

Practical issues

- Deadlines for the learning diary:
 - 8.11.2007, at noon
 - 22.11.2007, at noon
 - 13.12.2007, at noon
- There might be a change for the follow-up seminar at December, 7 (due to Independence Day in Finland)

Educational robotics

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Educational robotics in general

- The basic principles of robotics apply
- Cheap price is essential
 - Potential buyers: Educational institutions, parents
- Flexibility
- Expandability
 - Should be possible to apply in different contexts

Pedagogical foundations

- Emphasis on constructivism
- Learning by doing, learning by playing
- Problem based learning
- Learning settings and teaching methods should be re-defined
- Students' activity is essential

Case: Kids' Club

- Kids' Club combines technology club and research platform
- 10-15 years old kids and youngsters working with various technology projects
- Research: How particular tools work?
- Video (10 mins)

Educational robotics research

- Technical research
 - Artificial intelligence
 - Programming languages
- Educational research
 - Case studies about the usage of educational robotics
- Publications reporting successful and unsuccessful experiments can be found

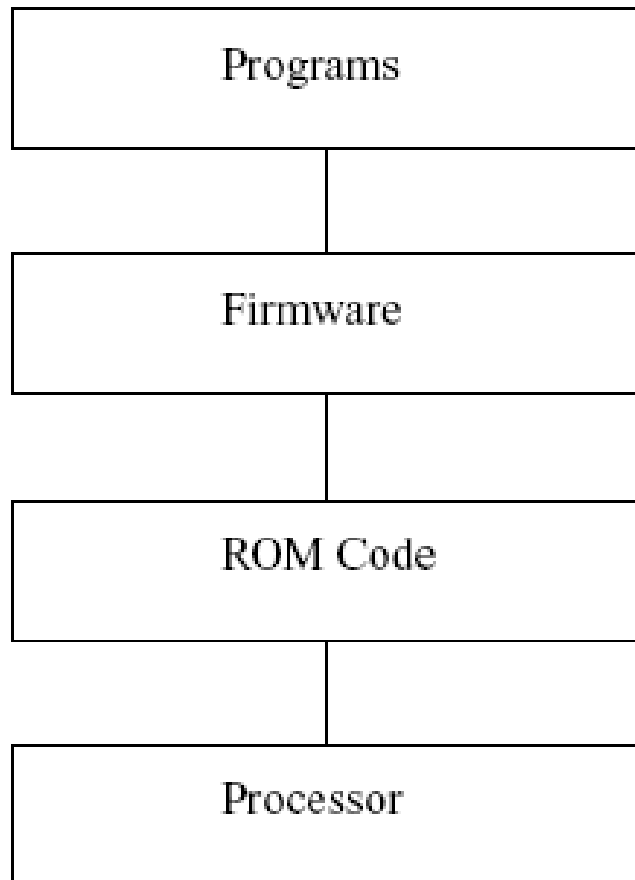
Lego Mindstorms

- Originally developed at MIT in mid-1980's
- Widely in use in all education levels
- A complete construction set with hundreds of pieces, sensors, motors, and RCX unit
- Programmable with various programming languages and platforms (RCX Code, NQC, Java, .NET, C(++), Python, ...)

Lego hardware

	RCX 2.0	RCX NXT
Processor	8-bit Hitachi H8	32-bit ARM7
Memory	32 Kb RAM, 16 Kb ROM	256 Kb FLASH, 64 Kb RAM
Outputs	3 motor ports	3 output ports
Inputs	3 sensor ports	4 input ports
Display	LCD display	100 x 64 pixel LCD graphical display
Batteries	6 AA (1.5 V)	6 AA (1.5 V)
Communication	IR port (transmitter + receiver)	USB 2.0, Bluetooth

Lego hardware



- Several abstraction layers
- Programmer works in the highest level
- Firmware can be replaced

A crash course for programming Legos

- Programming with PC
- Uploading the programs to the robot via IR, Bluetooth or USB
- Executing the program
- Fixing misbehaviors (hardware or program)
- Two examples of a simple program:
 - Make a robot which moves forward and stops when it collides

A crash course for programming Legos

- Subtask 1: Build a robot (already done)
 - Essentials: Motors and wheels for moving
 - Touch sensor(s) to detect the collision
 - Bumper to enhance the the functionality of touch sensor
- Subtask 2: Make the robot to move
 - Simple commands to run the motors
- Subtask 3: Program the touch sensor
 - Sensor listener or event loop can be used

A crash course for programming Legos

- Let's compare the implementation in two programming languages:
 - RCX Code: Fully graphical programming environment, bundled with Lego packages
 - NQC: **Not Quite C**, a C-like language for programming the robots with a standard firmware

Individual tasks

- Task 2: Educational robotics research
 - Search scientific articles about usage of educational robotics (published after 2000) from digital libraries and other search engines
 - Select two most interesting articles and write a short (one page) summary from these articles
 - Deadline 8.11.2007, at noon (together with learning diary)

Individual tasks

- Task 3: Kids' Club visit
 - Visit Kids' Club technology club
 - (<http://cs.joensuu.fi/kidsclub>)
 - Visits are possible according to the following schedule:
 - Tuesday 6.11, Thursday 8.11, Tuesday 20.11, Tuesday 4.12, 4pm – 6pm at EdTech lab (Science Park, 3rd floor)
 - Write a short reflection (your own thoughts) about what you saw in the club (you can also interview kids)
 - Deadline: 13.12.2007, at noon (together with learning diary)

Group work

- Form a group of 4-5 students
 - Group should be able to work together until end of course
- Select a chair of the group
 - Chair's duty is to keep group's working in control
 - First duty: Report names and emails of the group to Ilkka (by email after the lecture)

Group work

- Group should pick one of the topics:
 - RCJ Soccer robot (two groups)
 - RCJ Rescue robot (two groups)
 - Machine learning with Lego Mindstorms (for example maze solver)
 - Remote programming of the robots
 - Usage of mobile devices to program the robots
- First follow-up seminar next Friday
 - A short presentation about your implementation plans

Summary of the tasks

- Learning diary
 - Next part for the diary, deadline 8.11. at noon
- Individual task 2:
 - Article search, deadline 8.11. at noon
- Starting of the project work
 - A short group presentation on next Friday
 - No submissions needed in advance