

Medial Preparation of RoboNewbie for e-Learning

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The best way to understand (Artificial) Intelligence and Robotics is programming robots



RoboNewbie Framework

For experiments with simulated humanoid robots.

Required general resources:

- Normal computer
- Windows, Java, NetBeans, Java 3D

Required special resources

1. RoboNewbie
2. MotionEditor
3. Simulator SimSpark (Soccer playing: RoboCup)

Download: <http://www.naoteamhumboldt.de/projects/robonewbie/>



Robot Soccer as Challenge



Chess:

- Static
- 3 Minutes per move
- Single action
- Single player
- Information:
 - reliable
 - complete

Soccer:

- Dynamic
- Milliseconds
- Sequences of actions
- Team
- Information:
 - unreliable
 - incomplete

RoboCup Championships

	1997	Nagoya
	1998	Paris
	1999	Stockholm
	2000	Melbourne
	2001	Seattle
	2002	Fukuoka
	2003	Padua
	2004	Lissabon
	2005	Osaka
	2006	Bremen
	2007	Atlanta
	2008	Suzhou
	2009	Graz
	2010	Singapur
	2011	Istanbul
	2012	Mexico City
	2013	Eindhoven
	2014	Jeao Pessoa



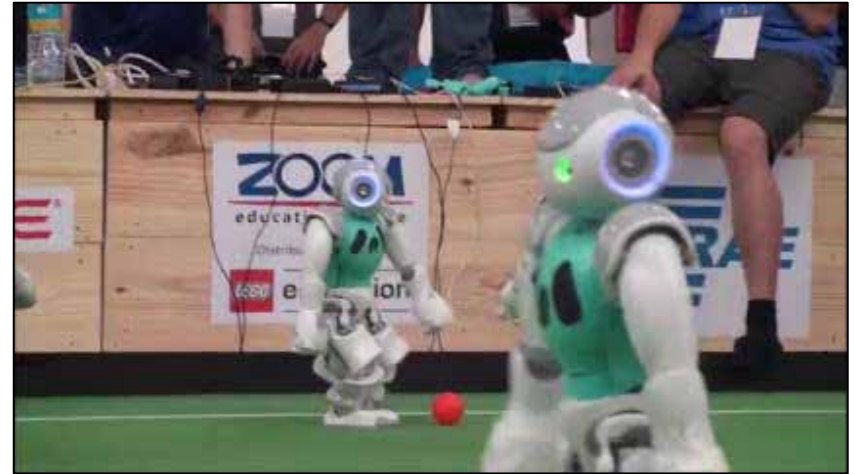
Bremen 2006:
444 Teams in different leagues
with ca. 2500 participants
from 36 countries

