teutolab-robotik - Hands-On Teaching of Human-Robot Interaction

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Motivation: bringing students of secondary school in touch with research

• Intelligent systems encounter us in our everyday life
• Increasing students’ interests in a playful way
• Countering the negative prejudices like “programming is too difficult”
• Motivating young people for a study at the involved departments at Bielefeld University
Motivation: Why Human-Robot Interaction?

- Available platforms like Nao, Aibo, or Pleo allow a new interdisciplinary perspective on robotics
- Emphasizing the social dimension of robotics
- Emphasizing learning aspects
- Getting an own (emotional) experience of robotics
What is *teutolab*?

- Hands-on laboratory experience for school students and their teachers
- For more than ten years at Bielefeld University
- Overarching goal is to sensible children and youths for scientific themes
Goals of teutolab-robotik

- Showing the fascination and variety of robotics instead of its complexity
- Creating self-identification with science and technology
- Students learn team working and increase their socio-cognitive processes
- An age-appropriately experimental enlarge to school
Courses’ model – Part I

- School students slip into the role of young researchers for one afternoon (three hours)
- Focusing on human-robot interaction, cognition and learning robots
- Two courses for students of secondary schools:
  - Academy of Robots (Die Roboterakademie):
    - for students of grades 7 to 9 (age 12-15)
  - Lab of Learning (Das Lernlabor)
    - for students of the senior grades (age 16-19)
Courses’ model – Part II

• Offer for class groups and single enrolments to open workshops and during school holidays
• Workshops occur without school teachers’ participation
• Course instructors are students
• No teacher-centred teaching
• Previous knowledge isn’t necessary
• Physical interaction with robots
• Programming with graphical interfaces
“Academy of Robots“ (age 12-15)

• Topics: human-robot-interaction and learning robots
• Contents:
  - Decision tree – differences between human’s and robot’s recognition a person
  - Robot platforms: Pleo and Aibo
• Goals:
  - getting to know the sensors
  - Programming tricks and a learning process
“Lab of Learning“ (age 16-19)

• Topics: learning robots and machine vision
• Contents:
  - “Bauernschach” – playing a board game against the computer
  - Robot platform: humanoid robot Nao
• Goals:
  - Realising which game strategy is used and assigning it to the robot
  - Programming learning strategies for the game “Rock, Paper, Scissors”
“Lab of Learning“
Introductory example “Bauernschach”

System learns strategy from success and failure examples
"Lab of Learning"
Transfer task: play rock-paper-scissors

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rock     scissors     paper     fountain
“Lab of Learning”
Using *Chorégraph* for programming
“Lab of Learning“
Simulation environment Webots
Course statistics and impact

- Since the start:
  - roughly 620 visitors
  - above 65 workshops
  - about 40% female participants
- The course is integrated in annual events like Girls’ Day and peanuts-Herbsthochschule
- Collaboration with school teachers and projects for highly gifted attendees like Kolumbus-Kids
Conclusion and Outlook

- Continuous evaluation of the courses with the participants’ feedback (89% best or 2nd best mark)
- Enlarging the offer to workshops for younger students and adults
- Creating of materials for teachers
- Better integration of robotics in school education (Bielefeld U is official education partner of Aldebaran)
- Aspiring cooperative EU-projects in education with robots
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Dissemination in German TV (kids channel)