

Introduction to ROS

Lecture 2: Gazebo

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Layout

- Gazebo Introduction
- Turtlebot introduction
- Running in gazebo
- Demo
- Handy tools and packages
- Installation

Video

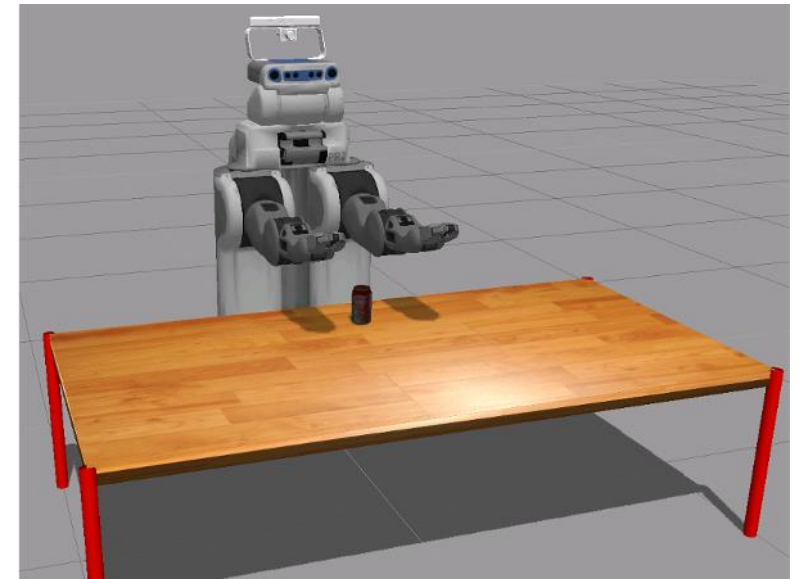
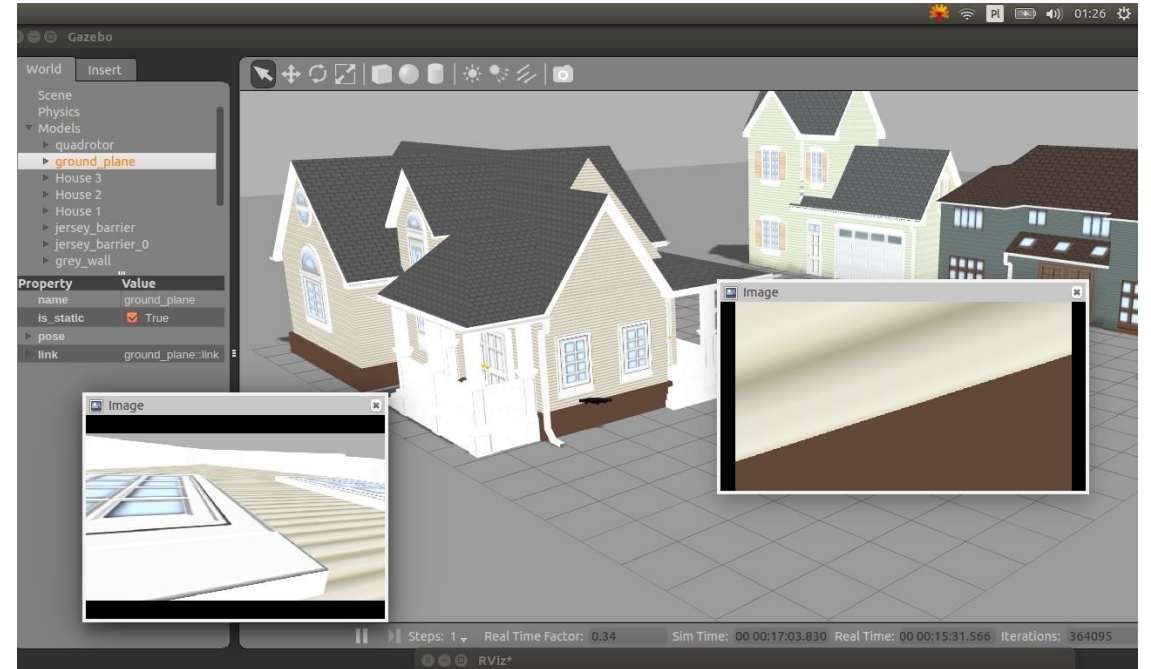
https://www.youtube.com/watch?v=R3xUKYcG_bc

