ECE470S - Robot Modeling and Control

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Instructor

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Teaching Assistants

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Lectures

Day and Time Room
Mon 15-16 BA1190
Wed 15-16 BA1190
Fri 9-10 BA1190

Textbook


Note: previous editions of this text are not compatible with this course

Additional Reference Text


Course Outline

• Classification of robotic manipulators and common kinematic arrangements
• Rigid motions
  ◦ Rotations, rotational transformations, and their parametrizations
  ◦ Composition of rotations
  ◦ Homogeneous transformations
• Forward and inverse kinematics
  ◦ Kinematic chains and forward kinematics
  ◦ Denavit-Hartenberg convention
  ◦ Inverse kinematics
• Velocity kinematics
  ◦ Angular velocities; addition of angular velocities; linear velocities
  ◦ Geometric and analytical Jacobian
  ◦ Static relationship between end effector forces and joint torques
  ◦ Inverse velocity and acceleration
  ◦ Kinematic singularities
• Path planning using artificial potential fields
• Independent joint control
• Dynamics
  ◦ D'Alembert-Lagrange principle and Euler-Lagrange equations of motion
  ◦ Equations of motion of a robot
• Multivariable control
  ◦ PD control with gravity compensation
  ◦ Feedback linearization in joint and task spaces
  ◦ Adaptive passivity-based control
Midterm Exam
Monday, March 6, 6-8PM,
EX310

Composition of Final Mark

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Tutorials

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<td>TUT01</td>
<td>Mon 10-12, WB342</td>
<td>Jan 23, Feb 6, Feb 27, Mar 13, Mar 27, Apr 10</td>
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<td>TUT02</td>
<td>Mon 10-12, WB342</td>
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Homework Assignments

There will be four to six homework assignments. Each submission will be given full credit (1 out of 1), independently of its correctness, provided that it is clearly legible and reasonably complete. Messy or largely incomplete assignments will not be given credit.

Laboratories (BA3114)

There are four labs in this course. They are performed in groups of two students. You'll form lab groups at the first lab session.

All labs require a preparation and a report. Each lab group submits a preparation at the beginning of the lab. One week after the lab, each lab group submits a lab report in box (TBA).

There are no make-up labs. You are not allowed to switch lab sessions. This is a strict policy. The TA will mark down the attendance.

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