ETH

Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Lecture "Methods of Finite Elements II"
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Assignment 1

1. Equilibrium conditions of truss system

Idealize the simple truss system shown in Figure 1 as an assemblage of two bar elements. Assume that the force in one bar element is given by ${}^{t}F_{bar} = k\,{}^{t}\delta$ (in the elastic region of the material), where ${}^{t}\delta$ is the elongation of the bar at time t.
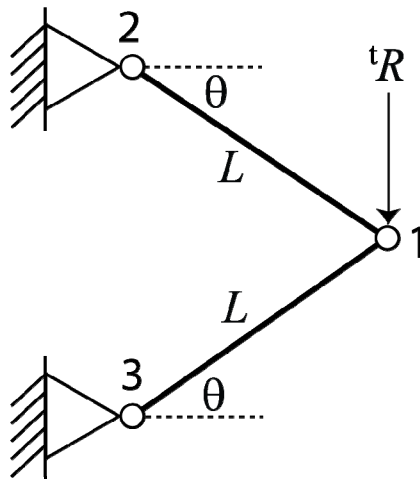

Figure 1. Truss system subjected to time-variant vertical load

(1.1)   Establish the equilibrium relation (6.5) for this system, assuming that the deformation is small and the material keeps in its elastic region.

(1.2)   Establish the force-displacement relationship for the two bars respectively.

(1.3)   Investigate the application of the assumption that the deformation is small.

Hint: Example 6.3 in Bathe (1996) may be useful.