Live Programming in ROS with PhaROS

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http://car.imt-lille-douai.fr

Robotic Application Lifecycle

1. Develop / Borrow Parts
2. Assemble Parts
3. Run + Analyze Behavior
4. Stop
5. Fix bugs / Improve
6. Goto step 2

ROS Robotic Application Lifecycle

1. Develop / Borrow ROS Packages
2. Assemble = Define Launch file
3. Run + Analyze Behavior
4. Stop
5. Fix bugs / Improve
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ROS Robotic Application Lifecycle

1. Develop / Borrow ROS Packages
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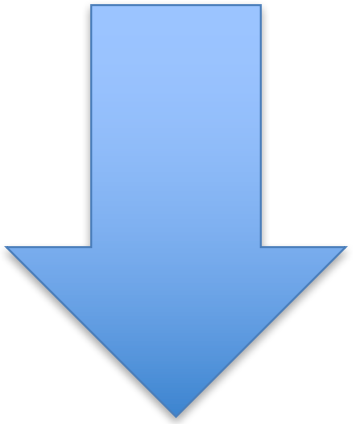
Context is lost
Forgotten details

Live Programming

Edit program at Run-time

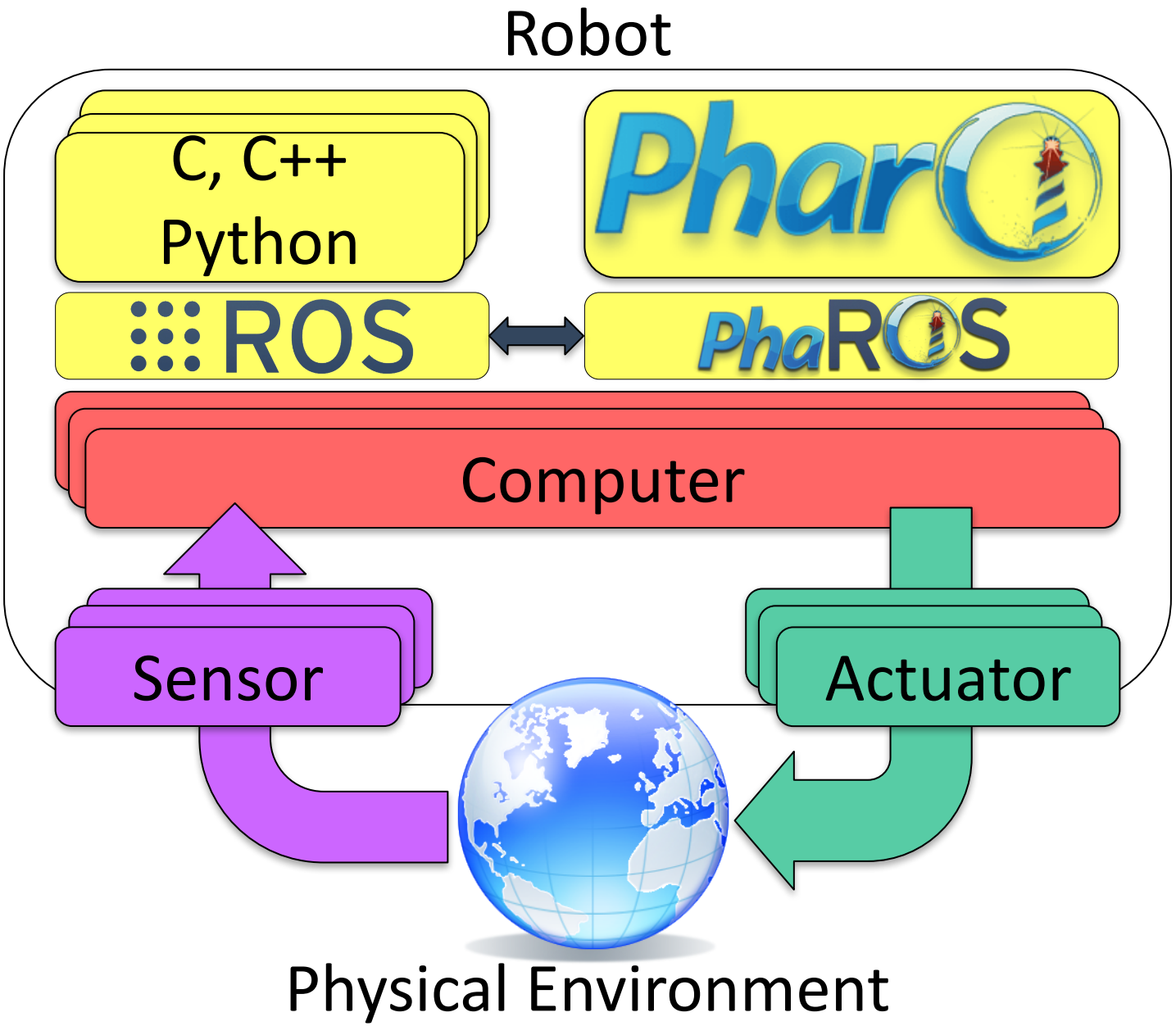


Immediate Feedback

Proposal

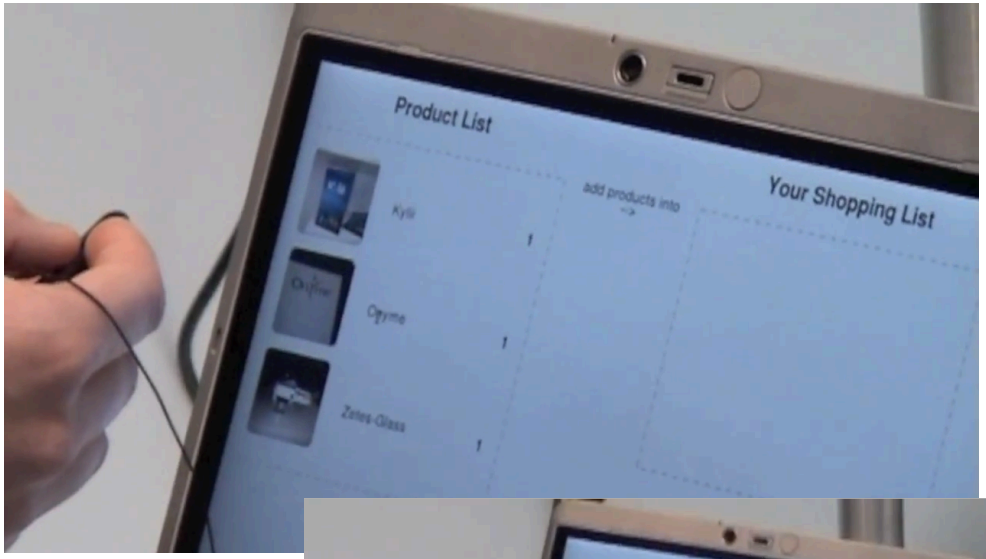
- Pharo
  - Highly reflective and Dynamic language
  - “The immersive programming experience”
  - http://www.pharo.org

- PhaROS
  - ROS Client for Pharo
  - http://car.imt-lille-douai.fr/
  - Nodes developed in Pharo
  - …

