


# Model Predictive Control System Design and Implementation Using MATLAB® (Advances in Industrial Control)

*By Liuping Wang*

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Model Predictive Control System Design and Implementation Using MATLAB® proposes methods for design and implementation of MPC systems using basis functions that confer the following advantages: - continuous- and discrete-time MPC problems solved in similar design frameworks; - a parsimonious parametric representation of the control trajectory gives rise to computationally efficient algorithms and better on-line performance; and - a more general discrete-time representation of MPC design that becomes identical to the traditional approach for an appropriate choice of parameters.

After the theoretical presentation, coverage is given to three industrial applications. The subject of quadratic programming, often associated with the core optimization algorithms of MPC is also introduced and explained.

The technical contents of this book is mainly based on advances in MPC using state-space models and basis functions. This volume includes numerous analytical examples and problems and MATLAB® programs and exercises.

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**Model Predictive Control System Design and Implementation Using MATLAB® (Advances in Industrial Control) By Liuping Wang Bibliography**

- Sales Rank: #2332961 in Books
- Published on: 2009-03-04
- Original language: English
- Number of items: 1
- Dimensions: 9.40" h x 1.00" w x 6.40" l, 1.70 pounds
- Binding: Hardcover
- 378 pages

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## Editorial Review

Review

From the reviews:

“This monograph gives an introduction to model predictive control and recent developments in its design and implementation using Matlab and Simulink. The book is aimed at a wide readership ranging from industrial control engineers to graduate students in the process and control disciplines.” (IEEE Control Systems Magazine, Vol. 30, August, 2010)

“The book gives an introduction to Model Predictive Control (MPC), and recent developments in design and implementation. … The book’s approach is expected to appeal to a wide readership ranging from the industrial control engineer to the postgraduate student in the process and control disciplines. Both will find the MATLAB demonstrations of the control concepts a valuable tutorial route to understanding MPC in practice.” (Karl-Heinz Waldmann, Zentralblatt MATH, Vol. 1200, 2011)

From the Back Cover

Model Predictive Control (MPC) is unusual in receiving on-going interest in both industrial and academic circles. Issues such as plant optimization and constrained control which are critical to industrial engineers are naturally embedded in its designs.

*Model Predictive Control System Design and Implementation Using MATLAB*® proposes methods for design and implementation of MPC systems using basis functions that confer the following advantages:

• continuous- and discrete-time MPC problems solved in similar design frameworks;

• a parsimonious parametric representation of the control trajectory gives rise to computationally efficient algorithms and better on-line performance; and

• a more general discrete-time representation of MPC design that becomes identical to the traditional approach for an appropriate choice of parameters.

After the theoretical presentation, detailed coverage is given to three industrial applications: a food extruder, a motor and a magnetic bearing system. The subject of quadratic programming, often associated with the core optimization algorithms of MPC is also introduced and explained.

The technical contents of this book, mainly based on advances in MPC using state-space models and basis functions – to which the author is a major contributor, will be of interest to control researchers and practitioners, especially of process control. From a pedagogical standpoint, this volume includes numerous simple analytical examples and every chapter contains problems and MATLAB® programs and exercises to assist the student.

About the Author

Liuping Wang received her PhD in 1989 from the University of Sheffield, UK; subsequently, she was an adjunct associate professor in the Dept. of Chemical Engineering at the University of Toronto, Canada. From 1998 to 2002, she was a senior lecturer and research coordinator in the Center for Integrated Dynamics and Control, University of Newcastle, Australia before joining RMIT University where she is a professor and Head of Discipline of Electrical Engineering. She is the author of two books, joint editor of one book, and has published over 130 papers.

Liuping Wang has been actively engaged in industry-oriented research and development since the completion of her PhD studies. Whilst working at the University of Toronto, Canada, she was a co-founder of an industry consortium for the identification of chemical processes. Since her arrival in Australia in 1998, she has been working with Australian government organisations and companies in the areas of food manufacturing, mining, automotive and power services, including Food Science Australia, Uncle Ben’s Australia, CSR, BHP-Billiton, Pacific Group Technologies, Holden Innovation, Alinta, and ANCA. She leads the Control Systems program at the Australian Advanced Manufacturing Cooperative Research Center (AMCRC) that develops next generation technology platforms for the manufacturing industry. She is also on the Board of Directors of the Australian Power Academy that promotes power-engineering education and raises scholarships from the power industry to support undergraduate students.

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