Ros Nao Tutorial

Universiteit van Amsterdam

Intelligent Robotics Lab

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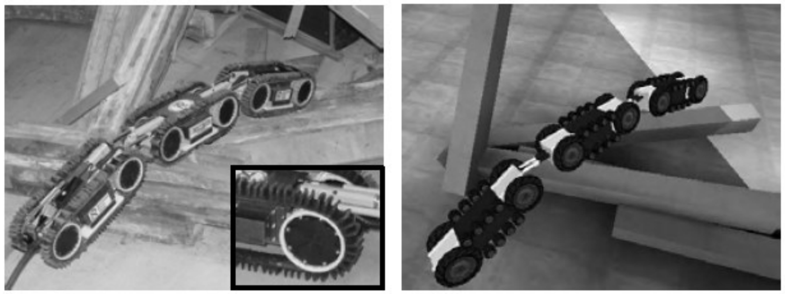
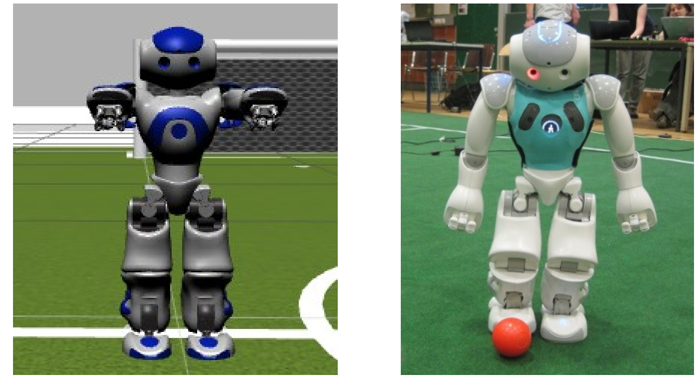
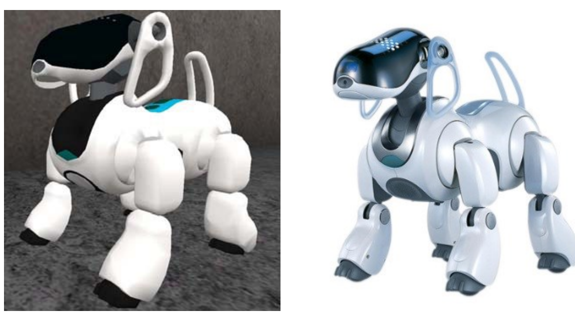
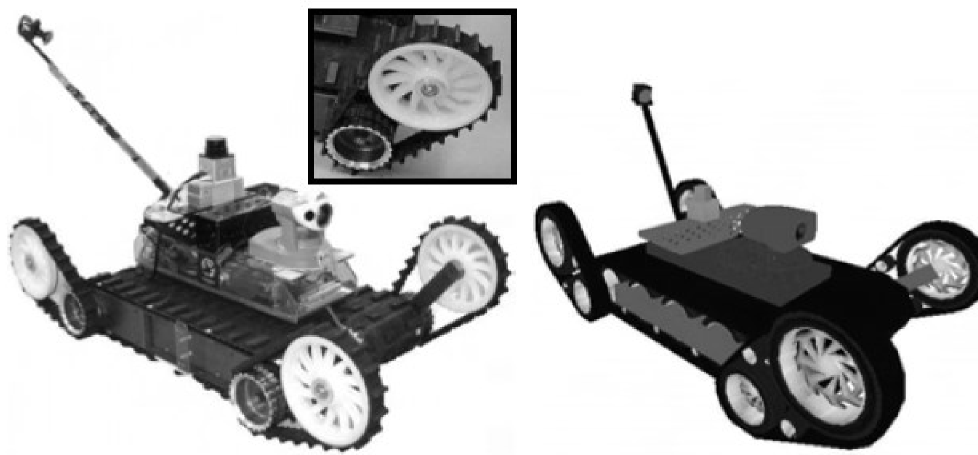
Future of Rescue Robot Simulation workshop,
Leiden, March 4, 2016

