

Interfacing Matlab/Simulink with V-REP for an Easy Development of Sensor-Based Control Algorithms for Robotic Platforms

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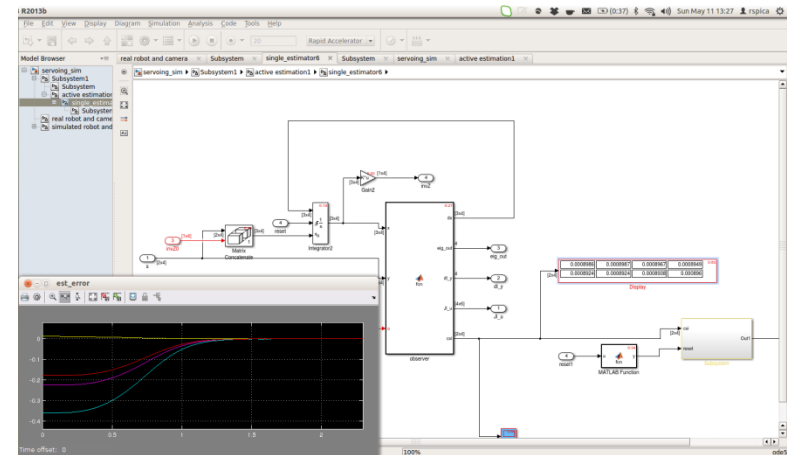
Lagadic group

Inria Rennes Bretagne Atlantique & IRISA

<http://www.irisa.fr/lagadic>

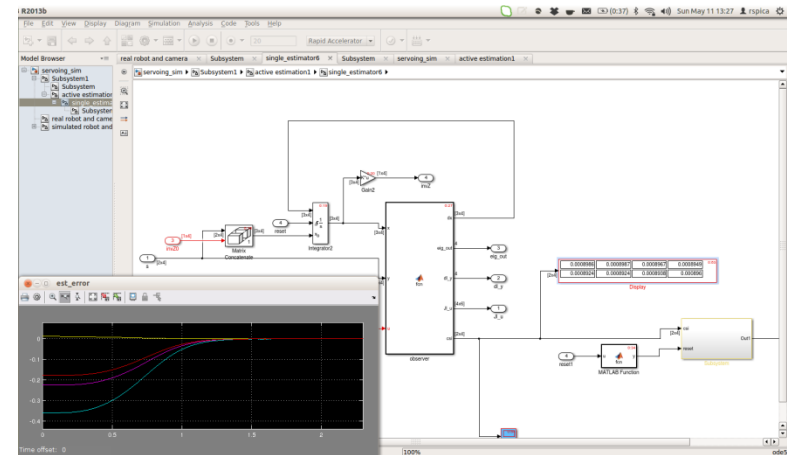
Why using Matlab/Simulink

- fast **prototyping** (debugging+testing) complex control algorithms
 - debugging, scopes, displays
 - post-processing, plotting, logging
- powerful **scripting** language
- huge library + File Exchange
- **integrate** external **C/C++** code (MEX files and s-function)
- automatic **code generation**
 - speed up execution time
 - **deployment** to other platforms (e.g., the robot itself)



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- **missing** a rigid body dynamics **simulator**



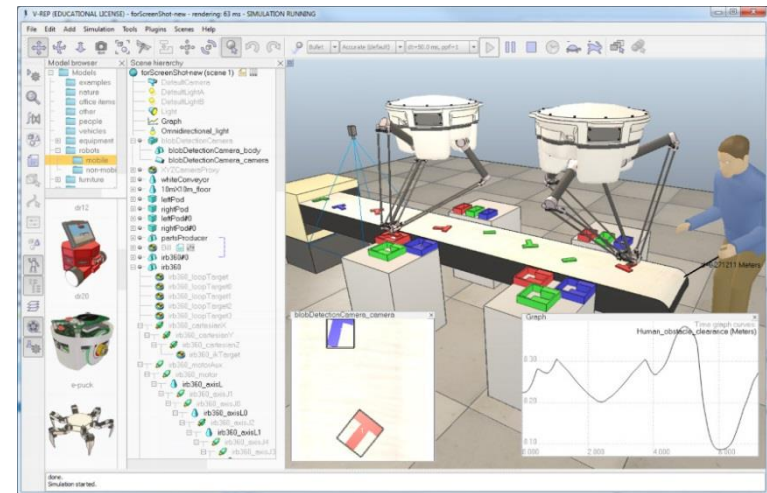
Why using a simulator

- **easy testing** and debugging algorithms
- no **risk** to damage real robots
- no **need** to have a real robot (useful for teaching)
- create different virtual environments or **particular testing conditions**
- **testing faster** than real time

