



Sandomierz, 5th–9th September 2016

POSITIVITY PRESERVING NUMERICAL SCHEME FOR FRACTIONAL MATHEMATICAL MODELS OF BIOLOGICAL AND EPIDEMIOLOGICAL PHENOMENONS

Anna Szafrńska¹, Jacky Cresson²

¹Gdańsk University of Technology, G. Narutowicz Street 11/12, 80-233 Gdańsk,

²Laboratoire de Mathématiques Appliquées de Pau, Université de Pau et des Pays de l'Adour, avenue de l'Université, BP 1155, 64013 Pau Cedex, France,

¹aszafranska@mif.pg.gda.pl, ²jacky.cresson@univ-pau.fr

ABSTRACT

The fractional generalization of classical models allows for taking into account some new behaviors of the models components which can not be covered by the classical cases. Nevertheless, during the generalization, one must be sure that constructed fractional problems satisfy the specific properties which classical models possess. Another difficulty is related to the solvability of the fractional differential equations in the explicit form what is more complicated than in the classical case. This leads to the necessity of numerical study of these equations and the construction of numerical methods which preserve the same properties as differential problems.

In this work we discuss the continuous fractional persistence problems in the case of positivity property. We present the convergent non-standard finite difference scheme which preserves positivity as the continuous model. Some applications to biology and epidemiology are given.

REFERENCES

- [1] J. Cresson and A. Szafrńska: *Discrete and continuous fractional persistence problems: the positivity property and applications*, accepted in Communications in Nonlinear Science and Numerical Simulation.