Gazebo

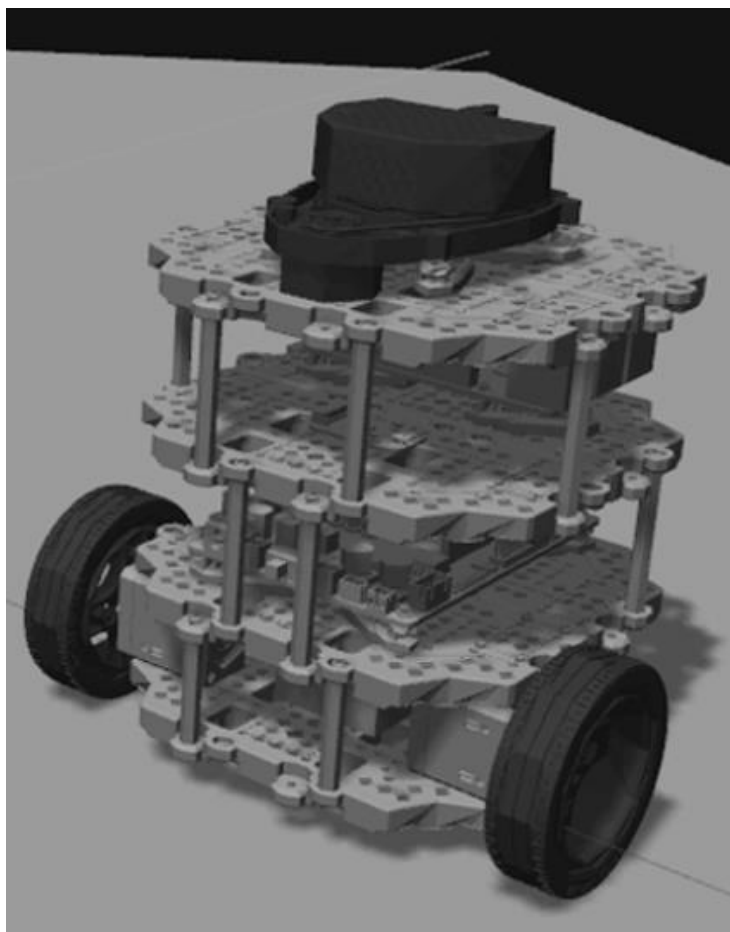
- 3D simulation environment
- ROS embedded
- Multi-physics engine support



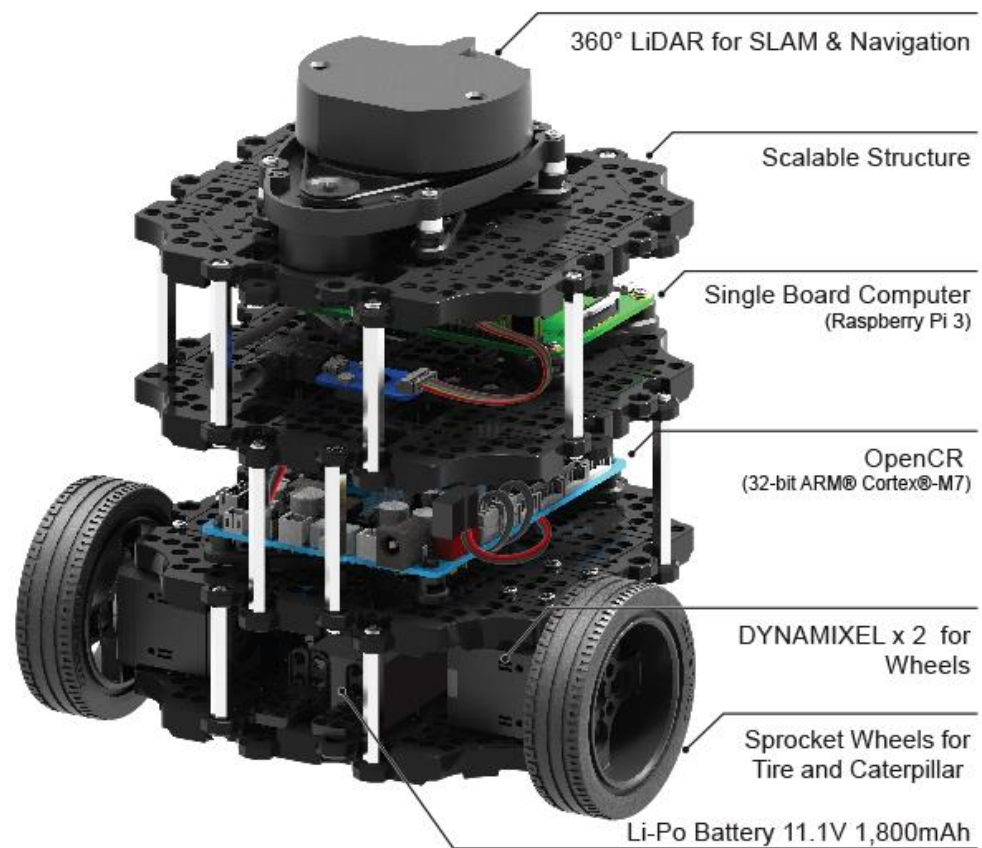
- Sensor simulation including cameras
- Different robots and 3D models
- Building editor