Why using a simulator

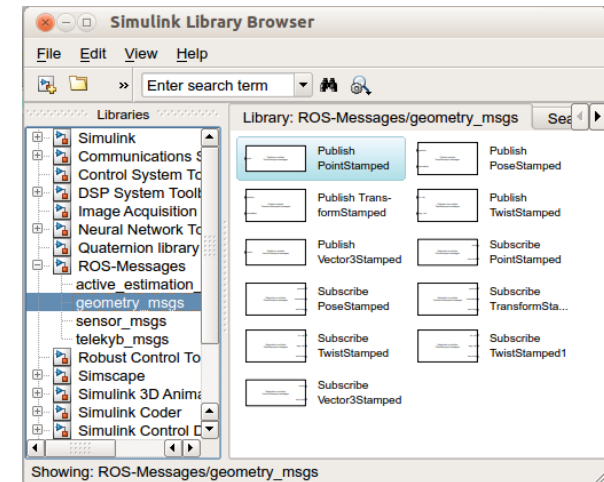
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- V-Rep
 - **open source** and free for academics
 - provides sensors, mechanisms, robots
 - algorithms for collision detection, planning, inverse kinematics,
 - support different simulation modes
 - highly **customizable** (e.g. C++ plugins)
 - support for ROS communication framework



Interfacing Matlab and V-Rep with ROS

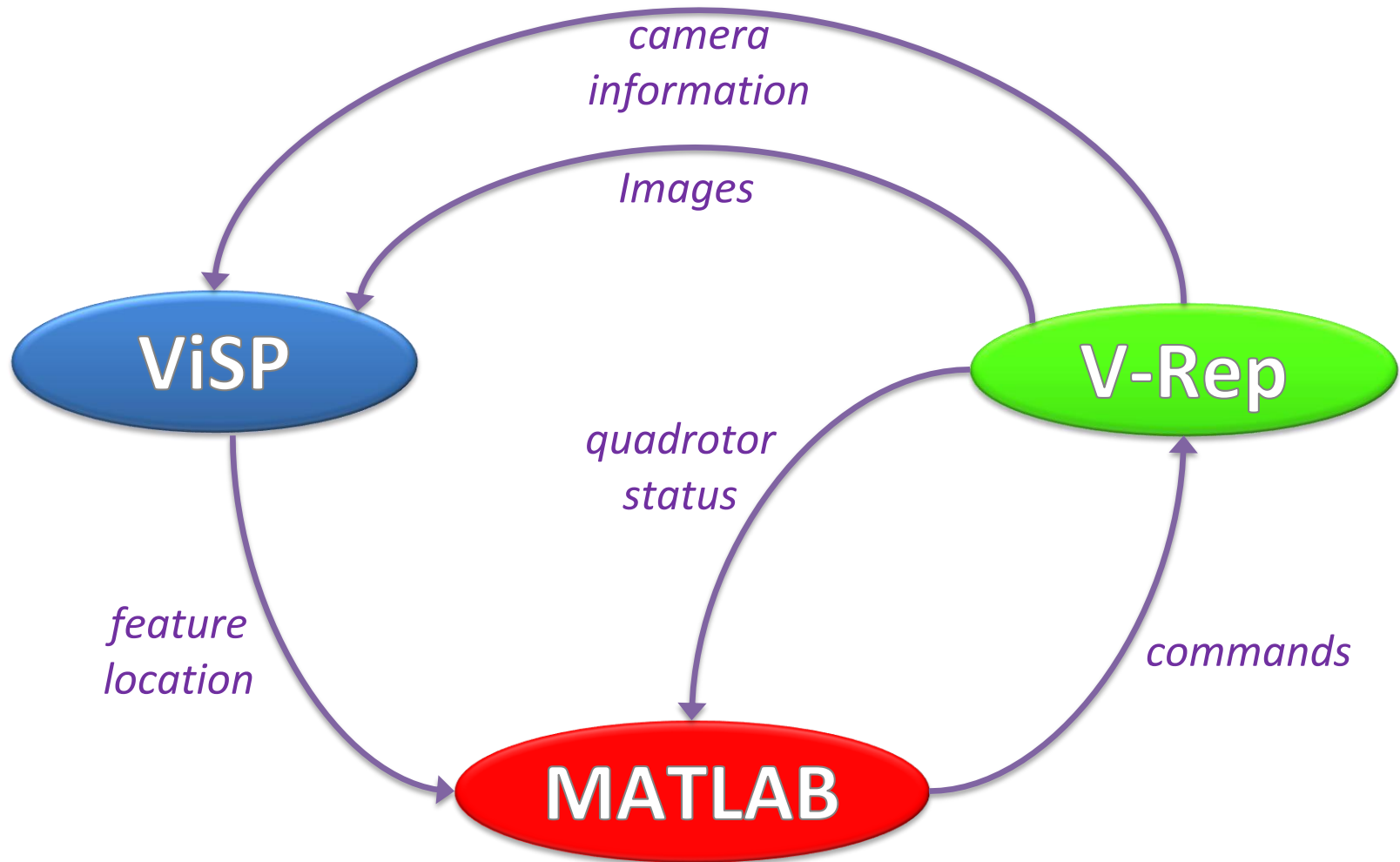
- **open source**
- widely spread benefits support from a big developer community
- provides many **standard drivers/algorithms**
- provides additional tools for logging/plotting/debugging
- **same code** with the simulated and real robots (just change some nodes and topic name)
- **native support by V-Rep** + custom plugin vrep_ros_bridge
- official support for Matlab on the way but many unofficial solutions available (e.g. integrate **ROS in C++ s-function**)



