第１１５回 広島数理解析セミナー （２００７年度）

Hiroshima Mathematical Analysis Seminar No.115

日時 ： ２月１日（金）１６：３０～１７：３０

場所 ： 広島大学理学部 Ｂ７０７

講師 ： Ruy Coimbra Charão 氏 （Federal University of Santa Catarina）

題目 ： Asymptotic properties for a semilinear plate equation in unbounded domains

要旨 ： In this work we consider the following Cauchy problem associated with a semilinear plate equation in $\mathbb{R}^n$, $n \geq 1$, under rotational inertia effects

$$\begin{cases} u_{tt} - \gamma \Delta u_{tt} + \Delta^2 u + u_t = f(u_t)\,, & x \in \mathbb{R}^n, \ \ t \geq 0 \\ u(0,x) = u_0(x)\,, & x \in \mathbb{R}^n \\ u_t(0,x) = u_1(x)\,, & x \in \mathbb{R}^n \end{cases}$$

where $\gamma > 0$ is a constant and $f(u_t)$ is a nonlinear term of type $|u_t|^p$. For $n = 2$ the function $u = u(t,x)$ represents the transversal displacement of the plate at the point x in the time t. The term $u_t = u_t(t,x)$ represents a frictional dissipation in the plate.

We note that this problem is an optional model, in some cases, for the model to vibrations of thin plates given by the full von Kármán system which has been studied for several authors.

For such problem we study the existence, uniqueness and asymptotic properties of global solutions. To the associated linear problem in dimension $n \geq 1$ we obtain the boundedness of the L^2-norm and a polynomial decay rate as t^{-1} of the total energy. These results hold for the semilinear problem with small data, $1 \leq n \leq 4$ and $1 \leq p \leq \infty$. In dimension $n \geq 5$ for the linear problem and $n = 5$ for the semilinear problem with small data and $2 \leq p \leq 5$, we obtain fast decay of the total energy and a decay as $t^{-1/2}$ for the L^2-norm of the solution and similar decay rate for the L^2-norm of hight derivatives.

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