

From Plant Data to Process Control

Ideas for process identification
and PID design

Liuping Wang
and William R. Cluett



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From Plant Data To Process Control Ideas For Process Identification And Pid Design

Jose A. Romagnoli, Ahmet Palazoglu



From Plant Data To Process Control Ideas For Process Identification And Pid Design:

From Plant Data to Process Control Liuping Wang, 2004-02-03 Process engineering spans industrial applications in the manufacturing sector from petrochemical to polymer to mineral production From Plant Data to Process Control covers the most up to date techniques and algorithms in the area of process identification PID and process control two key components of process engineering essential for optimizing production systems It examines both the theoretical advances in process design and control theory and a wide variety of implementations A wide variety of approaches are presented for building models of dynamical systems based on observed data process identification and for making the output of a system behave in a desired fashion by properly selecting the process input process control *Introduction to Process Control* Jose A. Romagnoli, Ahmet Palazoglu, 2020-07-14 Introduction to Process Control Third Edition continues to provide a bridge between traditional and modern views of process control by blending conventional topics with a broader perspective of integrated process operation control and information systems Updated and expanded throughout this third edition addresses issues highly relevant to today's teaching of process control Discusses smart manufacturing new data preprocessing techniques and machine learning and artificial intelligence concepts that are part of current smart manufacturing decisions Includes extensive references to guide the reader to the resources needed to solve modeling classification and monitoring problems Introduces the link between process optimization and process control optimizing control including the effect of disturbances on the optimal plant operation the concepts of steady state and dynamic back off as ways to quantify the economic benefits of control and how to determine an optimal transition policy during a planned production change Incorporates an introduction to the modern architectures of industrial computer control systems with real case studies and applications to pilot scale operations Analyzes the expanded role of process control in modern manufacturing including model centric technologies and integrated control systems Integrates data processing reconciliation and intelligent monitoring in the overall control system architecture Drawing on the authors combined 60 years of teaching experiences this classroom tested text is designed for chemical engineering students but is also suitable for industrial practitioners who need to understand key concepts of process control and how to implement them The text offers a comprehensive pedagogical approach to reinforce learning and presents a concept first followed by an example allowing students to grasp theoretical concepts in a practical manner and uses the same problem in each chapter culminating in a complete control design strategy A vast number of exercises throughout ensure readers are supported in their learning and comprehension Downloadable MATLAB toolboxes for process control education as well as the main simulation examples from the book offer a user friendly software environment for interactively studying the examples in the text These can be downloaded from the publisher's website Solutions manual is available for qualifying professors from the publisher **Introduction to Process Control, Second Edition** Jose A. Romagnoli, Ahmet Palazoglu, 2012-02-14 Introduction to Process Control Second Edition provides a

bridge between the traditional view of process control and the current expanded role by blending conventional topics with a broader perspective of more integrated process operation control and information systems Updating and expanding the content of its predecessor this second edition addresses issues in today's teaching of process control Teaching Learning Principles Presents a concept first followed by an example allowing students to grasp theoretical concepts in a practical manner Uses the same problem in each chapter culminating in a complete control design strategy Includes 50 percent more exercises Content Defines the traditional and expanded roles of process control in modern manufacturing Introduces the link between process optimization and process control optimizing control including the effect of disturbances on the optimal plant operation the concepts of steady state and dynamic backoff as ways to quantify the economic benefits of control and how to determine an optimal transition policy during a planned production change Incorporates an introduction to the modern architectures of industrial computer control systems with real case studies and applications to pilot scale operations Discusses the expanded role of process control in modern manufacturing including model centric technologies and integrated control systems Integrates data processing reconciliation and intelligent monitoring in the overall control system architecture Web Resource The book's website offers a user friendly software environment for interactively studying the examples in the text The site contains the MATLAB toolboxes for process control education as well as the main simulation examples from the book Access the site through the authors websites at www.pseonline.net and www.chms.ucdavis.edu research web pse ahmet Drawing on the authors combined 50 years of teaching experiences this classroom tested text is designed for chemical engineering students but is also suitable for industrial practitioners who need to understand key concepts of process control and how to implement them The authors help readers see how traditional process control has evolved into an integrated operational environment used to run modern manufacturing facilities

