

Tall Building Active Damping

Final Design Project

2.004 System Dynamics and Control

Fall 2007

Our Problem:

Modify a tall building's dynamic response to
reject wind disturbances and earthquakes

Shanghai World Finance Center Building

To be completed
in 2008

101 floors
492 m
(1,614 ft)



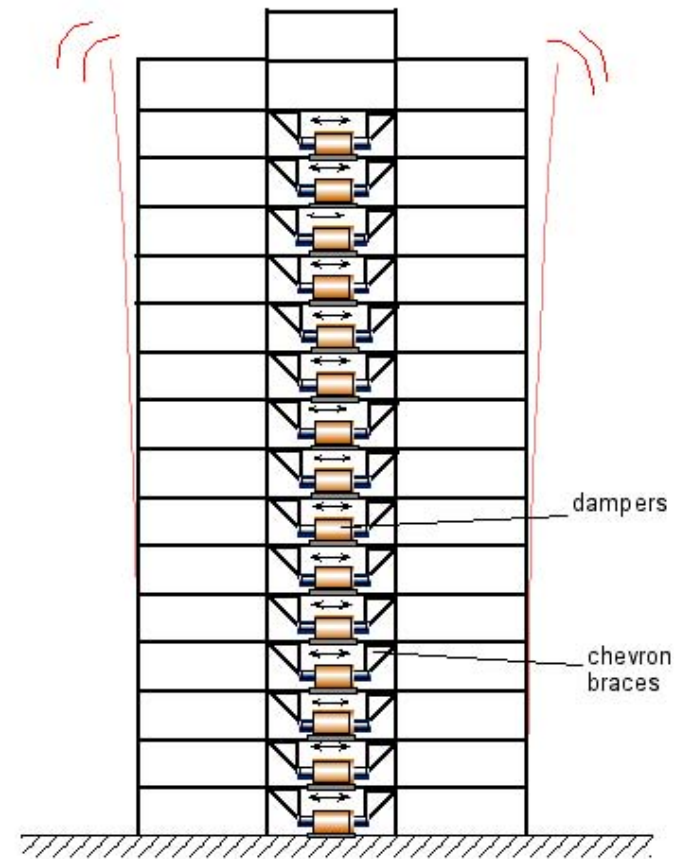


Taipei 101

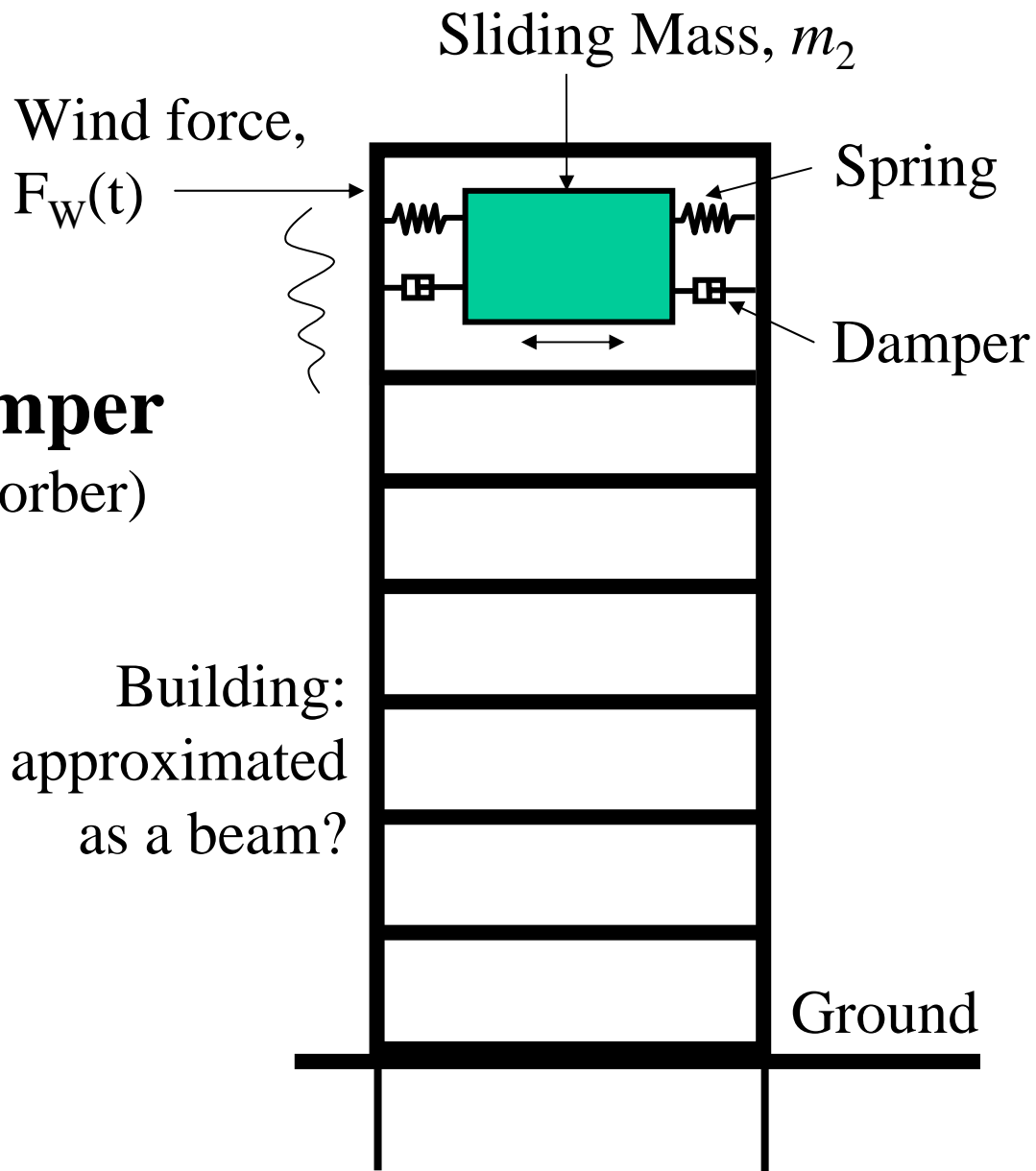
435 m

101 Floors

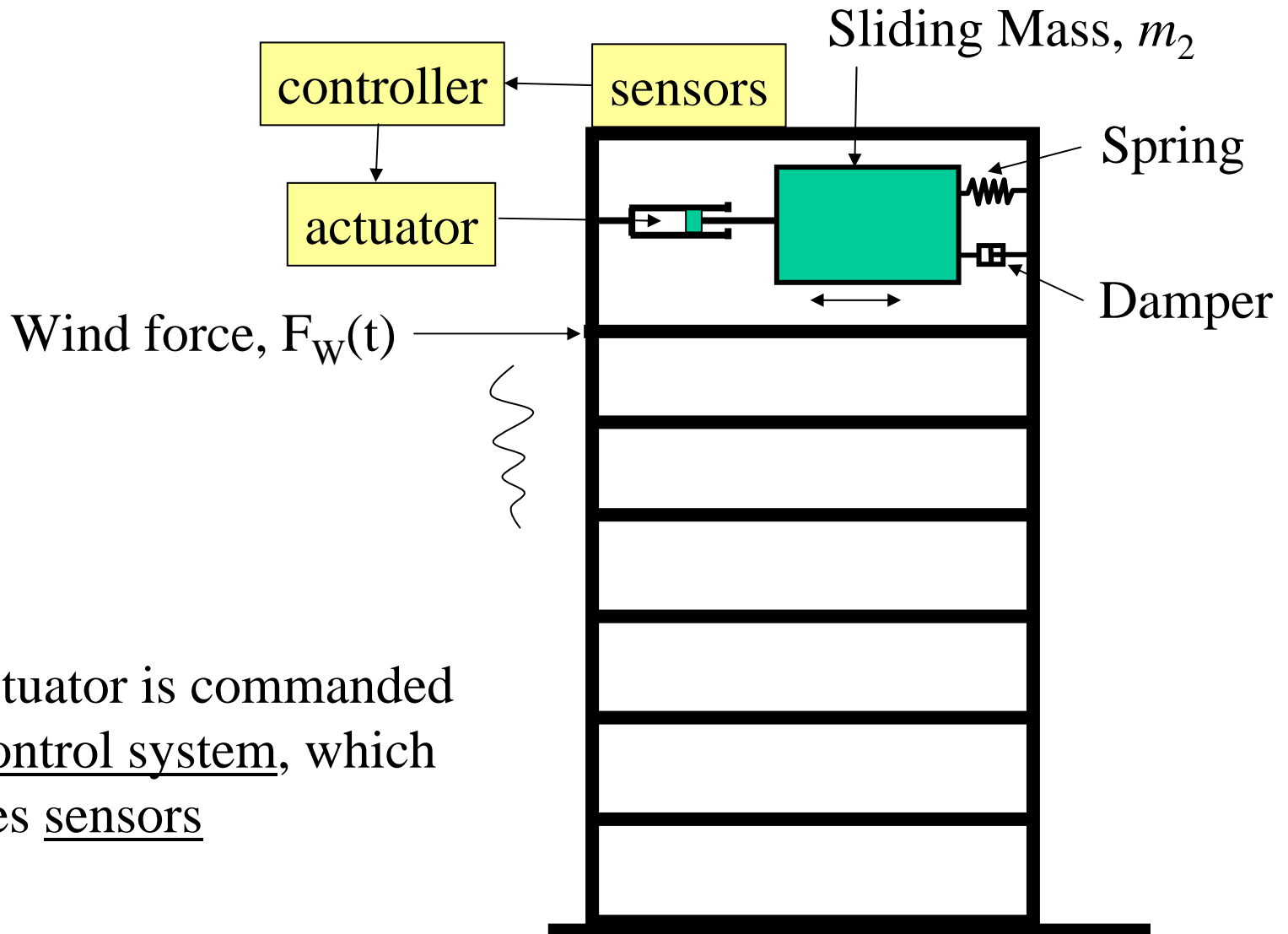
