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The optimal control approach to robust control design differs from conventional direct approaches to robust control that are more commonly discussed by firstly translating the robust control problem into its optimal control counterpart, and then solving the optimal control problem. Robust Control Design: An Optimal Control Approach offers a complete presentation of this approach to robust control design, presenting modern control theory in an concise

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This robust version of optimal control design is useful for the case of multi-model systems (finite-dimensional case) or systems with uncertainties such as (1)(infinite-dimensional case).

Robust optimal feedback control design for uncertain ...
Robust Industrial Control Systems: Optimal Design Approach for Polynomial Systems is essential reading for professional engineers requiring an introduction to optimal control theory and insights into its use in the design of real industrial processes. Students and researchers in the field will also find it an excellent reference tool.

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Robust industrial control systems: optimal design approach ...
Special focus is given through this paper to the dynamic performance of an MMC-based, point-to-point HVDC system. Using an optimal guaranteed cost control theory, a robust control approach is designed in order to reject the impact of the unmodeled uncertainty, mainly in the ac side of the MMC. For this aim, a small-signal state-space linear model is derived for the control design of an advanced local controller of each MMC station.

Robust Control Design of MMC-HVDC Systems Using ...
In control theory, robust control is an approach to controller design that explicitly deals with uncertainty. Robust control

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methods are designed to function properly provided that uncertain parameters or disturbances are found within some set. Robust methods aim to achieve robust performance and/or stability in the presence of bounded modelling errors. The early methods of Bode and others were fairly robust; the state-space methods invented in the 1960s and 1970s were sometimes found to lack ro

Robust control - Wikipedia

However, optimal control algorithms are not always tolerant to changes in the control system or the environment. Robust control theory is a method to measure the performance changes of a control system with changing system parameters. Application of this technique is important to

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building dependable embedded systems.

Robust Control Theory - Carnegie Mellon University
Optimal robust model predictive reset control design for performance improvement of uncertain linear system. ... This study aims to design a robust reset dynamic output feedback control (DOFC) for a class of uncertain linear systems. This procedure is performed as following. First, the elements of the robust DOFC are designed via the linear ...

Optimal robust model predictive reset control design for ...
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Robust Industrial Control Systems: Optimal Design Approach for Polynomial Systems presents a comprehensive introduction to the use of frequency domain and polynomial system design techniques for a range of industrial control and signal processing applications. The solution of stochastic and robust optimal control problems is considered, building

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up from single-input problems and gradually developing the results for multivariable design of the later chapters.

Robust Industrial Control Systems: Optimal Design Approach

...

(ii) How can we characterize an optimal control mathematically? (iii) How can we construct an optimal control? These turn out to be sometimes subtle problems, as the following collection of examples illustrates. 1.2

EXAMPLES EXAMPLE 1: CONTROL OF PRODUCTION AND CONSUMPTION. Suppose we own, say, a factory whose output we can control. Let us begin to

An Introduction to Mathematical Optimal Control Theory ...

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H_∞ (i.e. "H-infinity") methods are used in control theory to synthesize controllers to achieve stabilization with guaranteed performance. To use H_∞ methods, a control designer expresses the control problem as a mathematical optimization problem and then finds the controller that solves this optimization. H_∞ techniques have the advantage over classical control techniques in that H_∞ ...

H-infinity methods in control theory - Wikipedia

H-infinity and mu-synthesis techniques let you design controllers that maximize robust stability and performance. The toolbox adds robust tuning to the automated tuning capabilities of Control System Toolbox™. The tuned controllers can be decentralized with multiple tunable blocks

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spanning multiple feedback loops.

Robust Control Toolbox - MATLAB

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Optimální a robustní řízení, Optimal and robust control

Optimal and Robust Control - cvut.cz

Textbook reference for lectures 1-13 is . Applied Nonlinear Control, Slotine and Li, Prentice-Hall 1991. Main references for lectures 14-20 are . R1 Lohmiller, W., and Slotine, J.J.E., "On Contraction Analysis for Nonlinear Systems," Automatica, 34(6), 1998 R2 Slotine, J.J.E., "Modular Stability Tools for Distributed Computation and Control," Int. J. Adaptive Control and Signal Processing, 17(6 ...