Simulation & Real robots





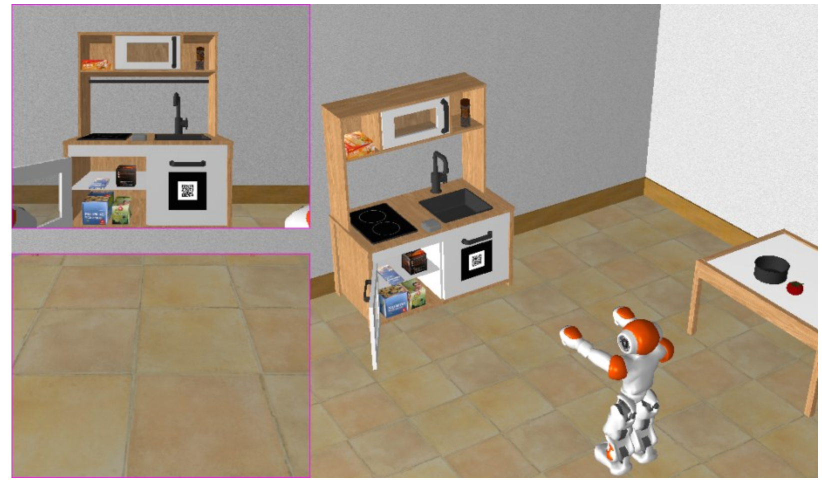




Humabot Challenge

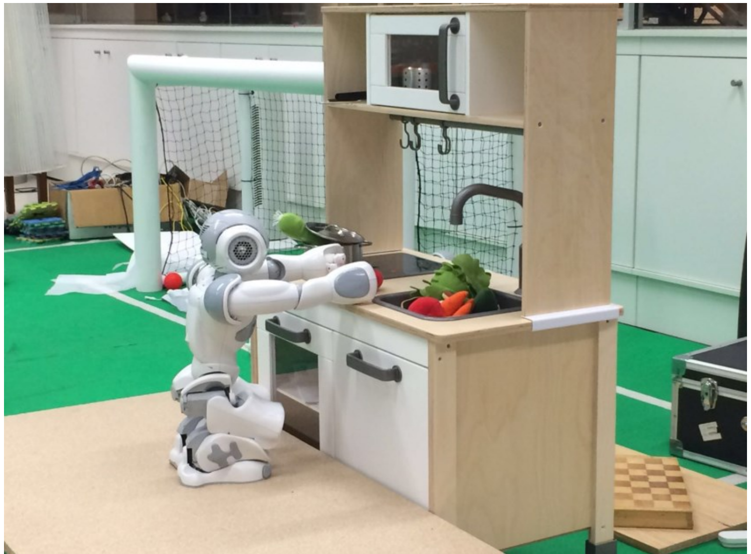
www.irs.uji.es/humabot/

Humabot Challenge

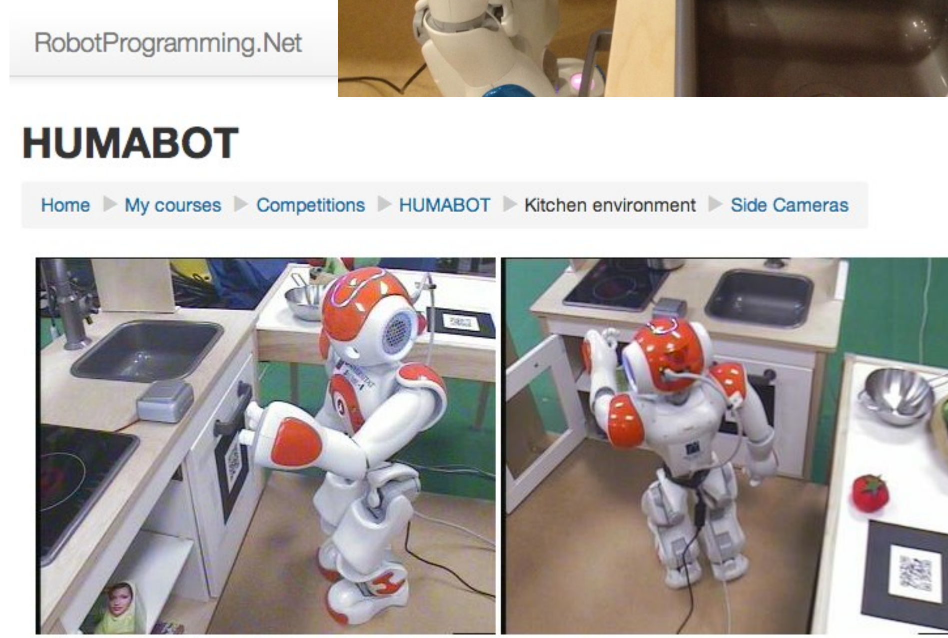


[1] P. J. S. Enric Cervera, Juan Carlos Garcia, “Toward the robot butler: The humabot challenge,” Robotics & Automation Magazine, IEEE (Volume:22, Issue: 2), 2015.

