



Making room under Gazebo: Accommodating newcomers and power users alike

Louise Poubel
May 11th, 2017

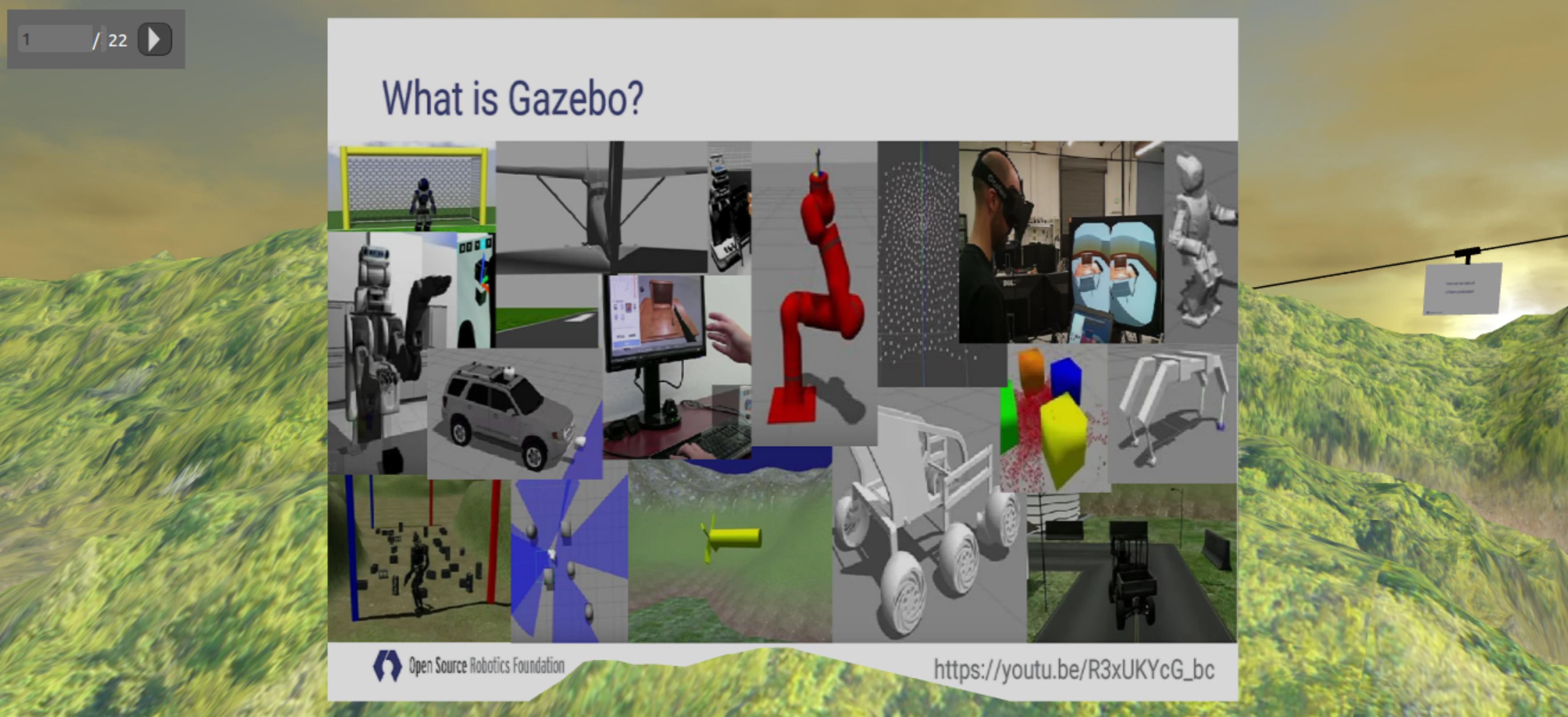
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OPEN SOURCE CONVENTION