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Comprehensive and accessible guide to the three main approaches to robust control design and its applications. Optimal control is a mathematical field that is concerned with control policies that can be deduced using optimization algorithms. The optimal control approach to robust control design differs from conventional direct approaches to robust control that are more commonly discussed by firstly translating the robust control problem into its optimal control counterpart, and then solving the optimal control problem. Robust Control Design: An Optimal Control Approach offers a complete presentation of this approach to

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robust control design, presenting modern control theory in an concise manner. The other two major approaches to robust control design, the H_∞ approach and the Kharitonov approach, are also covered and described in the simplest terms possible, in order to provide a complete overview of the area. It includes up-to-date research, and offers both theoretical and practical applications that include flexible structures, robotics, and automotive and aircraft control. Robust Control Design: An Optimal Control Approach will be of interest to those needing an introductory textbook on robust control theory, design and applications as well as graduate and postgraduate students involved in systems and control research. Practitioners will also find the applications presented useful when solving practical

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problems in the engineering field.

Shows readers how to exploit the capabilities of the MATLAB® Robust Control and Control Systems Toolboxes to the fullest using practical robust control examples.

Balancing rigorous theory with practical applications, Linear Systems: Optimal and Robust Control explains the concepts behind linear systems, optimal control, and robust control and illustrates these concepts with concrete examples and problems. Developed as a two-course book, this self-contained text first discusses linear systems, including

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controllability, observability, and matrix fraction description. Within this framework, the author develops the ideas of state feedback control and observers. He then examines optimal control, stochastic optimal control, and the lack of robustness of linear quadratic Gaussian (LQG) control. The book subsequently presents robust control techniques and derives H_∞ control theory from the first principle, followed by a discussion of the sliding mode control of a linear system. In addition, it shows how a blend of sliding mode control and H_∞ methods can enhance the robustness of a linear system. By learning the theories and algorithms as well as exploring the examples in Linear Systems: Optimal and Robust Control, students will be able to better understand and ultimately better manage engineering

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processes and systems.

This is a unified collection of important recent results for the design of robust controllers for uncertain systems, primarily based on H_∞ control theory or its stochastic counterpart, risk sensitive control theory. Two practical applications are used to illustrate the methods throughout.

While there are many books on advanced control for specialists, there are few that present these topics for nonspecialists. Assuming only a basic knowledge of automatic control and signals and systems, *Optimal and Robust Control: Advanced Topics with MATLAB®* offers a straightforward, self-contained handbook of advanced topics

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and tools in automatic control. Techniques for Controlling System Performance in the Presence of Uncertainty The book deals with advanced automatic control techniques, paying particular attention to robustness—the ability to guarantee stability in the presence of uncertainty. It explains advanced techniques for handling uncertainty and optimizing the control loop. It also details analytical strategies for obtaining reduced order models. The authors then propose using the Linear Matrix Inequalities (LMI) technique as a unifying tool to solve many types of advanced control problems. Topics covered include: LQR and H-infinity approaches Kalman and singular value decomposition Open-loop balancing and reduced order models Closed-loop balancing Passive systems and bounded-real systems Criteria

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for stability control This easy-to-read text presents the essential theoretical background and provides numerous examples and MATLAB exercises to help the reader efficiently acquire new skills. Written for electrical, electronic, computer science, space, and automation engineers interested in automatic control, this book can also be used for self-study or for a one-semester course in robust control.

A Two-port Framework for Robust and Optimal Control introduces an alternative approach to robust and optimal controller synthesis procedures for linear, time-invariant systems, based on the two-port system widespread in electrical engineering. The novel use of the two-port system

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in this context allows straightforward engineering-oriented solution-finding procedures to be developed, requiring no mathematics beyond linear algebra. A chain-scattering description provides a unified framework for constructing the stabilizing controller set and for synthesizing H_2 optimal and H_∞ sub-optimal controllers. Simple yet illustrative examples explain each step. A Two-port Framework for Robust and Optimal Control features:

