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Existence for large times of finite amplitude elastic waves arising from small disturbances.
(English) Zbl 0646.35059
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Summary: This paper deals with strict solutions $u_i(t, x_1, x_2, x_3)$ of a system of quasi-linear equations

$$\partial_t^2 u_i - \sum_k [c_2^2 \partial_{x_k} \partial_{x_k} u_i + (c_1^2 - c_2^2) \partial_{x_k} \partial_{x_i} u_k] = \sum_{k,r,s} C_{ikrs}(u') \partial_{x_k} \partial_{x_s} u_r$$

with $u' = (\partial_{x_i} u_k)$, and i,k,r,s ranging over 1,2,3. For given initial conditions

$$u_i = \epsilon f_i(x_1, x_2, x_3), \quad \partial_t u_i = \epsilon g(x_1, x_2, x_3) \quad for \quad t = 0$$

the life-span $T(\epsilon)$ is the supremum of all $t > 0$ to which the u_i can be extended as strict solutions for all x. It is shown that $\liminf_{\epsilon \to 0} \epsilon \log T(\epsilon) > 0$ for $C_{ikrs}, f_i, g_i \in C_0^\infty$, and $C_{ikrs} = C_{rsik}, C_{ikrs}(0) = 0$.

MSC:

35L70 Second-order nonlinear hyperbolic equations
35B20 Perturbations in context of PDEs
74B20 Nonlinear elasticity
35B40 Asymptotic behavior of solutions to PDEs

Keywords:

finite amplitude; elastic waves; small disturbances; almost global existence; solutions; quasi-linear equations; life-span

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