Beals, Michael; Métivier, Guy

Reflection of transversal progressing waves in nonlinear strictly hyperbolic mixed problems.

(English) Zbl 0633.35051
Am. J. Math. 109, 335-359 (1987).

The authors consider the reflection of regularity for a semilinear hyperbolic boundary value problem as follows:

$$P(y,D_y)u = f(y,u,...,\nabla^{m-2}u) \quad in \quad \{y>0\}, \quad B_j(y,D_y)u=0 \quad on \quad \{y_n=0\} \quad (j-1,2,...,\mu),$$

where P is a linear strictly hyperbolic operator of order m with smooth coefficients and f is a smooth function of the variables (y,u,...). Assume that the boundary $\{y_n=0\}$ is not characteristic for $P(y,D_y)$, and that the boundary operators $\{B_j : j=1,2,...,\mu\}$ satisfy the uniform Lopatinski condition. Moreover, assume that there are N characteristic surfaces $\Sigma_1,...,\Sigma_N$ which intersect the boundary transversally along a manifold Δ. They consider the above problem in a small neighbourhood of the manifold Δ. The principal theorem of this paper is as follows: If the solution is conormal with respect to the characteristic surfaces in the past, then it is also conormal with respect to the union of these surfaces $\{\Sigma_n\}_{n=1,...,N}$. This is a continuation of their work [Duke Math. J. 53, 125-137 (1986; Zbl 0613.35050)] where they have treated the case $N=2$.

Reviewer: M.Tsuji

MSC:

35L70	Second-order nonlinear hyperbolic equations
35L35	Initial-boundary value problems for higher-order hyperbolic equations
35L67	Shocks and singularities for hyperbolic equations
35B40	Asymptotic behavior of solutions to PDEs

Keywords:
reflection of regularity; semilinear; strictly hyperbolic; smooth coefficients; uniform Lopatinski condition; characteristic surfaces; conormal

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