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DISCRETE EXPONENTIAL STABILITY OF A HERMITE APPROXIMATION FOR A NON-HOMOGENEOUS DAMPED EULER–BERNOULLI BEAM

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Abstract: This paper studies a non-homogeneous damped Euler–Bernoulli beam subject to boundary feedback controls. A conforming cubic Hermite finite element semi-discretization is proposed. We prove, in the discrete weak setting, that the semi-discrete scheme is dissipative. Under a strictly positive distributed viscous damping assumption, we establish a mesh-independent exponential decay estimate by means of a Galerkin-admissible Lyapunov functional. We also derive an a priori error estimate of order two in the natural energy norm. Numerical experiments illustrate the decay of the discrete energy and the observed convergence rate.