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# Modeling And Control Of Discrete Event Dynamic Systems With Petri Nets And Other Tools Advanced Textbooks In Control And Signal Processing

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Modeling, Optimization and Control of Discrete-event Chemical Processes Using Petri Net Theory

Discrete-Event Modeling and Simulation

Modeling and Control from Discrete Event Systems and Real Time Systems to Hybrid Systems

Automata and Petri Net Perspectives

Modeling, Control with Priorities, and Incremental Model Evolution

Appliance and Research

Modeling and Control : Proceedings of a Joint Workshop Held in Prague, August 1992

Stochastic Modelling and Control

Modeling, Identification, Design, and Implementation

Modular Discrete Event Systems

Modeling and Analysis of Expert Control Systems in a Discrete- Event System Theoretic Framework

Modeling and Control of Logical Discrete Event Systems

Discrete-Event Modeling and Simulation

Discrete Event Systems

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**Alicia Franklin**

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Modeling, Optimization and Control of  
Discrete-event Chemical Processes Using  
Petri Net Theory Springer Science &

Business Media  
Introduction.- Mean-Value Models.-  
Discrete Event Models.- Control of Engine  
Systems.

**Discrete-Event Modeling and  
Simulation** Springer

This book aims at providing a view of the  
current trends in the development of  
research on Synthesis and Control of  
Discrete Event Systems. Papers collected

in this volume are based on a selection of  
talks given in June and July 2001 at two  
independent meetings: the Workshop on  
Synthesis of Concurrent Systems, held in  
Newcastle upon Tyne as a satellite event  
of ICATPN/ICACSD and organized by Ph.  
Darondeau and L. Lavagno, and the  
Symposium on the Supervisory Control of  
Discrete Event Systems (SCODES), held in  
Paris as a satellite event of CAV and

organized by B. Caillaud and X. Xie. Synthesis is a generic term that covers all procedures aiming to construct from specifications given as input objects matching these specifications. The origins and applications of synthesis have been studied and developed for long in connection with logics, programming, automata, discrete event systems, and hardware circuits. Logics and programming are outside the scope of this book, whose focus is on Discrete Event Systems and Supervisory Control. The stress today in this field is on a better applicability of theories and algorithms to practical systems design. Coping with decentralization or distribution and caring for an efficient realization of the synthesized systems or controllers are of the utmost importance in areas so diverse as the supervision of embedded or manufacturing systems, or the implementation of protocols in software or in hardware.

Modeling and Control from Discrete Event Systems and Real Time Systems to Hybrid Systems Birkhäuser

Theory of Modeling and Simulation: Discrete Event & Iterative System Computational Foundations, Third Edition,

continues the legacy of this authoritative and complete theoretical work. It is ideal for graduate and PhD students and working engineers interested in posing and solving problems using the tools of logico-mathematical modeling and computer simulation. Continuing its emphasis on the integration of discrete event and continuous modeling approaches, the work focuses light on DEVS and its potential to support the co-existence and interoperation of multiple formalisms in model components. New sections in this updated edition include discussions on important new extensions to theory, including chapter-length coverage of iterative system specification and DEVS and their fundamental importance, closure under coupling for iteratively specified systems, existence, uniqueness, non-deterministic conditions, and temporal progressiveness (legitimacy). Presents a 40% revised and expanded new edition of this classic book with many important post-2000 extensions to core theory Provides a streamlined introduction to Discrete Event System Specification (DEVS) formalism for modeling and simulation Packages all the

"need-to-know" information on DEVS formalism in one place Expanded to include an online ancillary package, including numerous examples of theory and implementation in DEVS-based software, student solutions and instructors manual

### **Automata and Petri Net Perspectives**

Springer Science & Business Media  
Stochastic discrete-event systems (SDES) capture the randomness in choices due to activity delays and the probabilities of decisions. This book delivers a comprehensive overview on modeling with a quantitative evaluation of SDES. It presents an abstract model class for SDES as a pivotal unifying result and details important model classes. The book also includes nontrivial examples to explain real-world applications of SDES.