Research and Championships



1st RoboCup 1997

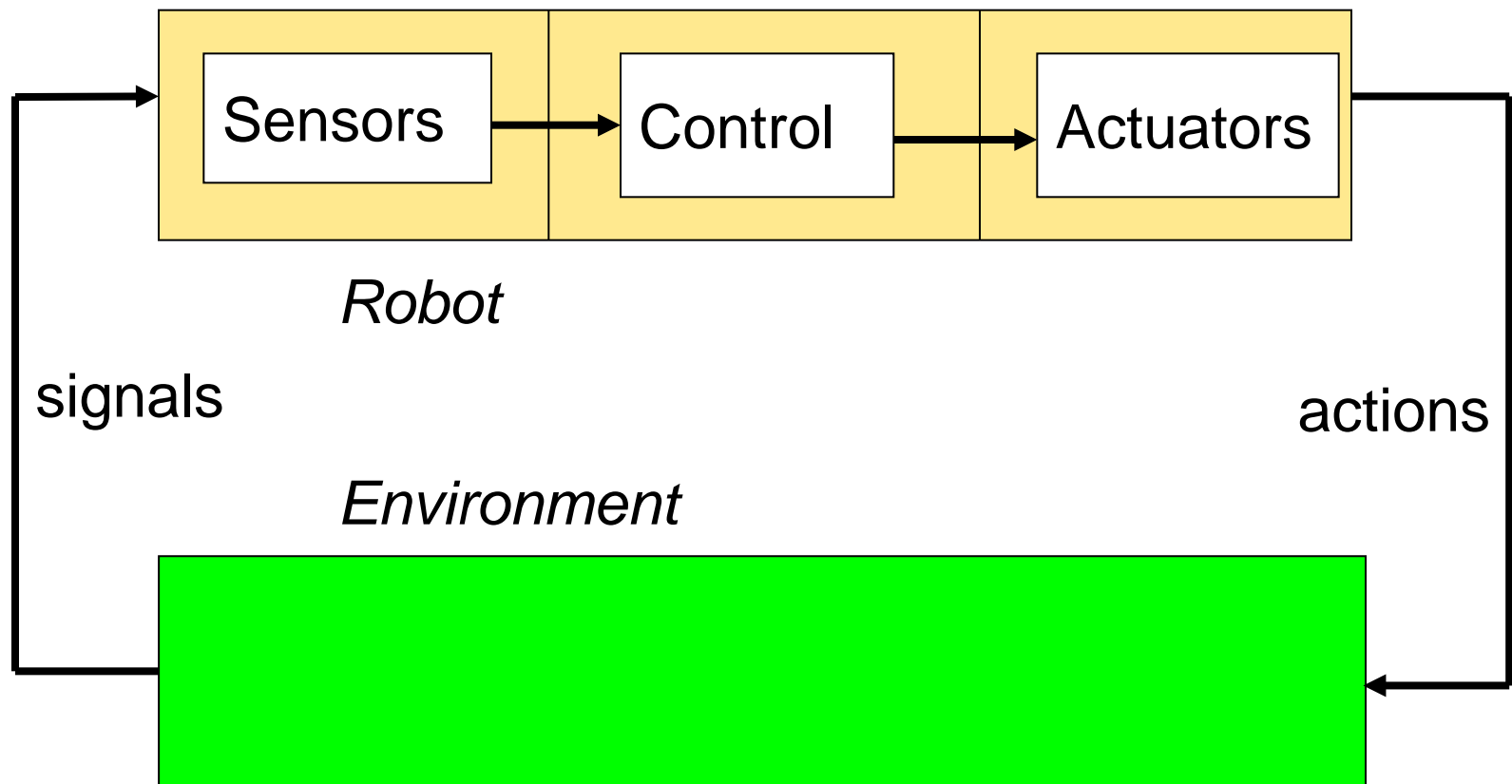
Nagoya (Japan)