Distributed Damper System



Here is a **Passive Damper**
(Dynamic Vibration Absorber)



This Lab: **Active Damper Design**



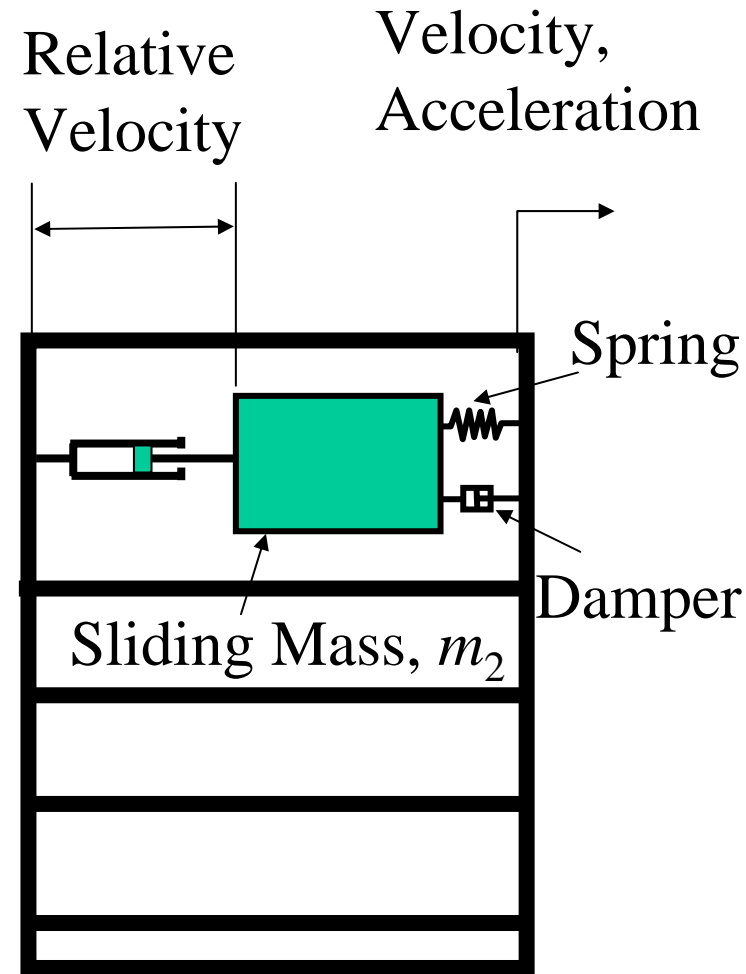
The actuator is commanded by a control system, which requires sensors

