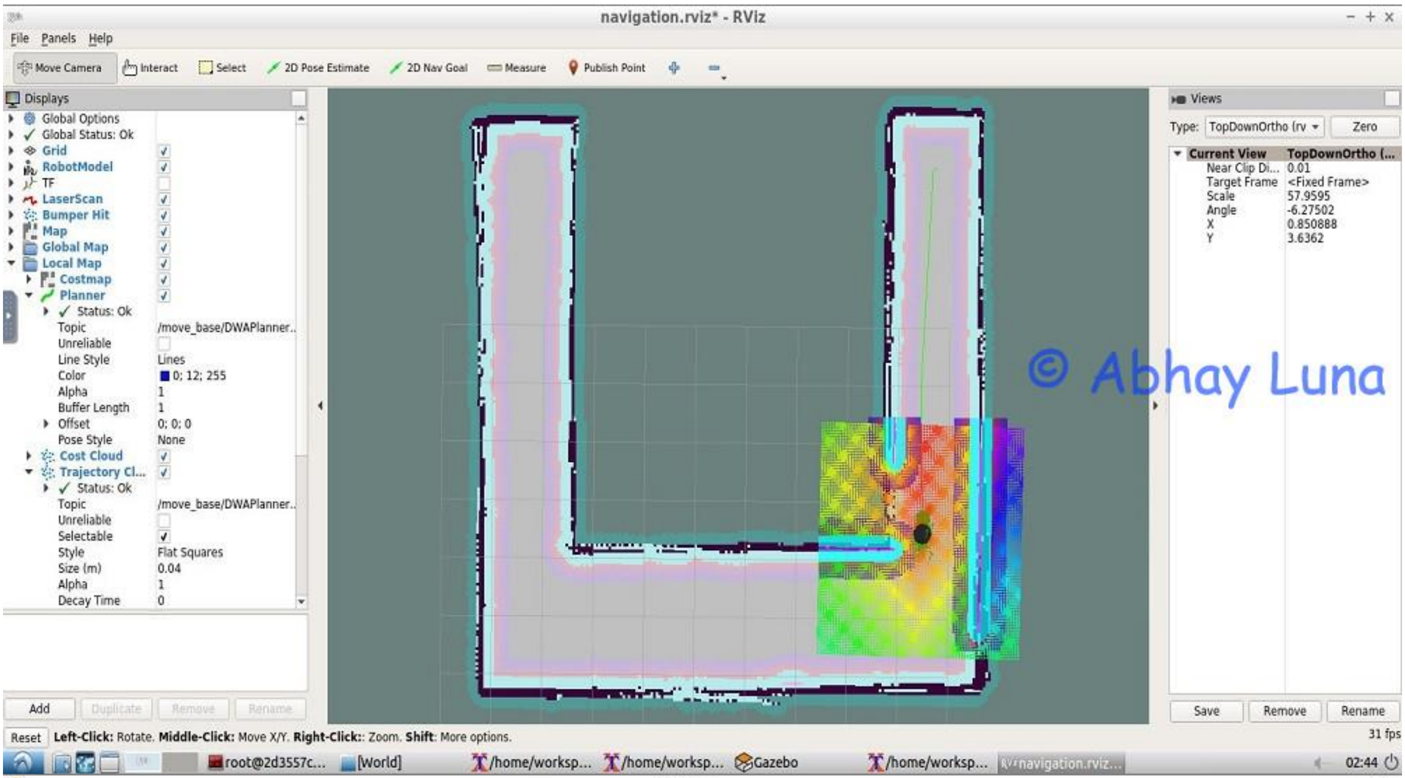

Global Options
Global Status: Ok
Grid ✓
RobotModel ✓
TF □
LaserScan ✓
Bumper Hit ✓
Map ✓
Global Map ✓
Local Map ✓
Costmap ✓
Planner ✓
Status: Ok
Topic /move_base/DWAPlanner..
Unreliable □
Line Style Lines
Color 0; 12; 255
Alpha 1
Buffer Length 1
Offset 0; 0; 0
Pose Style None
Cost Cloud ✓
Trajectory Cl... ✓
Status: Ok
Topic /move_base/DWAPlanner..
Unreliable □
Selectable ✓
Style Flat Squares
Size (m) 0.04
Alpha 1
Decay Time 0

Type: TopDownOrtho (rv

Current View	TopDownOrtho (...
Near Clip Di...	0.01
Target Frame	<Fixed Frame>
Scale	57.9595
Angle	-6.27502
X	0.850888
Y	3.6362

Left-Click: Rotate. Middle-Click: Move X/Y. Right-Click:: Zoom. Shift: More options.