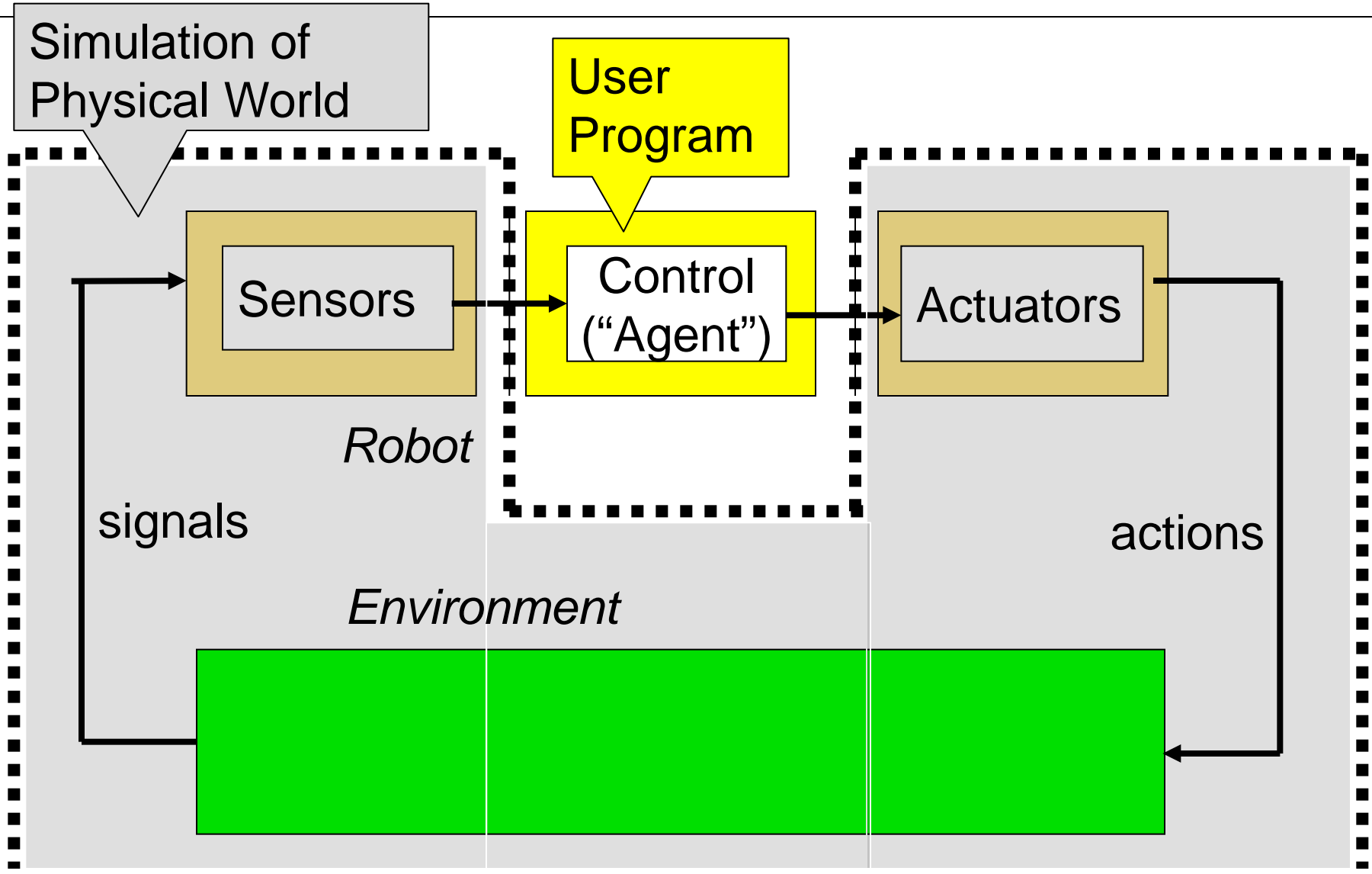
18th RoboCup 2014

Joao Pessao (Brasil)