- a hands-on, tutorial-style presentation giving the reader the opportunity to repeat the designs presented and easily to modify them for their own programs;
- an abundance of examples illustrating the most important steps in robust and optimal design; and
- end-of-chapter exercises. To further demonstrate the proposed approaches, in the last chapter an application case

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study is presented which demonstrates the use of the framework in a real-world control system design and helps the reader quickly move on with their own challenges. MATLAB® codes used in examples throughout the book and solutions to selected exercise questions are available for download. The text will have particular resonance for researchers in control with an electrical engineering background, who wish to avoid spending excessive time in learning complex mathematical, theoretical developments but need to know how to deal with robust and optimal control synthesis problems. Please see [<http://km.emotors.ncku.edu.tw/class/hw1.html>] for solutions to the exercises provided in this book.

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Optimal and Robust Scheduling for Networked Control Systems tackles the problem of integrating system components—controllers, sensors, and actuators—in a networked control system. It is common practice in industry to solve such problems heuristically, because the few theoretical results available are not comprehensive and cannot be readily applied by practitioners. This book offers a solution to the deterministic scheduling problem that is based on rigorous control theoretical tools but also addresses practical implementation issues. Helping to bridge the gap between control theory and computer science, it suggests that the consideration of communication constraints at the design stage will significantly improve the performance of the control system. Technical Results, Design

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Techniques, and Practical Applications The book brings together well-known measures for robust performance as well as fast stochastic algorithms to assist designers in selecting the best network configuration and guaranteeing the speed of offline optimization. The authors propose a unifying framework for modelling NCSs with time-triggered communication and present technical results. They also introduce design techniques, including for the codesign of a controller and communication sequence and for the robust design of a communication sequence for a given controller. Case studies explore the use of the FlexRay TDMA and time-triggered control area network (CAN) protocols in an automotive control system. Practical Solutions to Your Time-Triggered Communication Problems This unique book

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develops ready-to-use engineering tools for large-scale control system integration with a focus on robustness and performance. It emphasizes techniques that are directly applicable to time-triggered communication problems in the automotive industry and in avionics, robotics, and automated manufacturing.

Robust Control System Design: Advanced State Space Techniques, Second Edition expands upon a groundbreaking and combinatorial approach to state space control system design that fully realizes the critical loop transfer function and robustness properties of state/generalized state feedback control. This edition offers many new examples and exercises to illustrate and clarify new design concepts,

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approaches, and procedures while highlighting the fact that state/generalized state feedback control can improve system performance and robustness more effectively than other forms of control. Revised and expanded throughout, the second edition presents an improved eigenstructure assignment design method that enhances system performance and robustness more directly and effectively and allows for adjustment of design formulations based on design testing and simulation. The author proposes the systematic controller order adjustment for the tradeoff between performance and robustness based on the complete unification of the state feedback control and static output feedback control. The book also utilizes a more accurate robust stability measure to guide control designs.

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Robust Industrial Control Systems: Optimal Design Approach for Polynomial Systems presents a comprehensive introduction to the use of frequency domain and polynomial system design techniques for a range of industrial control and signal processing applications. The solution of stochastic and robust optimal control problems is considered, building up from single-input problems and gradually developing the results for multivariable design of the later chapters. In addition to cataloguing many of the results in polynomial systems needed to calculate industrial controllers and filters, basic design procedures are also introduced which enable cost functions and system descriptions to be specified in order to satisfy industrial requirements. Providing a range of

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solutions to control and signal processing problems, this book:

- * Presents a comprehensive introduction to the polynomial systems approach for the solution of H_2 and H_∞ optimal control problems.
- * Develops robust control design procedures using frequency domain methods.
- * Demonstrates design examples for gas turbines, marine systems, metal processing, flight control, wind turbines, process control and manufacturing systems.
- * Includes the analysis of multi-degrees of freedom controllers and the computation of restricted structure controllers that are simple to implement.
- * Considers time-varying control and signal processing problems.
- * Addresses the control of non-linear processes using both multiple model concepts and new optimal control solutions.

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Systems: Optimal Design Approach for Polynomial Systems is essential reading for professional engineers requiring an introduction to optimal control theory and insights into its use in the design of real industrial processes. Students and researchers in the field will also find it an excellent reference tool.

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