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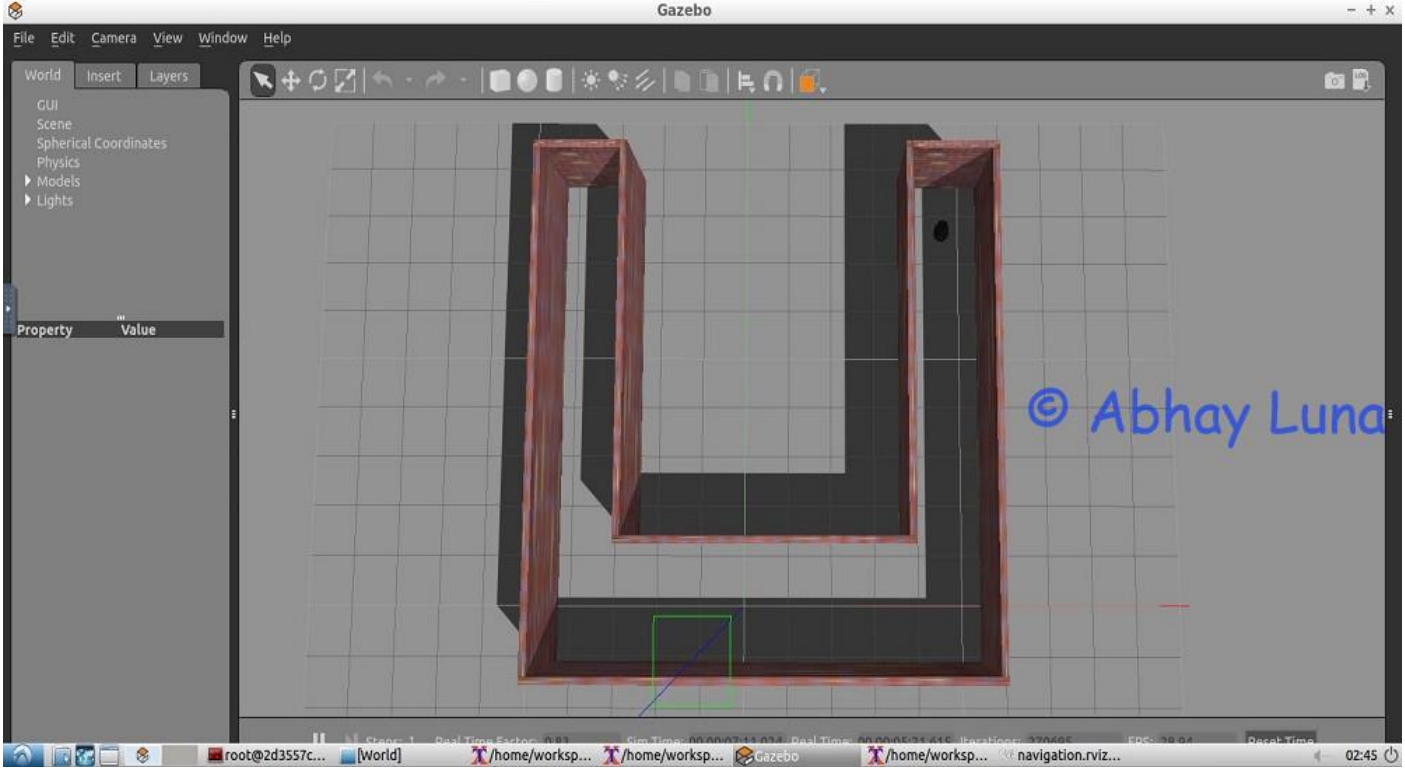

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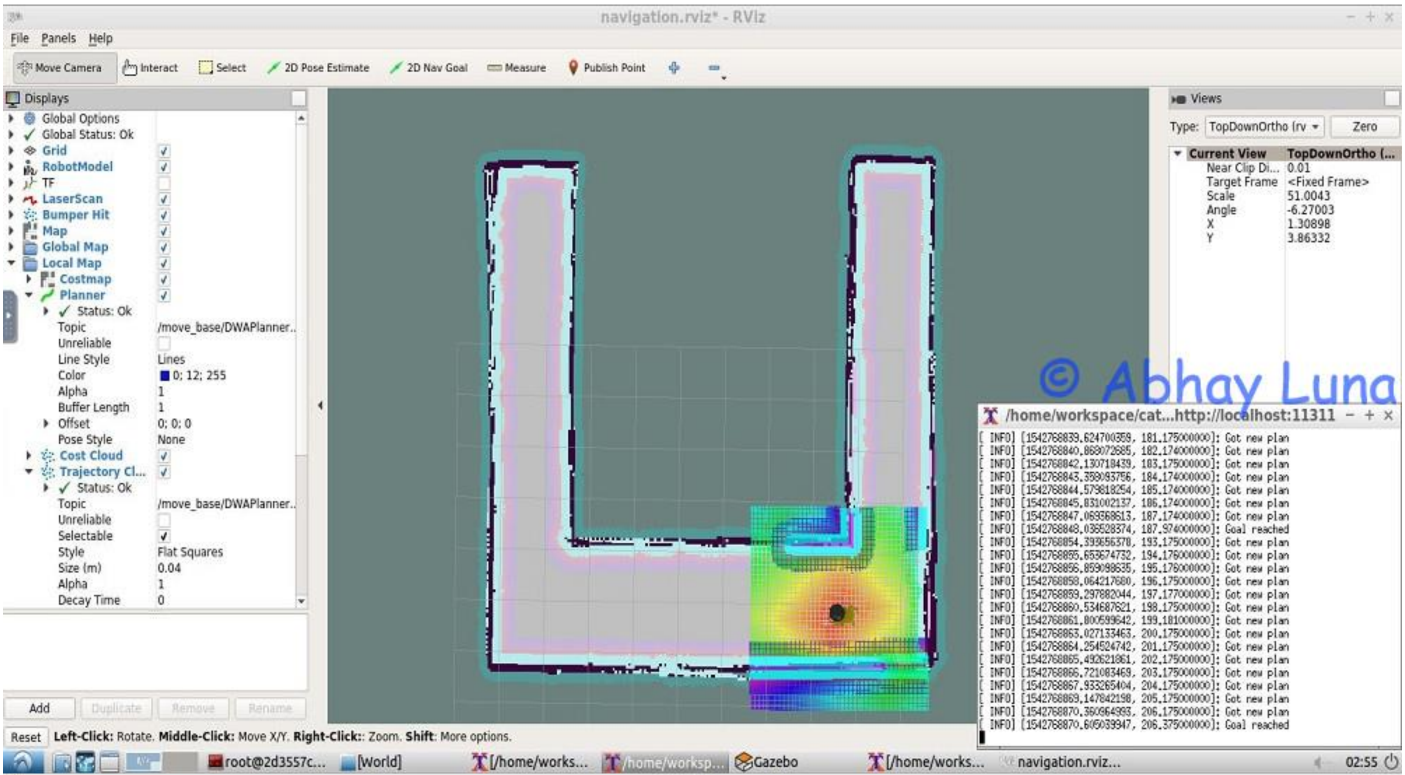
For run **pick_objects.sh** open a terminal:

```
cd /home/workspace/catkin_ws/src/ShellScripts
./pick_objects.sh
```