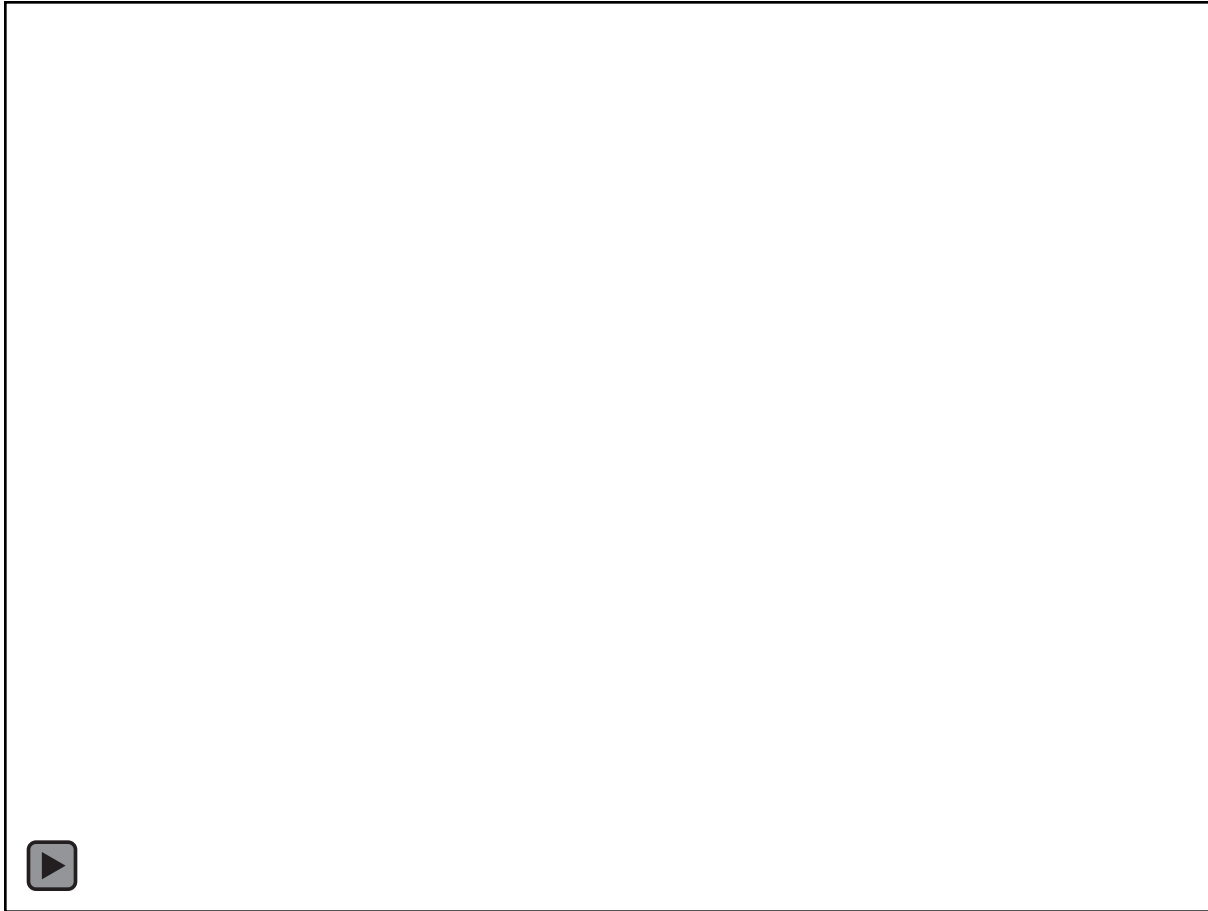
Real Robot in Real World



Simulation



Simulated Soccer



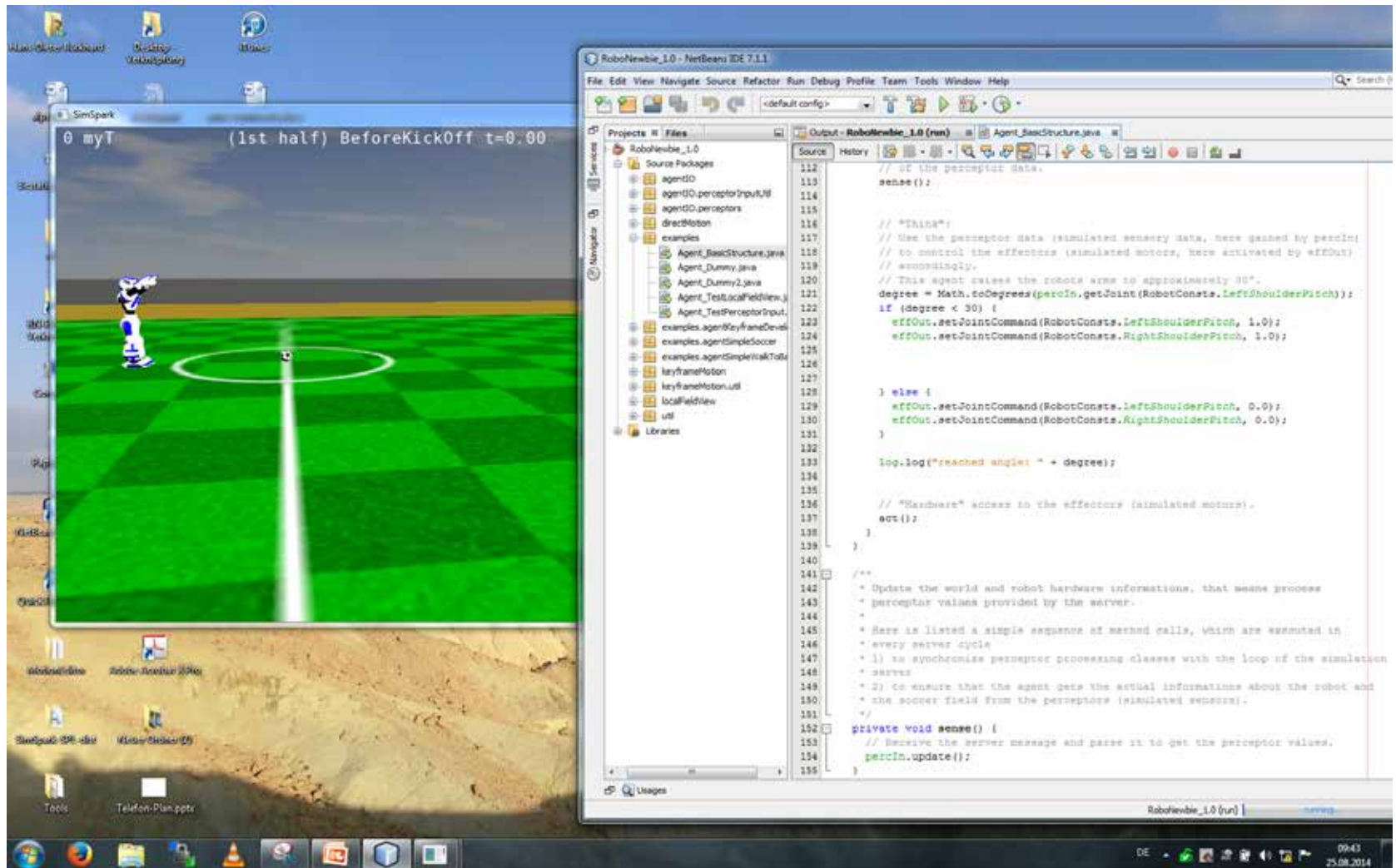
RoboCup2012 Mexico City Final Match (1.half)
UT Austin Villa (University of Texas at Austin, USA)
vs. **RoboCanes** (University of Miami, USA)

RoboNewbie

Uses the soccer simulation of the RoboCup community.
Provides a framework for connecting players to simulator.
Provides first examples.



RoboNewbie: Installation < 30 minutes



RoboNewbie was used

In Robotics courses with about 30-40 hours lectures/exercises

... according to our DAAD project in
Novi Sad, Rijeka, Sarajevo, Plovdiv.

... according to other DAAD funding in
