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Fractional calculus is a mathematical analysis field which is concerned with the generalization of differentiation and integration to arbitrary real or even complex orders. Although the idea of fractional calculus has been first mentioned at the end of 17th century, recent studies reveal that many physical phenomena in nature and experiments can be accurately modeled by fractional differential equations. More specifically, the fractional derivative considers the history of previous states in its definition, so it provides an excellent instrument for the modeling memory and hereditary properties in some physical and biological phenomena.

On the other hand, chaos is a very interesting nonlinear phenomenon which has been intensively studied during the last four decades due to its useful applications in science and technology. A regular chaotic system has one positive Lyapunov exponent, whereas a system with more than one positive Lyapunov exponent is called “hyperchaotic.” Therefore, hyperchaotic systems are more sensitive to perturbations, external disturbances, and parameter variations than conventional chaotic ones.

Thus, research about fractional-order hyperchaotic systems gains a lot of interest from both theoretical and applied points of view. Some fractional-order hyperchaotic systems have been investigated, such as the fractional-order hyperchaotic Rössler system and the fractional-order hyperchaotic Chen system. Recent publications also include nonlinear circuits, secure communication, laser applications, spread spectrum communication, communication in star coupled network, video encryption communication, color image encryption algorithm, and applications of different types of synchronization.

The main objective of this special issue is to provide an opportunity to study the new developments related to novel chaotic systems, synchronization schemes, bifurcations, and control in hyperchaotic fractional-order systems along with their applications. We invite authors and researchers to contribute their original research articles as well as review articles.

Potential topics include but are not limited to the following:

- ▶ Development and applications of novel controlling schemes for chaotic behavior and bifurcations in hyperchaotic fractional-order systems
- ▶ Applications of chaos synchronization and bifurcations in hyperchaotic fractional-order systems
- ▶ Chaos in epidemic fractional-order models
- ▶ Hyperchaotic fractional-order circuits
- ▶ Applications in chaos-based cryptography

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Lead Guest Editor

Ahmed Elsaid, Mansoura University,
Mansoura, Egypt
a_elsaid@mans.edu.eg

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delfim@ua.pt

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Kolhapur, India
sbb_maths@unishivaji.ac.in

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University, Ismailia, Egypt
aelsadany1@yahoo.com

Amr Elsonbaty, Mansoura University,
Mansoura, Egypt
sonbaty2010@gmail.com

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