

**Parkopedia**  
Helping You Park

# GAZEBO

Autoware Map Data and  
Formats working group



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01 August 2019

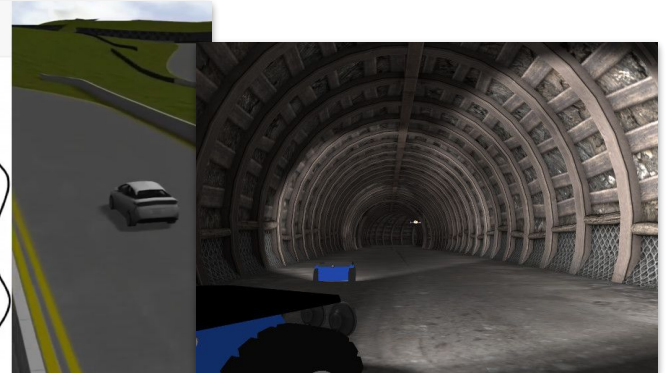
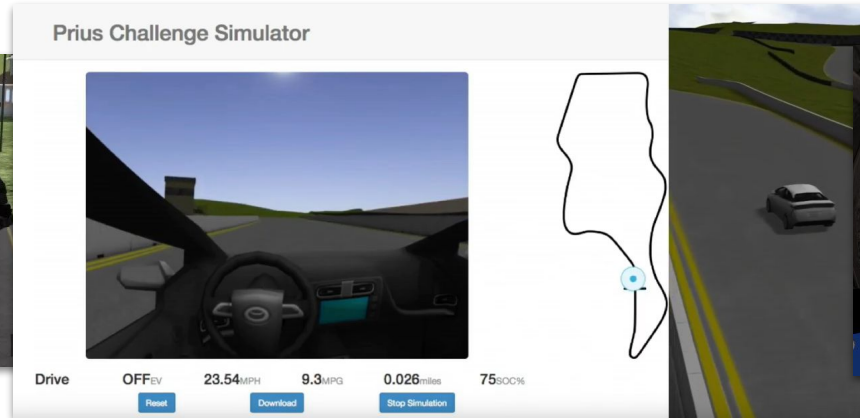
# GAZEBO

- History

- 2002: Development began
- 2004 - 2011: Part of *Player* project
- 2009: ROS integration
- 2011: Independent project supported by Willow Garage
- 2012: OSRF became steward

- Use in challenges

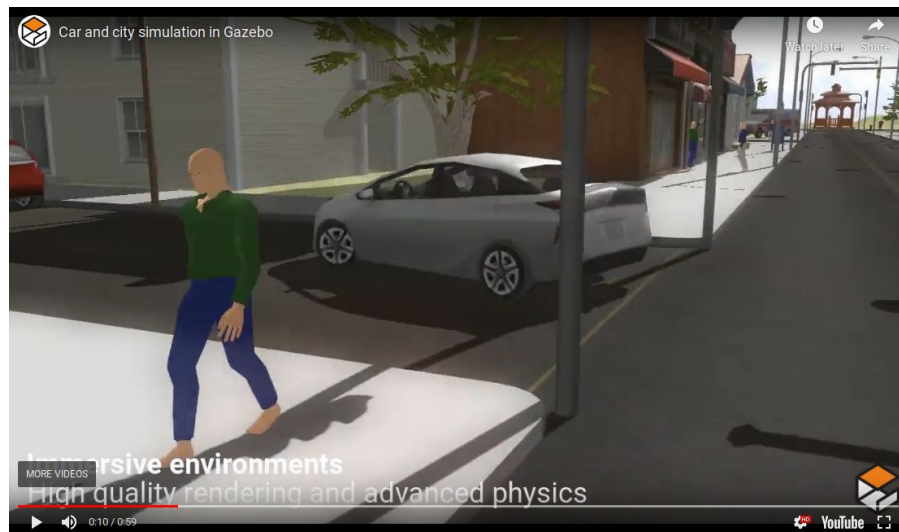
- DARPA Robotics Challenge
- Prius Challenge
- DARPA Subterranean Challenge





