Local Existence And Exponential Growth For A Nonlinear Vscoelastic Hyperbolic Equation

Kh.ZENNIR [1], B.SAID-HOUARI [2], H.SISSAOUI[1].
1) Laboratoire (LANOS),Université Badji Mokhtar, Annaba.
2) Université Paul Sabatier, Toulouse, France.
khaledzennir1@yahoo:fr

Abstract:

In this work, we consider a viscoelastic wave equation, with strong damping, nonlinear damping and source terms in the following problem

$$u_{tt} + \int_0^t g(t-s)\Delta u(s,x)ds + a\left|u_t\right|^{m-2}u_t = \Delta u + \omega\Delta u_t + b\left|u\right|^{p-2}u,\ x \in \Omega,\ t > 0 \quad (1)$$

subjected to the following initial and boundary conditions

$$u(0,x) = u_0(x),\ u_t(0,x) = u_1(x),\ x \in \Omega \quad (2)$$

$$u(t,x) = 0,\ x \in \Gamma,\ t > 0 \quad (3)$$

Where Ω is a bounded domain in R^N (N ≥1), with smooth boundary Γ ; and a; b; w are positive constants, m ≥ 2; p ≥ 2; and g is a nonnegative, non-increasing function. This type of problems are not only important from the theoretical point of view, but also arise in many physical applications and describe a great deal of models in applied science. One of the most important .eld of such problems arise in the models of nonlinear viscoelasticity. Many authors studied these types of problems, and several results appeared in the

literature. The goal of this work is the study of the local existence and exponen- tial growth of solutions of the problem (1)- (3) when $t \to \infty$

References:

[1] V. Georgiev and G.Todorova, Existence of solution of the wave equation with nonlinear damp-ing and source terms, Journal of diferential equations 109, 295-308, (1994).
[2] S. Gerbi and B. Said-Houari, Local existence and exponential growth for a semilinear damped wave equation with dynamic boundary conditions, Advance in Di¤erential Equations. july 2008.
[3] S. Messaoudi and N-E.Tatar , Global existence and uniform stability of a solutions for qua- silinear viscoelastic problem, Math. Meth. Appl. Sci, 30, 665-680, (2007).
[4] R. Ikehata, Some remarks on the wave equations with nonlinear damping and source terms, Non- linear Analysis. Vol 27, no 10,1165-1175, (1996).
[5] E. Vittilaro, Global nonexistence theorems for a class of evolution equations with dissipation, Arch. Rational Mech. Anal, 149, 155-182, (1999).
[6] Shun-Tang Wu and Long-Yi Tsai, On global existence and blow-up of solutions or an integro- di¤erential equation with strong damping, Taiwanese journal of mathematics. Vol 10, No.4, pp.979-1014, (2006).