Ohrid.

In other courses in Warsaw and Berlin.

Students can exercise

Problems concerning

- Perception
- Motion
- Decision making

All must be integrated according to soccer play.

Final competition:

Groups of students compete
with programs for fast scoring players.

Students exercise

Best result up to now:
Plovdiv June 2014

Damyan Damyanov
Ivelin Rusev
Petar Bilev



RoboNewbie at a Secondary School

Part of an extended Informatics course.

- Based on Java programming skills.
- Needs some more explanations concerning underlying Mathematics and Physics.

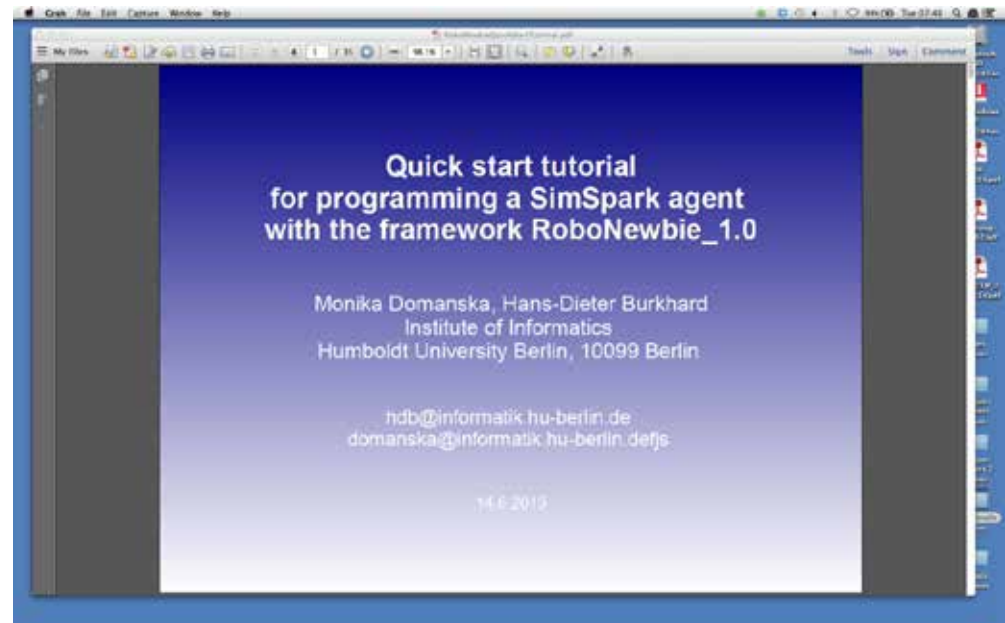
Workshops about usage of RoboNewbie held by the students for

