Autonomous Robots I (Robotic/Cobotic) - Orga

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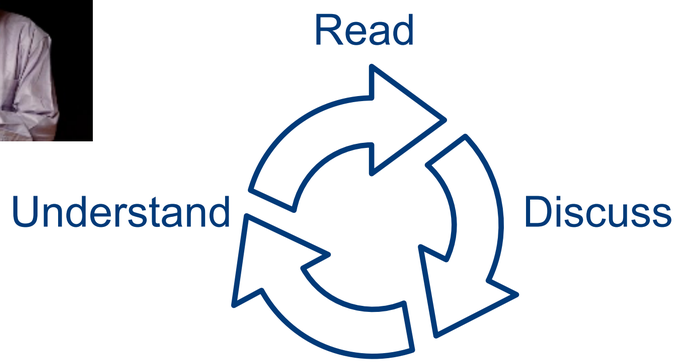
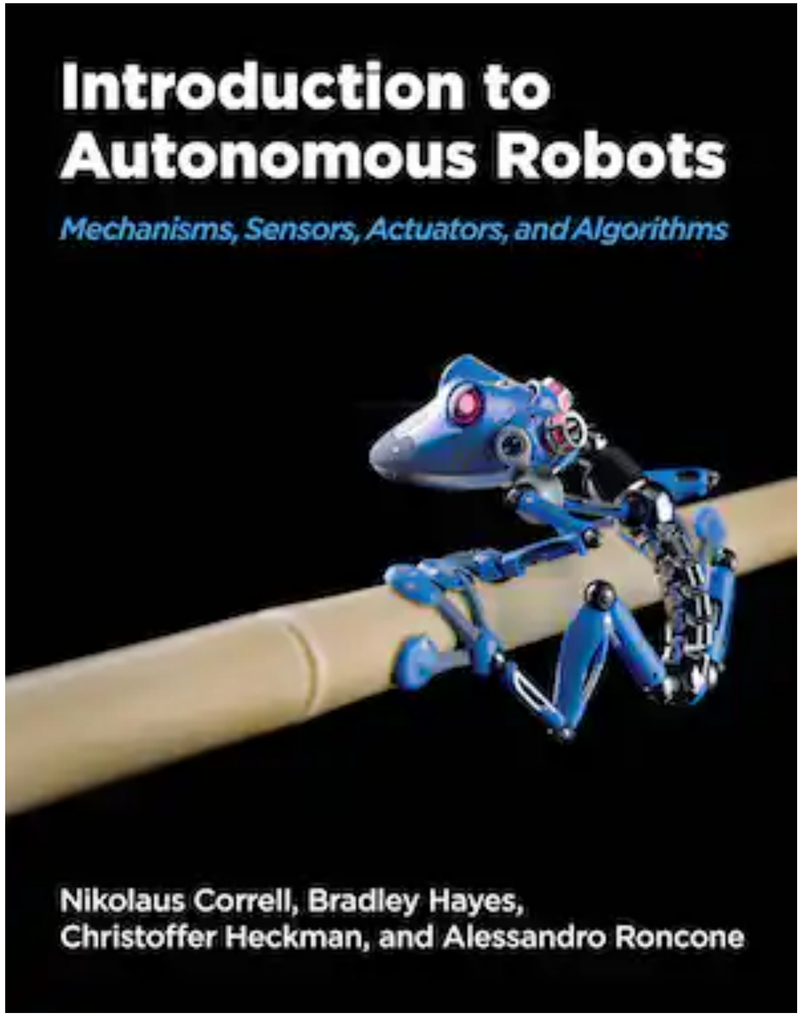
- Content
  - Stationary Robots / Robot Manipulators
  - Kinematics, Dynamics
  - Vision, Perception
  - Grasping