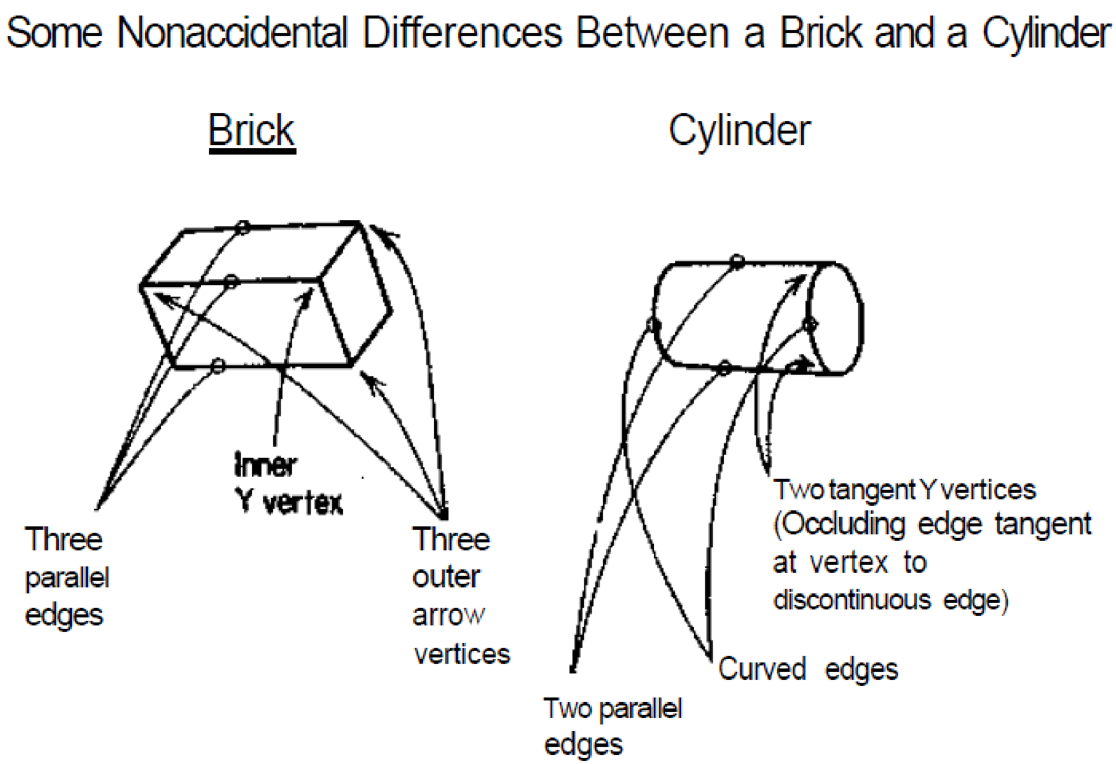
Standard Environment



DUKTIG
Play kitchen

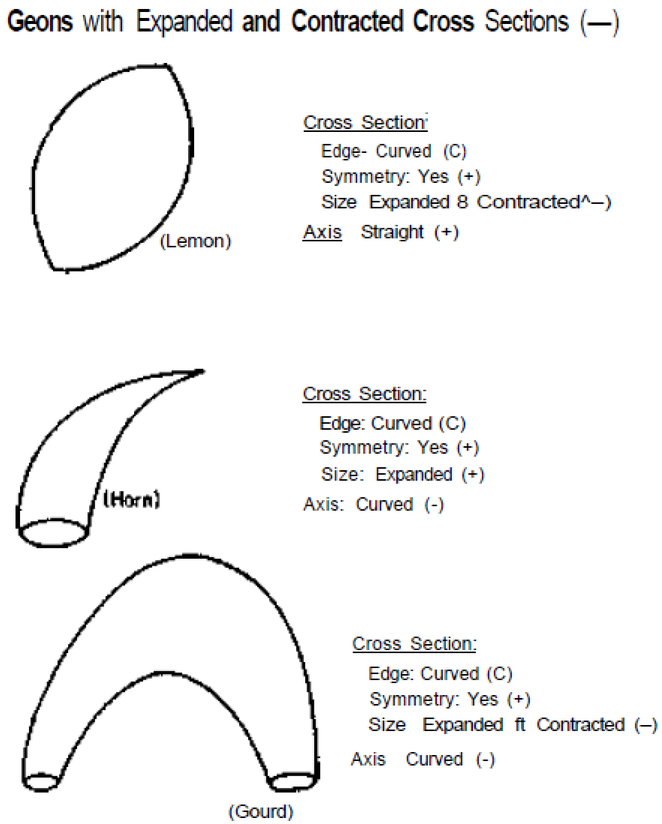


Bio-inspired perception



[2] I. Biederman, "Recognition-by-components: a theory of human image understanding." Psychological review, vol. 94, no. 2, p. 115, 1987.

Bio-inspired perception



[2] I. Biederman, "Recognition-by-components: a theory of human image understanding." Psychological review, vol. 94, no. 2, p. 115, 1987.