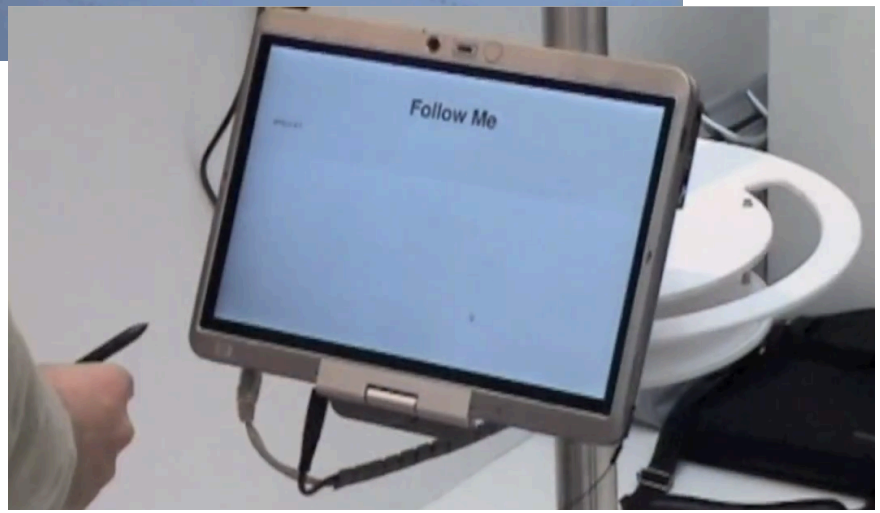

Robot
C, C++
Python
Pharo
ROS
PhaROS
Computer
Sensor
Actuator
Physical Environment

