Local Existence for Solutions of Fully Nonlinear Wave Equations

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Abstract

Let Ω be a domain in $\mathbb{R}^n$ and let $m \in \mathbb{N}$ be given. We study the initial–boundary value problem for the equation $F(t,x,\overline{D}_x^{2m}u(t,x),\overline{D}_x^m\partial_t u(t,x),\partial_t^2 u(t,x)) = f(t,x)$ with homogeneous Dirichlet's boundary condition; here u is a scalar function, $\overline{D}_x^m u := (\partial_x^\alpha u)_{|\alpha|\leq m}$ and certain restrictions are made on F guaranteeing that energy estimates are possible. We prove the existence of a $T > 0$ such that a unique classical solution u exists on $[0,T] \times \Omega$. Furthermore we show that $T \to \infty$ if the data tend to zero.

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