Networked and Distributed Predictive Control: Methods and Nonlinear Process Network Applications (Advances in Industrial Control)

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Networked and Distributed Predictive Control: Methods and Nonlinear Process Network Applications (Advances in Industrial Control) Panagiotis D. Christofides, Jinfeng Liu, David Muñoz de la Peña Networked and Distributed Predictive Control presents rigorous, yet practical, methods for the design of networked and distributed predictive control systems – the first book to do so. The design of model predictive control systems using Lyapunov-based techniques accounting for the influence of asynchronous and delayed measurements is followed by a treatment of networked control architecture development. This shows how networked control can augment dedicated control systems in a natural way and takes advantage of additional, potentially asynchronous and delayed measurements to maintain closed loop stability and significantly to improve closed-loop performance. The text then shifts focus to the design of distributed predictive control systems that cooperate efficiently in computing optimal manipulated input trajectories that achieve desired stability, performance and robustness specifications but spend a fraction of the time required by centralized control systems. Key features of this book include: • new techniques for networked and distributed control system design; • insight into issues associated with networked and distributed predictive control and their solution; • detailed appraisal of industrial relevance using computer simulation of nonlinear chemical process networks and wind- and solar-energy-generation systems; and • integrated exposition of novel research topics and rich resource of references to significant recent work. A full understanding of Networked and Distributed Predictive Control requires a basic knowledge of differential equations, linear and nonlinear control theory and optimization methods and the book is intended for academic researchers and graduate students studying control and for process control engineers. The constant attention to practical matters associated with implementation of the theory discussed will help each of these groups understand the application of the book’s methods in greater depth.

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