ROS-interface to USARsim

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Based on work by Zeid Kootbally and Stephen Balakirsky

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What is USARSim?

- High-fidelity multi-robot simulator developed on top of an existing game engine
  - High performance physics and 3D rendering

- Originally conceived as tool for Urban Search and Rescue (USAR), it has a much broader scope [1]

Basic Premise

- Would like to be able to develop, debug, and evaluate cognitive systems
  - Repeatable trials
  - Known ground truth, noise, detections, false detections
- Evaluation environment should provide realism
  - Realistic complexity
  - Tailored data output
  - Environmental interaction
  - Obey basic laws of physics in sensing and mobility
USARSim variety of platforms
A wide variety of simulated worlds
UDK based simulated worlds

Dutch Open Final

VMAC factory

NIST campus

RoboCup 2012 Preliminary
GameBots is origin USARSim

Interface defined in 2003

Interface stable since 2013

e.g.: INIT {ClassName robot_class } {Name robot_name }
   {Location x,y,z } {Rotation r , p , y }
DRIVE {Left float } {Right float } {Normalized bool }
   {Light bool } {Flip bool }
GEO {Type GroundVehicle} {Name string }
   {Dimensions x , y , z } {COG x , y , z }
   {WheelRadius float } {WheelSeparation float }
   {WheelBase float }
CONF {Type AerialVehicle} {Name string }
   {SteeringType string } {Mass float }
CONF {Type Camera} {CameraDefFov 0.8727}
   {CameraMinFov 0.3491} {CameraMaxFov 2.0943}
   {CameraFov 0.8726}

http://sourceforge.net/apps/mediawiki/usarsim/
The configuration of a robot is converted into the Transform Trees of ROS.
Coupling to ROS navigation stack
Example

1. Bring up an environment in USARSim.
2. $roscore
3. $roslaunch usarsim usarsim.launch
4. $rosrun teleop_twist_keyboard teleop_twist_keyboard.py
5. $rosrun gmapping slam_gmapping scan:=lms200 _odom_frame:=odom
Adaption by the RoboCup teams

Conclusion

USARSim can now be used as simulator for ROS modules.

USARSim is based on a state-of-the-art Game Engine, which allows the creation of detailed worlds, realistic lighting conditions and reliable physics.
Publications on Virtual Robots and USARSim

If you would like to have your papers added to this list, send them to any of the USARSim/Virtual Robots organizers.

Research behind USARSim (incomplete chronological list)