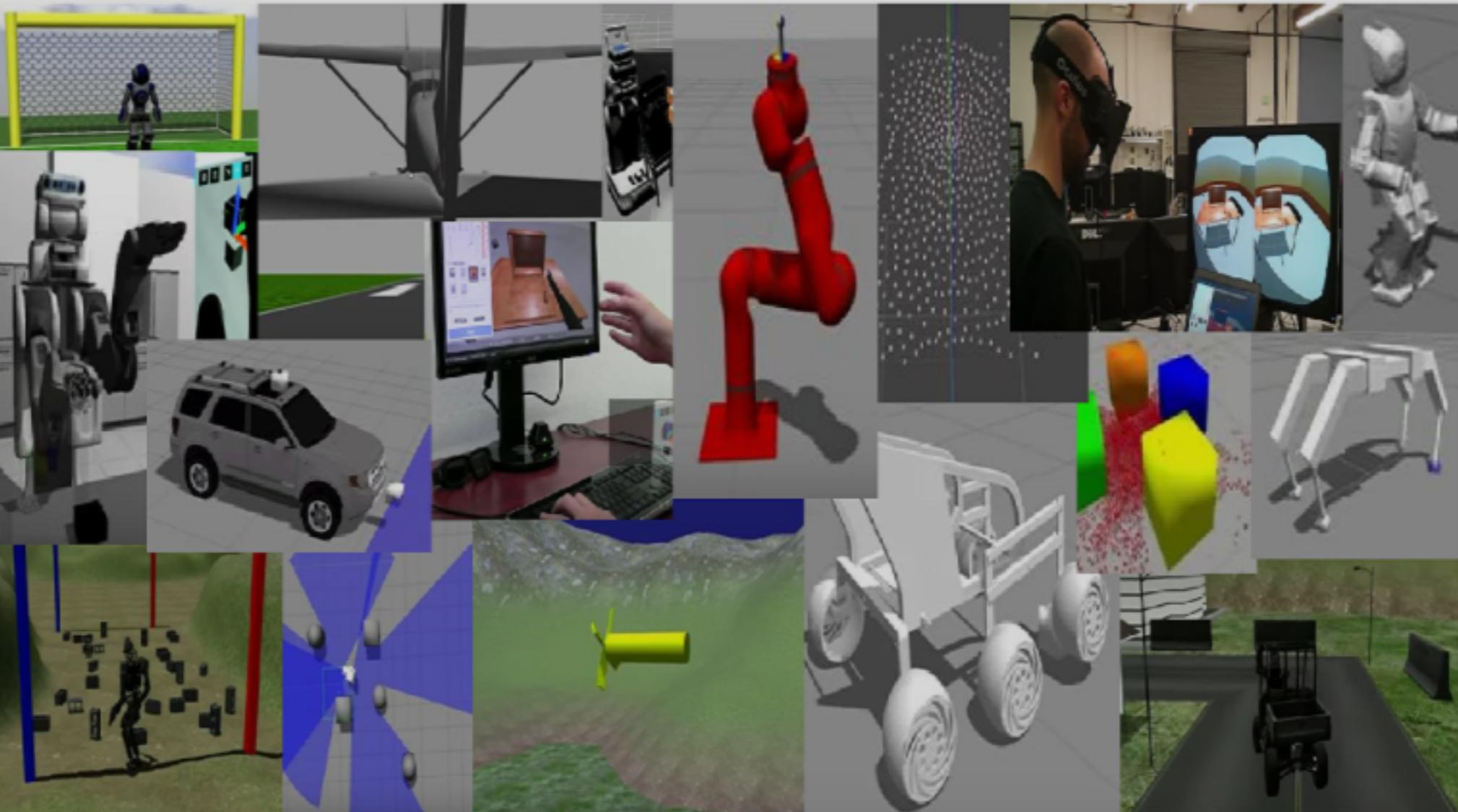


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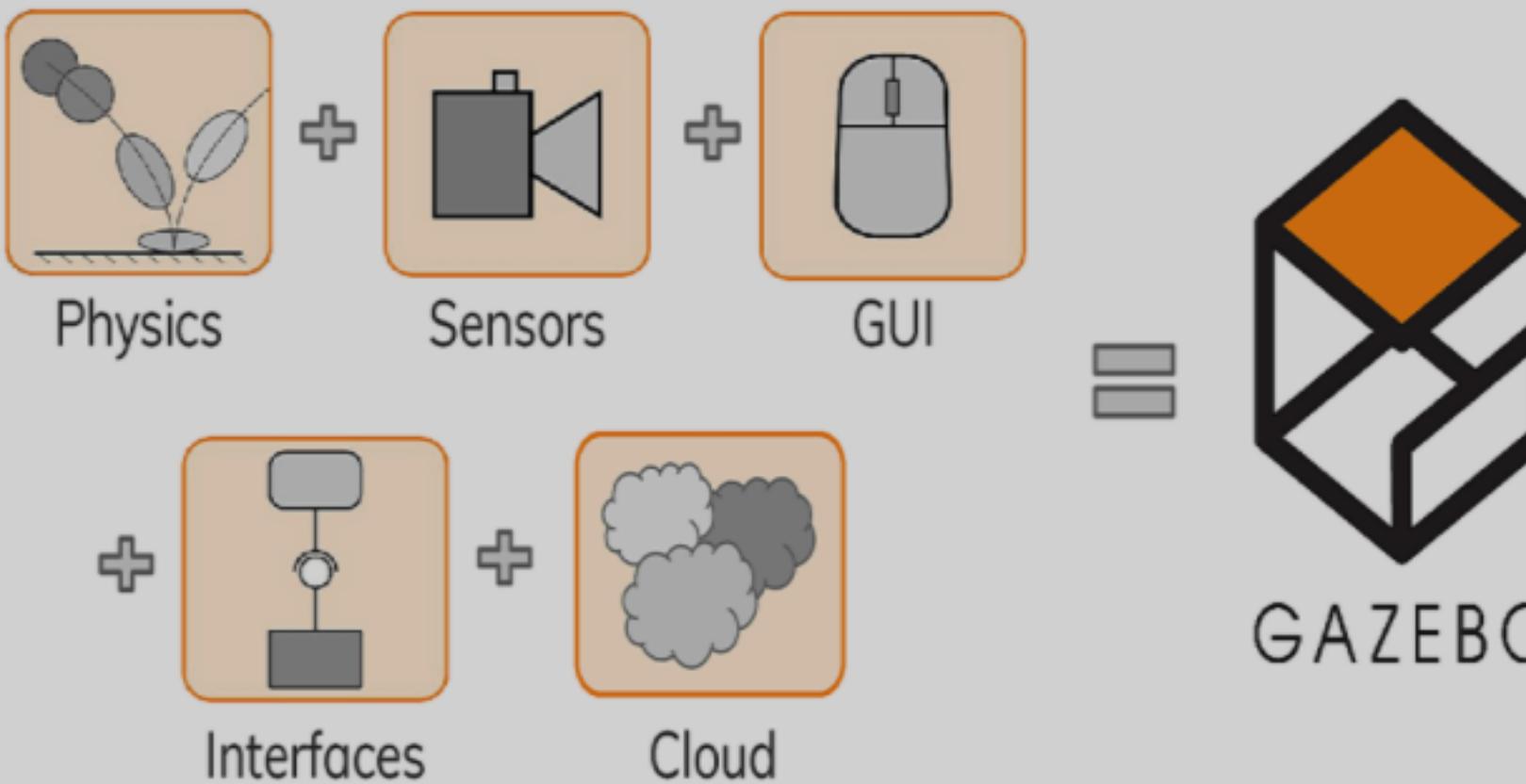
What is Gazebo?





What is Gazebo?