Planner
Status: Ok
Topic /move_base/DWAPlanner..
Unreliable □
Line Style Lines
Color 0; 12; 255
Alpha 1
Buffer Length 1
Offset 0; 0; 0
Pose Style None

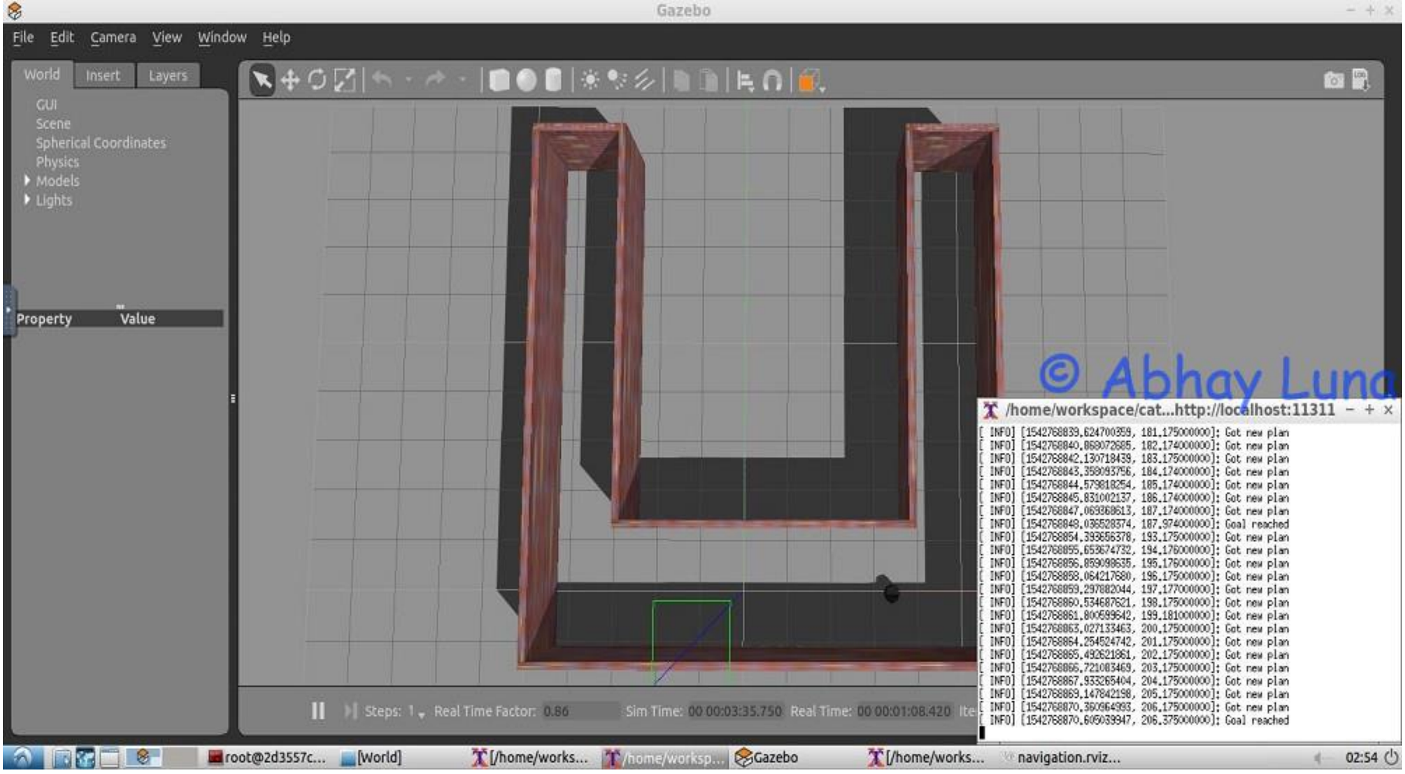
Trajectory Cl...
Status: Ok
Topic /move_base/DWAPlanner..
Unreliable □
Selectable ✓
Style Flat Squares
Size (m) 0.04
Alpha 1
Decay Time 0

