On the integrability of some classes of multidimensional quasilinear first order PDEs by a variant of the dressing method

A.I.Zenchuk [1]   P.M.Santini [2]

April 30, 2007

1. Center of Nonlinear Studies of L.D.Landau Institute for Theoretical Physics (International Institute of Nonlinear Science), Kosygina 2, Moscow, 119334, Russia.

2. Dipartimento di Fisica, Università di Roma "La Sapienza" and Instituto Nazionale di Fisica Nucleare, Sezione di Roma1, Piazz.le Aldo Moro 2, I-00185 Roma, Italy.

We use the integral operator with nontrivial kernel to generalize the dressing algorithm for construction multidimensional nonlinear PDEs and describe their solution spaces. As a simplest example, we represent the algorithm deriving equation $w_t+\sum_{k=1}^n w_{x_k}\rho^{(k)}(w) = \rho(w)+[w,T\tilde{\rho}(w)]$, where w is the unknown $N\times N$ matrix function of the $n+1$ independent variables $(x_1,..,x_n,t)$, T is any constant diagonal matrix, $[\cdot,\cdot]$ is the usual commutator between matrices, and $\rho^{(k)}$, ρ, $\tilde{\rho}$ are $n+2$ arbitrary scalar functions representable by positive power series [1, 2]. We discuss generalization of the above equations corresponding to functions $\rho^{(k)}(w,x)$, $\rho(w,x)$, $\tilde{\rho}(w,x)$ representable by power series of w with scalar coefficients depending on x.

References

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