15th INTERNATIONAL CONFERENCE
Dynamical Systems — Theory and Applications
December 2-5, 2019. Lodz, POLAND.

DSTA 2019

paper id: BIF210

On qualitative analysis of lattice dynamical system of two- and three-dimensional biopixels array: bifurcations and transition to chaos

Oleksandr Nakonechnyi, Vasyl Martsenyuk, Aleksandra Kłos-Witkowska

Abstract: We consider the model of two- or three-dimensional biopixels array, which can be used for design of biosensors. The model is based on the system of lattice differential equations with time delay, describing interactions of biological species of neighbouring pixels. The qualitative analysis includes permanence and extinctions of solutions, stability investigation, bifurcations and transition to chaos. The stability conditions are obtained with help of the method of Lyapunov functionals. They are formulated in terms of the value of time necessary for immune response. Numerical research are presented with help of phase portraits, square and hexagonal lattice plots and bifurcation diagrams.

[1)] Oleksandr Nakonechnyi, Professor: Taras Shevchenko National University of Kyiv, Glushkova Av.4 Build.6, Kyiv, Ukraine (UA), a.nakonechniy@gmail.com.

[2)] Vasyl Martsenyuk, Professor: University of Bielsko-Biala, 2 Willowa St, 43-300 Bielsko-Biała, Poland (PL), vmartsenyuk@ath.bielsko.pl.

[3)] Aleksandra Kłos-Witkowska, Ph.D.: University of Bielsko-Biala, Willowa Str 2, Poland (PL), awitkowska@ath.bielsko.pl.