### Modeling, Control with Priorities, and Incremental Model Evolution Elsevier

The field of discrete event systems has emerged to provide a formal treatment of many of the man-made systems such as manufacturing systems, communication networks, automated traffic systems, database management systems, and computer systems that are event-driven,

highly complex, and not amenable to the classical treatments based on differential or difference equations. Discrete event systems is a growing field that utilizes many interesting mathematical models and techniques. In this book we focus on a high level treatment of discrete event systems, where the order of events, rather than their occurrence times, is the principal concern. Such treatment is needed to guarantee that the system under study meets desired logical goals. In this framework, discrete event systems are modeled by formal languages or, equivalently, by state machines. The field of logical discrete event systems is an interdisciplinary field-it includes ideas from computer science, control theory, and operations research. Our goal is to bring together in one book the relevant techniques from these fields. This is the first book of this kind, and our hope is that it will be useful to professionals in the area of discrete event systems since most of the material presented has appeared previously only in journals. The book is also designed for a graduate level course on logical discrete event systems. It contains all the necessary background

material in formal language theory and lattice theory. The only prerequisite is some degree of "mathematical maturity". Appliance and Research Academic Press Control of Discrete-event Systems provides a survey of the most important topics in the discrete-event systems theory with particular focus on finite-state automata, Petri nets and max-plus algebra. Coverage ranges from introductory material on the basic notions and definitions of discrete-event systems to more recent results. Special attention is given to results on supervisory control, state estimation and fault diagnosis of both centralized and distributed/decentralized systems developed in the framework of the Distributed Supervisory Control of Large Plants (DISC) project. Later parts of the text are devoted to the study of congested systems through fluidization, an over approximation allowing a much more efficient study of observation and control problems of timed Petri nets. Finally, the max-plus algebraic approach to the analysis and control of choice-free systems is also considered. Control of Discrete-event Systems provides an

introduction to discrete-event systems for readers that are not familiar with this class of systems, but also provides an introduction to research problems and open issues of current interest to readers already familiar with them. Most of the material in this book has been presented during a Ph.D. school held in Cagliari, Italy, in June 2011.

Modeling and Control : Proceedings of a Joint Workshop Held in Prague, August 1992 McGraw-Hill Science, Engineering & Mathematics

This book shows how supervisory control theory (SCT) supports the formulation of various control problems of standard types, like the synthesis of controlled dynamic invariants by state feedback, and the resolution of such problems in terms of naturally definable control-theoretic concepts and properties, like reachability, controllability and observability. It exploits a simple, abstract model of controlled discrete-event systems (DES) that has proved to be tractable, appealing to control specialists, and expressive of a range of control-theoretic ideas. It allows readers to choose between automaton-based and dually language-based forms of

SCT, depending on whether their preference is for an internal-structural or external-behavioral description of the problem. The monograph begins with two chapters on algebraic and linguistic preliminaries and the fundamental concepts and results of SCT are introduced. To handle complexity caused by system scale, architectural approaches—the horizontal modularity of decentralized and distributed supervision and the vertical modularity of hierarchical supervision—are introduced. Supervisory control under partial observation and state-based supervisory control are also addressed; in the latter, a vector DES model that exploits internal regularity of algebraic structure is proposed. Finally SCT is generalized to deal with timed DES by incorporating temporal features in addition to logical ones. Researchers and graduate students working with the control of discrete-event systems or who are interested in the development of supervisory control methods will find this book an invaluable aid in their studies. The text will also be of assistance to researchers in manufacturing, logistics, communications and transportation, areas

which provide plentiful examples of the class of systems being discussed. *Stochastic Modelling and Control* Modeling and Control of Discrete-event Dynamic Systems with Petri Nets and Other Tools Collecting the work of the foremost scientists in the field, *Discrete-Event Modeling and Simulation: Theory and Applications* presents the state of the art in modeling discrete-event systems using the discrete-event system specification (DEVS) approach. It introduces the latest advances, recent extensions of formal techniques, and real-world examples of various applications. The book covers many topics that pertain to several layers of the modeling and simulation architecture. It discusses DEVS model development support and the interaction of DEVS with other methodologies. It describes different forms of simulation supported by DEVS, the use of real-time DEVS simulation, the relationship between DEVS and graph transformation, the influence of DEVS variants on simulation performance, and interoperability and composability with emphasis on DEVS standardization. The text also examines extensions to DEVS, new formalisms, and

abstractions of DEVS models as well as the theory and analysis behind real-world system identification and control. To support the generation and search of optimal models of a system, a framework is developed based on the system entity structure and its transformation to DEVS simulation models. In addition, the book explores numerous interesting examples that illustrate the use of DEVS to build successful applications, including optical network-on-chip, construction/building design, process control, workflow systems, and environmental models. A one-stop resource on advances in DEVS theory, applications, and methodology, this volume offers a sampling of the best research in the area, a broad picture of the DEVS landscape, and trend-setting applications enabled by the DEVS approach. It provides the basis for future research discoveries and encourages the development of new applications. *Modeling, Identification, Design, and Implementation* Birkhäuser CD-ROM contains: MATLAB m-files -- Discussions and examples of MATLAB commands relevant to each chapter -- Test data for 3 case studies.

