V-Rep, Matlab/Simulink and ROS for Mobile Robots Simulation

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The motivation

• Need: a simulation environment.
  - Testing and debugging algorithms.
  - No risk to damage real robots.
  - Possibility to create different virtual environments.
  - Same code with the simulated and real robots (ROS).
  - ViSP for visual tracking and visual servoing algorithm.
  - Matlab/Simulink environment for a “fast prototyping”.

v-rep

ROS.org
• **What is it?** General purpose 3D robot simulator with integrated development environment.

• **What can it do?** Sensors, mechanisms, robots and whole systems can be modeled and simulated in various ways.

• First public release in March 2010

• Last version: V-REP V3.1.1 (March 26th 2014)
Scene Objects

Shapes

Joints

Cameras

Lights

Dummies / reference frames

Mirrors

Proximity sensors

Force / torque sensors

Vision sensors

Mills

Plots

Paths / trajectories
v-rep

Calculation Modules

Collision detection

Physics / Dynamics

Minimum distance calculation

Path / motion planning

Forward / Inverse kinematics
Plugin V-Rep ROS Bridge

• The main application of the plugin is to provide a communication interface between V-Rep and ROS. The aim is to control the V-Rep simulation externally using ROS messages.
• The plugin is a shared library that is automatically loaded by V-REP's main client application at program start-up.
• Our plugin looks for known objects in the scene in order to manage them:
  • Robots:
    • Manipulators
    • Quadrotors
    • Mobile robots
    • Humanoids
  • Sensors:
    • Vision Sensor
    • IMU Sensor
  • Rigid body handler:
    • Pose
    • Twist
Demo 1) Quadrotor tracking a 3D target
Demo 1) Quadrotor tracking a 3D target
Demo 2) Quadrotor controlling its pose via a visual servoing law

### Diagram

- **ViSP**
  - CameraInfo
  - Images
  - Status Quadrotor
  - Features Location

- **MATLAB**
  - Commands

- **V-Rep**
Demo 2) Quadrotor controlling its pose via a visual servoing law
Demo 3) Pioneer 3D-X controlling its pose via a visual servoing law
Demo 3) Pioneer 3D-X controlling its pose via a visual servoing law
Demo 3) Pioneer 3D-X controlling its pose via a visual servoing law
Demo 4) Adept Viper s850 and Romeo
Links and Contacts

- Lagadic: http://www.irisa.fr/lagadic/
- ViSP: http://www.irisa.fr/lagadic/visp/
- Vrep_ros_bridge:
  - ROS wiki: http://wiki.ros.org/vrep_ros_bridge
  - GIT Repository: https://github.com/lagadic/vrep_ros_bridge
  - Demo: http://www.irisa.fr/lagadic/demo/demo-vrep/

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