STABILIZATION OF COUPLED WAVE EQUATIONS WITH A BOUNDARY DAMPING

MONIA BEL HADJ SALAH

Abstract. In this talk we study the stabilization of two coupled wave equations with a damping condition at the boundary. In the first equation we suppose the existence of a positive density ρ. Therefore, we consider the following system

$$\begin{cases} \rho^2\,\partial_t^2 u_1(x,t) - \partial_x^2 u1(x,t) + \partial_t u_2(x,t) = 0,\ (0,1)\times(0,+\infty), \\ \partial_t^2 u_2(x;t) - \partial^2 x u_2(x,t) - \partial_t u_1(x,t) = 0,\ (0,1)\times(0,+\infty), \\ u_1(0,t) = 0, u_2(0,t) = u_2(1,t) = 0,\ t\in(0,+\infty), \end{cases}$$

with the following initial conditions

$$u_1(x,0) = u_1^0(x), \partial_t u_1(x,0) = u_1^1(x), u_2(x,0) = u_2^0(x), \partial_t u_2(x,0) = u_2^1(x)$$

and the boundary dissipation law

$$\partial_x u_1(1,t) + \partial_t u_1(1,t) = 0,\ t\in(0,+\infty).$$

We give the asymptotic expansion of the eigenvalues of the infinitesimal generator of the associated semigroup near the imaginary axis. Moreover, using the frequency domain approach combined with a multiplier method, we establish the uniform stability of the system when $\rho = 1$ and a polynomial energy decay rate of type $1/\sqrt{t}$ if ρ is a rational number.

UR Analysis and Control of PDEs, Faculty of Sciences of Monastir, Tunisia.