Model Predictive Control System Design and Implementation Using MATLAB® Liuping Wang, 2009-03-04 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

Advances in Power Systems and Energy Management Neeraj Priyadarshi, Sanjeevikumar Padmanaban, Ranjan Kumar Ghadai, Amiya Ranjan Panda, Ranjeeta Patel, 2021-01-20 This book comprises select proceedings

of the international conference ETAEERE 2020 and focuses on contemporary issues in energy management and energy efficiency in the context of power systems The contents cover modeling simulation and optimization based studies on topics like medium voltage BTB system cost optimization of a ring frame unit in textile industry rectenna for RF energy harvesting ecology and energy dimension in infrastructural designs study of AGC in two area hydro thermal power system energy efficient and reliable depth based routing protocol for underwater wireless sensor network and power line communication This book can be beneficial for students researchers as well as industry professionals **Linear Feedback Control** Dingyu Xue,YangQuan Chen,Derek P. Atherton,2007-01-01 Less mathematics and more working examples make this textbook suitable for almost any type of user *Identification of Continuous-time Models from Sampled Data* Hugues Garnier,Liuping Wang,2008-03-13 This is the first book dedicated to direct continuous time model identification for 15 years It cuts down on time spent hunting through journals by providing an overview of much recent research in an increasingly busy field The CONTSID toolbox discussed in the final chapter gives an overview of developments and practical examples in which MATLAB can be used for direct time domain identification of continuous time systems This is a valuable reference for a broad audience

PID and Predictive Control of Electrical Drives and Power Converters using MATLAB / Simulink Liuping Wang,Shan Chai,Dae Yoo,Lu Gan,Ki Ng,2015-03-02 A timely introduction to current research on PID and predictive control by one of the leading authors on the subject PID and Predictive Control of Electric Drives and Power Supplies using MATLAB Simulink examines the classical control system strategies such as PID control feed forward control and cascade control which are widely used in current practice The authors share their experiences in actual design and implementation of the control systems on laboratory test beds taking the reader from the fundamentals through to more sophisticated design and analysis The book contains sections on closed loop performance analysis in both frequency domain and time domain presented to help the designer in selection of controller parameters and validation of the control system Continuous time model predictive control systems are designed for the drives and power supplies and operational constraints are imposed in the design Discrete time model predictive control systems are designed based on the discretization of the physical models which will appeal to readers who are more familiar with sampled data control system Soft sensors and observers will be discussed for low cost implementation Resonant control of the electric drives and power supply will be discussed to deal with the problems of bias in sensors and unbalanced three phase AC currents Brings together both classical control systems and predictive control systems in a logical style from introductory through to advanced levels Demonstrates how simulation and experimental results are used to support theoretical analysis and the proposed design algorithms MATLAB and Simulink tutorials are given in each chapter to show the readers how to take the theory to applications Includes MATLAB and Simulink software using xPC Target for teaching purposes A companion website is available Researchers and industrial engineers and graduate students on electrical engineering courses will find this a valuable resource **State Feedback Control and**

