Decay of solution energy of some viscoelastic equations of hyperbolic type

Salim A. Messaoudi

Mathematical Sciences Department
KFUPM, Dhahran 31261, Saudi Arabia

messaoud@kfupm.edu.sa

Abstract — Consider two Hilbert spaces H and V such that $V \subset H \subset V'$ (dual of V). Our aim is to study the asymptotic behavior of solutions of the following problem

$$u_{tt}(t) + Au(t) - \int_0^t g(t-s)Au(s)ds = 0, t > 0,$$

$$u(0) = u_0 \in V, u_t(0) = u_1 \in H,$$

where $A : V \to V'$ is a self adjoint differential operator satisfying

$$\langle Au, v\rangle_{V' \times V} = \langle A^{1/2}u, A^{1/2}v\rangle_{H \times H}$$

and $g : \mathbb{R}_+ \to \mathbb{R}_+$ is a positive nonincreasing differentiable function. We will show that the dissipation induced by the integral term is strong enough to have a uniform stabilization. We also give some applications related to the wave equation, Petrovsky system, and the higher dimension wave equation.