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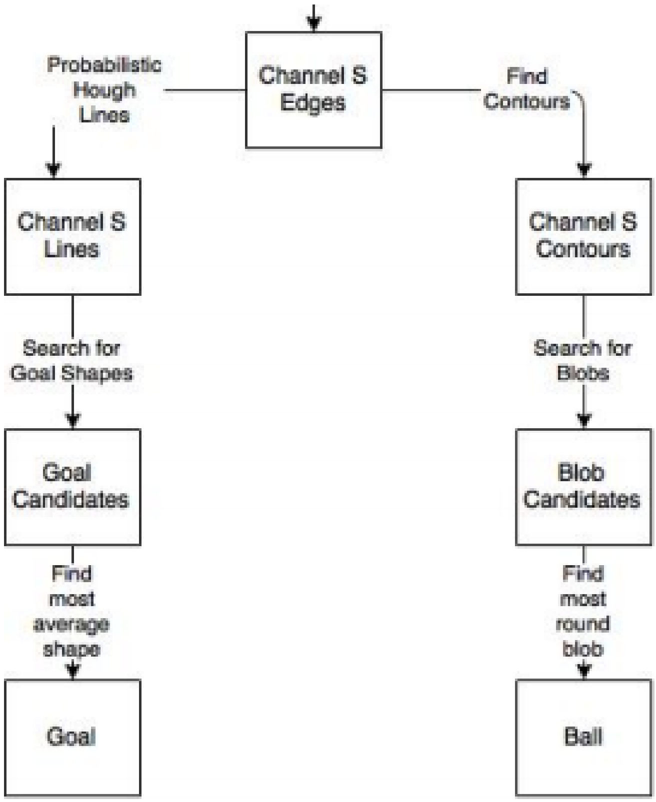
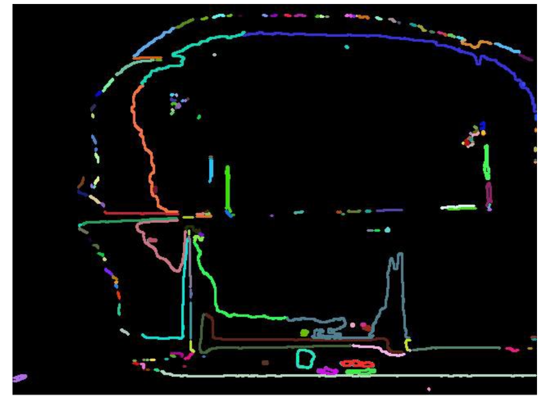
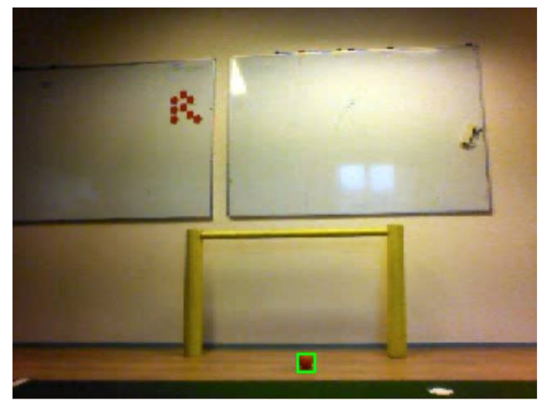
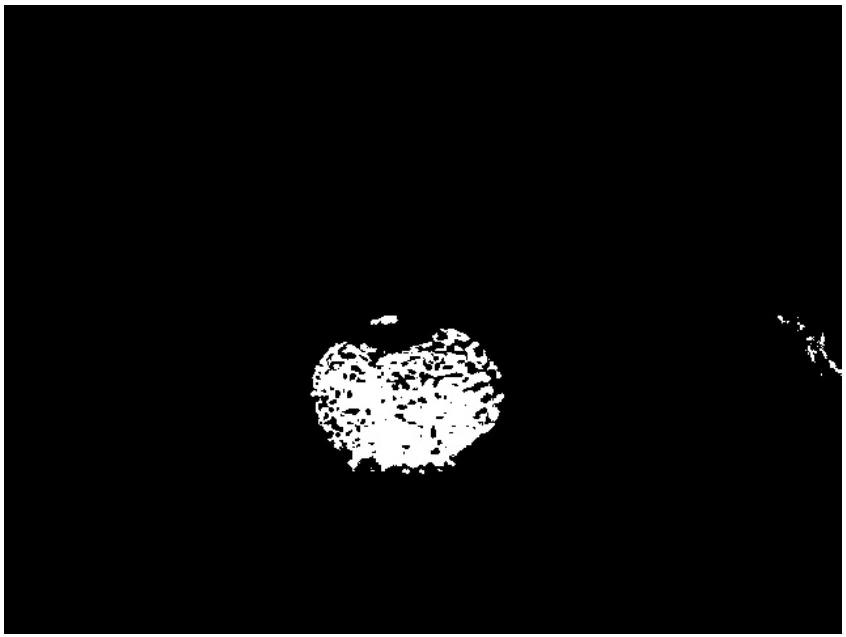


