ROS and Gazebo Overview for DroneCode

Tully Foote (tfoote@osrfoundation.org)

March 2015
Independent non-profit R&D company with a mission to support the development, distribution, and adoption of open source software for use in robotics research, education, and product development.

We maintain

ROS and Gazebo
The Goal: (Open Source) Rapid Prototyping

Web 2.0

Robotics

Open Source Robotics Foundation
The Goal: (Open Source) Rapid Prototyping

**Web 2.0**
- Linux
- MySQL
- Python

**Robotics**
- ROS and friends
- Gazebo
- OpenCV
- PCL
- CloudSim
- MoveIt!
ROS: Robot Operating System

Libraries and tools for programming robots

ROS = Plumbing + Tools + Capabilities + Ecosystem

Used in labs, classrooms, and companies around the world
A common platform for many robots

https://www.youtube.com/watch?v=PGaXiLZD2KQ
Reusable autonomy

Example: The ROS Navigation Stack is used on a wide variety of robots

http://wiki.ros.org/navigation
Goal: best possible substitute for physical robot

Use cases:
- Design and testing of robot components and control
- Software testing and verification
- Competitions and other comparisons
Simulation capabilities

https://www.youtube.com/watch?v=RvfKP5m0w0
Simulating humanoid robots

https://www.youtube.com/watch?v=iR4c0pWSAf8
ROS + Gazebo to control and simulate UAVs

https://www.youtube.com/watch?v=qfFF9-0k4KA
<table>
<thead>
<tr>
<th>Country</th>
<th>Visitors</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>53,530</td>
<td>23.40%</td>
</tr>
<tr>
<td>Germany</td>
<td>25,133</td>
<td>10.99%</td>
</tr>
<tr>
<td>China</td>
<td>17,812</td>
<td>7.79%</td>
</tr>
<tr>
<td>Japan</td>
<td>14,619</td>
<td>6.39%</td>
</tr>
<tr>
<td>Spain</td>
<td>9,192</td>
<td>4.02%</td>
</tr>
<tr>
<td>Canada</td>
<td>8,611</td>
<td>3.76%</td>
</tr>
<tr>
<td>France</td>
<td>8,399</td>
<td>3.67%</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>7,434</td>
<td>3.25%</td>
</tr>
<tr>
<td>India</td>
<td>7,360</td>
<td>3.22%</td>
</tr>
<tr>
<td>Italy</td>
<td>6,623</td>
<td>2.90%</td>
</tr>
<tr>
<td>Brazil</td>
<td>5,837</td>
<td>2.55%</td>
</tr>
<tr>
<td>South Korea</td>
<td>4,988</td>
<td>2.18%</td>
</tr>
<tr>
<td>Australia</td>
<td>4,828</td>
<td>2.11%</td>
</tr>
<tr>
<td>Singapore</td>
<td>4,688</td>
<td>2.05%</td>
</tr>
<tr>
<td>Russia</td>
<td>3,534</td>
<td>1.54%</td>
</tr>
<tr>
<td>Portugal</td>
<td>3,194</td>
<td>1.40%</td>
</tr>
<tr>
<td>Netherlands</td>
<td>2,556</td>
<td>1.12%</td>
</tr>
<tr>
<td>Switzerland</td>
<td>2,454</td>
<td>1.07%</td>
</tr>
<tr>
<td>Poland</td>
<td>2,279</td>
<td>1.00%</td>
</tr>
<tr>
<td>Taiwan</td>
<td>2,252</td>
<td>0.98%</td>
</tr>
</tbody>
</table>
Metrics (for July 2014)

Downloads:
  Total packages: **3,570,374 (+123% over last year)**
  Unique IP addresses: **49,153 (+343%)**
  Does not count mirrors (8 public and many private)

Web activity:
  ros.org (wiki):
    Unique visitors: **87,820 (+48%)**
    Page views: **976,031 (31.5K / day)**
  answers.ros.org (Q&A forum):
    Total questions to date: **18,144 (+38%)**
    Answer rate: **68%**

Research use (as of January 2014):
  Citations of “ROS: an open-source Robot Operating System” (Quigley et al., 2009): **1350 (+62%)**
ROS 2.0: Building on top of DDS

Data Distribution Service: industry-standard communication system

= discovery + serialization + transport

- Open source and proprietary versions available
- Proven in mission-critical applications
- Suitable for real-time and embedded domains

http://design.ros2.org/
DDS power with ROS ease-of-use

Use the DDS implementation of your choice

http://design.ros2.org/articles/ros Middleware Interface.html