Spring 2020

控制系統
Control Systems

Unit 24
Mechanical Systems – Distributed Parameter Systems

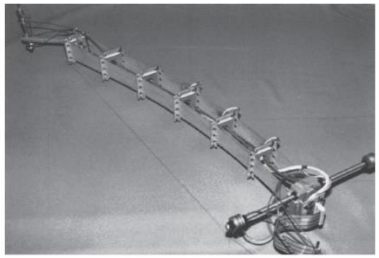
Feng-Li Lian & Ming-Li Chiang

NTU-EE

Mar 2020 – Jul 2020

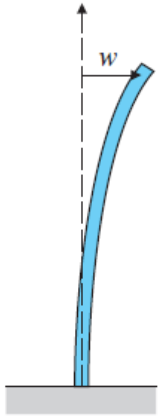
Example: Distributed Parameter Systems

Flexible beams



(a)

- Actual structures usually bend
- The equation is a fourth-order partial differential equation
- The mass elements are continuously distributed along the beam with a small amount of flexibility between elements
- This type of system is called a distributed parameter system



(b)

Model (Equations of Motion, [Thomson and Dahleh, 1998])

$$EI\frac{\partial^4 w}{\partial x^4} + \rho\frac{\partial^2 w}{\partial x^2} = 0$$

E = Young's modulus

I = beam area moment of inertia

ρ = beam density

w = beam deflection at length x along the beam