Goal: Best possible substitute for physical robots



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Stats

Gazebo 7
(current LTS)

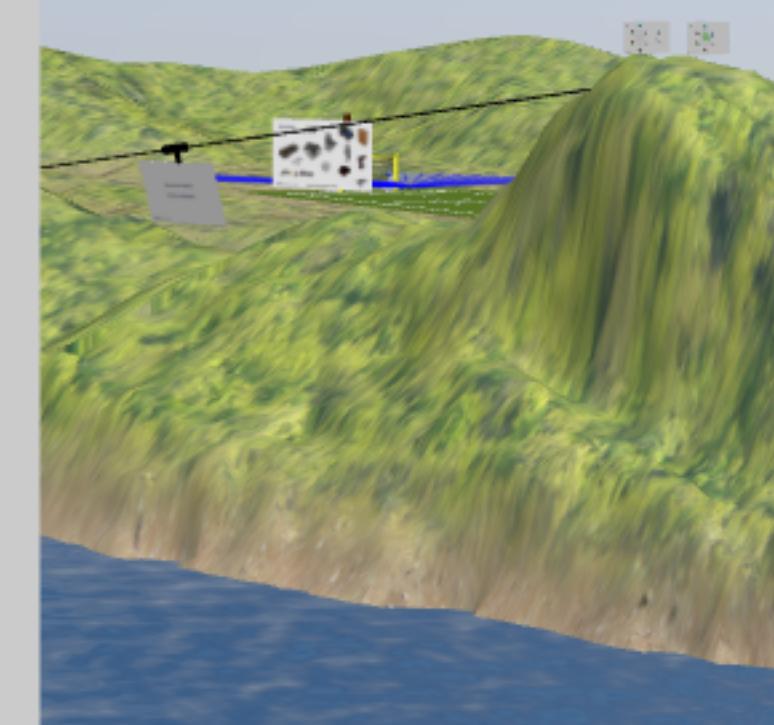
Birth	Fall 2002
Downloads	1k/month
Lines of code	298k
Lines of comments	99k
Test function coverage	52.9%
Test branch coverage	44.5%
Tests	1222
Contributors	100+

*Not counting SDFormat, Ignition, tutorials...



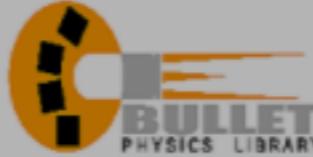
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gazebosim.org





Dependencies



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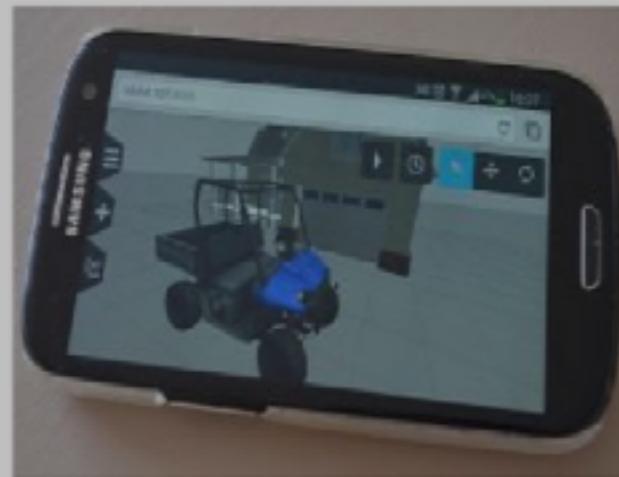
Cloud



Simulations in the cloud

The Pr^op Shop

Online sharing simulation resources



Web, desktop & mobile interfaces



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Use cases

- Iterate on algorithms
- Prototyping
- Education
- Competitions
- Continuous integration
- ...



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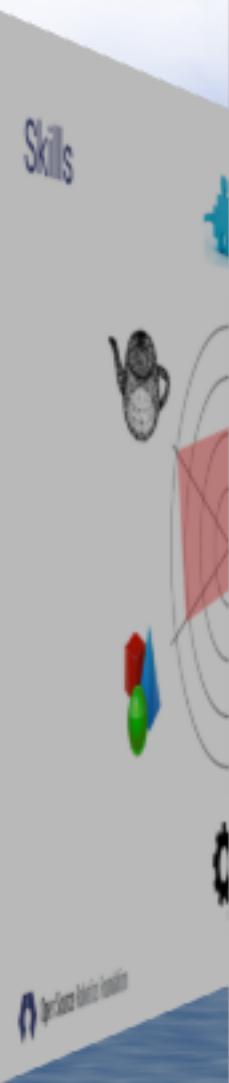
Who are Gazebo's users?



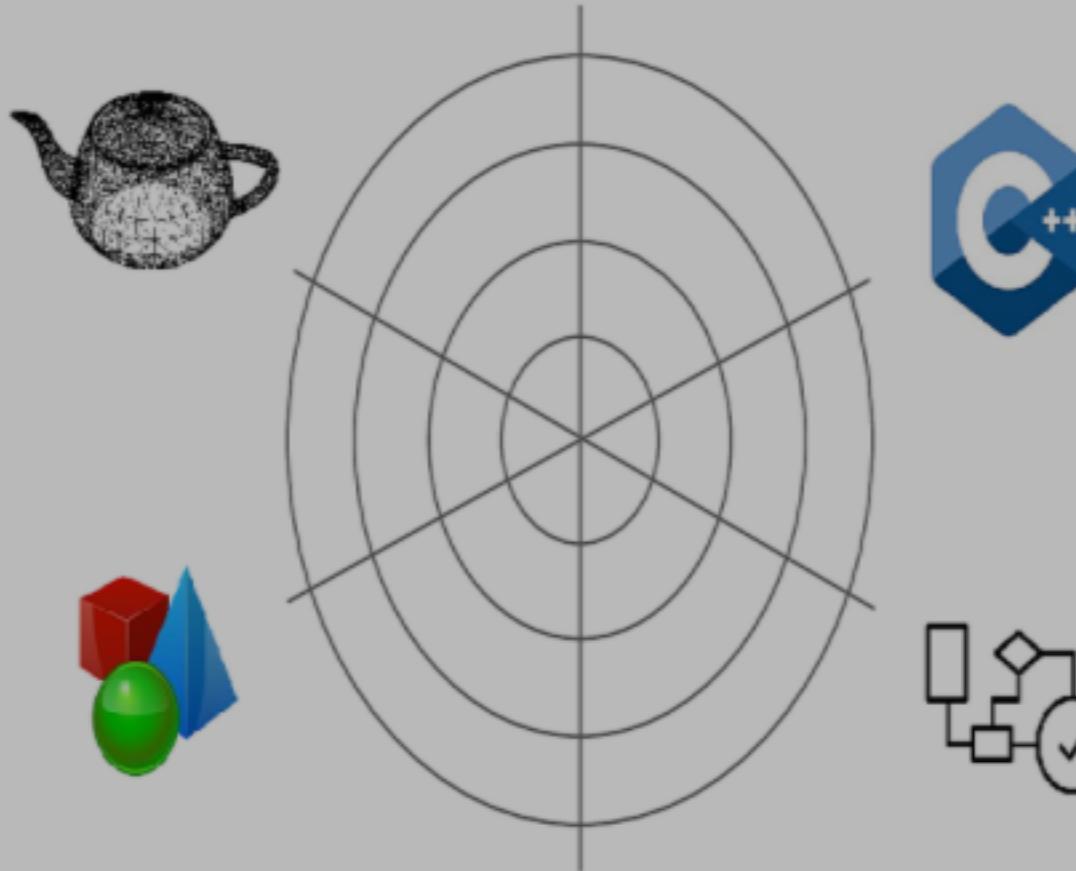
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Skills

