ColumbiaX: CSMM.103x Robotics

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COURSE OUTLINE

Beginning of every week, new material will be available and the corresponding project/homework will also be released. Following outlines the material to be covered and schedule.

Week 1: Starts September 17

- Introduction to Robotics
- Robotics and AI
- Introduction to ROS
- Project 1

Week 2: Starts September 24

- 2D Transforms, Homogenous Coordinates
- 3D Transforms, Thinking about Transforms
- Transform Inverse, Rotation Representations
- Transforms in ROS, the TF library
- Project 2

Week 3: Starts October 1

- Robot Arms Introduction, Kinematic Chains
- Forward Kinematics: URDF
- Forward Kinematics: Analytical Methods, DH Parameters
- Forward Kinematics: DH Examples
- Project 3

Week 4: Starts October 8

- Analytical IK, Robot Examples
- Robot Workspaces and IK Solutions
- Homework 1

Week 5: Starts October 15

- Differential Kinematics: Jacobian Definition and Analytical Computation
- Singularities
- Full Kinematics: Robot Examples
- Homework 2

Week 6: Starts October 22

Study week

Week 7: Starts October 29

- Numerical Jacobian Computation
- Cartesian and Null Space Control
- Project 4

Week 8: Starts November 5

- Motion Planning: Configuration Space vs. Task Space
- Stochastic Motion Planning
- Project 5

Week 9: Starts November 12

- Mobile Robots Introduction
- Mobile Robots Kinematics: Differential Drive, Other Kinematics
- Path planning for mobile robots

Week 10: Starts November 19

  - Course Recap
  - Things We Have Not Covered
  - Robotics and AI Revisited

Final Exam

11/26/2018 - 12/3/2018