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The Cauchy problem for a coupled system of the damped wave equations

Abstract

We consider the Cauchy problem for a coupled system of damped wave equations

$$(P) \qquad \begin{cases} u_{tt} - \Delta u + u_t = |v|^p, \\ v_{tt} - \Delta v + v_t = |u|^q, \end{cases} \quad (t,x) \in \mathbf{R}_+ \times \mathbf{R}^N$$

with $(u, v, u_t, v_t)(0, x) = (u_0, v_0, u_1, v_1)(x),\ x \in \mathbf{R}^N$. It was shown for the corresponding system of heat equations by M. Escobedo and M. A. Herrero [1] that

$$(*) \qquad \alpha := \max\Big(\frac{p+1}{pq-1}, \frac{q+1}{pq-1}\Big) = \frac{N}{2}$$

gives the critical exponents.

In my talk we discuss the relation between $(*)$ and the Fujita critical exponent $\rho_F(N) = 1 + \frac{2}{N}$ on the single equation, and moreover, seek for the asymptotic profiles of the global-in-time solution for small data in the supercritical exponent and the blow-up time of the local solution for suitable data in the subcritical exponent, which is mainly based on [2].

Bibliography

[1] Escobedo, M. and Herrero, M. A., *Boundedness and blow up for a semilinear reaction-diffusion system*, J. Differential Equations, **89**, 176-202 (1991).

[2] Nishihara, K., *Asymptotic behavior of solutions for a system of semilinear heat equations and the corresponding damped wave system*, Osaka J. Math., **49**, 331-348 (2012).