VOLTERRA-FREDHOLM NONLINEAR INTEGRAL EQUATIONS VIA PICARD OPERATORS THEORY

CLAUDIA BACOȚIU

Abstract. In the present paper we study existence and uniqueness of the solution, data dependence of the solution, comparison theorems, lower and upper subsolutions and differentiability of the solution with respect to a parameter of the following Volterra-Fredholm nonlinear integral equation

$$u(t,x) = g(t,x) + \int_0^t \int_\Omega K(t,x,s,y,u(s,y)) \mathrm{d}y \mathrm{d}s.$$

MSC 2000. 45G10, 47H10.

Key words. Volterra-Fredholm integral equation, fixed point, Picard operator, data dependence, subsolution, differentiability of the solution.

REFERENCES

[1] BRUNNER, H. and MESSINA, E., *Time-stepping methods for Volterra-Fredholm integral equations*, Rend. Mat., **23** (2003), 329–342.

[2] CARDONE, A., MESSINA, E. and RUSSO, E., *A fast iterative method for discretized Volterra-Fredholm integral equations*, J. Comput. Appl. Math., **189** (2006), 568–579.

[3] DIEKMANN, O., *Thresholds and travelling waves for the geographical spread of infection*, J. Math. Biol., **6** (1978), 109–130.

[4] DOBRIȚOIU, M., *An Integral Equation with Modified Argument*, Stud. Univ. Babeș-Bolyai Math., **52** (1999), 3, 81–94.

[5] DOBRIȚOIU, M., RUS, I.A. and ȘERBAN, M.A., *An Integral Equation Arising from Infectious Diseases, Via Picard Operators*, Stud. Univ. Babeș-Bolyai Math., **52** (1999), 3, 81–94.

[6] HADIZADEH, M., *Posteriori Error Estimates for the Nonlinear Volterra-Fredholm Integral Equations*, Comput. Math. Appl., **45** (2003), 677–687.

[7] MALEKNEJAD, K. and HADIZADEH, M., *A New Computational Method for Volterra-Fredholm Integral Equations*, Comput. Math. Appl., **37** (1999), 1–8.

[8] MALEKNEJAD, K. and FADAEI YAMI, M.R., *A computational method for system of Volterra-Fredholm integral equations*, Appl. Math. Comput., **183** (2006), 589–595.

[9] MUREȘAN, V., *Existence, uniqueness and data dependence for the solution of a Fredholm integral equation with linear modification of the argument*, Acta Sci. Math.(Szeged), **68** (2002), 117–124.

[10] PACHPATTE, B.G., *On mixed Volterra-Fredholm type integral equations*, Indian J. Pure Appl. Math, **17** (1986), 448–496.

[11] RUS, I.A., *Generalized Contractions and Applications*, Cluj University Press, Cluj-Napoca, 2001.

[12] RUS, I.A., *A delay integral equation from biomathematics*, Preprint No. 3, 1989, 87–90.

[13] Rus, I.A., *Picard operators and applications*, Sci. Math. Jpn., **58** (2003), No. 1, 191–219.

[14] Rus, I.A., *Weakly Picard operators and applications*, Seminar on Fixed Point Theory Cluj Napoca, **2** (2001), 41–58.

[15] Rus, I.A., *Fiber Picard operators and applications*, Stud. Univ. Babeş-Bolyai Math., **44** (1999), 89–98.

[16] Tămăşan, A., *Differentiability with respect to lag for nonlinear pantograph equation*, Pure Math. Appl., **9** (1998), 215–220.

[17] Thieme, H.R., *A Model for the Spatial Spread of an Epidemic*, J. Math. Biol., **4** (1977), 337–351.

[18] Wazwaz, A.M., *A reliable treatment for mixed Volterra-Fredholm integral equations*, Appl. Math. Comput., **127** (2002), 405–414.

Brassai Samuel High School

Cluj-Napoca, Romania

E-mail: Claudia.Bacotiu@clujnapoca.ro