A BOUNDARY CONTACT PROBLEM FOR THE BRESSE'S BEAM

Abstract. In this paper we study the semilinear contact problem to the Bresse beam (circular arch) of the length of a interval $[0, L] \subset \mathbb{R}$, see ([1], [2]), which is built-in at boundary and moves freely at other end constrained between two stops. Also we consider that the system is under influence only one dissipative mechanism frictional type. Our main result is to prove the existence of weak solutions for the Signorini's problem and that the dissipation mechanism is enough to stabilized exponentially the whole system provided the velocities of waves propagations are the same. In the case that the velocities are different, we prove the system decay polinomially. To do this we introduce the hybrid-penalized method see [3], this method allow us to show the asymptotic behavior which does not possible using multiplicatives techniques. Some numerical experiments are presented.

$$\begin{aligned}
&\rho_1\varphi_{tt} - k(\varphi_x + \psi + lw)_x - \kappa_0 l(w_x - l\varphi) + \mathcal{F}_1(\varphi, \psi, w) = 0, && \text{in } (0, L) \times (0, \infty)\\
&\rho_2\psi_{tt} - b\psi_{xx} + k(\varphi_x + \psi + lw) + \gamma\psi_t + \mathcal{F}_2(\varphi, \psi, w) = 0, && \text{in } (0, L) \times (0, \infty)\\
&\rho_1 w_{tt} - \kappa_0(w_x - l\varphi)_x + kl(\varphi_x + \psi + lw) + \mathcal{F}_3(\varphi, \psi, w) = 0, && \text{in } (0, L) \times (0, \infty)
\end{aligned} \tag{1}$$

in the $x = L$-end we consider two obstacles that can produce contact in the transverse oscillation of the beam, where g_1 and g_2 are the gaps of the obstacle, therefore we have that

$$g_1 \leq \varphi(L, t) \leq g_2, \quad \forall t > 0. \tag{2}$$

Authors.

(1) J.E. Munoz Rivera. *Department of Research and Development, National Laboratory for Scientific Computation, Petrópolis, Rio de Janeiro, Brazil*
E-mail: *jemunozrivera@gmail.com*

(2) C. A. da Costa Baldez. *Department of Mathematics, Federal University of Pará, Bragança, Pará, Brazil.*
E-mail: *baldez@ufpa.br*

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