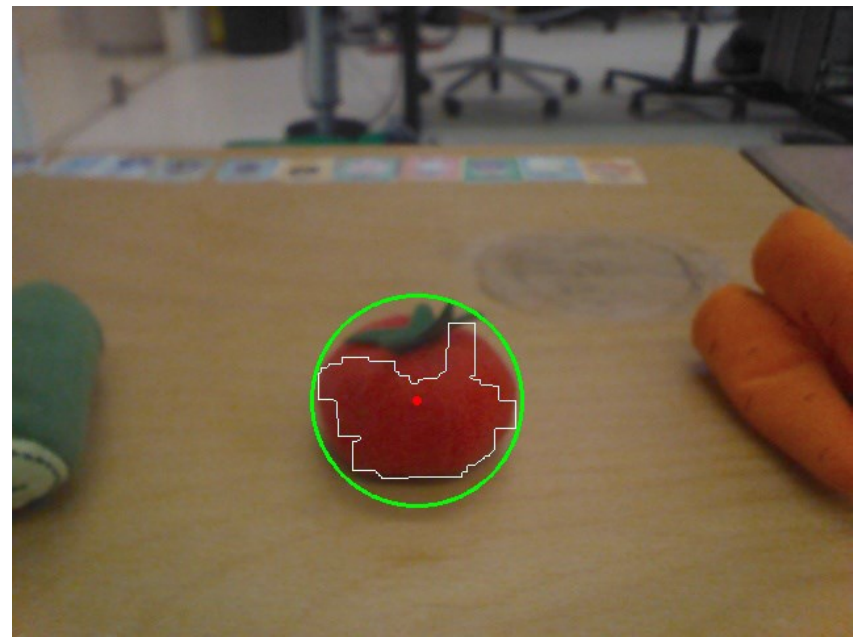




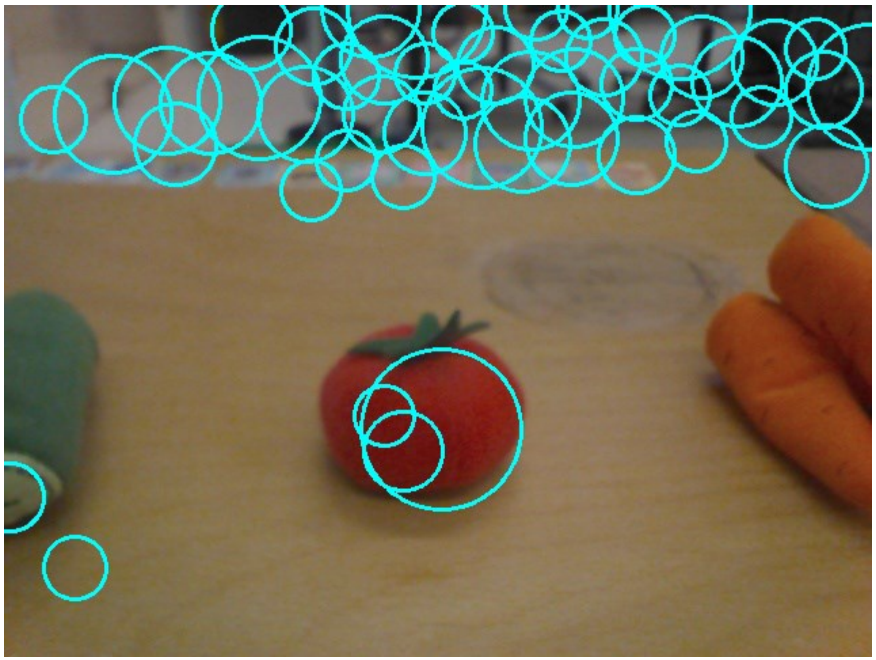
[2] G. E. Ras, “Cognitive image processing for humanoid soccer in dynamic environments,” Bachelor thesis, Maastricht University, June 2015.

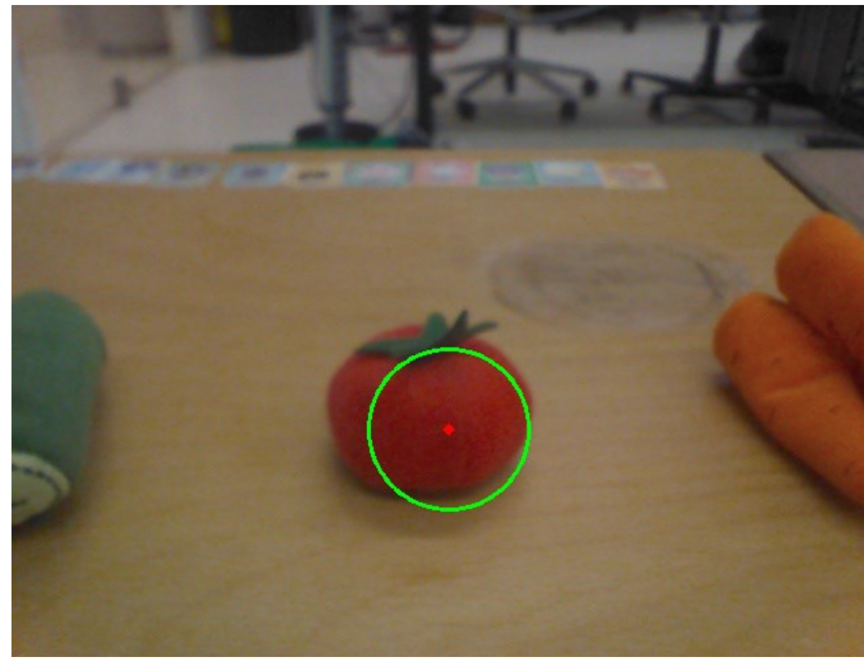
Colour based + Contours





Circle based + Colour





Colour invariant blob detection

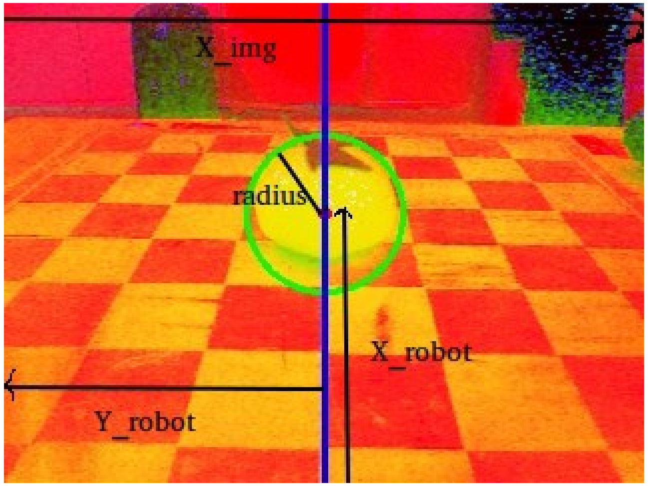
Result

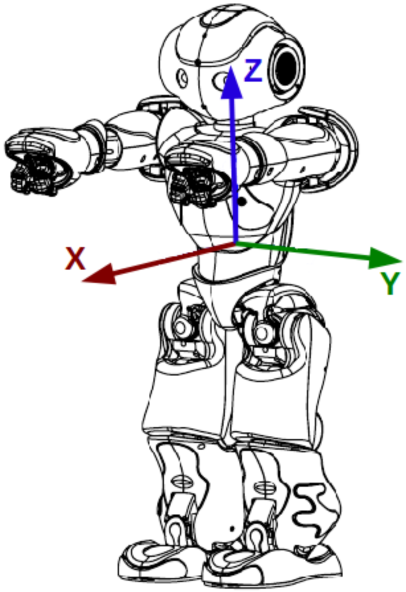
TABLE I. Results of the Different Detecting Algorithms
1 means detected tomato, 0 means detected nothing