- Joint Ostfalia/NTNU Lecture https://vc2.sonia.de/b/rei-3du-vaa-1zu
  - Robots (Prof. Gerndt - Ostfalia)
    - Inverted / flipped classroom
      - Read ‘Introduction to Autonomous Robots’ chapters 1 to 9* https://ebookcentral.proquest.com/lib/ostfalia/detail.action?docID=29673057
      - Consultations
        - Summarise and Discuss
  - Robot Vision (Prof. Baltes - NTNU)
    - Remote lectures
  - Project work (joint students teams)
    - Implement
    - Understand





Prof. Dr.-Ing. Reinhard Gerndt (r.gerndt(at)ostfalia.de)

* Mobile Robots will be subject of the lecture ‘Autonomous Robotics’

Inverted Classroom

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- https://ebookcentral.proquest.com/lib/ostfalia/detail.action?docID=29673057,
- e.g. chapter 1:
- ‘Introduction’

Robotics celebrated its 60th birthday in 2021, dating back to the first commercial robot in 1961 (the Unimate). In a “Tonight Show” at the time, this robot did am
ball into a ho
things we exp
creative. Sinc
years have pa
be and what

Take-home lessons

- The best solution to a problem is a function of the available sensing, actuation, computation and communication abilities of the available platform. Usually, there exist trade-offs that allow you to solve a problem using a minimal set of resources but compromise performance characteristics such as speed, accuracy or reliability.
- Robotics problems are di
Intelligence, particularly
or actuation.
- The unreliability of senso
a probabilistic notion of
uncertainty.

Exercises

1. What kind of sensors do you need to solve the “Ratslife” game? Think both about trivial and close-to-optimal approaches.
2. What devices in your home could be considered robots? Why and why not?
3. Is a mechanical clock a robot? Why and why not?

- Weekly assignment: 1-page summary of each chapter and relation to >= 1 reference (paper, book, …)

Projects

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- Peg-in-hole using Intera on Sawyer robot
  - Repeatedly pick up pegs and place it in holes according to some high-level algorithm

- Dynamic Pick-and-place using ROP on Sawyer
  - Repeatedly pick objects from a dynamic environment and place objects in a dynamic environment

- Mixed teams with Taiwan for robotics and vision expertise
- Details to follow!

Schedule* - Thursday 08:15 - 11:30 - Room 152 + HCR Lab

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Date	Subject
26.09.	1. Introduction, Introduction to Sawyer robot with Intera; Peg-in-hole project start
03.10.	Holiday - Time to work on Peg-in-hole project
10.10.	2. Robotics consultations (chapter 2 summary due), introduction to ROS, Gazebo, … and project work
17.10.	3. Computer vision lecture, robotics consultations (chapter 3 summary due), introduction to ROS, Gazebo, … and project work
24.10	4. Computer vision lecture, robotics consultations (chapter 4 summary due), introduction to ROS, Gazebo, … and project work
31.10.	Holiday - Time to work on project
07.11.	5. Peg-in-hole project presentation, consultations (chapter 5 summary due) and project work
14.11.	6. Computer vision lecture, consultations (chapter 6 summary due) and project work; Dynamic Pick-and-place project start
21.11	7. Computer vision lecture, robotics consultations (chapter 7 summary due) and project work
28.11.	8. Computer vision lecture, robotics consultations (chapter 8 summary due) and project work
05.12.	9. Computer vision lecture, robotics consultations (chapter 9 summary due) and project work
12.12.	10. Consultations and project work
19.12.	11. Dynamic Pick-and-place project presentation, due date for final documentations
???	Final exam

*Subject to change

Good to Know

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- StudIP - ‚Robotics/Cobotics'
  - Slides
  - Additional documents
  - File exchange (consider setting up a Git for your programming activities)
  - Groups (possibly 2 +2)

- Grading covering robotics and vision
  - 10% One page summaries
  - 50% Projects
    - 20% Peg-in-hole (demonstration, documentation and video)
    - 30 % Dynamic Pick-and-place (demonstration, documentation and video)
  - 40% Exams
    - 10% Intermediate exam
    - 30% Final exam