Stability Properties for Some Non-autonomous Dissipative Phenomena Proved by Families of Liapunov Functionals

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Abstract: We prove some new results regarding the boundedness, stability and attractivity of the solutions of a class of initial-boundary-value problems characterized by a quasi-linear third order equation which may contain time-dependent coefficients. The class includes equations arising in superconductor theory, and in the theory of viscoelastic materials. In the proof we use a family of Liapunov functionals \(W\) depending on two parameters, which we adapt to the ‘error’, i.e. to the size \(\sigma\) of the chosen neighbourhood of the null solution.

Keywords: nonlinear higher order PDE-stability, boundedness-boundary value problems.


1 Introduction

In this paper we study the boundedness and stability properties of a large class of initial-boundary-value problems of the form

\[
\begin{align*}
-\varepsilon(t)u_{xx} + u_{tt} - C(t)u_{xx} + a'u_t &= F(u) - au_t, \quad x \in [0,\pi[, \quad t > t_0, \\
\varepsilon(0, t) &= 0, \quad u(\pi, t) = 0, \\
u(0, t) &= 0, \\
u(x, t_0) &= u_0(x), \quad u_t(x, t_0) = u_1(x).
\end{align*}
\]

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