
Degeneracy in finite time of 1D quasilinear wave equations

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Abstract

We consider the large time behavior of solutions of the Cauchy problem of the quasilinear wave equation: $\partial_t^2 u = \partial_x((1+u)^{2a}\partial_x u)$, which has richly physical backgrounds. If $1+u(0,x)$ is bounded away from a positive constant, we can construct a local solution for smooth initial data. When $1+u(t,x)$ is going to 0 in finite time, the equation degenerates. We give a sufficient condition that the equation degenerates in finite time. A known result on global existence and our main theorem determine a threshold of $\int_{\mathbb{R}} u_1(x)dx$ separating the global existence of solutions and the occurrence of the degeneracy.

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