Type: TopDownOrtho (rv

Current View TopDownOrtho (...
Near Clip Di... 0.01
Target Frame <Fixed Frame>
Scale 51.0043
Angle -6.27003
X 1.30898
Y 3.86332

Left-Click: Rotate. Middle-Click: Move X/Y. Right-Click:: Zoom. Shift: More options.

```
[ INFO] [1542768839.624700359, 181.175000000]: Got new plan
[ INFO] [1542768840.868072685, 182.174000000]: Got new plan
[ INFO] [1542768842.130718439, 183.175000000]: Got new plan
[ INFO] [1542768843.358093756, 184.174000000]: Got new plan
[ INFO] [1542768844.579818254, 185.174000000]: Got new plan
[ INFO] [1542768845.831002137, 186.174000000]: Got new plan
[ INFO] [1542768847.069368613, 187.174000000]: Got new plan
[ INFO] [1542768848.036528374, 187.974000000]: Goal reached
[ INFO] [1542768854.393656378, 193.175000000]: Got new plan
[ INFO] [1542768855.653674732, 194.176000000]: Got new plan
[ INFO] [1542768856.859098635, 195.176000000]: Got new plan
[ INFO] [1542768858.064217680, 196.175000000]: Got new plan
[ INFO] [1542768859.297882044, 197.177000000]: Got new plan
[ INFO] [1542768860.534687621, 198.175000000]: Got new plan
[ INFO] [1542768861.800599642, 199.181000000]: Got new plan
[ INFO] [1542768863.027133463, 200.175000000]: Got new plan
[ INFO] [1542768864.254524742, 201.175000000]: Got new plan
[ INFO] [1542768865.492621861, 202.175000000]: Got new plan
[ INFO] [1542768866.721083469, 203.175000000]: Got new plan
[ INFO] [1542768867.933265404, 204.175000000]: Got new plan
[ INFO] [1542768869.147842198, 205.175000000]: Got new plan
[ INFO] [1542768870.360964993, 206.175000000]: Got new plan
[ INFO] [1542768870.605039947, 206.375000000]: Goal reached
```

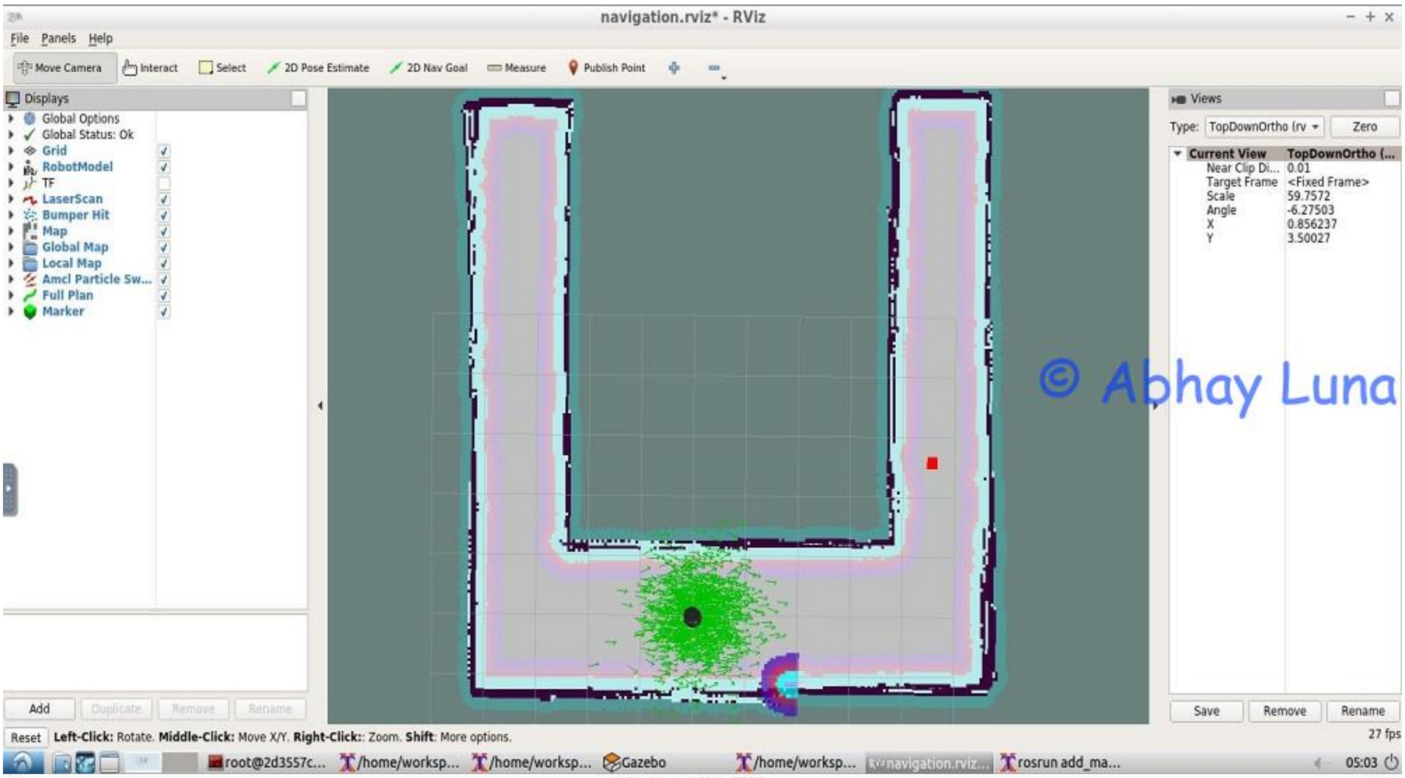


Steps: 1 Real Time Factor: 0.86 Sim Time: 00 00:03:35.750 Real Time: 00 00:01:08.420

