



Toward Analytical Chaos in Nonlinear Systems

Albert C. J. Luo

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Exact analytical solutions to periodic motions in nonlinear dynamical systems are almost not possible. Since the 18th century, one has extensively used techniques such as perturbation methods to obtain approximate analytical solutions of periodic motions in nonlinear systems. However, the perturbation methods cannot provide the enough accuracy of analytical solutions of periodic motions in nonlinear dynamical systems. So the bifurcation trees of periodic motions to chaos cannot be achieved analytically. The author has developed an analytical technique that is more effective to achieve periodic motions and corresponding bifurcation trees to chaos analytically.

Toward Analytical Chaos in Nonlinear Systems systematically presents a new approach to analytically determine periodic flows to chaos or quasi-periodic flows in nonlinear dynamical systems with/without time-delay. It covers the mathematical theory and includes two examples of nonlinear systems with/without time-delay in engineering and physics. From the analytical solutions, the routes from periodic motions to chaos are developed analytically rather than the incomplete numerical routes to chaos. The analytical techniques presented will provide a better understanding of regularity and complexity of periodic motions and chaos in nonlinear dynamical systems.

Key features:

- Presents the mathematical theory of analytical solutions of periodic flows to chaos or quasiperiodic flows in nonlinear dynamical systems
- Covers nonlinear dynamical systems and nonlinear vibration systems
- Presents accurate, analytical solutions of stable and unstable periodic flows for popular nonlinear systems
- Includes two complete sample systems
- Discusses time-delayed, nonlinear systems and time-delayed, nonlinear vibrational systems
- Includes real world examples

Toward Analytical Chaos in Nonlinear Systems is a comprehensive reference for researchers and practitioners across engineering, mathematics and physics disciplines, and is also a useful source of information for graduate and senior undergraduate students in these areas.

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