Video 1: Live coding turtlesim

Our Shopping cart robot



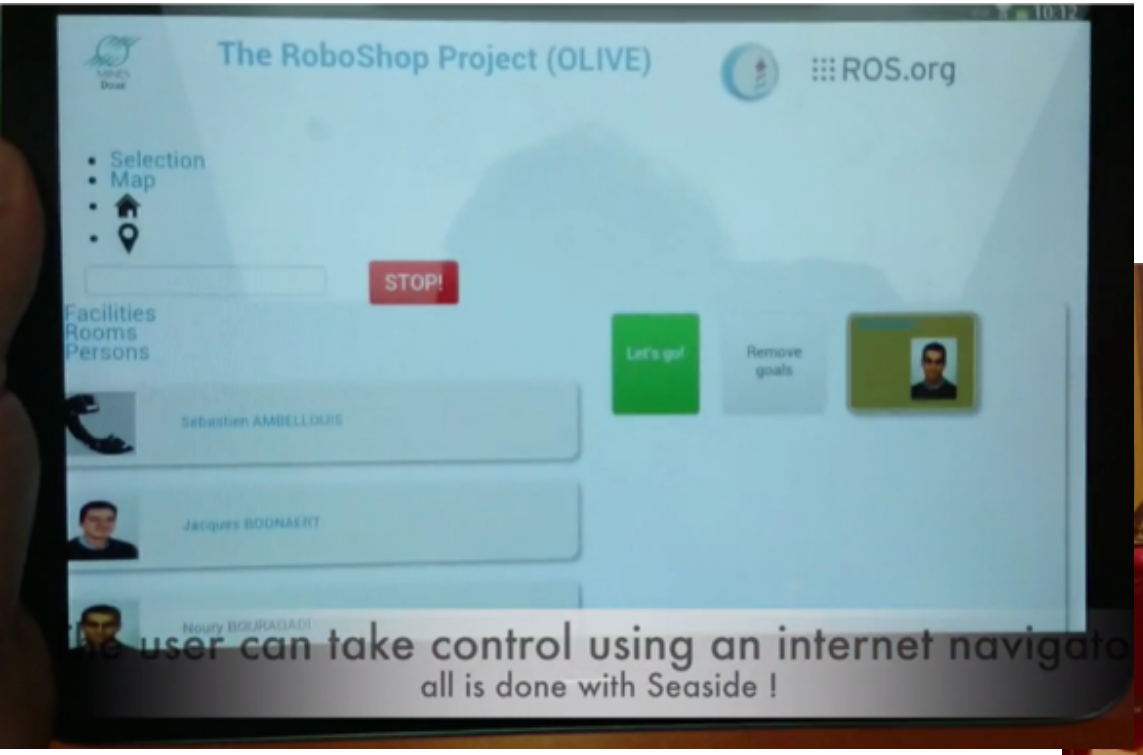
1) Select products



2) Follow the robot

http://car.mines-douai.fr/2013/11/roboshop-demo-16oct2013/

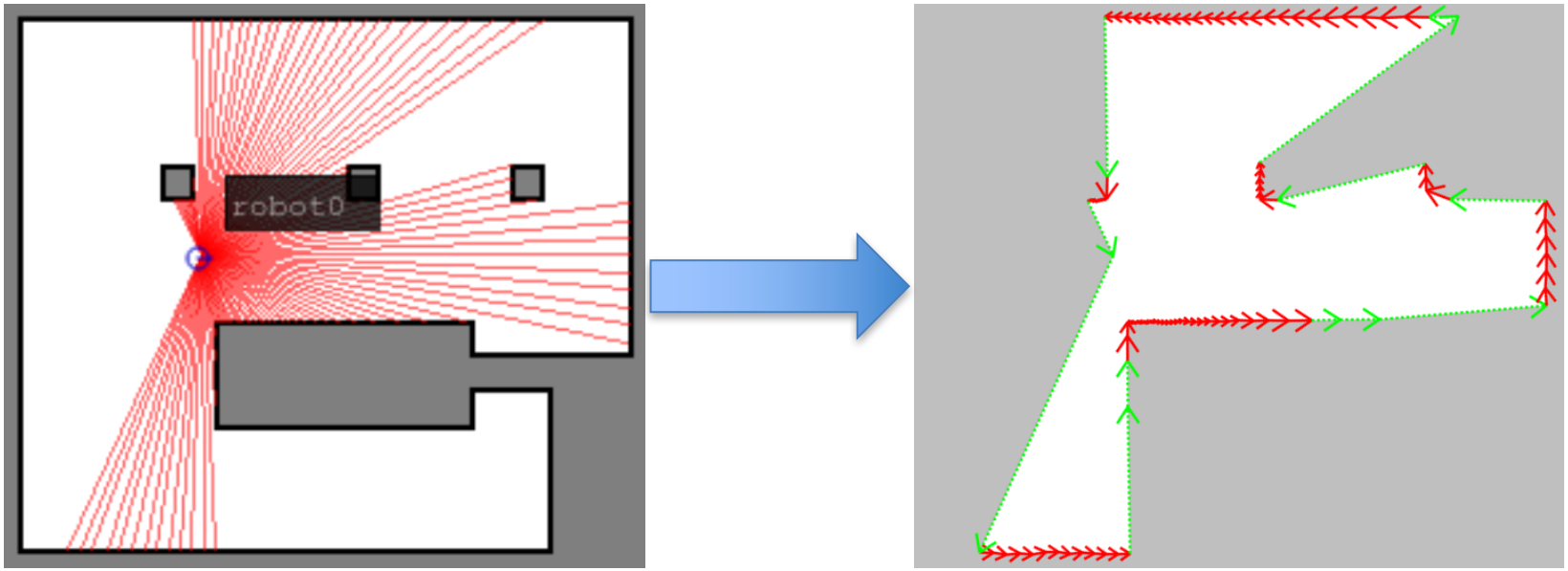
Our Lab Guiding Robot



http://car.imt-lille-douai.fr/2014/10/controlling-robots-with-pharos

Current Work

- A full 2D-SLAM in PhaROS based on Vector Maps



[Bai2016] **Vector Maps: A Lightweight and Accurate Map Format for Multi-robot Systems**
Khelifa Baizid, Guillaume Lozenguez, Luc Fabresse and Noury Bouraqadi
Best Paper Award of ICIRA'16

Conclusion

- Live programming ROS applications
- PhaROS provides:
  - Dynamic parameter modification
  - Dynamic node creation
  - Dynamic topic connection
  - Live debugging
  - …
- PhaROS nodes are catkin compliant (rosrun, launch files)

Live Programming in ROS with

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