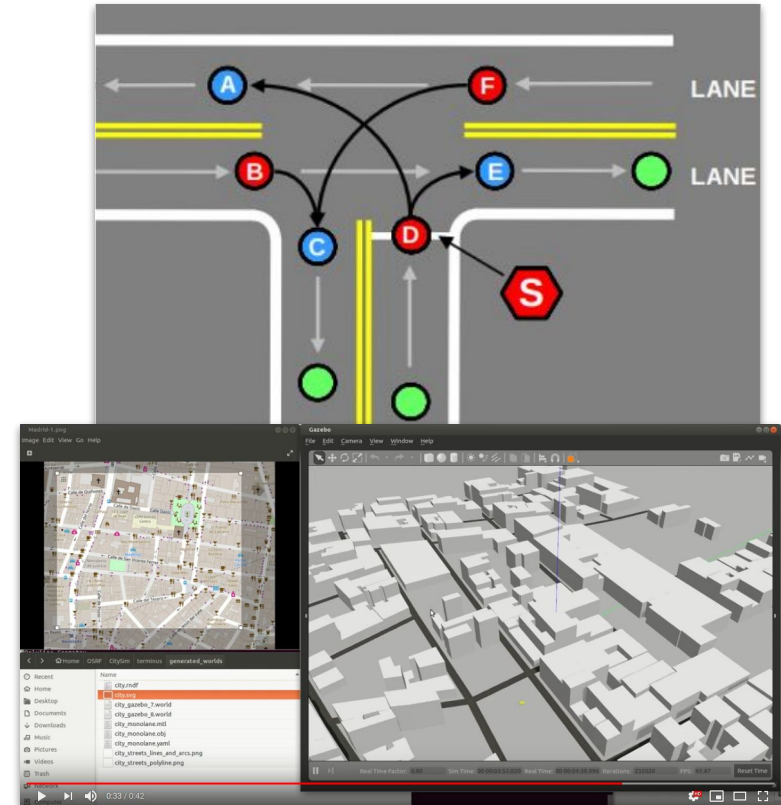
# SELF DRIVING CARS

- 2017: Car demo (Prius) + City simulation
- Car demo includes:
  - Hybrid engine model
  - Energy usage from throttle, drag, transmission
  - Regenerative braking
  - Camera, LiDAR, RADAR, USS
- City simulation includes:
  - Roads
  - Buildings
  - Animated pedestrians
- Car demo still developed (last commit 4 months ago), city simulation not
- Presentation:  
<https://www.youtube.com/watch?v=z-pxFKyIZ98>



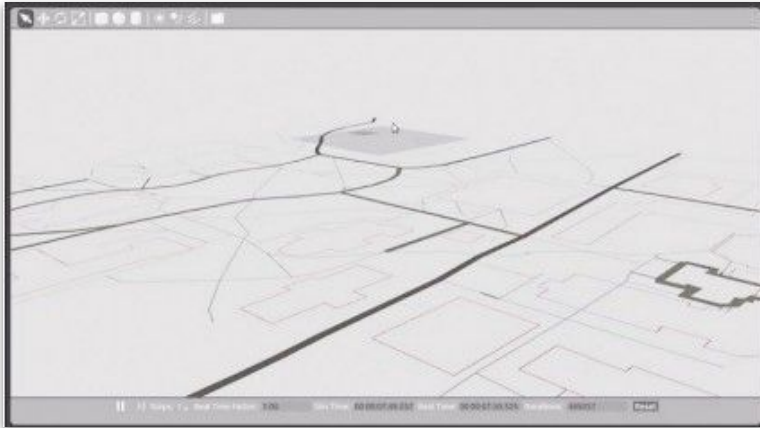
# MAPS

- Natively:
  - No explicit support for maps
  - Environment described in robot and world descriptions
  - Formats: URDF and SDF
  - 3D models: OBJ, STL, OpenCollada
- City simulation:
  - Route Network Definition File (RNDF) [parser](#)
  - Format used in DARPA challenge
  - 2017 ROSCon presentation promises to explain why not OpenDrive instead, but doesn't
- [Ekumenlabs Terminus](#)
  - Create city by procedural generation or OSM data
  - Output to RNDF, SDF, OpenDrive
  - Last development 2 years ago, Gazebo RNDF plugin repository gives 404