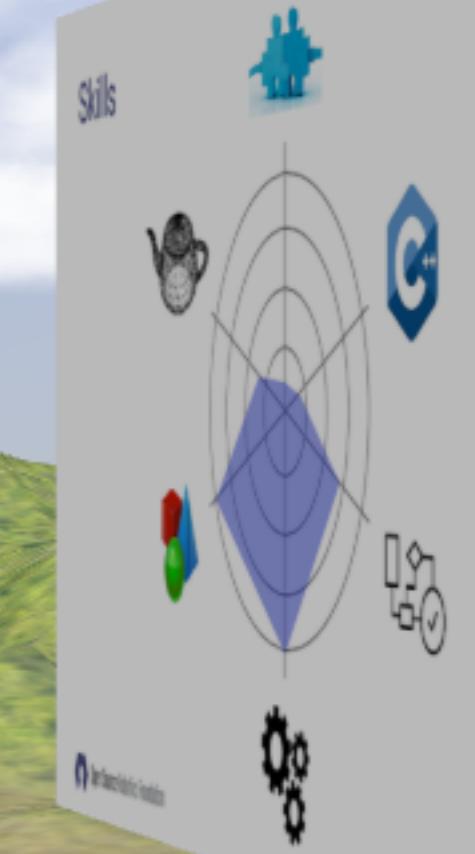
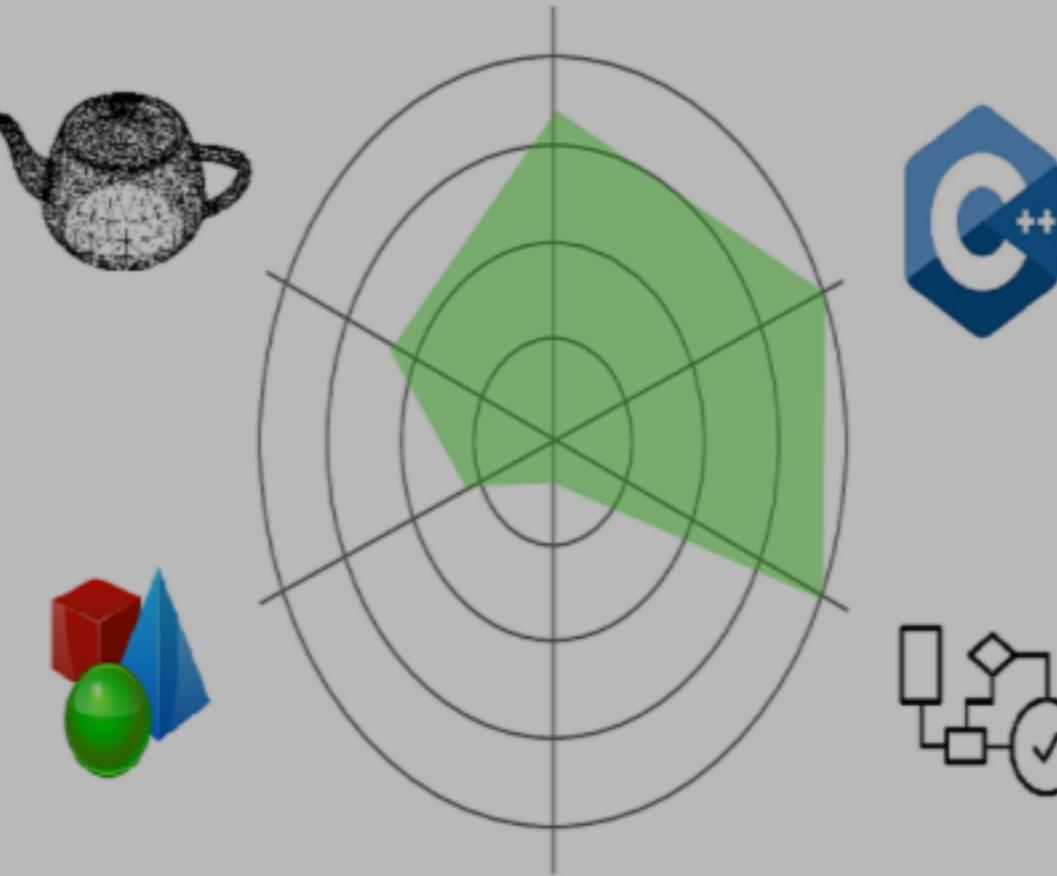


