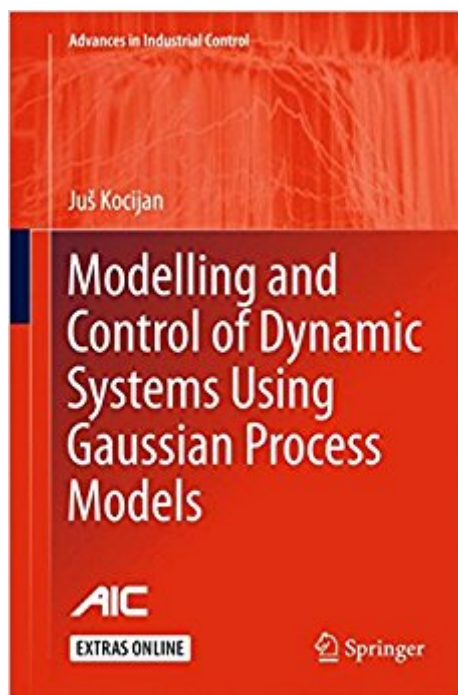




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Modelling And Control Of Dynamic Systems Using Gaussian Process Models (Advances In Industrial Control)



Synopsis

This monograph opens up new horizons for engineers and researchers in academia and in industry dealing with or interested in new developments in the field of system identification and control. It emphasizes guidelines for working solutions and practical advice for their implementation rather than the theoretical background of Gaussian process (GP) models. The book demonstrates the potential of this recent development in probabilistic machine-learning methods and gives the reader an intuitive understanding of the topic. The current state of the art is treated along with possible future directions for research. Systems control design relies on mathematical models and these may be developed from measurement data. This process of system identification, when based on GP models, can play an integral part of control design in data-based control and its description as such is an essential aspect of the text. The background of GP regression is introduced first with system identification and incorporation of prior knowledge then leading into full-blown control. The book is illustrated by extensive use of examples, line drawings, and graphical presentation of computer-simulation results and plant measurements. The research results presented are applied in real-life case studies drawn from successful applications including: a gas-liquid separator control; urban-traffic signal modelling and reconstruction; and prediction of atmospheric ozone concentration. A MATLAB® toolbox, for identification and simulation of dynamic GP models is provided for download.

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JuÅi Kocijan is a senior research fellow at the Department of Systems and Control, Jozef Stefan Institute, the leading Slovenian research institute in the field of natural sciences and engineering, and a Professor of Electrical Engineering at the University of Nova Gorica, Slovenia. His past experience in the field of control engineering includes teaching and research at the University of Ljubljana and visiting research and teaching posts at several European universities and research institutes. He has been active in applied research in automatic control through numerous domestic and international research grants and projects, in a considerable number of which he acted as project leader. His research interests include the modelling of dynamic systems with Gaussian process models, control based on Gaussian process models, multiple-model approaches to modelling and control, applied nonlinear control, Individual Channel Analysis and Design. His other experience includes: serving as one of the editors of the *Engineering Applications of Artificial*

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