Complexity

Special Issue on
Iterative Learning and Fractional Order Control for Complex Systems

WILEY | Hindawi

CALL FOR PAPERS

Control theory asks how to influence the behavior of a dynamical system with appropriately chosen inputs so that the system's output follows a desired trajectory or final state. A key notion in control theory is the feedback process: The difference between the actual and desired output is applied as feedback to the system's input, forcing the system's output to converge to the desired output. Feedback control has deep roots in physics and engineering.

Indeed, when a system is performing the same task repeatedly, it is advantageous to use the knowledge from the previous iterations of the same task in order to reduce the error on successive trials. An example of such a system is robot arm manipulators, when the reference trajectory is repeated over a given operation time. Using the conventional control algorithms with such systems, the same error is repeated from cycle to cycle. Iterative Learning Control (ILC) is a relatively new addition to the toolbox of control algorithm. It is concerned with the performance of systems that operate in a repetitive manner. ILC differs from most existing control methods in the sense that it exploits every possibility to incorporate past control information, such as tracking errors and control input signals, into the construction of the present control action in order to enable the controlled system to perform progressively better from operation to operation. Since the ILC method was proposed by Uchiyama and presented as a formal theory by Arimoto, this technique has been the centre of interest of many researchers over the last decades.

Fractional order control systems have also received great attention recently, from both an academic and industrial viewpoint, because of their increased flexibility (with respect to integer order systems) which allows a more accurate modelling of complex systems and the achievement of more challenging control requirements.

The aim of this special issue is to present the latest developments, trends, research solutions, and applications of ILC and fractional order control and to explore the more fertile avenues for future research. The breadth of scope for the special issue includes both theoretical research and experimental application.

We welcome original high-quality papers previously unpublished, addressing recent results for complex systems (nonlinear dynamical systems, complex dynamical networks, stochastic systems, chaotic nonlinear systems, complex mechanical structures, robots, etc.).

Potential topics include but are not limited to the following:

- Applications of fractional order control systems
- Bifurcation analysis and control
- Chaos analysis, control, and anticontrol
- Chaos modelling
- Chaos synchronization and antisynchronization
- Chaos-based digital communication
- Chaos-based secure communication
- Chaotic neural networks, electronics, and systems
- Chaotic systems
- Circuit realization of chaotic systems
- Control and synchronization of complex networks
- Control of chaotic systems
- Fractional order control
- Fractional order modeling of physical systems
- Fractional system identification and optimization
- Fuzzy fractional order controller
- Hyperchaotic systems
- ILC of nonlinear dynamical systems
- ILC of complex dynamical networks
- Decentralized ILC
- Adaptive ILC
- ILC of stochastic systems
- ILC of chaotic nonlinear systems
- ILC of complex mechanical structures and robotics
- ILC of multiagent systems

Authors can submit their manuscripts through the Manuscript Tracking System at https://mts.hindawi.com/submit/journals/complexity/ilccs/.

Papers are published upon acceptance, regardless of the Special Issue publication date.

Lead Guest Editor
Farah Bouakrif, University of Jijel, Jijel, Algeria
f.bouakrif@gmail.com

Guest Editors
Ahmad Taher Azar, Benha University, Benha, Egypt
ahmad_t_azar@ieee.org

Christos Volos, Aristotle University of Thessaloniki, Thessaloniki, Greece
volos@physics.auth.gr

Jesus M. Muñoz-Pacheco, Benemérita Universidad Autónoma de Puebla, Puebla, Mexico
jesusm.pacheco@correo.buap.mx

Viet-Thanh Pham, Hanoi University of Science and Technology, Hanoi, Vietnam
thanh.phamviet@phenikaa-uni.edu.vn

Submission Deadline
Friday, 21 September 2018

Publication Date
February 2019