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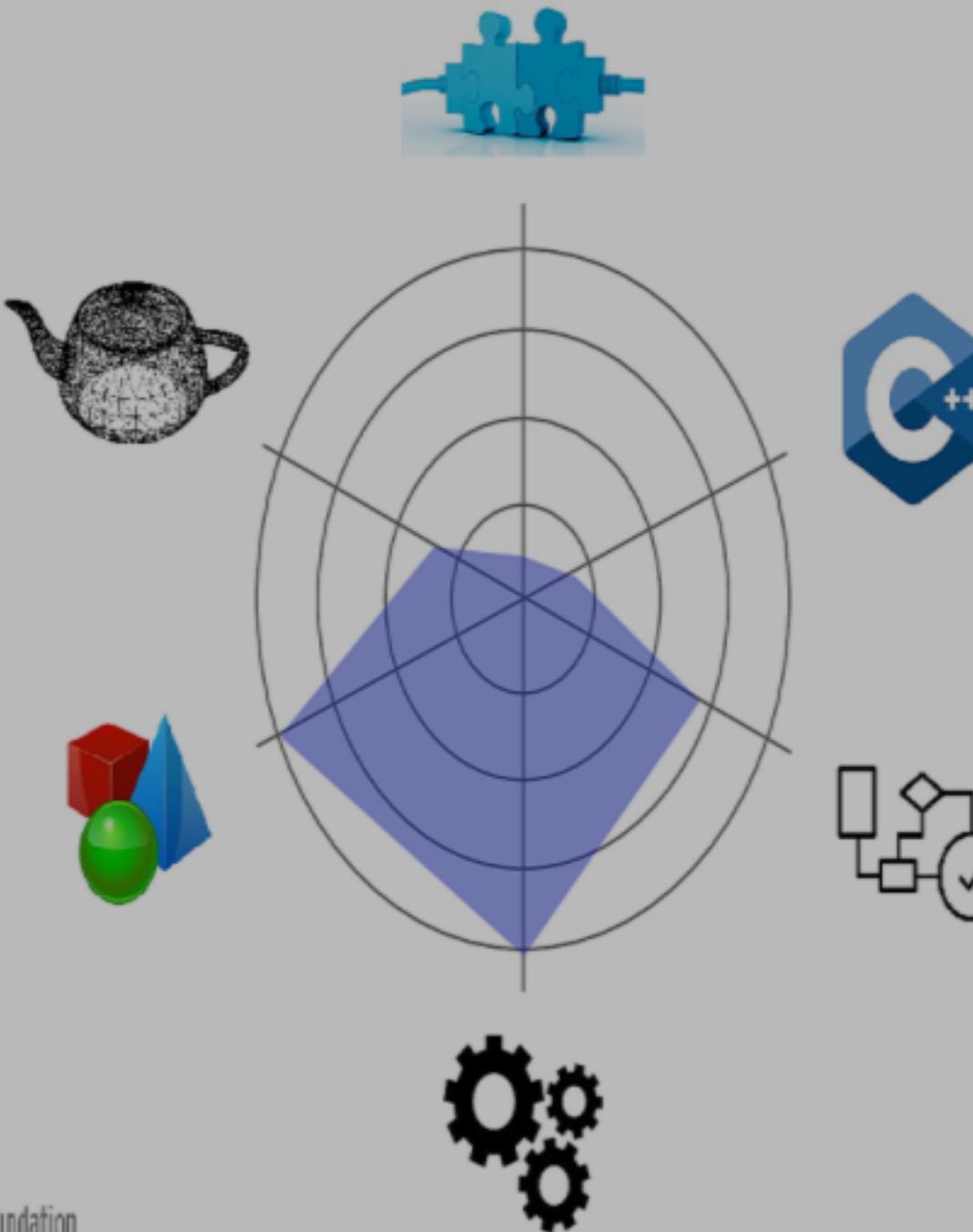


Skills



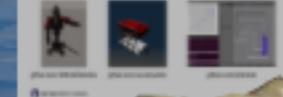


Skills



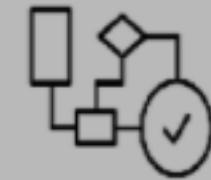
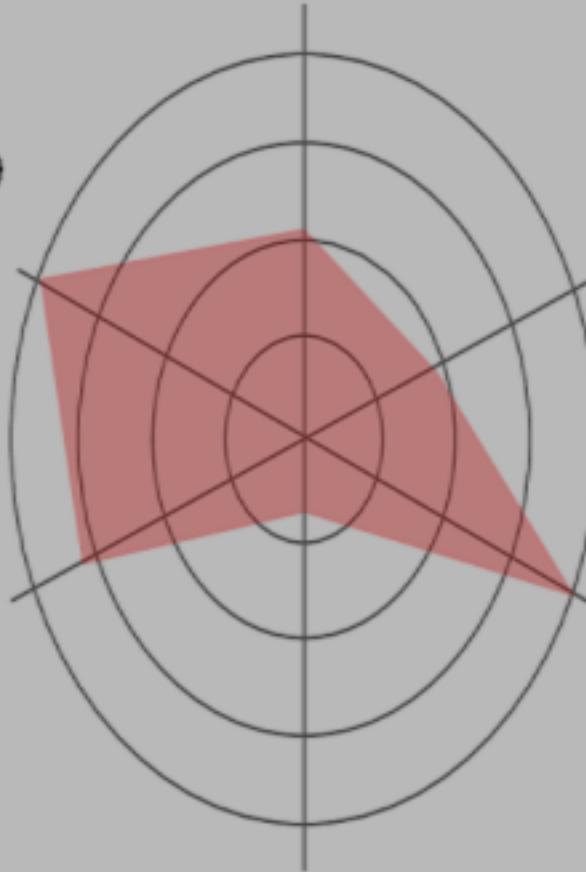
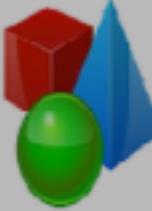
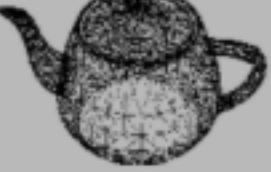
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Open source
▪ Encourage sharing
▪ Take advantage of each other's strengths





Skills



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How can we make all
of them comfortable?



