STABILITY OF A TIMOSHENKO BEAM WITH TIME DELAYS IN THE BOUNDARY.

Abstract. In this work we analyze the exponential stability of the Timoshenko system with total dissipation at the border with delays. The system is fixed at the right.We work in the context of the theory of semigroups.
And we study the Timoshenko model with partial dissipation at the border. We model this dissipative mechanism with delay. We prove that the solution decays exponentially to zero, provided the wave speed are equals and the length of the interval is an strategical value.

The corresponding model is given by:

$$\begin{aligned} \rho_1\varphi_{tt} - \kappa(\varphi_x+\psi)_x &= 0,\\ \rho_2\psi_{tt} - b\psi_{xx} + \kappa(\varphi_x+\psi) &= 0. \end{aligned}$$

At the left end of the beam we have the boundary conditions:

$$\begin{aligned} \kappa(\varphi_x+\psi)(0,t) &= \mu_1\varphi_t(0,t) + (1-\mu_1)\varphi_t(0,t-\ell\tau),\\ b\psi_x(0,t) &= \mu_2\psi_t(0,t) + (1-\mu_2)\psi_t(0,t-\ell\tau). \end{aligned}$$

On the other hand, on the right end of the beam we have:

$$\varphi(\ell,t) = \psi(\ell,t) = 0.$$

The initial delay condition is given by:

$$\varphi_t(0,t-\ell\tau) = f_1(t-\ell\tau), \quad \psi_t(0,t-\ell\tau) = f_2(t-\ell\tau), \quad \forall x \in]0,\ell[, \quad \forall t \in [0,\ell\tau].$$

Verifying the initial conditions:

$$\varphi(x,0) = \varphi_0(x), \quad \varphi_t(x,0) = \varphi_1(x), \quad \psi(x,0) = \psi_0(x), \quad \psi_t(x,0) = \psi_1(x).$$

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