- interested teachers
- new students

Preparation for e-Learning

Plans for a complete course.

Start with our tutorial for RoboNewbie:
Transfer existing slides to videos.



Structure of Videos

No replay of a lecture

Short episodes

How to move a limb

Big screen for presentations, examples, ...

*Scheme of all joints,
Interesting parts of programs, ...*

Questions, exercises:

Integrated in episodes with discussion of possible results

Task: Program a head movement

Preparation

Minimize cutting

Produce complete (parts of) episodes as a whole

Scripts with pre-planned text and links to presentations

Appearance related to perspective of student

Prepared presentations: examples, exercises, results, ...

Programs: code, parts to show/change

Running programs

Moving robot

First trial

The screenshot shows a desktop environment with three main windows:

- OpenOffice.org Writer:** A presentation slide titled "Part 1: Motor control" with text describing the "Agent_BasicStructure" program and its motor commands.
- NetBeans IDE:** A Java IDE window showing the project structure for "RoboNewbie_1.0" and the source code for "Agent_BasicStructure.java".
- RoboNewbie_1.0.m4v:** A video player window showing the output of the RoboNewbie application.

Spoken text teacher	Screen NetBeans	Screen
Part 1: Motor control		
Agent_BasicStructure is our "Hello World" program. It shows how our framework works. The robot lifts his arms for welcome. To do so, he must move the joints in the shoulders with his motors. The motors must therefore receive a command by the control program.	Open Agent_BasicStructure	0.00
How to use the <code>Agent_BasicStructure</code> program. Using the <code>Agent_BasicStructure</code> class from the <code>org.robocup.teachbot</code> package.		0.20
Motor commands are defined here.	124 ff	0.50 0.60
LeftShoulderPitch is the joint for moving left arm up and down.		1.25 Show
RightShoulderPitch is the joint for moving right arm up and down.		Show
Both motors are driven simultaneously such that both arms move at the same time.		1.30 Show motion for both arms
NEW EPISODE We study the motor command in more		

```

private void sense() {
    // Sense the sensor message and parse it to get the message fields.
    sensor.update();
}

// Move the robot forward, that means also attach message to the sensor
// Move up 1 unit & apply rotation of sensor call. wheel and wheeling in
// every sensor cycle
// To calculate the rotation, we need to know the rotation of the sensor
// To move the robot forward to the sensor regularly in every sensor
// cycle
// Second to take the "prop" message to be used in every sensor cycle.
// Use up "agent" message for details.

private void act() {
    // Send agent message to the sensor.
    agent.sendAgentMessage();
}

// Print sensor information.
private void printLog() {
    log.println();
}
    
```

First learned lesson

- Use robot for demonstration of gestures
- Highlight important parts of code
- Don't be stuck at prepared texts
- But perform demonstrations strictly as prepared
- Keep the predefined ordering of demonstrations

Thank you!

By the way: Next RoboCup Competitions will be

- Hefei (China) 2015 July 5-11
- Leipzig (Germany) 2016 June 30- July 4



Promotion Video for RoboCup 2016