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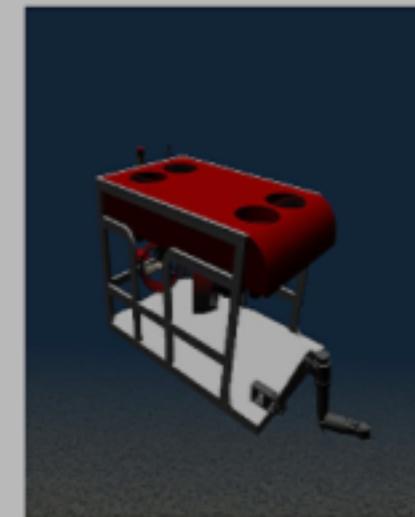


Open source

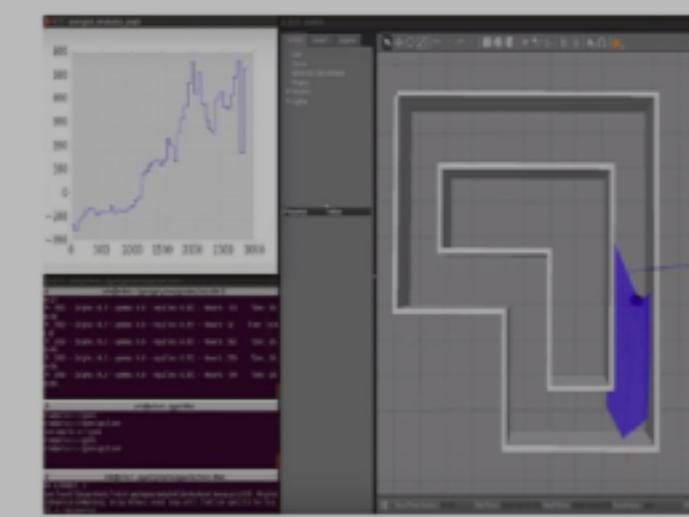
- Encourage sharing
- Take advantage of each other's strengths



github.com/RethinkRobotics



github.com/uuvsimulator



github.com/erlerobot



Tutorials



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Gazebo Tutorials

Gazebo tutorials are organized into *Guided* and *Categorized*. Documentation is also available for the [API](#), and a help forum is located at [Gazebo Answers](#).

[Browse all tutorials](#)

Guided

A curriculum-style set of tutorials, recommended for people new to Gazebo.

Beginner

First-time Gazebo users

1. [Overview and Installation](#)
2. [Understanding the GUI](#)
3. [Model Editor](#)

Bonus material

1. [Building with custom SDF](#)
2. [Building Editor](#)
3. [Logging and Playback](#)

Intermediate

Customize simulation

1. [Construct a Velodyne LiDAR](#)
2. [Model appearance](#)
3. [Sensor Noise](#)
4. [Upload Velodyne model](#)
5. [Control plugin](#)
6. [Connect to ROS](#)

Advanced

Contribute to Gazebo

1. [Where is the code?](#)
2. [Run your own copy of Gazebo](#)
3. [Workflow](#)
4. [Code quality](#)
5. [Code review](#)

Categorized

Stand-alone tutorials categorized by topic. Click on a topic to view the tutorials in that category.

Installation

[Instructions to install...](#)

Get Started

[Welcome to the Gazebo...](#)

Build a Robot

[The following tutorials...](#)

Model Editor

[The following tutorials...](#)

Build a World

[These tutorials describ...](#)

Tools and utilities

[Gazebo ships with ma...](#)

Write a plugin

[Plugins allow you to c...](#)

Plugins

[The following tutorials ...](#)

Sensors

[A simulated sensor an...](#)

Using Math

[Gazebo has a custom ...](#)

User Input

[User input can take m...](#)

Connect to Player

[Player is a robot contr...](#)

Web client (Gzweb)

[Gzweb is a WebGL clie...](#)

Connect to ROS

[ROS is a robot control ...](#)

Transport library

[Communication betwe...](#)

Physics Library

[A core component of ...](#)

Rendering Library

[Gazebo's rendering libr...](#)

Development

[Customizing Gazebo L...](#)

DRCSim

[DARPA Robotics Chall...](#)

Scripting (javascript and Node.js)

[Gazebo scripting interfa...](#)

HAPTIX

[The following architur...](#)

Open source

- Encourage sharing
- Take advantage of each o...



[GitHub](#)

[Bitbucket](#)

[SourceForge](#)

[FossHub](#)

[OpenROV](#)

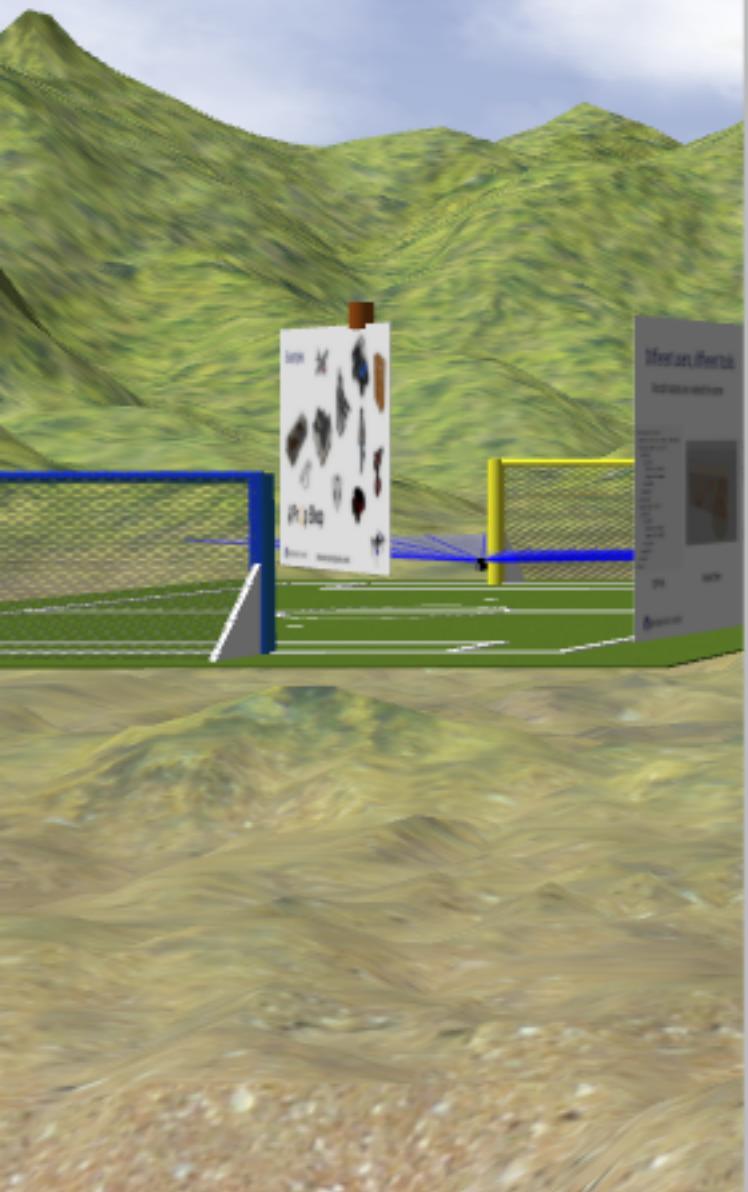
[OpenSim](#)

