EE 543: Models of Robot Manipulation Blake Hannaford

Course Overview

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- Spatial Serial Chain Mechanisms
- Using robot arms to position and orient objects
- Mathematical Analysis
- Emphasis on computational issues (not theoretical)
- Innovative and Time Efficient Course Structure

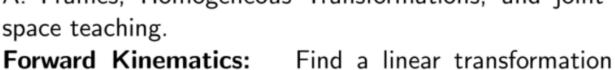


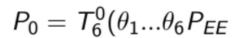
ELECTRICAL ENGINEERING

Understand and Program Solutions to Fundamental **Problems**

Positioning: Q: How do we specify the position and orientation of robot arms and objects?

A: Frames, Homogeneous Transformations, and jointspace teaching.





from end effector (P_{EE}) to base frame (P_0) :





Inverse Kinematics, Incremental Kinematics (velocity and force), Inverse Dynamics, Position Control, Force Control, Trajectory Generation, Motion Planning, Sensor Based Control, Telemanipulation, etc.





ELECTRICAL ENGINEERING

Innovative Course Structure:

60-90 minutes lecture on **Pre-recorded Video** (watch at home/work prior to class)

In-Class-Active-Learning:

- 6:00PM 8:00PM:
- Work in teams or individually on In-Class-Problems (ICPs)
- Continuous in-person assistance from Prof. and TA's.

Symbolic Math Toolkit

- We will have access to a symbolic math toolkit in Python using the sympy package (all problems of 5 DOF or greater, but do hand computations for < 5 DOF).
- We will have simple programming assignments to create a library of numerical functions in Scilab or Matlab.

Homework and Final Project

NO FINAL

