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Editorial

Periodic motions and chaos in nonlinear dynamical systems

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Analytical predictions of periodic motions and chaos are very difficult, which has been an unsolved issue in nonlinear dynamical systems since the 17th century. Recently, analytical and semi-analytical methods for periodic motions in nonlinear dynamical systems were developed, and they may provide new insights into these unsolved problems in nonlinear dynamical systems.

This special issue focuses on analytical solutions for periodic motions to chaos in engineering systems. Objectives of this special issue are:

- to present the recently developed methods for accurate periodic motions and towards analytical chaos rather than numerical simulation,
- to apply analytical and semi-analytical methods to determine periodic motions to chaos,
- to analytically determine unstable periodic motions and control to the unstable periodic motions in application,
- to help readers understand the complexity of periodic motions in nonlinear dynamical systems.

To achieve the aforementioned objectives, four topics are addressed: (i) 1-dimensional, nonlinear systems; (ii) analytical solutions and control to unstable periodic motions; (iii) many degrees of freedom systems and continuous systems, and (iv) experimental studies of periodic motions. The four topics are distributed through the following papers.

- Periodic motions to chaos in a 1-dimensional, time-delay, nonlinear system [1]
- Experimental and analytical periodic motions in a first-order nonlinear circuit system [2]
- Analytical solutions of periodic motions in a first-order quadratic nonlinear circuit system [3]
- Feedback control of unstable periodic motion for brushless motor with unsteady external torque [5]
- Periodic motions and chaos in a power system including power disturbance [4]
- Steady state performance of a nonlinear vibration absorber on vibration reduction of a harmonic forced oscillator [6]

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– Frequency-amplitude characteristics of periodic motions in a periodically forced van der Pol oscillator [7]
– Periodic, aperiodic and chaotic motions of harmonically excited SDOF and MDOF nonlinear dynamical systems [8]
– Resonance capture and targeted energy transfer for suppressing aeroelastic instability of 2-D wing [9]
– Devil's staircases in a thermoacoustic system with sinusoidal excitations [10].

The editor would like to thank all authors for their contributions and reviewers for reviewing manuscripts in this special issue. In addition, the editor would like to thank European Physical Journal-Special Topics, Sabine Lehr and Vincent Colpin for all their support. This special issue will benefit our scientific community. The editor hopes these materials will help promote understanding of periodic motions to chaos in nonlinear dynamical systems.

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