ME 699
Control of Robotic Systems
Spring 2019

Contact Information

Instructor:	Dr. Hasan A. Poonawala
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Course Information

Time & Location Mon & Wed 5:00pm - 6:15pm, FPAT 255.

Course Description

The course focuses on the theoretical foundations that enable us to make robots move the way we want them to move. The first part of the course involves modeling of robotic systems such as industrial robot manipulators, legged robots, and quadrotors, using equations that capture the mechanics of these systems. The movements we want become control problems defined in terms of these mechanical models. The second part of the course focuses on some of these control problems and the leading methods we know for solving them. Students will implement these methods via simulations of robots, and a portion of the evaluation will involve successfully simulating robot tasks.

Course Topics

Rigid body kinematics and dynamics; Serial Link Manipulators; Kinematic and Analytic Jacobians; Forward/Inverse Dynamics; Singularities; Trajectory Planning; Position Control; Force Control.

Prerequisites

No course prerequisites. The course relies heavily on linear algebra, dynamics, and control systems. Coursework involves programming using Julia, MATLAB and python.

Student Learning Outcomes

Students will learn how to

- represent 3D spatial relationships mathematically,
- formulate kinematic and dynamic equations of robotic systems,
- synthesize position/trajectory/force tracking controllers, and
- simulate robotic systems and test control algorithms.

Required Materials

No required textbook.

Main text: *Robot Modeling and Control*, M. W. Spong, S. Hutchinson, and M. Vidyasagar, John Wiley & Sons, 2006.

Supplementary texts:
Introduction to Robotics: Mechanics and Control, J. J. Craig, Prentice Hall, 2004.

Robotics: Modelling, Planning and Control, B. Siciliano, L. Sciavicco, L. Villani, and G. Oriolo, Springer, 2011.