Mathematical Methods and Models in Biosciences
June 18-23, 2023, Pomorie, Bulgaria
https://biomath.math.bas.bg/biomath/index.php/bmcs

On the qualitative analysis of fractional-order impulsive gene regulatory networks

Gani Stamov[1], Trayan Stamov[2], Ivanka Stamova[1]

[1]Department of Mathematics,
The University of Texas at San Antonio,
San Antonio, TX 78249, USA
gani.stamov@utsa.edu
ivanka.stamova@utsa.edu

[2]Department of Engineering Design,
Technical University of Sofia, Sofia, 1000, Bulgaria
tstamov@tu-sofia.bg

A class of fractional-order impulsive gene regulatory networks (GRNs) is intestigated. The proposed model is an extension of some existing integer-order GRNs using fractional derivatives of Caputo type. Some qualitative properties of solutions such as stability and almost periodicity are studied and new criteria are established by the Lyapunov functions approach. The effects of time-varying delays and impulsive perturbations at fixed times on the almost periodicity are considered. Numerical example are also presented to justify our findings.

Keywords: gene regulatory networks, fractional derivatives, impulses, stability, almost periodicity

References

[1] T. Stamov, I. Stamova, Design of impulsive controllers and impulsive control strategy for the Mittag-Leffler stability behavior of fractional gene regulatory networks, *Neurocomputing*, 424:54-62, 2021.

[2] G. Stamov, T. Stamov, I. Stamova, On the almost periodicity in discontinuous impulsive gene regulatory networks, *Mathematical Methods in the Applied Sciences*, 2021.

[3] I. Stamova, G. Stamov, Lyapunov Approach for Almost Periodicity in Impulsive Gene Regulatory Networks of Fractional Order with Time-Varying Delays, *Fractal and Fractional*, 5(4):268, 2021.