

HOPF BIFURCATIONS OF A RATIO-DEPENDENT
PREDATOR-PREY MODEL INVOLVING TWO DISCRETE
MATURATION TIME DELAYS

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Abstract

In this talk, we give a detailed Hopf bifurcation analysis of a ratio-dependent predator-prey system involving two different discrete delays. By analyzing the characteristic equation associated with the model, its linear stability is investigated. Choosing delay terms as bifurcation parameters the existence of Hopf bifurcations is demonstrated. Furthermore, some of the bifurcation properties including direction, stability and period are mentioned. Finally, theoretical results are supported by some numerical simulations.

Keywords: Hopf bifurcation, delay differential equation, time delay, stability, periodic solutions, population dynamics.

References

- [1] C. Celik, The stability and Hopf bifurcation for a predator-prey system with time delay, *Chaos, Solitons & Fractals*, **37**, (2008), 87-99.
- [2] C. Celik, Hopf bifurcation of a ratio-dependent predator-prey system with time delay, *Chaos, Solitons & Fractals*, **42**,(2009), 1474-1484.
- [3] N. D. Hassard and Y. H. Kazarinoff, *Theory and Applications of Hopf Bifurcation*, Cambridge University Press, 1981.
- [4] E. Karaoglu and H. Merdan, Hopf bifurcation analysis for a ratio-dependent predator-prey system involving two delays, *ANZIAM Journal* **55**, (2014), 214-231.

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