Aalto University
School of Electrical
Engineering

ELEC-E8126 Robotic Manipulation
Course information

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17.1.2022

What do you expect from the course?

Contents

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

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!

Follow MyCourses!

Teaching

- Independent study
  - Readings
- Lectures
  - Discuss concepts, summarize, give new viewpoints
  - Mon 10:15-12 (periods 3-4), over Zoom
- Assignments / quizzes
  - Weekly electronic quizzes based on lectures and readings
- Assignments / exercises tasks
  - 6 exercises tasks, to be completed individually
  - Weekly electronic quizzes to familiarize with exercise materials

Grading and evaluation

- To pass, 50% of maximum total grade must be achieved.
- Grading
  - Quizzes 25% (lecture+exercise-quizzes)
  - Exercise-assignments 75%
- Extra points from active participation (lectures/exercises).

Workload estimate

- Lectures 26 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)
  - Guest lecturers: Gökhan Alcan, Fares Abu-Dakka

- TAs (assignments)
  - Fares Abu-Dakka
  - Tran Nguyen Le
  - Jens Lundell
  - Daulet Baimukashev

Contacting teachers

- Primary
  - At lectures/exercises
  - Course Slack channel
- Secondary
  - Email

Questions?