*Modular Discrete Event Systems* Springer Science & Business Media  
 Discrete-event dynamic systems (DEDS) permeate our world. They are of great importance in modern manufacturing processes, transportation and various forms of computer and communications networking. This book begins with the mathematical basics required for the study of DEDS and moves on to present various tools used in their modeling and control. Industrial examples illustrate the concepts and methods discussed, making this book an invaluable aid for students embarking on further courses in control, manufacturing engineering or computer studies.

*Modeling and Analysis of Expert Control Systems in a Discrete-Event System Theoretic Framework* CRC Press  
 Research of discrete event systems is strongly motivated by applications in flexible manufacturing, in traffic control and in concurrent and real-time software verification and design, just to mention a few important areas. Discrete event system theory is a promising and dynamically developing area of both control theory and computer science.

Discrete event systems are systems with non-numerically-valued states, inputs, and outputs. The approaches to the modelling and control of these systems can be roughly divided into two groups. The first group is concerned with the automatic design of controllers from formal specifications of logical requirements. This research owes much to the pioneering work of P.J. Ramadge and W.M. Wonham at the beginning of the eighties. The second group deals with the analysis and optimization of system throughput, waiting time, and other performance measures for discrete event systems. The present book contains selected papers presented at the Joint Workshop on Discrete Event Systems (WODES'92) held in Prague, Czechoslovakia, on August 26-28, 1992 and organized by the Institute of Information Theory and Automation of the Czechoslovak Academy of Sciences, Prague, Czechoslovakia, by the Automatic Control Laboratory of the Swiss Federal Institute of Technology (ETH), Zurich, Switzerland, and by the Department of Computing Science of the University of Groningen, Groningen, the Netherlands.

#### **Modeling and Control of Logical**

**Discrete Event Systems** John Wiley & Sons

Collecting the work of the foremost scientists in the field, *Discrete-Event Modeling and Simulation: Theory and Applications* presents the state of the art in modeling discrete-event systems using the discrete-event system specification (DEVS) approach. It introduces the latest advances, recent extensions of formal techniques, and real-world examples of various applications. The book covers many topics that pertain to several layers of the modeling and simulation architecture. It discusses DEVS model development support and the interaction of DEVS with other methodologies. It describes different forms of simulation supported by DEVS, the use of real-time DEVS simulation, the relationship between DEVS and graph transformation, the influence of DEVS variants on simulation performance, and interoperability and composability with emphasis on DEVS standardization. The text also examines extensions to DEVS, new formalisms, and abstractions of DEVS models as well as the theory and analysis behind real-world system identification and control. To

support the generation and search of optimal models of a system, a framework is developed based on the system entity structure and its transformation to DEVS simulation models. In addition, the book explores numerous interesting examples that illustrate the use of DEVS to build successful applications, including optical network-on-chip, construction/building design, process control, workflow systems, and environmental models. A one-stop resource on advances in DEVS theory, applications, and methodology, this volume offers a sampling of the best research in the area, a broad picture of the DEVS landscape, and trend-setting applications enabled by the DEVS approach. It provides the basis for future research discoveries and encourages the development of new applications.

### **Discrete-Event Modeling and Simulation** Springer Nature

Over the last decades Discrete Event Simulation has conquered many different application areas. This trend is, on the one hand, driven by an ever wider use of this technology in different fields of science and on the other hand by an incredibly creative use of available software

programs through dedicated experts. This book contains articles from scientists and experts from 10 countries. They illuminate the width of application of this technology and the quality of problems solved using Discrete Event Simulation. Practical applications of simulation dominate in the present book. The book is aimed to researchers and students who deal in their work with Discrete Event Simulation and which want to inform them about current applications. By focusing on discrete event simulation, this book can also serve as an inspiration source for practitioners for solving specific problems during their work. Decision makers who deal with the question of the introduction of discrete event simulation for planning support and optimization this book provides a contribution to the orientation, what specific problems could be solved with the help of Discrete Event Simulation within the organization.

