

CLASSICAL SOLUTIONS OF QUASILINEAR FUNCTIONAL DIFFERENTIAL SYSTEMS ON THE HAAR PYRAMID

ELŻBIETA PUŹNIAKOWSKA

Abstract. The Cauchy problem for a quasilinear functional differential system is considered. A theorem on the existence of classical solutions defined on the Haar pyramid is proved. The theory of bicharacteristics and the method of successive approximations are used. Differential systems with deviated variables and differential integral systems can be obtained from a general theory by specializing given operators.

Mathematics subject classification (2000): 35R10, 35L60.

Keywords and phrases: partial differential equations, Haar pyramid, classical solutions, bicharacteristics.

REFERENCES

- [1] V. E. ABOLINIA, A. D. MYSHIS, Mixed problem for semilinear hyperbolic system on the plane, Mat. Sb. (N. S.), **50** (1960), 423 442.
- [2] P. BASSANINI, M. CESARINA SALVATORI, A boundary value problem for nonlinear hyperbolic integro-differential systems, Boll. Un. Mat. Ital. B (5), 18, 3 (1981), 785 – 798.
- [3] P. BRANDI, R. CAPPITELLI, Existence, uniqueness and continuous dependence for a hereditary non-linear functional partial differential equation of the first order, Ann. Polon. Math., 47, 2 (1986), 121 136.
- [4] P. Brandi, A. Salvadori, Z. Kamont, Existence of generalized solutions of hyperbolic differential equations, Nonlinear Anal., 50, 7 (2002), 919 940.
- [5] L. CESARI, A boundary value problem for quasilinear hyperbolic systems in the Schauder canonic form, Ann. Scuola Norm. Sup. Pisa Cl. Sci. (4), 1 (1974), 311 358.
- [6] T. CZŁAPIŃSKI, On the Cauchy problem for quasilinear hyperbolic systems of partial differential functional equations of the first order, Z. Anal. Anwendungen, 10, 2 (1991), 169 – 182.
- [7] T. CZŁAPIŃSKI, On the local Cauchy problem for nonlinear hyperbolic functional differential equations, Ann. Polon. Math., 67, 3 (1997), 215 232.
- [8] T. CZŁAPIŃSKI, Z. KAMONT, On the local Cauchy problem for quasilinear hyperbolic functional differential systems, Appl. Anal., 64, 3–4 (1997), 329 342.
- [9] T. CZŁAPIŃSKI, On the mixed problem for quasilinear partial functional differential equations with unbounded delay, Ann. Polon. Math., 72, 1 (1999), 87 98.
- [10] Z. KAMONT, Existence of solutions of first order partial differential functional equations, Comment. Math. Prace Mat., 25, 2 (1985), 249 263.
- [11] Z. KAMONT, *Initial value problems for hyperbolic differential functional systems*, Boll. Un. Mat. Ital. B (7), **8**, 4 (1994), 965 984.
- [12] Z. KAMONT, Hyperbolic Functional Differential Inequalities and Applications, Mathematics and its Applications, 486. Kluwer Academic Publishers Dordrecht, 1999.
- [13] A. D. MYSHKIS, A. S. SLOPAK, A mixed problem for systems of differential functional equations with partial derivatives and with operators of the Volterra type, Mat. Sb. (N. S.), 41 (1957), 239 – 256.
- [14] A. D. MYSHKIS, A. M. FILIMONOV, Continuous solutions of quasilinear hyperbolic systems in two independent variables, Diff. Urav., 17 (1981), 488 – 500.
- [15] J. SZARSKI, Cauchy problem for differential functional equations with first order partial derivatives, Bull. Acad. Polon. Sci. Ser. Sci. Math. Astronom. Phys., 24, 8 (1976), 577 – 580.



[16] J. SZARSKI, Cauchy problem for an infinite system of differential - functional equations with first order partial derivatives, Comment. Math. Special Issue, 1 (1978), 293 – 300.