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Boundary stabilization of linear elastodynamic systems. (English) Zbl 0531.93044

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This paper considers vibrations of a finite elastic medium whose motion can be modeled by the linear, autonomous, elastodynamic system $\rho u_{i,tt} - \sigma_{ij,j} + qu_i = 0, i = 1, 2, 3$, where ρ (x) is the local density of the medium, $\sigma_{ij}(x)$ the stress tensor, q(x)u a restoring force (q(x)$\geq$ 0) and u(x,t) the local displacement. A portion Γ_0 of the boundary of the medium is clamped and a traction force of the form $\sigma_{ij}n_j = -bu_{i,t}$ is exerted on the remainder Γ_1 of the boundary. It is trivial that if b(x)$\geq$ 0, the energy within the medium is non-increasing in time. The main result of this paper is that the energy decays exponentially if $b(x) \geq b_0 > 0$ and if Γ_0 and Γ_1 satisfy certain geometric conditions. For related results see *G. Chen* [J. Math. Pures Appl. IX. Ser. 58, 249-274 (1979; Zbl 0414.35044) and SIAM J. Control Optimization 19, 106-113 (1981; Zbl 0461.93036)] and the author [J. Differ. Equations 50, 163-182 (1983)].

MSC:

93D15	Stabilization of systems by feedback
35L20	Initial-boundary value problems for second-order hyperbolic equations
93C20	Control/observation systems governed by partial differential equations
93C05	Linear systems in control theory
74B99	Elastic materials
74H99	Dynamical problems in solid mechanics
35B37	PDE in connection with control problems (MSC2000)

Keywords:

elastodynamic systems; boundary control; uniform stabilization

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