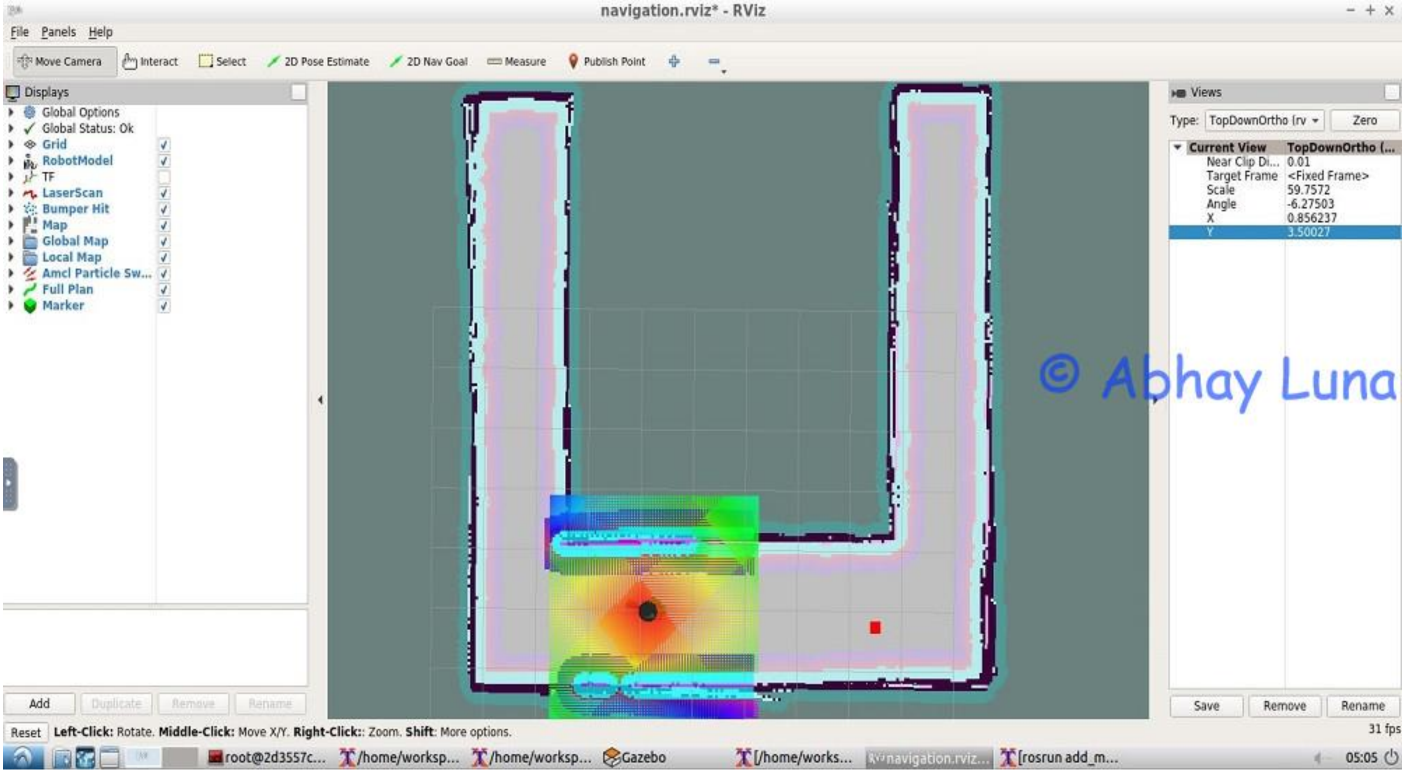
```
[ INFO] [1542768839.624700359, 181.175000000]: Got new plan
[ INFO] [1542768840.868072685, 182.174000000]: Got new plan
[ INFO] [1542768842.130718439, 183.175000000]: Got new plan
[ INFO] [1542768843.358093756, 184.174000000]: Got new plan
[ INFO] [1542768844.579818254, 185.174000000]: Got new plan
[ INFO] [1542768845.831002137, 186.174000000]: Got new plan
[ INFO] [1542768847.069368613, 187.174000000]: Got new plan
[ INFO] [1542768848.036528374, 187.974000000]: Goal reached
[ INFO] [1542768854.393656378, 193.175000000]: Got new plan
[ INFO] [1542768855.653674732, 194.176000000]: Got new plan
[ INFO] [1542768856.859098635, 195.176000000]: Got new plan
[ INFO] [1542768858.064217680, 196.175000000]: Got new plan
[ INFO] [1542768859.297882044, 197.177000000]: Got new plan
[ INFO] [1542768860.534687621, 198.175000000]: Got new plan
[ INFO] [1542768861.800599642, 199.181000000]: Got new plan
[ INFO] [1542768863.027133463, 200.175000000]: Got new plan
[ INFO] [1542768864.254524742, 201.175000000]: Got new plan
[ INFO] [1542768865.492621861, 202.175000000]: Got new plan
[ INFO] [1542768866.721083469, 203.175000000]: Got new plan
[ INFO] [1542768867.933265404, 204.175000000]: Got new plan
[ INFO] [1542768869.147842198, 205.175000000]: Got new plan
[ INFO] [1542768870.360964993, 206.175000000]: Got new plan
[ INFO] [1542768870.605039947, 206.375000000]: Goal reached
```