Turtlebot 3



Burger



Running Gazebo with Turtlebot

- roslaunch

```
<launch>
```

```
<node name="listener-1" pkg="rospy_tutorials" type="listener" />
<node name="listener-2" pkg="rospy_tutorials" type="listener" args="-foo arg2" />
<node name="listener-3" pkg="rospy_tutorials" type="listener" respawn="true" />
<node ns="wg1" name="listener-wg1" pkg="rospy_tutorials" type="listener" respawn="true" />
<group ns="wg2">
  <remap from="chatter" to="hello"/>
  <node pkg="rospy_tutorials" type="listener" name="listener" args="--test" respawn="true" />
  <node pkg="rospy_tutorials" type="talker" name="talker">
    <param name="talker_1_param" value="a value" />
    <remap from="chatter" to="hello-1"/>
    <env name="ENV_EXAMPLE" value="some value" />
  </node>
</group>
<include file="$(dirname)/other.launch" />
</launch>
```

Running Gazebo with Komodo

- roslaunch

```
roslaunch turtlebot_gazebo turtlebot3_house.launch
```

Running Gazebo

- Launch file and arguments

```
roslaunch turtlebot_gazebo turtlebot3_house.launch x_pos:=0
```


Installation

- git, Github.com
- git clone, git checkout

Installation

<http://emanual.robotis.com/docs/en/platform/turtlebot3/simulation/#gazebo-3d-simulator>

rqt

- Topic monitor
- Message publisher
- Robot steering
- Image view
- Many more...

The screenshot displays the rqt (Robot Query Tool) interface, which is a graphical user interface for interacting with ROS (Robot Operating System) topics and services. The interface is divided into several panels:

- Web:** A web browser showing the ROS.org website.
- Publisher:** A panel for publishing data to a topic. It shows a table of topics and their data:

topic	type	rate	enabled	expression
/cmd_vel2	std_msgs/Float32	10.00	True	
data	float32			$\cos(i/20)*20$
/cmd_vel3	std_msgs/Float32	5.00	True	
data	float32			$\sin(i/20)*10$

- Robot Steering:** A panel for controlling a robot's movement. It features a slider for the velocity (cmd_vel) and buttons for "Stop" and "Refresh".
- Logger Level:** A panel for viewing log messages. It shows a list of nodes and their log levels (Debug, Info, Warn, Error, Fatal).
- Console:** A panel for displaying log messages. It shows a table of messages with columns for Message, Severity, Node, and Time.

Message	Severity	Node	Time
#9 Loading Setup Assistant Complete	Info	/moveit_setup_assistant	11:11:25.344 (2012-08-02)
#8 Listening to 'moveit_planning_scene'	Info	/moveit_setup_assistant	11:11:25.294 (2012-08-02)
#7 Starting scene monitor	Info	/moveit_setup_assistant	11:11:25.293 (2012-08-02)
#6 Configuring kinematics solvers	Info	/moveit_setup_assistant	11:11:25.107 (2012-08-02)
#4 Robot semantic model successfully loaded.	Info	/moveit_setup_assistant	11:11:23.119 (2012-08-02)
#5 Setting Param Server with Robot Seman...	Info	/moveit_setup_assistant	11:11:23.119 (2012-08-02)

- Plot:** A panel for displaying a plot of data. It shows a graph of two sine waves, one red and one blue, representing the data from the /cmd_vel2 and /cmd_vel3 topics.

