ON THE STABILIZATION OF AN ABSTRACT COUPLED SYSTEM WITH MEMORY IN ONE EQUATION

Abstract. We consider an abstract model of two coupled elastic materials. One of the materials has conservative characteristics whereas the other one has dissipative properties. The dissipative effect is caused by the presence of a memory term that depends on the fractional stationary operator with exponent $\theta \leq 1$. The problem is modeled by the equations

$$\rho_1 u_{tt} + \beta_1 Au - \int_0^\infty g(s)A^\theta u(t-s)ds + \alpha v_t = 0,$$
$$\rho_2 v_{tt} + \beta_2 Av - \alpha u_t = 0,$$

satisfying the initial data

$$u(0) = u_0,\ v(0) = v_0,\ u_t(0) = u_1,\ v_t(0) = v_1, u(-s) = \phi_0(s), s > 0.$$

Here A is a positive self-adjoint operator that has bounded inverse. Optimal decay rates for the solutions of this problem are obtained. We show that the decay rates depends on the exponent θ and the wave propagation speeds:

$$\chi_0 = \frac{\beta_1}{\rho_1} - \frac{\beta_2}{\rho_2}.$$

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References.

(1) A. Borichev and Y. Tomilov, Optimal polynomial decay of functions and operator semigroups. Math. Ann. 347 (2010), 455-478.

(2) Z. Liu and S. Zheng, Semigroups associated with dissipative systems. Chapman & Hall, 1999.

(3) J.E. Muoz Rivera and M.G.Naso. Asymptotic stability of semigroups associated with linear weak dissipative systems with memory. J. Math. Anal. Appl. 326 (2007), 691-707.

(4) H.P. Oquendo and M.Astudillo, Optimal decay for plates with rotational inertia and memory. Mathematische Nachrichten 292 (2019), 1796-1806.