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Editorial

Chaos-Fractals Theories and Applications

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Chaos-fractals theories and applications play an important role in nonlinear science research. The subject has been widely investigated with significant progress and achievements especially in recent years. In addition, it has been applied to many scientific disciplines, such as meteorology, physics, engineering, economics, biology, and even philosophy. This special issue on Chaos-Fractals Theories and Applications publishes 19 papers, most of which are carefully reviewed by experts and peers in the field.

Some research on chaos theory is addressed by 5 papers. For example, T. Lu et al. study the retentivity of chaos under topological conjugation, proving that chaotic properties are all preserved under such a condition. However, an example is given to show that Li-Yorke chaos is not preserved under topological conjugation if the domain is extended to a general metric space. J. Luo suggests a state-feedback control method for fractional-order nonlinear systems subject to input saturation. It is shown that linear state-feedback controller can be used to control the fractional-order nonlinear systems.

There are 6 papers focusing on fractals research. For instance, M. Romera et al. introduce a method to draw complete external rays based on the escape lines and Bézier curves. It solves the limitation in drawing an external ray because it reaches a point from which the drawing tool cannot continue to work. J. Lu et al. develop a fractal color image watermarking method. S. Zhu et al. explore an efficient fractal video codec for compressing multiviews. They make full use of the characteristic of fractal video coding and the nature of video particularly.

In addition, there are 8 papers which address chaos-fractals applications. Just to introduce a few, T. Zhao et al. report their recent works on free space ranging with chaotic light. Using a laser diode with optical feedback as a chaotic source, a prototype of chaotic lidar was developed, which can achieve a range-independent resolution of 18 cm and measurable distance of 130 m in distance. Y. Wu et al. report their investigation on the time delay signature in chaotic semiconductors, subject to delayed filtered optical feedback, of which a Fabry-Pérot interferometer type of filter is placed in the external cavity. Especially, a new memristor based chaotic circuit is presented by Y. Li et al. It is generated by replacing the nonlinear resistor in Chua's circuit with a flux-controlled memristor and a negative conductor. The dynamical behaviors are verified by both computer simulations and laboratory experiments.

By filing these papers together in a special issue, we wish to provide better views for our readers and researchers about the important areas of chaos-fractals research, regarding both theory and applications.

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