Demo – laser scan

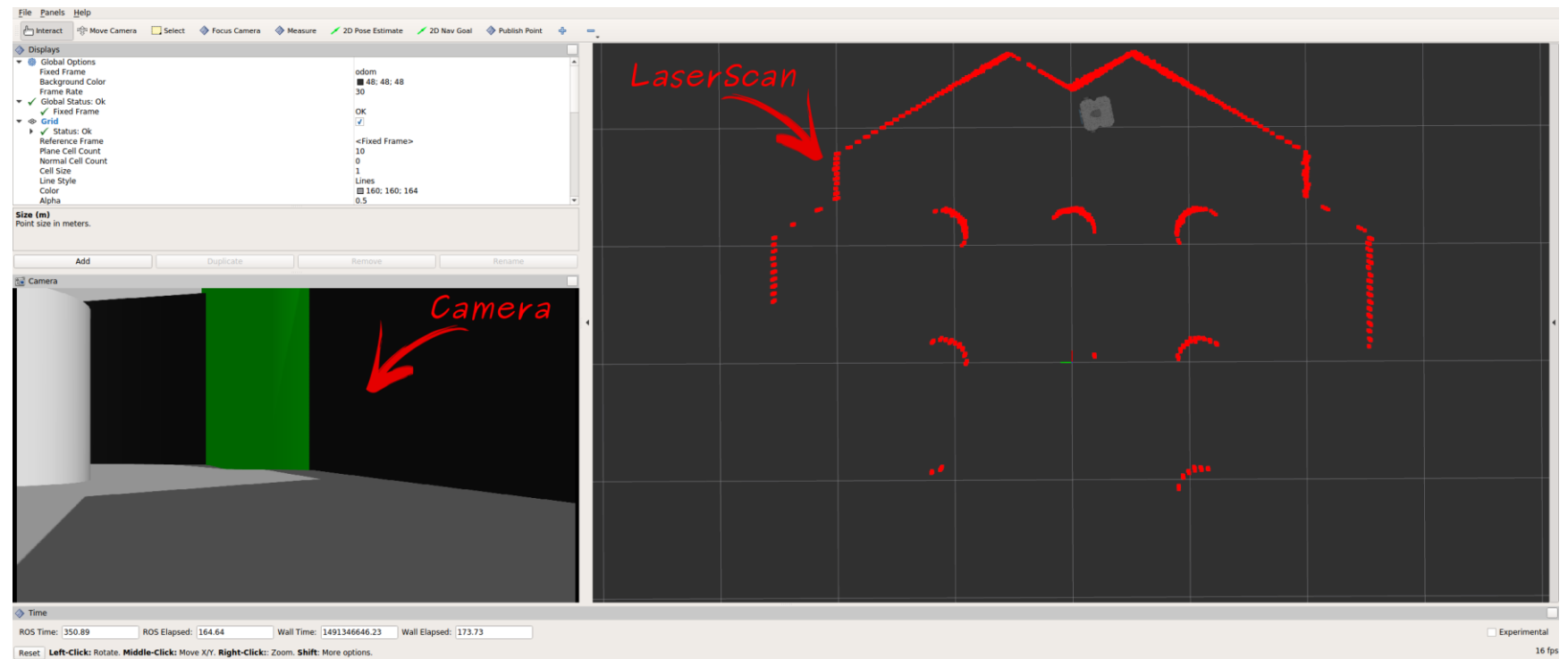
```
#!/usr/bin/env python
import rospy
from geometry_msgs.msg import Twist
from sensor_msgs.msg import LaserScan

def callback(data):
    center=data.ranges[0]
    rospy.loginfo(center)
    msg = Twist()
    if( center>0.8):
        msg.linear.x = 0.4
    else:
        msg.linear.x = 0.0
    pub.publish(msg)

if __name__ == '__main__':
    rospy.init_node('checkObstacle', anonymous=True)
    rospy.Subscriber("/scan", LaserScan, callback)
    pub = rospy.Publisher('/cmd_vel', Twist, queue_size=10)
    rospy.spin()
```

Rviz

- Robot model
- Laser scan
- Maps- global, local, cost



Questions?