Differential and Integral Equations, Volume 7, Number 4, July 1994, pp. 885–908.

UNIFORM DECAY OF WEAK SOLUTIONS TO A VON KÁRMÁN PLATE WITH NONLINEAR BOUNDARY DISSIPATION

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Dedicated to the memory of Peter Hess

Abstract. Asymptotic behavior of solutions to a von Kármán model with $\gamma \equiv 0$; i.e., without accounting for rotational forces, is considered. It is shown that in the presence of nonlinear boundary damping all weak solutions decay to zero uniformly in the energy norm.

1. Introduction.

1.1. Statement of the problem. Let Ω be an open bounded domain in $\mathbb{R}^2$ with a sufficiently smooth (e.g., C^∞) boundary, Γ. In Ω, we consider the following von Kármán system in the variables $w(t,x)$ and $\chi(w(t,x))$ with nonlinear feedback controls, f and g:

$$w_{tt} + \Delta^2 w + b(x) w_t = [w, \chi(w)] \quad \text{in } Q_\infty = (0,\infty)\times\Omega \tag{1.1.a}$$

$$w(0,\cdot) = w_0, \quad w_t(0,\cdot) = w_1 \quad \text{in } \Omega \tag{1.1.b}$$

$$\Delta w + (1-\mu) B_1 w = -f(\frac{\partial}{\partial\nu} w_t) \quad \text{on } \Sigma_\infty = (0,\infty)\times\Gamma \tag{1.1.c}$$

$$\frac{\partial}{\partial\nu}\Delta w + (1-\mu) B_2 w - w = g(w_t) \quad \text{on } \Sigma_\infty = (0,\infty)\times\Gamma, \tag{1.1.d}$$

where $b(x) \in L^\infty(\Omega)$ satisfies $b(x) > 0$ almost everywhere in Ω, $0 < \mu < \frac{1}{2}$ is Poisson's ratio, and the operators B_1 and B_2 are given by

$$\begin{aligned} B_1 w &= 2 n_1 n_2 w_{xy} - n_1^2 w_{yy} - n_2^2 w_{xx} \\ B_2 w &= \frac{\partial}{\partial\tau}[(n_1^2 - n_2^2) w_{xy} + n_1 n_2 (w_{yy} - w_{xx})], \end{aligned} \tag{1.2}$$

Received September 1993.
*This material is based upon work partially supported under a National Science Foundation Mathematical Sciences Postdoctoral Research Fellowship.
†Partially supported by National Science Foundation Grant NSF DMS-9204338.
AMS Subject Classifications: 35Q72, 73D35.