# MAPS

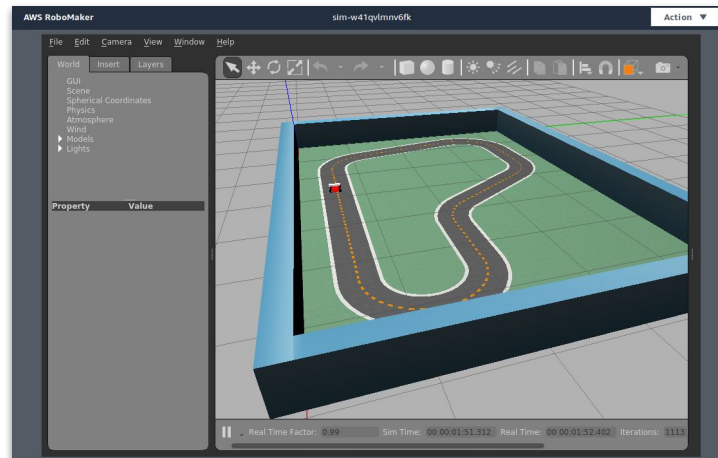
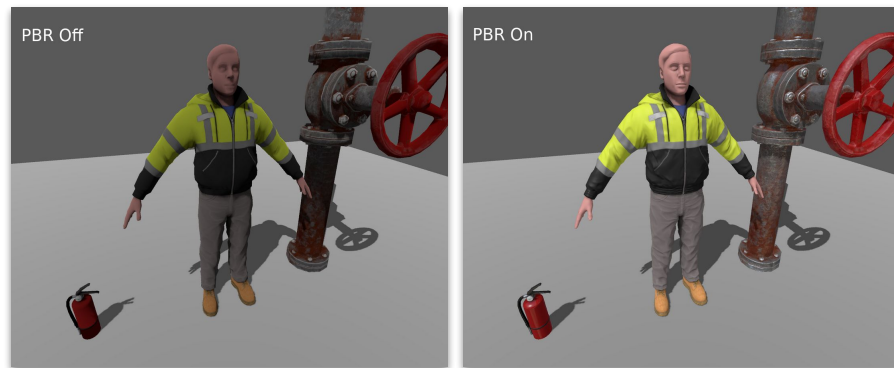
- [Gazebo\\_osm](#)
  - Developed in 2014 as part of Gnome Outreach Program for Women
  - Converts OSM to SDF
  - [Fork with some additions](#) (last 5 months ago)
- [OSM2World](#)
  - [Export to OBJ -> convert to COLLADA](#)



# FUTURE



- Current version: 10
- [ROS 2 support](#)
- Version 11 will be last version
- Rewrite happening as 'Ignition Robotics' process; full transition + migration over the course of 2019 - 2020
  - Restructure (modularize)
  - Modernize
  - Efficiency
  - Better rendering
- Cloud support
  - AWS Robomaker



# CONCLUSION

- Pros
  - Free, open source, permissive Apache 2 license
  - Strongly tied in with ROS (2)
  - Highly customizable and extensible with plugins
  - Widely used, at least in academia
  - Cloud solutions available for running large scale experiments
- Cons
  - Out of the box not best in class for visual sensors (but improvements on roadmap)
  - Not fastest in class physics
  - Extra tools needed to work with maps, which are not very actively developed