Project Goals

- Design Goals
 - Damp out Induced Vibrations
 - Improve Upon Passive Solution
- Project Deliverables
 - Model of System (LAB 7)
 - Open-Loop Design (LAB 8)
 - Closed-Loop Design (LAB 8) } Matlab & Simulink
 - Final Design and Experimental Verification (LAB 9)
 - Design History and Performance Record Document

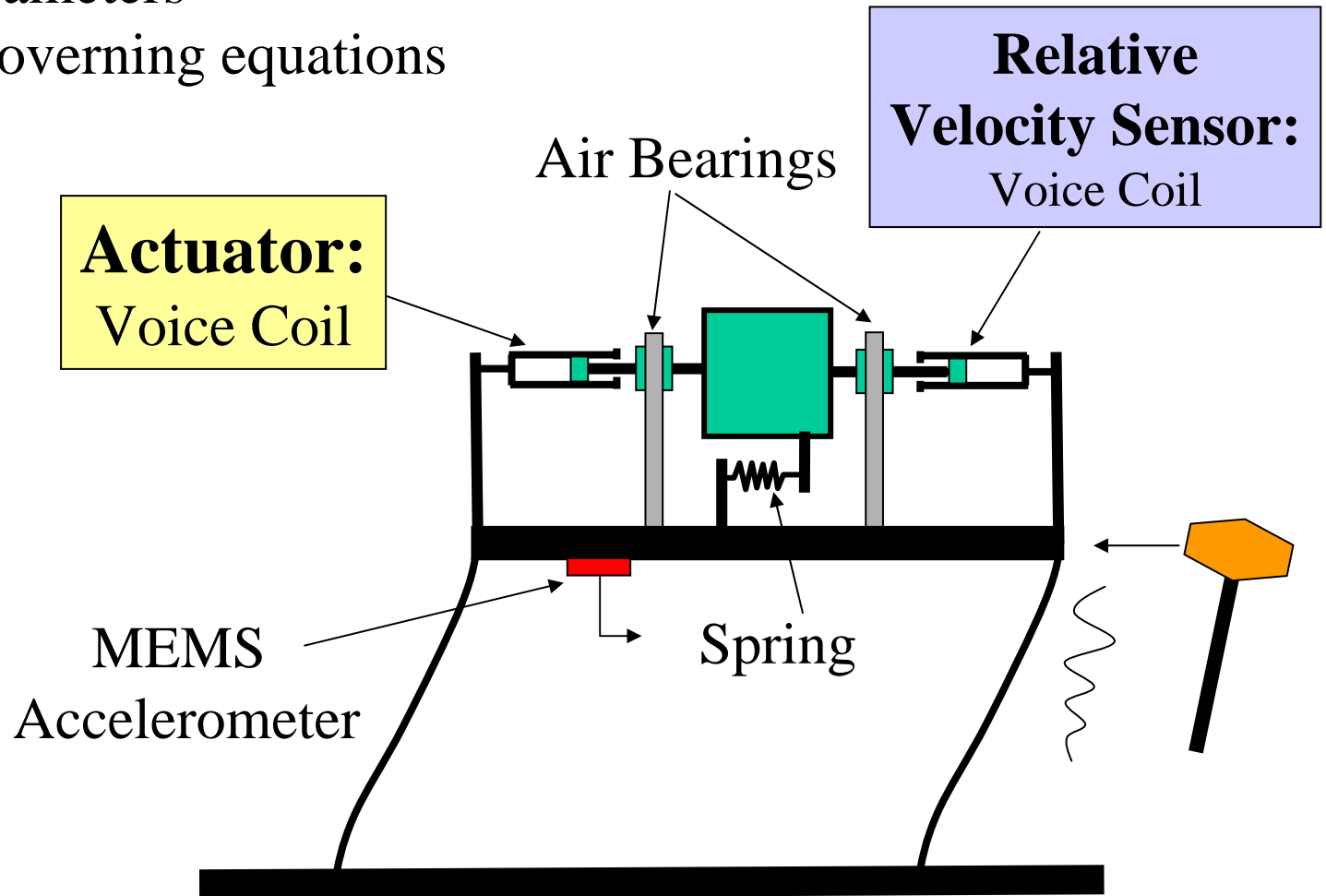
Lab 7

- Create Linear Model of System
 - Inputs?
 - Output?
 - State Space?
 - Transfer Function(s)?
 - System Parameters?
 - Mass, damping, stiffness...
- Deliverable
 - State Space or Transfer Function Model verified by Instructor
 - Estimates of System Parameters