For run **add_markers.sh** open a terminal:

```
cd /home/workspace/catkin_ws/src/ShellScripts
./add_markers.sh
```


navigation.rviz* - RViz
File Panels Help
Move Camera Interact Select 2D Pose Estimate 2D Nav Goal Measure Publish Point
Displays
Global Options
Global Status: Ok
Grid
RobotModel
TF
LaserScan
Bumper Hit
Map
Global Map
Local Map
Amcl Particle Sw...
Full Plan
Marker
Add Duplicate Remove Rename
Views
Type: TopDownOrtho (rv Zero
Save Remove Rename
Reset Left-Click: Rotate. Middle-Click: Move X/Y. Right-Click:: Zoom. Shift: More options.
27 fps
root@2d3557c... /home/worksp... /home/worksp... Gazebo /home/worksp... navigation.rviz... rosrun add_ma...
05:03
© Abhay Luna

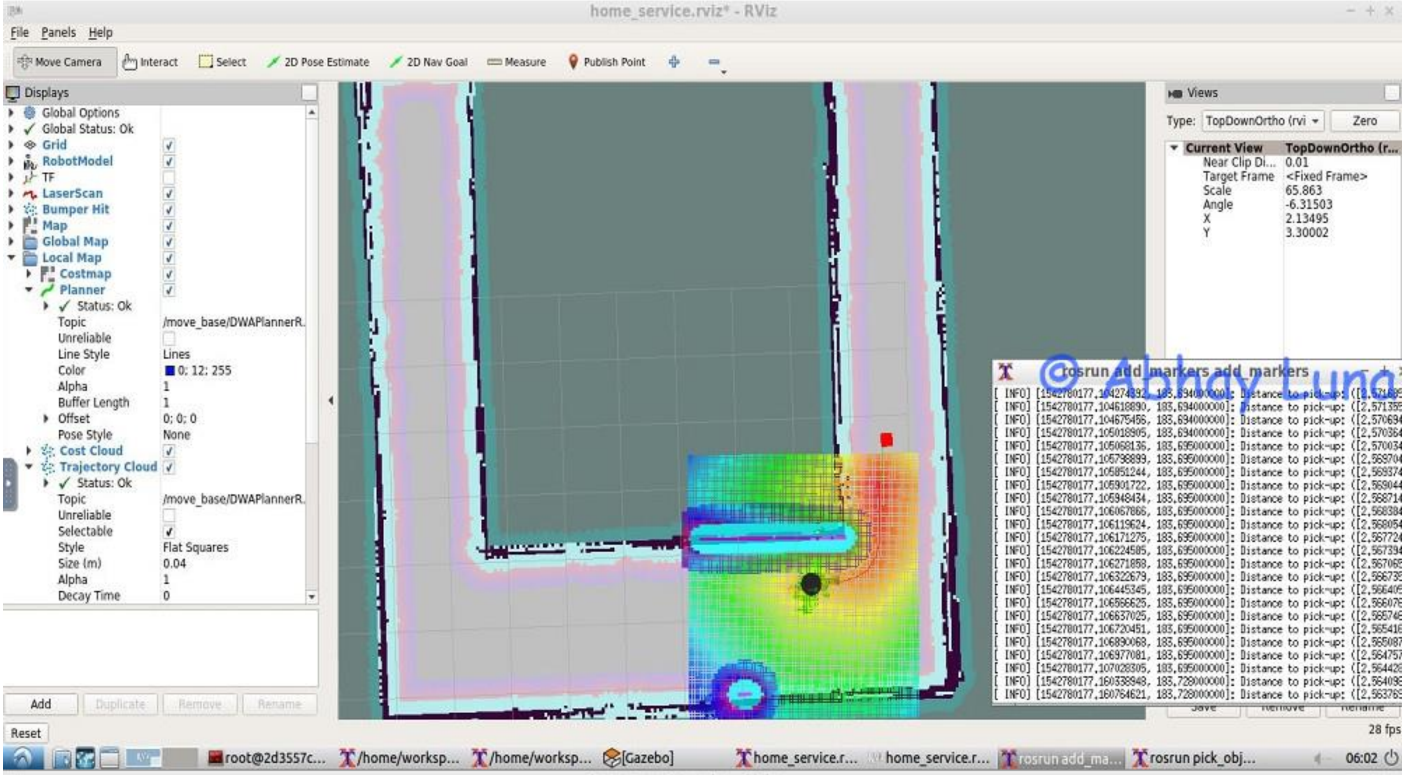
Current View	TopDownOrtho (...
Near Clip Di...	0.01
Target Frame	<Fixed Frame>
Scale	59.7572
Angle	-6.27503
X	0.856237
Y	3.50027


navigation.rviz* - RViz
File Panels Help
Move Camera Interact Select 2D Pose Estimate 2D Nav Goal Measure Publish Point
Displays
Global Options
Global Status: Ok
Grid
RobotModel
TF
LaserScan
Bumper Hit
Map
Global Map
Local Map
Amcl Particle Sw...
Full Plan
Marker
Add Duplicate Remove Rename
Views
Type: TopDownOrtho (rv Zero
Save Remove Rename
Reset Left-Click: Rotate. Middle-Click: Move X/Y. Right-Click:: Zoom. Shift: More options.
31 fps
root@2d3557c... /home/worksp... /home/worksp... Gazebo [/home/works... navigation.rviz... [rosrun add_m...
05:05
© Abhay Luna