[OpenWeld](#)



Tutorials

Every
single
step



Compiling this code will result in a shared library, `~/gazebo_plugin_tutorial/build/libfactory.so`, that can be inserted in a Gazebo simulation.

```
$ mkdir ~/gazebo_plugin_tutorial/build  
$ cd ~/gazebo_plugin_tutorial/build  
$ cmake ../  
$ make
```

Make the shapes

Make a models directory with a box and a cylinder inside

```
$ mkdir ~/gazebo_plugin_tutorial/models  
$ cd ~/gazebo_plugin_tutorial/models  
$ mkdir box cylinder
```

Create a box model

```
$ cd box  
$ gedit model.sdf
```



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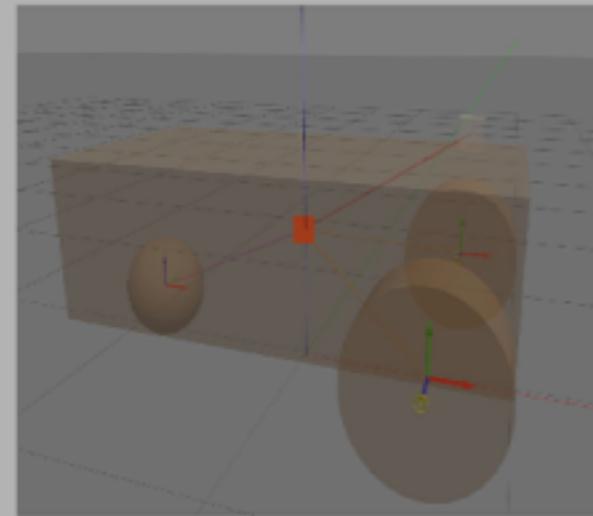


Different users, different tools

Not all robots are created the same

```
<link name="left_wheel">
  <pose>0.1 0.13 0.1 0 1.5708 1.5708</pose>
  <collision name="collision">
    <geometry>
      <cylinder>
        <radius>.1</radius>
        <length>.05</length>
      </cylinder>
    </geometry>
  </collision>
  <visual name="visual">
    <geometry>
      <cylinder>
        <radius>.1</radius>
        <length>.05</length>
      </cylinder>
    </geometry>
  </visual>
</link>
```

SDF file



Model Editor

```
% front_wheel_locations.keys.each do |k|
  x0 = front_wheel_locations[k][:x]
  y0 = front_wheel_locations[k][:y]
%>
<link name="wheel<%= k %>">
  <pose><%= x0 > <%= y0 > <%= wheel_radius > <%= -Math::PI/2 > <%= center_angle > </pose>
  <inertial>
    <mass><%= wheel_mass ></mass>
    <center>
      <xyz><%= wheel_ixx ></xyz>
      <xyz><%= wheel_iyy ></xyz>
      <xyz><%= wheel_izz ></xyz>
    </center>
    <inertia>
      <ixx><%= ix0 ></ixx>
      <ixy><%= iy0 ></ixy>
      <ixz><%= iz0 ></ixz>
      <iyx><%= iy0 ></iyx>
      <iyz><%= iz0 ></iyz>
      <izx><%= ix0 ></izx>
    </inertia>
  </inertial>
  <collision name="collision">
    <geometry>
```

Templated file





Examples





Forum



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Command "roslaunch gazebo_ros empty_world.launch"
crashes gazebo

[gazebo_ros](#)

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install Gazebo in Debian Jessie

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c++ file in a gazebo model plugin?

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[cpp](#)

[model_plugin](#)

[c++](#)

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6 hours ago sloritz

Insert IMU in gazebo model

[no votes](#)

[1 answer](#)

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Joints not independent

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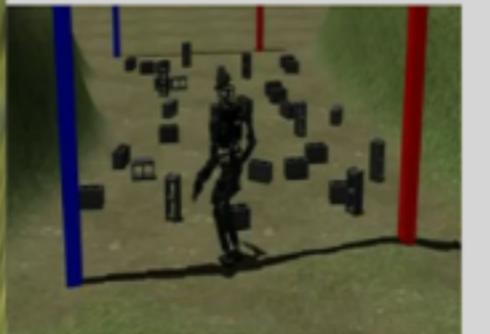
6 hours ago chapulina



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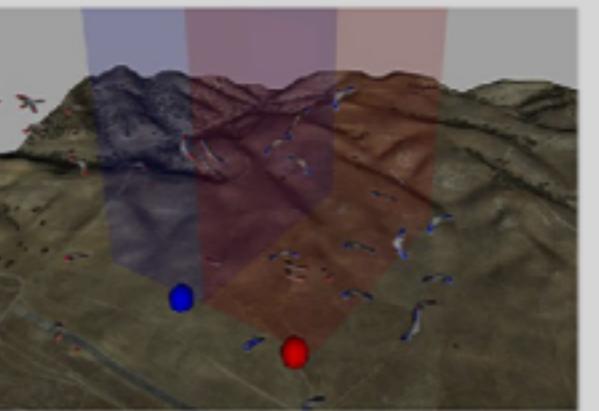
"Eat your own dog food"