Kalman Filtering with MATLAB/Simulink Tutorials Liuping Wang, Robin Ping Guan, 2022-10-07 STATE FEEDBACK CONTROL AND KALMAN FILTERING WITH MATLAB SIMULINK TUTORIALS Discover the control engineering skills for state space control system design simulation and implementation State space control system design is one of the core courses covered in engineering programs around the world Applications of control engineering include things like autonomous vehicles renewable energy unmanned aerial vehicles electrical machine control and robotics and as a result the field may be considered cutting edge The majority of textbooks on the subject however lack the key link between the theory and the applications of design methodology State Feedback Control and Kalman Filtering with MATLAB Simulink Tutorials provides a unique perspective by linking state space control systems to engineering applications The book comprehensively delivers introductory topics in state space control systems through to advanced topics like sensor fusion and repetitive control systems More it explores beyond traditional approaches in state space control by having a heavy focus on important issues associated with control systems like disturbance rejection reference tracking control signal constraint sensor fusion and more The text sequentially presents continuous time and discrete time state space control systems Kalman filter and its applications in sensor fusion State Feedback Control and Kalman Filtering with MATLAB Simulink Tutorials readers will also find MATLAB and Simulink tutorials in a step by step manner that enable the reader to master the control engineering skills for state space control system design and Kalman filter simulation and implementation An accompanying website that includes MATLAB code High end illustrations and tables throughout the text to illustrate important points Written by experts in the field of process control and state space control systems State Feedback Control and Kalman Filtering with MATLAB Simulink Tutorials is an ideal resource for students from advanced undergraduate students to postgraduates as well as industrial researchers and engineers in electrical mechanical chemical and aerospace engineering

Model Predictive Control for Doubly-Fed Induction Generators and Three-Phase Power Converters Alfeu Squarezi, 2022-01-06 Model Predictive Control for Doubly Fed Induction Generators and Three Phase Power Converters describes the application of model predictive control techniques with modulator and finite control sets to squirrel cage induction motor and in doubly fed induction generators using field orientation control techniques as both current control and direct power control Sections discuss induction machines their key modulation techniques introduce the utility of model predictive control review core concepts of vector control direct torque control and direct power control alongside novel approaches of MPC Mathematical modeling of cited systems MPC theory their applications MPC design and simulation in MATLAB are also considered in depth The work concludes by addressing implementation considerations including generator operation under voltage sags or distorted voltage and inverters connected to the grid operating under distorted voltage Experimental results are presented in full Adopts model predictive control design for optimized induction machines geared for complex grid dynamics Demonstrates how to simulate model predictive control using MATLAB and Simulink Presents information about hardware

implementation to obtain experimental results Covers generator operation under voltage sags or distorted voltage

Control and Mechatronics Bodgan Wilamowski,J. David Irwin,2018-10-08 The Industrial Electronics Handbook Second Edition combines traditional and newer more specialized knowledge that will help industrial electronics engineers develop practical solutions for the design and implementation of high power applications Embracing the broad technological scope of the field this collection explores fundamental areas including analog and digital circuits electronics electromagnetic machines signal processing and industrial control and communications systems It also facilitates the use of intelligent systems such as neural networks fuzzy systems and evolutionary methods in terms of a hierarchical structure that makes factory control and supervision more efficient by addressing the needs of all production components Enhancing its value this fully updated collection presents research and global trends as published in the IEEE Transactions on Industrial Electronics Journal one of the largest and most respected publications in the field Control and Mechatronics presents concepts of control theory in a way that makes them easily understandable and practically useful for engineers or students working with control system applications Focusing more on practical applications than on mathematics this book avoids typical theorems and proofs and instead uses plain language and useful examples to Concentrate on control system analysis and design comparing various techniques Cover estimation observation and identification of the objects to be controlled to ensure accurate system models before production Explore the various aspects of robotics and mechatronics Other volumes in the set Fundamentals of Industrial Electronics Power Electronics and Motor Drives Industrial Communication Systems Intelligent Systems

Advanced PID Control Karl Johan Åström,Tore Hägglund,2006 Annotation The authors of the best selling bookPID Controllers Theory Design and Tuningonce again combine their extensive knowledge in the PID arena to bring you an in depth look at the world of PID control A new book Advanced PID Controlbuilds on the basics learned in PID Controllers but augments it through use of advanced control techniques Design of PID controllers are brought into the mainstream of control system design by focusing on requirements that capture effects of load disturbances measurement noise robustness to process variations and maintaining set points In this way it is possible to make a smooth transition from PID control to more advanced model based controllers It is also possible to get insight into fundamental limitations and to determine the information needed to design good controllers The book provides a solid foundation for understanding operating and implementing the more advanced features of PID controllers including auto tuning gain scheduling and adaptation Particular attention is given to specific challenges such as reset windup long process dead times and oscillatory systems As in their other book modeling methods implementation details and problem solving techniques are also presented *CJChE* ,2005-08

