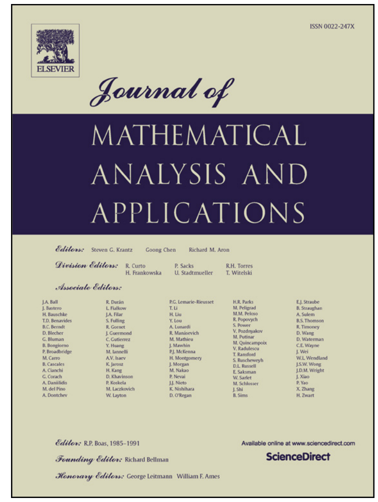

The existence and the asymptotic behavior of a plate equation with frictional damping and a logarithmic source term

Mohammad M. Al-Gharabli, Salim A. Messaoudi

PII: S0022-247X(17)30490-0
DOI: http://dx.doi.org/10.1016/j.jmaa.2017.05.030
Reference: YJMAA 21391

To appear in: *Journal of Mathematical Analysis and Applications*

Received date: 16 August 2016

THE EXISTENCE AND THE ASYMPTOTIC BEHAVIOR OF A PLATE EQUATION WITH FRICTIONAL DAMPING AND A LOGARITHMIC SOURCE TERM

Mohammad M. Al-Gharabli[(1)] and Salim A. Messaoudi[(2)]
(1) King Fahd University of Petroleum and Minerals
The Preparatory Year Program, Department of Mathematics
Dhahran 31261, Saudi Arabia.
E-mail: mahfouz@kfupm.edu.sa
(2) King Fahd University of Petroleum and Minerals
Department of Mathematics and Statistics
Dhahran 31261, Saudi Arabia.
E-mail: messaoud@kfupm.edu.sa

Abstract. In this paper, we consider a plate equation with a logarithmic nonlinearity in the presence of a frictional damping. We prove, for a suitably chosen initial data, a global existence as well as a decay result.

Keywords: Exponential decay, Logarithmic nonlinearity, Frictional damping, Plate equation.
AMS Classification: $35B35, 35L55, 75D05, 74D10, 93D20$.

1. introduction

The uniform stabilization of Kirchhoff plates was investigated by several authors; for example, Rivera et al. [32] considered the following equation

$$u_{tt} - \gamma \Delta u_{tt} + \Delta^2 u - \int_0^t g(t-s)\Delta^2 u(s)ds = 0, \text{ in } Q_T = \Omega \times (0,T),$$

together with initial and dynamical boundary conditions and proved that the sum of the first and second energies decays exponentially (respectively polynomially) if the kernel g decays exponentially (respectively polynomially). Alabau-Boussouira et al. [1] looked into the following problem

$$u_{tt} + \Delta^2 u - \int_0^t g(t-s)\Delta^2 u(s)ds = f(u), \text{ in } Q_T = \Omega \times (0,T), \tag{1.1}$$

and established exponential and polynomial decay results for sufficiently small initial data. Lin and Li [25] discussed

$$u_{tt} - \gamma \Delta u_{tt} + \Delta^2 u - \int_0^t g(t-s)\Delta^2(s)ds = div(C(f(\nabla u)\nabla u)), \text{ in } Q_T = \Omega \times (0,T),$$

together with initial and dynamical boundary conditions similar to those imposed by Rivera et al. [32], and established similar decay results. Messaoudi [31] studied the following problem