Current View	TopDownOrtho (...
Near Clip Di...	0.01
Target Frame	<Fixed Frame>
Scale	59.7572
Angle	-6.27503
X	0.856237
Y	3.50027

For run the project **home_service.sh** open a terminal:

```
cd /home/workspace/catkin_ws/src/ShellScripts
./home_service.sh
```



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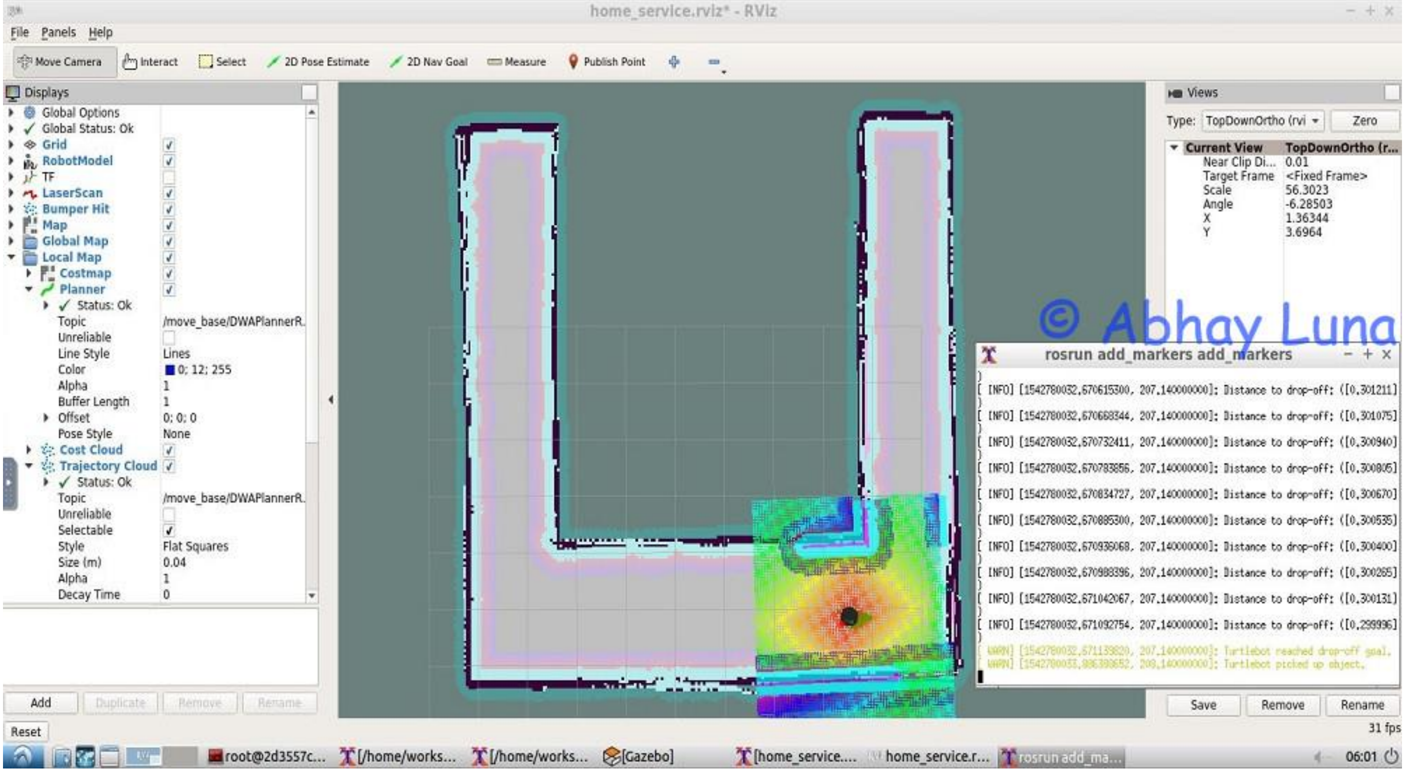
```
Global Options
Global Status: Ok
Grid              ☑
RobotModel        ☑
TF                □
LaserScan         ☑
Bumper Hit        ☑
Map               ☑
Global Map        ☑
Local Map         ☑
  Costmap         ☑
  Planner         ☑
    Status: Ok
    Topic         /move_base/DWAPlannerR...
    Unreliable    □
    Line Style    Lines
    Color         0; 12; 255
    Alpha         1
    Buffer Length 1
    Offset        0; 0; 0
    Pose Style    None
  Cost Cloud      ☑
  Trajectory Cloud ☑
    Status: Ok
    Topic         /move_base/DWAPlannerR...
    Unreliable    □
    Selectable    ☑
    Style         Flat Squares
    Size (m)      0.04
    Alpha         1
    Decay Time    0
```

```
Type: TopDownOrtho (rvi   Zero
Current View      TopDownOrtho (r...
  Near Clip Di... 0.01
  Target Frame    <Fixed Frame>
  Scale           65.863
  Angle           -6.31503
  X               2.13495
  Y               3.30002
```