	color based	Circle based	Blobs
tomato	1	1	1
carrot	0	0	0
cucumber	0	0	0
garlic	0	background	0
lettuce	0	0	lettuce
all1	1	1	1
all2	1	0	garlic
all3	1	1	1 & background
without1	0	0	garlic
without2	0	0	carrot

Localization

X_robot = (RADIUS_TO_METERS / radius)
Y_robot = (REAL_WIDTH / radius)*(img_width/2 - x_img)
Z_robot = 0.35



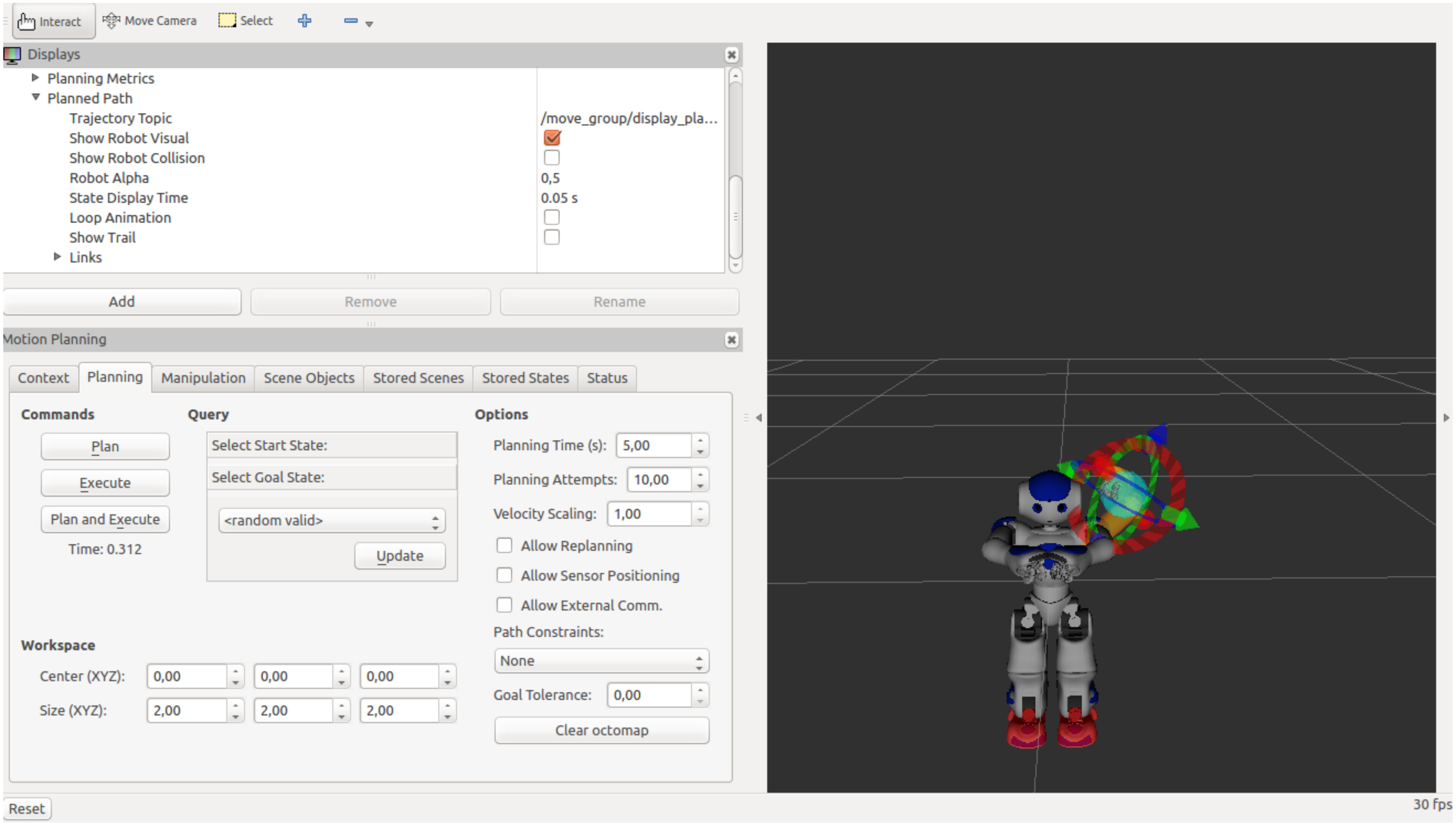


Result

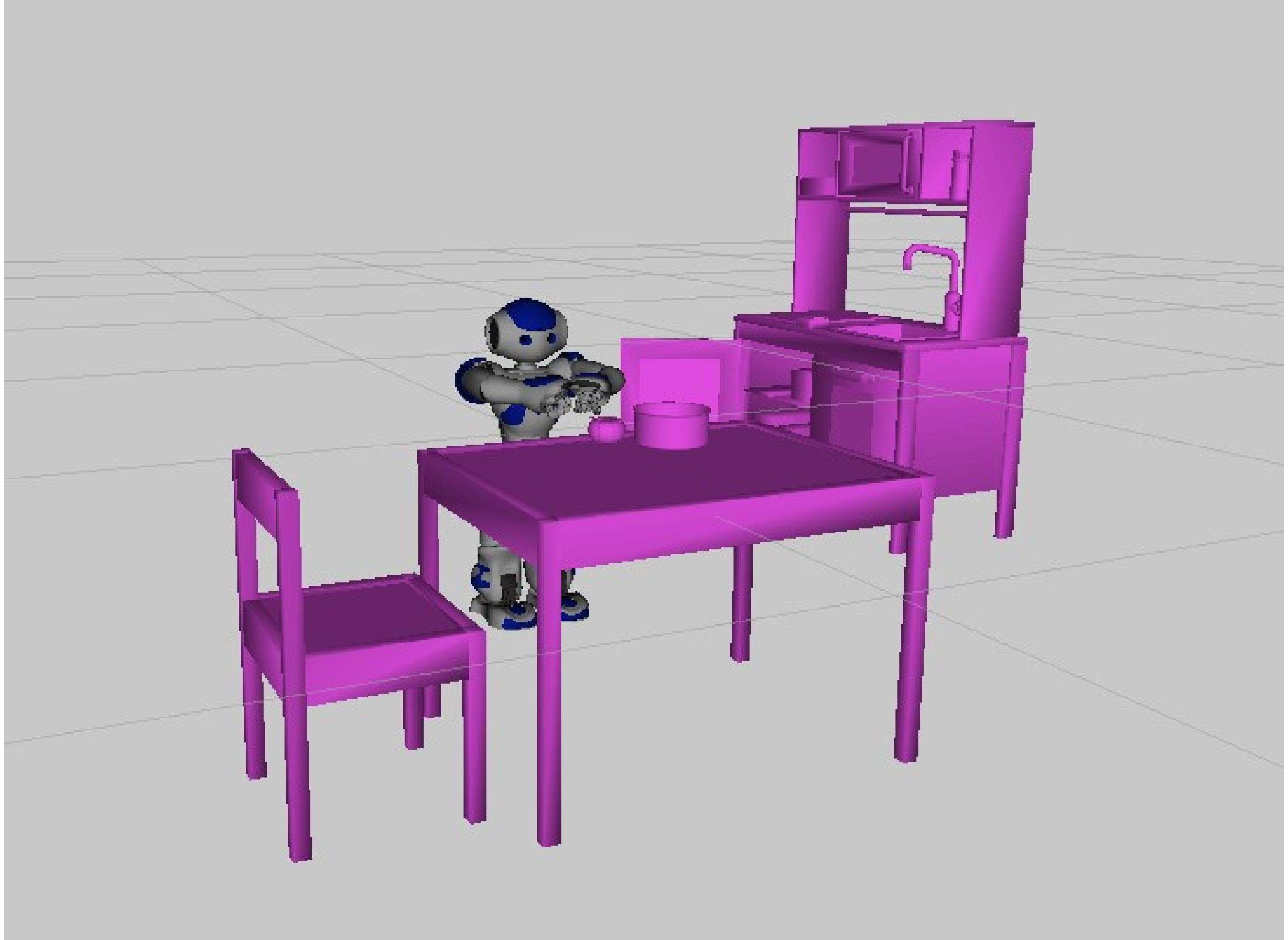
TABLE 2. RESULTS OF THE LOCALIZATION ALGORITHMS, IN METERS

Real x	Real y	Estim. x	Estim. y	Diff. x	Diff. y
0.22	0	0.23	-0.006	0.001	-0.006
0.22	0.076	0.27	0.077	0.046	0.001
0.22	-0.076	0.27	-0.076	0.046	0.000
0.30	0	0.31	0	0.009	0
0.30	0.076	0.31	0.062	0.009	0.014
0.30	-0.076	0.39	-0.071	0.086	0.005
0.38	0	0.37	0.001	0.004	0.001
0.38	0.076	0.37	0.061	0.004	0.015
0.38	-0.076	0.54	-0.076	0.164	0.000