American Book Publishing Record ,2001 **Adaptive Systems in Control and Signal Processing 1989** T.S. Durrani,D.H. Owens,M.A. Johnson,M.J. Grimble,2014-06-28 The Symposium covered three major areas adaptive control identification and signal processing In all three new developments were discussed covering both theoretical and applications

research Within the subject area of adaptive control the discussion centred around the challenges of robust control design to unmodelled dynamics robust parameter estimation and enhanced performance from the estimator while the papers on identification took the theme of it being a bridge between adaptive control and signal processing The final area looked at two aspects of signal processing recursive estimation and adaptive filters

Iterative Identification and Control

Pedro Albertos, Antonio Sala Piqueras, 2012-12-06 An exposition of the interplay between the modelling of dynamic systems and the design of feedback controllers based on these models is the main goal of this book The combination of both subjects into a cohesive development allows the consistent treatment of both problems to yield powerful new tools for the improvement of system performance Central among the themes of this work is the observation that operation of a system in feedback with a controller exposes the areas in which the model fit is constraining the controller performance achieved The book presents new techniques for the understanding of the iterative improvement of performance through the successive fitting of models using closed loop data and the design of high performance controllers using these models The subject matter includes New approaches to understanding how to affect the fit of dynamical models to physical processes through the choice of experiments data pre filtering and model structure connections between robust control design methods and their dependency on the quality of model fit experimental design in which data collected in operation under feedback can reveal areas that limit the performance achieved iterative approaches to link these model fitting and control design phases in a cogent manner so as to achieve improved performance overall The authors of individual chapters are some of the most renowned and authoritative figures in the fields of system identification and control design

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P. Albertos Pérez, Doctor Antonio Sala, 2002-05-21 An exposition of the interplay between the modelling of dynamic systems and the design of feedback controllers based on these models The authors of individual chapters are some of the most renowned and authoritative figures in the fields of system identification and control design

Industrial Process Identification

Ai Hui Tan, Keith Richard Godfrey, 2019-01-01 Industrial Process Identification brings together the latest advances in perturbation signal design It describes the approaches to the design process that are relevant to industries The authors discussion of several software packages Frequency Domain System Identification Toolbox prs GALOIS multilev_new and Input Signal Creator will allow readers to understand the different designs in industries and begin designing common classes of signals The authors include two case studies that provide a balance between the theory and practice of these designs the identification of a direction dependent electronic nose system and the identification of a multivariable cooling system with time varying delay Major aspects of signal design such as the formulation of suitable specifications in the face of practical constraints the classes of designs available the various objectives necessitating separatetreatments when dealing with nonlinear systems and extension to multi input scenarios are discussed Codes including some that will produce simulated data are included to help readers replicate the results described Industrial Process Identification is a powerful

source of information for control engineers working in the process and communications industries seeking guidance on choosing identification software tools for use in practical experiments and case studies The book will also be of interest to academic researchers and students working in electrical mechanical and communications engineering and the application of perturbation signal design Advances in Industrial Control reports and encourages the transfer of technology in control engineering The rapid development of control technology has an impact on all areas of the control discipline The series offers an opportunity for researchers to present an extended exposition of newwork in all aspects of industrial control **UKACC**

International Conference on Control '98, 1-4 September 1998, Venue, University of Wales, Swansea, UK ,1998

European Control Conference 1995 ,1995-09-05 Proceedings of the European Control Conference 1995 Rome Italy 5 8 September 1995

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