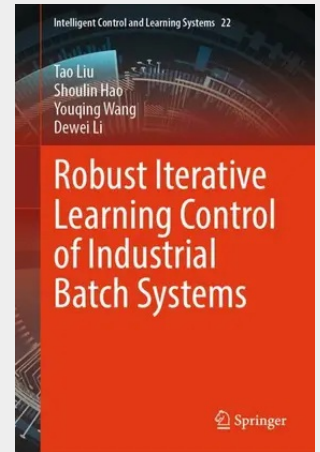


Robust Iterative Learning Control of Industrial Batch Systems

This book offers advanced iterative learning control (ILC) and optimization methods for industrial batch systems, facilitating engineering applications subject to time- and batch-varying process uncertainties that could not be effectively addressed by the existing ILC methods. In particular, advanced ILC designs based on the classical proportional-integral-derivative (PID) control loop are presented for the convenience of application, which could not only realize perfect tracking of the desired output trajectory under repetitive process uncertainties and disturbance, but also maintain robust tracking against time-varying uncertainties and disturbance. Moreover, optimization-based ILC designs are provided to deal with the input and/or output constraints of batch process operation, based on the model predictive control (MPC) principle for process optimization. Furthermore, predictor-based ILC designs are given to deal with time delay in the process input, state or output as often encountered in practice, which could obtain evidently improved control performance compared to the developed ILC methods mainly devoted to delay-free batch processes. In addition, data-driven ILC methods are also presented for application to batch operation systems with unknown dynamics and time-varying uncertainties. Benchmark examples from the existing literature are used to demonstrate the advantages of the proposed ILC methods, along with real applications to industrial injection molding machines, 6-degree-of-freedom robotic manipulator, and refrigerated/heating circulators of pharmaceutical crystallizers. This book will be a valuable source of information for control engineers and researchers in industrial process control theory and engineering field. It can also be used as an advanced textbook for undergraduate and graduate students in control engineering, process system engineering, chemical engineering, mechanical engineering, electrical engineering, biomedical engineering and industrial automation engineering.

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