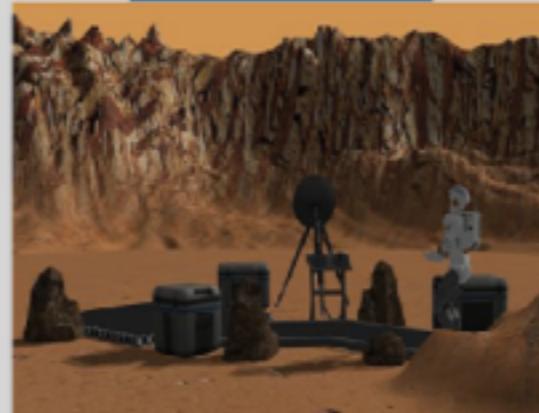
HAPTIX



SASC



ARIAC





Mentorship

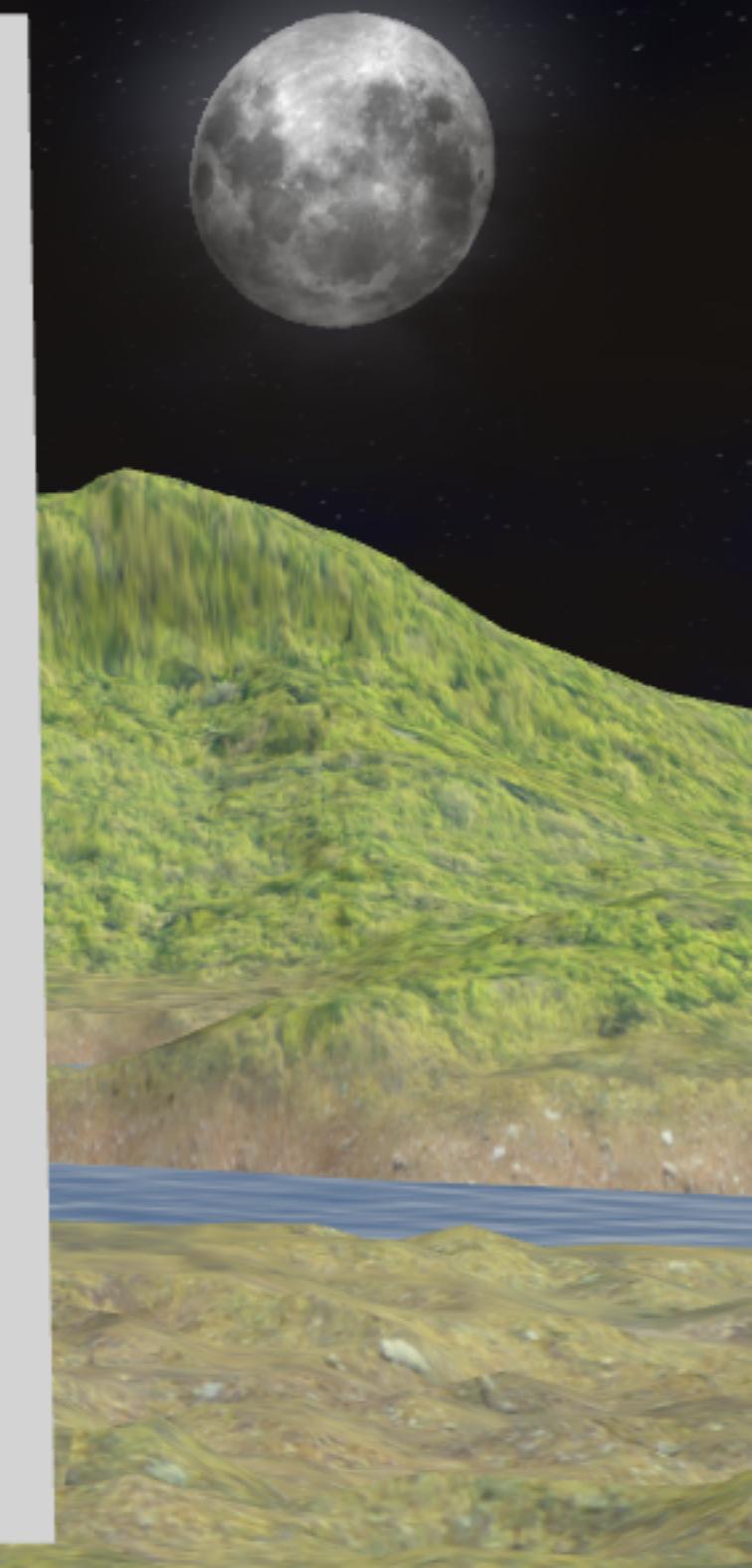
OUTREACHY



Google
Summer of Code



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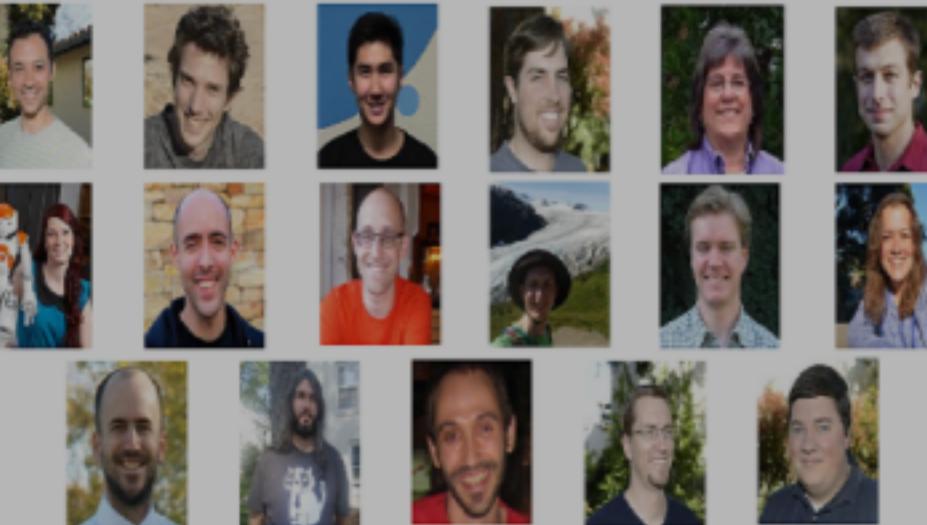
There's room for everyone!



Thank you!

<http://gazebosim.org>

 @chapulinaBR



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