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ABSTRACT | Bob Kooi

Title

Analysis of Torus bifurcations in epidemiological and ecological models.

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Abstract

The transitions of the bifurcation pattern of autonomous systems when they becomes nonautonomous due to periodic forcing is studied. The focus is the the role of the Torus bifurcation involved a route to chaos in models of epidemiological and ecological systems. For instance the Hopf bifurcation of the autonomous systems becomes a Torus bifurcation in the associated periodically forced system where the amplitude of the forcing is zero. This makes this transition a natural starting point for the continuation of the torus bifurcation. By performing several numerical experiments using bifurcation analysis and the calculation of Lyapunov exponents, the transition to chaos, possibly via Arnold tongues, is studied in detail.

References

[1] Aguiar, M., Kooi, B.W., & Stollenwerk, N. 2008. Epidemiology of dengue fever: A model with temporary cross-immunity and possible secondary infection shows bifurcations and chaotic behavior in wide parameter regions. Mathematical Modelling of Natural Phenomena, 3(4):48-70.

[2] Aguiar, M., Stollenwerk, N., & Kooi, B.W. 2009. Torus bifurcations, isolas and chaotic attractors in a simple dengue fever model with ADE and temporary cross immunity. International Journal of Computer Mathematics, 86(10/11): 1867–1877.