MotionPlanning

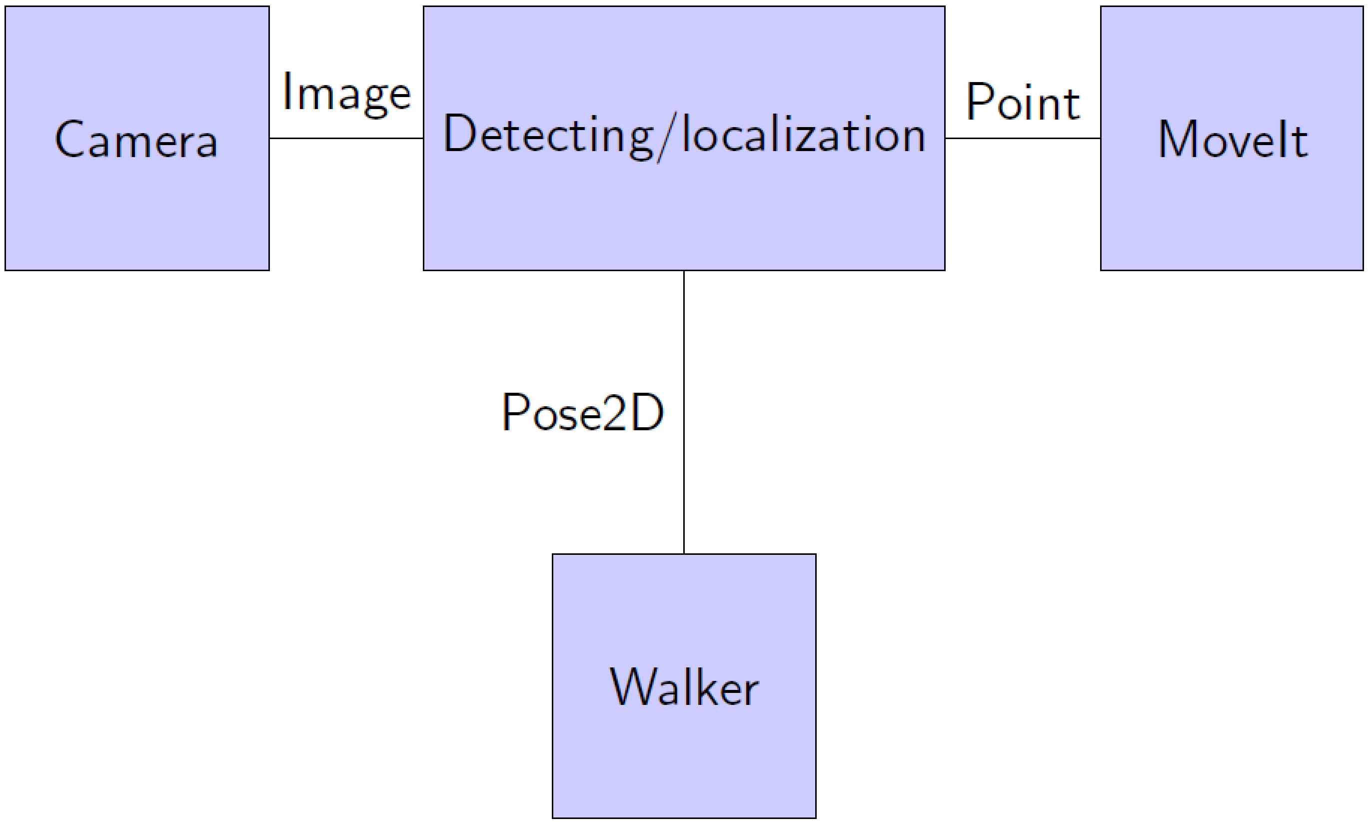


Humabots environment



Environment ported from Webots to Rviz / MoveIt.

ROS pipeline



Result

Tutorial

Software for day 5

To have multiple robots in their own namespace, you could follow the instructionof the pioneer3at_demo provided by Stefan Kohlbrecher and Nate Koenig.

What is needed for to control a real robot is a working version of the simulation of a Nao robot.

- Follow the steps of the ros Nao installation
- mkdir ~/naoqi
- Download pynaoqi-python2.7-2.1.4.13-linux64.tar.gz
- cp ~/Downloads/pynaoqi-python2.7-2.1.4.13-linux64.tar.gz ~/naoqi
- cd ~/naoqi
- tar xzf pynaoqi-python2.7-2.1.4.13-linux64.tar.gz
- echo 'export PYTHONPATH=~/naoqi/pynaoqi-python2.7-2.1.4.13-linux64:$PYTHONPATH' >> ~/.bashrc
- python

  inside python shell

  >>> from naoqi import ALProxy

  >>> quit()

If this works, the NaoQi Python bindings are correctly installed. Continue with the ROS packages for the Nao robot.

- sudo apt-get install ros-indigo-nao-robot
- sudo apt-get install ros-indigo-nao-bringup
- sudo apt-get install ros-indigo-naoqi-bridge
- sudo apt-get install ros-indigo-naoqi-extras

FutureOfRescue/day5.php

Conclusion

In this workshop:

- we have a simulated arena from two virtual rescue competitions
- we have used two protocols
- we have have experimented with multiple robot settings
- we have seen that the ros-code could be directly applied to real robots

- **Robots, Games, and Research: Success stories in USARSim**
  A full day workshop held at IROS 2009
  Steve Balakirsky, Stefano Carpin and Mike Lewis
- **USARSim/MOAST: Highly Realistic Simulation and Control for Multi Robot**
  A full day workshop held at ICRA 2006
  Stefano Carpin, Mike Lewis, Adam Jacoff, and Stephen Balakirsky
- **Urban search and rescue: from Robocup to real world applications**
  A full day workshop held at IROS 2004
  Stefano Carpin, Andreas Birk, Daniele Nardi, Adam Jacoff and Satoshi Tadokoro