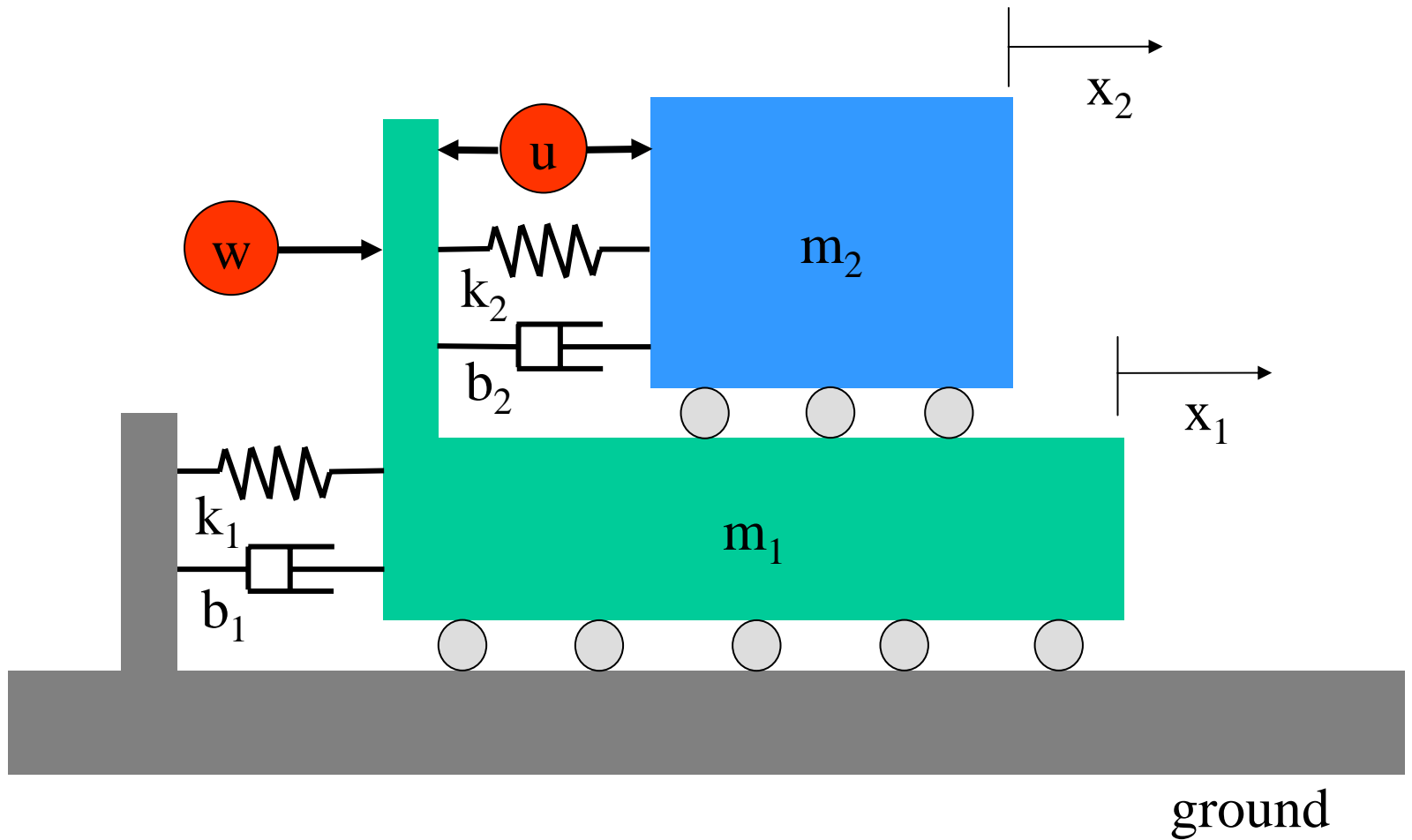


Modeling:

- Make your own sketch of the system
- Draw an icon model: mass, spring, damper, actuator, etc.
- Define parameters
- Develop governing equations



A schematic with all the parameters and variables you need!



Today's Lab

- Understanding the system
- Modeling
- Parameter Identification