Shirai, Akira

Maillet type theorem for nonlinear partial differential equations and Newton polygons.
(English) Zbl 0995.35002
J. Math. Soc. Japan 53, No. 3, 565-587 (2001).

The author considers the following Cauchy problem for non-Kowalevskian nonlinear partial differential equations:

$$t^n D_t^m u(t,x) = a(x)t^{k-m+n} + f(t,x,D_t^j D_x^\alpha u),$$

$$u(t,x) = 0(t^k),$$

where in the nonlinearity $0 \le j \le m_0$, $0 \le j + |\alpha| \le N$, with n, m, m_0, N, k given nonnegative integers, $m \le m_0 \le N$, $m_0 < k$ and $a(x) \ne 0$ in a neighborhood of the origin. The functions a and f are holomorphic. Under an additional assumption on the Taylor expansion of f, the author proves existence and uniqueness of a formal solution $u(t,x) = \sum_{j=k}^{\infty} u_j(x)t^j$ in a neighborhood of the origin. Moreover, this solution belongs to the formal Gevrey class G^s, where s is charcterized in terms of the Newton polygon associated to the equation.

Reviewer: L.Rodino (Torino)

MSC:

35A07 Local existence and uniqueness theorems (PDE) (MSC2000)
35C10 Series solutions to PDEs
35A20 Analyticity in context of PDEs

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