Dynamics of Continuous, Discrete and Impulsive Systems
Series **A:** *Mathematical Analysis* **14 (2007)** 851-872
 http://www.watam.org

THE DECAY PROPERTIES OF SOLUTIONS FOR COUPLED KIRCHHOFF TYPE EQUATIONS

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Abstract. The aim of this paper is to study the existence of solutions and the uniform decay rate of energy for coupled wave equations of Kirchhoff type with nonlinear boundary damping and memory source term. Also, the exponential decay of solutions is estiablished by using Faedo-Galerkin's approximation and perturbed energy method.
Keywords. Kirchhoff type equations, existence, uniform decay, boundary damping, memory source term.
AMS (MOS) subject classification: 35K55,35B40.

1 Introduction

In this paper, we consider the following boundary value problem

$$\begin{aligned}
&\rho_1(t)u_{tt} - \alpha\triangle u'' - M(\|\nabla u\|^2 + \|\nabla v\|^2)\triangle u - \triangle u' \geq 0, \\
&\qquad \text{in Q} = \Omega \times [0,T], && (1)\\
&\rho_2(t)v_{tt} - \beta\triangle v'' - M(\|\nabla u\|^2 + \|\nabla v\|^2)\triangle v - \triangle v' \geq 0 \quad \text{in Q}, && (2)\\
&u(x,0) = u_0(x),\ u'(x,0) = u_1(x), \\
&v(x,0) = v_0(x),\ v'(x,0) = v_1(x),\ \text{on } x \in \Omega, && (3)\\
&u = v = \frac{\partial u}{\partial \nu} = \frac{\partial v}{\partial \nu} = 0 \qquad \text{on } \Sigma_1 = \Gamma_1 \times [0,T], && (4)\\
&\alpha\frac{\partial u''}{\partial \nu} + M(\|\nabla u\|^2 + \|\nabla v\|^2)\frac{\partial u}{\partial \nu} + \frac{\partial u'}{\partial \nu} + u + u' + g(t)|u'|^\mu u' \\
&= g * |u|^\gamma u \quad \text{on } \Sigma_0 = \Gamma_0 \times [0,T], && (5)\\
&\beta\frac{\partial v''}{\partial \nu} + M(\|\nabla u\|^2 + \|\nabla v\|^2)\frac{\partial v}{\partial \nu} + \frac{\partial v'}{\partial \nu} + v + v' + g(t)|v'|^\mu v' \\
&= g * |v|^\gamma v \quad \text{on } \Sigma_0 = \Gamma_0 \times [0,T], && (6)
\end{aligned}$$

where Ω is a bounded domain of R^n with C^2 boundary $\Gamma = \partial\Omega$ satisfying $\Gamma = \Gamma_0 \bigcup \Gamma_1$, $\overline{\Gamma}_0 \bigcap \overline{\Gamma}_1 = \phi$ and $\Gamma_0,\ \Gamma_1$ possess positive measures, $\rho_1(t), \rho_2(t)$