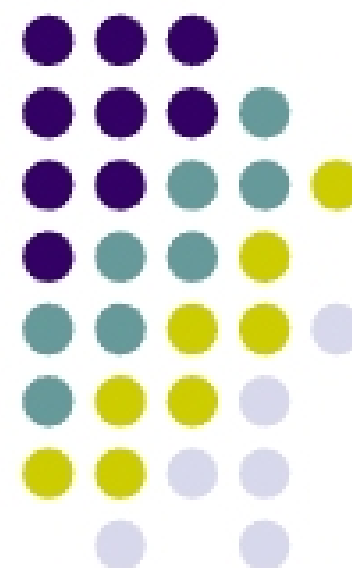


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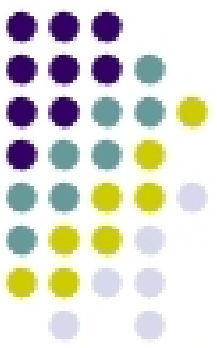
Kinematics and Dynamics of Machine Systems

Dynamics of Planar Systems
May 05, 2009

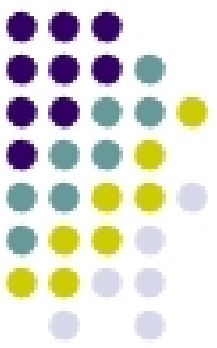
Inverse Dynamics 6.4
Equilibrium Analysis 6.5



Before we get started...



- Last Time:
 - Discussed about the solution of Differential Algebraic Equations (DAEs) that govern the time evolution of a mechanism
 - Collection of differential equations (the equations of motion) and algebraic equations (the kinematic and driving constraints)
 - We discussed the Newmark method
 - Allows one to get the a numerical solution of the problem
 - This is an approximation on a time grid of the actual solution, since we typically cannot find the actual solution
 - Fundamental Idea: express the positions and velocities as functions of accelerations
- Today
 - Discuss the concept of Inverse Dynamics Analysis
 - Discuss the concept of Equilibrium Analysis
 - Cover two examples (one for Inverse Dynamics, the other one on Equilibrium Analysis)
- Looking ahead
 - Final exam: Friday, May 15 @ 12:25 PM
 - Room: 1152ME



Inverse Dynamics: The idea

- First of all, what does dynamics analysis mean?
 - You apply some forces/torques on a mechanical system and look at how the configuration of the mechanism changes in time
 - How it moves also depends on the ICs associated with that mechanical system
- In **inverse** dynamics, the situation is quite the opposite:
 - You specify a motion of the mechanical system and you are interested in finding out the set of forces/torques that were actually applied to the mechanical system to lead to this motion
- When is **inverse** dynamics useful?
 - It's useful in controls. For instance in controlling the motion of a robot: you know how you want this robot to move, but you need to figure out what joint torques you should apply to make it move the way it should