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Comparison theorems for solutions of hyperbolic equations. (English. Russian original)

Zbl 0678.35063

Math. USSR, Sb. 62, No. 2, 349-371 (1989); translation from Mat. Sb., Nov. Ser. 134(176), No. 3(11), 353-374 (1987).

At first, the authors complain why it is useful to introduce a quasi- asymptotics for studying the behaviour of solutions of hyperbolic initial-boundary value problem as $t \to \infty$. A function h(t,x) has uniform quasi-asymptotics ω (x) if, roughly speaking its integral mean in t of m-th order of a certain type has the limit ω (x) as $t \to \infty$ uniformly in $x \in \Omega$. Then the authors consider the following boundary value problem

$$(*) \quad p(x)u_{tt} - \sum_{i,j=1}^{n} (a_{ij}(x)u_{x_i})_{x_j} = f(t,x), \quad \frac{\partial u}{\partial N}|_{\partial\Omega} = 0, \quad u|_{t=0} = u_t|_{t=0} = 0,$$

with bounded coefficients p, a_{ij} and $p(x) \geq p, = const > 0$. They establish so-called comparison theorems connecting the existence of the quasi-asymptotics to (*) with its existence for the problem (*) with $p = 1$; the last was studied earlier [see the authors, Mat. Sb. Nov. Ser. 131(173), No.4(12), 419-437 (1986; Zbl 0635.35056)]. So they prove theorems on necessary and sufficient conditions under which there exists such a quasi-asymptotics. The case of $n = 1$ is separately considered. To establish the theorems the authors study an initial problem in a Banach space, that covers the above problem, and establish corresponding theorems for it.

Reviewer: L.Lebedev

MSC:

35L20 Initial-boundary value problems for second-order hyperbolic equations
35B40 Asymptotic behavior of solutions to PDEs
35D05 Existence of generalized solutions of PDE (MSC2000)

Keywords:

quasi-asymptotics; initial-boundary value; integral mean; comparison theorems; existence; Banach space

Full Text: DOI