Aalto University
School of Electrical
Engineering

ELEC-E8126 Robotic Manipulation Course information

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What do you expect from the course?

Contents

- Aspects of state-of-the-art robot manipulation
    - Perception
    - Planning trajectories
    - Planning grasps
    - Learning manipulation skills
    - Coordinated motions
    - Handling contact

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Learning goals – What's the course about?

After completing the course, a student can

- explain main concepts related to robotic manipulation

- read scientific literature in robotics to choose approaches for a particular problem

- implement state-of-the-art algorithms

State-of-the-art examples

- Learning dynamic manipulation tasks
  - https://youtu.be/W_gxLKSsSIE
- Learning assembly tasks
  - https://youtu.be/JeVppkoloXs
- Learning dextrous in-hand manipulation
  - https://www.youtube.com/watch?v=6fo5NhnyR8I

Prerequisities

- Programming (C++ will be used in assignments)
- Robotics basics (e.g. kinematics)
- Control engineering basics (e.g. feedback, PID)
- Math (calculus, vector and matrix algebra)

- Motivation to work hard!

Teaching

- Independent study
  - Readings

- Lectures
  - Discuss concepts, summarize, give new viewpoints
  - Mon 10:15-12 (periods 3-4)

- Assignments / quizzes
  - Weekly electronic quizzes based on lectures and readings

- Assignments / mini-project exercises
  - 6 exercises / mini-projects, to be completed individually

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Grading and evaluation

- To pass, 50% of maximum total grade must be achieved.

- Grading
  - Quiz-assignments 25%
  - Exercise-assignments 75%

- Extra points from active participation (lectures/exercises).

Workload estimate

- Lectures 24 h
- Exercise sessions 22 h
- Independent study / Readings and quizzes 28 h
- Independent study / Solving exercises 56 h
- Total 130 h

Material

- MyCourses
  - Lecture slides
  - Links to readings and videos

- Primary book
  - Lynch & Park, "Modern Robotics: Mechanics, Planning, and Control"

- Secondary books
  - LaValle, "Planning algorithms"
  - Murray, Li & Sastry, "Mathematical Introduction to Robotic Manipulation"

Teachers

- Lecturer
  - Ville Kyrki (ville.kyrki@aalto.fi)

- TAs (assignments and project)
  - Fares Abu-Dakka
  - Eshagh Kargar
  - Tran Nguyen Le

Contacting teachers

- Primary
  - At lectures/exercises
  - Course Slack channel

- Secondary
  - Email

Questions?