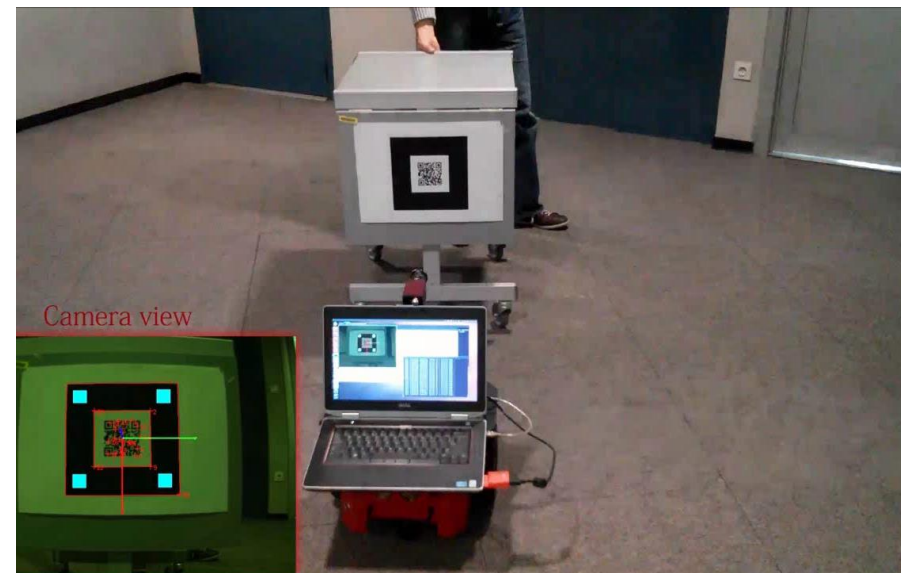
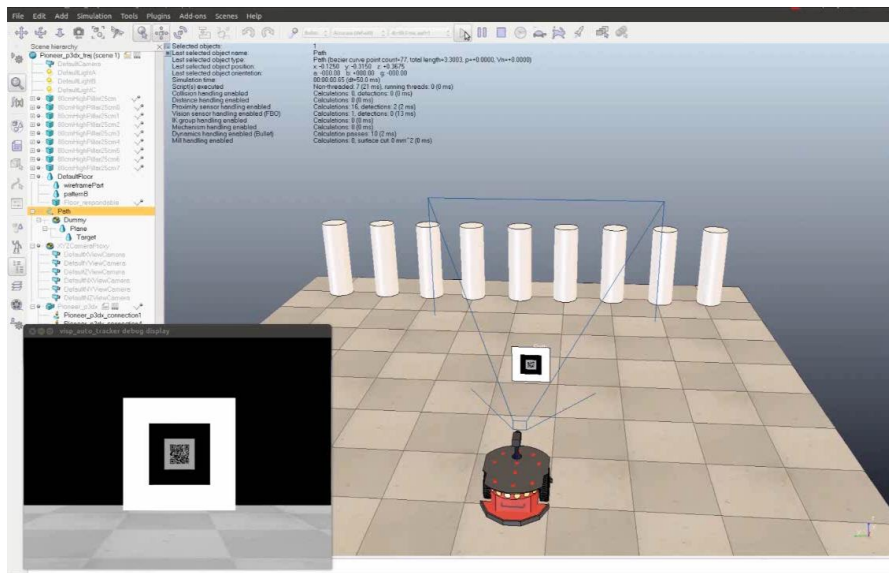
Synchronizing Matlab and V-Rep (?)

- synchronize both softwares with the **system time** (real time execution)
- V-Rep supports real-time and real-time-factor running
- in Matlab (my understanding):
 - official solution: use a real time target in code generation
 - our “quick & dirty” solution: use a custom s-function block that pauses the simulation to keep simulation time and system time synchronized

Demo: visual servoing for a quadrotor and a manipulator



Demo: visual servoing on simulated/real Pioneer



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/>
- **Contacts**:
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