*Discrete Event Systems* Springer  
Research of discrete event systems is strongly motivated by applications in flexible manufacturing, in traffic control and in concurrent and real-time software verification and design, just to mention a

few important areas. Discrete event system theory is a promising and dynamically developing area of both control theory and computer science. Discrete event systems are systems with non-numerically-valued states, inputs, and outputs. The approaches to the modelling and control of these systems can be roughly divided into two groups. The first group is concerned with the automatic design of controllers from formal specifications of logical requirements. This research owes much to the pioneering work of P.J. Ramadge and W.M. Wonham at the beginning of the eighties. The second group deals with the analysis and optimization of system throughput, waiting time, and other performance measures for discrete event systems. The present book contains selected papers presented at the Joint Workshop on Discrete Event Systems (WODES'92) held in Prague, Czechoslovakia, on August 26-28, 1992 and organized by the Institute of Information Theory and Automation of the Czechoslovak Academy of Sciences, Prague, Czechoslovakia, by the Automatic Control Laboratory of the Swiss Federal Institute of Technology (ETH), Zurich,

Switzerland, and by the Department of Computing Science of the University of Groningen, Groningen, the Netherlands. *Proceedings of a Joint Workshop held in Prague, August 1992* Birkhauser

This unique textbook comprehensively introduces the field of discrete event systems, offering a breadth of coverage that makes the material accessible to readers of varied backgrounds. The book emphasizes a unified modeling framework that transcends specific application areas, linking the following topics in a coherent manner: language and automata theory, supervisory control, Petri net theory, Markov chains and queueing theory, discrete-event simulation, and concurrent estimation techniques. Topics and features: detailed treatment of automata and language theory in the context of discrete event systems, including application to state estimation and diagnosis comprehensive coverage of centralized and decentralized supervisory control of partially-observed systems timed models, including timed automata and hybrid automata stochastic models for discrete event systems and controlled Markov chains discrete event simulation

an introduction to stochastic hybrid systems sensitivity analysis and optimization of discrete event and hybrid systems new in the third edition: opacity properties, enhanced coverage of supervisory control, overview of latest software tools This proven textbook is essential to advanced-level students and researchers in a variety of disciplines where the study of discrete event systems is relevant: control, communications, computer engineering, computer science, manufacturing engineering, transportation networks, operations research, and industrial engineering. Christos G. Cassandras is Distinguished Professor of Engineering, Professor of Systems Engineering, and Professor of Electrical and Computer Engineering at Boston University. Stéphane Lafortune is Professor of Electrical Engineering and Computer Science at the University of Michigan, Ann Arbor.

[Introduction to Discrete Event Systems](#)  
Springer Science & Business Media  
Modeling and Control of Discrete-event Dynamic Systems with Petri Nets and Other Tools  
Springer Science & Business Media  
*Discrete Event Systems: Modeling and*

*Control* Springer Science & Business Media  
This textbook is ideal for a course in engineering systems dynamics and controls. The work is a comprehensive treatment of the analysis of lumped parameter physical systems. Starting with a discussion of mathematical models in general, and ordinary differential equations, the book covers input/output and state space models, computer simulation and modeling methods and techniques in mechanical, electrical, thermal and fluid domains. Frequency domain methods, transfer functions and frequency response are covered in detail. The book concludes with a treatment of stability, feedback control (PID, lead-lag, root locus) and an introduction to discrete time systems. This new edition features many new and expanded sections on such topics as: solving stiff systems, operational amplifiers, electrohydraulic servovalves, using Matlab with transfer functions, using Matlab with frequency response, Matlab tutorial and an expanded Simulink tutorial. The work has 40% more end-of-chapter exercises and 30% more examples.  
*Control of Discrete-Event Systems* CRC Press



A first approach for modeling time series of counts : the thinning-based INAR (1) model -- Further thinning-based models for count time series -- INGARCH models for count time series -- Further models for count time series -- Analyzing categorical time series -- Models for categorical time series -- Control charts for count processes -- Control charts for categorical processes  
Discrete-time Dynamic Models John Wiley & Sons

Supervisory Control of Discrete Event Systems Using Petri Nets presents a novel approach to its subject. The concepts of supervisory control and discrete event systems are explained, and the background material on general Petri net theory necessary for using the book's control techniques is provided. A large

number of examples is used to illustrate the concepts and techniques presented in the text, and there are plenty of references for those interested in additional study or more information on a particular topic. Supervisory Control of Discrete Event Systems Using Petri Nets is intended for graduate students, advanced undergraduates, and practicing engineers who are interested in the control problems of manufacturing, communication and computer networks, chemical process plants, and other high-level control applications. The text is written from an engineering perspective, but it is also appropriate for students of computer science, applied mathematics, or economics. The book contains enough background material to stand alone as an

introduction to supervisory control with Petri nets, but it may also be used as a supplemental text in a course on discrete event systems or intelligent autonomous control.

Springer Science & Business Media

"This is an excellent and well-written text on discrete event simulation with a focus on applications in Operations Research. There is substantial attention to programming, output analysis, pseudo-random number generation and modelling and these sections are quite thorough. Methods are provided for generating pseudo-random numbers (including combining such streams) and for generating random numbers from most standard statistical distributions." --ISI Short Book Reviews, 22:2, August 2002

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