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Discrete Energy behavior of a damped Timoshenko system

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The Timoshenko system describes the transverse vibrations of a beam at a frist approximation, these movements can be modeled by a set of two coupled wave equations. In this talk, we consider a one-dimensional Timoshenko system subjecte to different types of dissipation (undamped, linear damping and nonlinear damping) and we design a discretization scheme, based on a combination between the finite element method and the finite differences one. This scheme reach to present the discrete energy formula showing the positivity, the energy conservation property and the types of the decay rates in the case of a damped system. We numerically reproduce the analytical results established on the decay rate of the energy associted with each type of dissipation.

Key words:*Finite differences, Finite elements, Damped Timoshenko system, Nonlinear dissipation, Energy method, Strong stability, Optimality, Asymptotic behavior, Lower energy estimates, Regularity, Energy comparison principles.*

Figure 1: Tacoma Narrows Bridge 2009.

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