Convex Optimization Approach to Robust Iterative Learning Control with Application to Industrial Process Control and Flexible Link

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Abstract

This research develops a convex optimization design of robust iterative learning control (ILC) algorithm for linear systems subject to parametric uncertainties. The system model is described by the Markov matrix as an affine function of parametric uncertainties. The robust ILC design is formulated as a min-max problem using a quadratic performance criterion subject to constraints of the control input update. We reformulate the design problem as a convex optimization over linear matrix inequalities. The LMI problem can efficiently solved using available convex optimization software. The robust ILC algorithm has been developed and we prove the convergence of the control input and the error. Moreover, we apply robust ILC algorithm to industrial process control and flexible link to demonstrate the effectiveness of the design algorithm.

Biography

David Banjerdpongchai received B.Eng. degree (First class honors) from Chulalongkorn University, and M.S. and Ph.D. degrees from Stanford University, all in Electrical Engineeringtively. He has been with the department of Electrical Engineering, Faculty of Engineering, Chulalongkorn University. Currently, he is a professor of Electrical Engineering and head of Control Systems Research laboratory. In addition, he serves as a deputy director of International School of Engineering. He is a member of ECTI and senior member of IEEE. He served as a chair of Systems and Control of ECTI Association, from 2010-2014 and has served as a chair of IEEE Control Systems Society Thailand Chapter since 2015. He has served as a general co-chair of ECTI-CON 2013. His research interests are energy management systems, analysis and synthesis of robust control systems, and convex optimization in robust control problems.