

Diffusion Phenomenon of Solutions for the Damped Wave Equations

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We consider the Cauchy problem for the damped wave equation

$$(DW) \quad \begin{cases} u_{tt} - \Delta u + u_t = f(u), & (t, x) \in \mathbf{R}_+ \times \mathbf{R}^N, \\ (u, u_t)(0, x) = (u_0, u_1)(x), & x \in \mathbf{R}^N. \end{cases}$$

Our main interest is in the asymptotic behavior of solutions as $t \rightarrow \infty$. The solution u to (DW) is expected to behave like the solution ϕ to the corresponding diffusive equation

$$(H) \quad \begin{cases} -\Delta \phi + \phi_t = f(\phi), & (t, x) \in \mathbf{R}_+ \times \mathbf{R}^N, \\ \phi(0, x) = \phi_0(x), & x \in \mathbf{R}^N. \end{cases}$$

This property is called the *Diffusion Phenomenon* of solutions to (DW). In the talk our recent developments will be shown.