rosrun add_markers add_markers

```
[ INFO] [1542780177,104274392, 183,694000000]: Distance to pick-up: ([2,57168
[ INFO] [1542780177,104618890, 183,694000000]: Distance to pick-up: ([2,571355
[ INFO] [1542780177,104675456, 183,694000000]: Distance to pick-up: ([2,570694
[ INFO] [1542780177,105018905, 183,694000000]: Distance to pick-up: ([2,570364
[ INFO] [1542780177,105068136, 183,695000000]: Distance to pick-up: ([2,570034
[ INFO] [1542780177,105798899, 183,695000000]: Distance to pick-up: ([2,569704
[ INFO] [1542780177,105851244, 183,695000000]: Distance to pick-up: ([2,569374
[ INFO] [1542780177,105901722, 183,695000000]: Distance to pick-up: ([2,569044
[ INFO] [1542780177,105948434, 183,695000000]: Distance to pick-up: ([2,568714
[ INFO] [1542780177,106067866, 183,695000000]: Distance to pick-up: ([2,568384
[ INFO] [1542780177,106119624, 183,695000000]: Distance to pick-up: ([2,568054
[ INFO] [1542780177,106171275, 183,695000000]: Distance to pick-up: ([2,567724
[ INFO] [1542780177,106224585, 183,695000000]: Distance to pick-up: ([2,567394
[ INFO] [1542780177,106271858, 183,695000000]: Distance to pick-up: ([2,567065
[ INFO] [1542780177,106322679, 183,695000000]: Distance to pick-up: ([2,566735
[ INFO] [1542780177,106445345, 183,695000000]: Distance to pick-up: ([2,566405
[ INFO] [1542780177,106566625, 183,695000000]: Distance to pick-up: ([2,566076
[ INFO] [1542780177,106637025, 183,695000000]: Distance to pick-up: ([2,565746
[ INFO] [1542780177,106720451, 183,695000000]: Distance to pick-up: ([2,565416
[ INFO] [1542780177,106890068, 183,695000000]: Distance to pick-up: ([2,565087
[ INFO] [1542780177,106977081, 183,695000000]: Distance to pick-up: ([2,564757
[ INFO] [1542780177,107028305, 183,695000000]: Distance to pick-up: ([2,564428
[ INFO] [1542780177,160338948, 183,728000000]: Distance to pick-up: ([2,564098
[ INFO] [1542780177,160764621, 183,728000000]: Distance to pick-up: ([2,563769
```



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```
Global Options
Global Status: Ok
Grid              ☑
RobotModel        ☑
TF                □
LaserScan         ☑
Bumper Hit        ☑
Map               ☑
Global Map        ☑
Local Map         ☑
  Costmap         ☑
  Planner         ☑
    Status: Ok
    Topic         /move_base/DWAPlannerR...
    Unreliable    □
    Line Style    Lines
    Color         0; 12; 255
    Alpha         1
    Buffer Length 1
    Offset        0; 0; 0
    Pose Style    None
  Cost Cloud      ☑
  Trajectory Cloud ☑
    Status: Ok
    Topic         /move_base/DWAPlannerR...
    Unreliable    □
    Selectable    ☑
    Style         Flat Squares
    Size (m)      0.04
    Alpha         1
    Decay Time    0
```

```
Type: TopDownOrtho (rvi   Zero
Current View      TopDownOrtho (r...
  Near Clip Di... 0.01
  Target Frame    <Fixed Frame>
  Scale           56.3023
  Angle           -6.28503
  X               1.36344
  Y               3.6964
```

rosrun add_markers add_markers

```
)
[ INFO] [1542780032,670615300, 207,14000000]: Distance to drop-off: ([0,301211]
)
[ INFO] [1542780032,670668344, 207,14000000]: Distance to drop-off: ([0,301075]
)
[ INFO] [1542780032,670732411, 207,14000000]: Distance to drop-off: ([0,300940]
)
[ INFO] [1542780032,670783856, 207,14000000]: Distance to drop-off: ([0,300805]
)
[ INFO] [1542780032,670834727, 207,14000000]: Distance to drop-off: ([0,300670]
)
[ INFO] [1542780032,670885300, 207,14000000]: Distance to drop-off: ([0,300535]
)
[ INFO] [1542780032,670936068, 207,14000000]: Distance to drop-off: ([0,300400]
)
[ INFO] [1542780032,670988396, 207,14000000]: Distance to drop-off: ([0,300265]
)
[ INFO] [1542780032,671042067, 207,14000000]: Distance to drop-off: ([0,300131]
)
[ INFO] [1542780032,671092754, 207,14000000]: Distance to drop-off: ([0,299996]
)
[ WARN] [1542780032,671139820, 207,14000000]: Turtlebot reached drop-off goal.
[ WARN] [1542780033,986380652, 209,14000000]: Turtlebot picked up object.
```