
Stability results of the beam equation with a delay term in the internal feedbacks

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In this work, we investigate the stability properties of a beam equation with a fourth-order spatial derivative, modeling the transverse vibrations of an elastic beam under the effect of local damping and a time-delayed internal feedback. To handle the delay term, we introduce an associated memory variable that satisfies a transport equation. Using semigroup theory, we reformulate the system as an abstract Cauchy problem in an appropriate Hilbert space. We then prove the well-posedness of the problem and study the energy decay of the system. Under suitable assumptions on the delay and damping coefficients, we establish exponential stability. Our results extend previous works on damped beam equations and provide new insights into the effect of internal delay feedback

Keywords: Integrodifferential; mild solution; nonlinear kernel, alpha norm, fractional power operator.