

# Iterative Learning Control

Analysis, Design, Integration  
and Applications

*Editors*

Zeng-Guang Bi and Jian-Xin Xu

# Iterative Learning Control Analysis Design Integration Applications

**Paul M.J. van den Hof, Carsten  
Scherer, Peter S.C. Heuberger**

## **Iterative Learning Control Analysis Design Integration Applications:**

**Iterative Learning Control** Zeungnam Bien,Jian-Xin Xu,2012-12-06 Iterative Learning Control 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. There are two phases in Iterative Learning Control: first the long term memory components are used to store past control information; then the stored control information is fused in a certain manner so as to ensure that the system meets control specifications such as convergence, robustness, etc. It is worth pointing out that those control specifications may not be easily satisfied by other control methods as they require more prior knowledge of the process in the stage of the controller design. ILC requires much less information of the system variations to yield the desired dynamic behaviors. Due to its simplicity and effectiveness, ILC has received considerable attention and applications in many areas for the past one and half decades. Most contributions have been focused on developing new ILC algorithms with property analysis. Since 1992, the research in ILC has progressed by leaps and bounds. On one hand, substantial work has been conducted and reported in the core area of developing and analyzing new ILC algorithms. On the other hand, researchers have realized that integration of ILC with other control techniques may give rise to better controllers that exhibit desired performance which is impossible by any individual approach.

### **Real-time**

**Iterative Learning Control** Jian-Xin Xu, Sanjib K. Panda, Tong Heng Lee, 2008-12-12 Real time Iterative Learning Control demonstrates how the latest advances in iterative learning control ILC can be applied to a number of plants widely encountered in practice. The book gives a systematic introduction to real time ILC design and source of illustrative case studies for ILC problem solving. The fundamental concepts, schematics, configurations and generic guidelines for ILC design and implementation are enhanced by a well selected group of representative simple and easy to learn example applications. Key issues in ILC design and implementation in linear and nonlinear plants, pervading mechatronics and batch processes are addressed in particular. ILC design in the continuous and discrete time domains, design in the frequency and time domains, design with problem specific performance objectives including robustness and optimality, design in a modular approach by integration with other control techniques and design by means of classical tools based on Bode plots and state space.

**Iterative Learning Control Algorithms and Experimental Benchmarking** Eric Rogers, Bing Chu, Christopher Freeman, Paul Lewin, 2023-01-12 Iterative Learning CONTROL ALGORITHMS AND EXPERIMENTAL BENCHMARKING Iterative Learning Control Algorithms and Experimental Benchmarking Presents key cutting edge research into the use of iterative learning control. The book discusses the main methods of iterative learning control ILC and its interactions as well as comparator performance that is so crucial to the end user. The book provides integrated coverage of the major approaches to date in terms of basic systems theoretic properties, design algorithms and experimentally measured performance as well as the links with repetitive control and other related areas. Key features: Provides comprehensive coverage of the main

approaches to ILC and their relative advantages and disadvantages Presents the leading research in the field along with experimental benchmarking results Demonstrates how this approach can extend out from engineering to other areas and in particular new research into its use in healthcare systems rehabilitation robotics The book is essential reading for researchers and graduate students in iterative learning control repetitive control and more generally control systems theory and its applications **Linear and Nonlinear Iterative Learning Control** Jian-Xin Xu,Ying Tan,2003-09-04 This monograph summarizes the recent achievements made in the field of iterative learning control The book is self contained in theoretical analysis and can be used as a reference or textbook for a graduate level course as well as for self study It opens a new avenue towards a new paradigm in deterministic learning control theory accompanied by detailed examples

Intelligent Technologies and Engineering Systems Jengnan Juang,Yi-Cheng Huang,2013-05-21 This book concentrates on intelligent technologies as it relates to engineering systems The book covers the following topics networking signal processing artificial intelligence control and software engineering intelligent electronic circuits and systems communications and materials and mechanical engineering The book is a collection of original papers that have been reviewed by technical editors These papers were presented at the International Conference on Intelligent Technologies and Engineering Systems held Dec 13 15 2012 **Model-Based Control:** Paul M.J. van den Hof,Carsten Scherer,Peter S.C. Heuberger,2009-08-05 Model Based Control will be a collection of state of the art contributions in the field of modelling identification robust control and optimization of dynamical systems with particular attention to the application domains of motion control systems high accuracy positioning systems and large scale industrial process control systems The book will be directed to academic and industrial people involved in research in systems and control industrial process control and mechatronics **Soft Robotics based on Electroactive Polymers** Guoying Gu,Herbert Shea,Stefan Seelecke,Gursel Alici,Gianluca Rizzello,2021-06-17

**2001 IEEE International Symposium on Computational Intelligence in Robotics and Automation** Hong Zhang,2001 Control and Intelligent Systems ,2003 Journal of Dynamic Systems, Measurement, and Control ,2007 Proceedings of the ... IEEE International Conference on Control Applications ,1996 **Astrodynamics** ,2006 **SME Technical Paper** Society of Manufacturing Engineers,2005 **Astrodynamics 2003** ,2004 The Kyle T. Alfriend Astrodynamics Symposium Shannon L. Coffey,2011 **JSME International Journal** , International Journal of Applied Mathematics and Computer Science ,2003 **Proceedings of the ASME Dynamic Systems and Control Division--2003** ,2003 Iterative Learning Control Z. Zenn Bien,Hidenori Kimura,2002 **Spaceflight Mechanics 2003** Daniel J. Scheeres,2003

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