ASYMPTOTIC STABILITY OF THE WAVE EQUATION ON COMPACT MANIFOLDS AND LOCALLY DISTRIBUTED VISCOELASTIC DISSIPATION

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Abstract. We discuss the asymptotic stability of the wave equation on a compact Riemannian manifold \((M, g)\) subject to locally distributed viscoelastic effects on a subset \(\omega \subset M\). Assuming that the well known geometric control condition \((\omega, T_0)\) holds and supposing that the relaxation function is bounded by a function that decays exponentially to zero, we show that the solutions of the corresponding partial viscoelastic model decay exponentially to zero. We give a new geometric proof extending the prior results in the literature from the Euclidean setting to compact Riemannian manifolds (without or with boundary).

\[
\begin{align*}
    u_{tt} - \kappa_0 \Delta u + \int_0^t g(t-s) \text{div}[a(x) \nabla u(s)] \, ds &= 0 \quad \text{on} \ M \times ]0, \infty[, \\
    u &= 0 \quad \text{on} \ \partial M \times ]0, \infty[, \\
    u(0) &= u^0, \quad u_t(0) = u^1, \quad x \in M.
\end{align*}
\]

References


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