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**FFT bifurcation: a tool for spectrum analyzing of dynamical systems.** (English) [Zbl 07488767]


Summary: This paper presents FFT bifurcation as a tool for investigating complex dynamics. Firstly, two well-known chaotic systems (Rössler and Lorenz) are discussed from the frequency viewpoint. Then, both discrete-time and continuous-time systems are studied. Various systems with different properties are discussed. In discrete-time systems, Logistic map and a biological map are investigated. For continuous-time systems, a system with a stable equilibrium, forced van der Pol system, and a system with a line of equilibria are discussed. For each system under investigation, the proposed FFT bifurcation diagrams are compared with the conventional bifurcation diagrams, showing some interesting information uncovered by the FFT bifurcation. For periodic trajectories, the FFT bifurcations show high power at the dominant frequency and harmonics. By doubling the periods, their dominant frequencies are halved, and more harmonics emerge in the studied frequency intervals. For the chaotic dynamics, the FFT bifurcation shows a wideband power spectrum. The FFT bifurcation shows interesting results in comparison to conventional bifurcation diagrams.

**MSC:**

- 37Nxx Applications of dynamical systems
- 37Dxx Dynamical systems with hyperbolic behavior
- 34Cxx Qualitative theory for ordinary differential equations

**Keywords:**

FFT bifurcation; bifurcation diagram; dynamical system; frequency spectrum; hidden dynamics

**Full Text:** DOI

**References:**


