Euler-Bernoulli beam with tip mass and passivity-based control

By Maja Miletic

AV Akademikerverlag Nov 2015, 2015. Taschenbuch. Book Condition: Neu. 220x150x10 mm. This item is printed on demand - Print on Demand Neuware - In this work, time evolution of a cantilever with a tip body is considered. The cantilever is modeled by the Euler-Bernoulli beam equation. A passivity based dynamic feedback controller is applied at the free end to include damping. The main question considered in this work is the long-term behavior of such controlled systems, in particular the asymptotic stability. To perform the stability analysis, the system is posed as an evolution problem. Identifying an appropriate Lyapunov functional proves to be fundamental for the analysis. Demonstrating the precompactness of system trajectories, the asymptotic stability follows from La Salle's invariance principle. However, when the control law includes nonlinearities, the proof for the precompactness of the system trajectories is difficult and a novel approach needs to be developed. Another considered problem is a numerical method for the controlled Euler-Bernoulli beam system. The finite element method is utilized for the space discretization, and the Crank-Nicolson scheme for time discretization. To illustrate the effectiveness and dissipativity of the developed numerical method, simulation results are presented. 168 pp. Englisch.

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