

Discrete Event Simulation A First Course

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A Practical Approach Linköping University Electronic Press

Computer modeling and simulation (M&S) allows engineers to study and analyze complex systems. Discrete-event system (DES)-M&S is used in modern management, industrial engineering, computer science, and the military. As computer speeds and memory capacity increase, so DES-M&S tools become more powerful and more widely used in solving real-life problems. Based on over 20 years of evolution within a classroom environment, as well as on decades-long experience in developing simulation-based solutions for high-tech industries, Modeling and Simulation of Discrete-Event Systems is the only book on DES-M&S in which all the major DES modeling formalisms – activity-based, process-oriented, state-based, and event-based – are covered in a unified manner: A well-defined procedure for building a formal model in the form of event graph, ACD, or state graph. Diverse types of modeling templates and examples that can be used as building blocks for a complex, real-life model. A systematic, easy-to-follow procedure combined with sample C# codes for developing simulators in various modeling formalisms. Simple tutorials as well as sample model files for using popular off-the-shelf simulators such as SIGMA®, ACE®, and Arena®. Up-to-date research results as well as research issues and directions in DES-M&S. Modeling and Simulation of Discrete-Event Systems is an ideal textbook for undergraduate and graduate students of simulation/industrial engineering and computer science, as well as for simulation practitioners and researchers.

Discrete-event System Simulation John Wiley & Sons

Discrete Event System Simulation is ideal for junior- and senior-level simulation courses in engineering, business, or computer science. It is also a useful reference for professionals in operations research, management science, industrial engineering, and information science. While most books on simulation focus on particular software tools, Discrete Event System Simulation examines the principles of modeling and analysis that translate to all such tools. This language-independent text explains the basic aspects of the technology, including the proper collection and analysis of data, the use of analytic techniques, verification and validation of models, and designing simulation experiments. It offers an up-to-date treatment of simulation of manufacturing and material handling systems, computer systems, and computer networks. Students and instructors will find a variety of resources at the associated website, www.bcn.net/, including simulation source code for download, additional exercises and solutions, web links and errata.

Discrete Event Simulations Elsevier

The first practical textbook on AnyLogic 7 from AnyLogic developers. AnyLogic is the unique simulation software that supports three simulation modeling methods: system dynamics, discrete event, and agent based modeling and allows you to create multi-method models. The book is structured around four examples: a model of a consumer market, an epidemic model, a job shop model and an airport model. We also give some theory on different modeling methods. You can consider this book as your first guide in studying AnyLogic 7.

Theory and Applications Academic Press

Concurrent simulation is over twenty years old. During that period it has been widely adopted for the simulation of faults in digital circuits, for which it provides a combination of extreme efficiency and generality. Yet, it is remarkable that no book published so far presents a correct and sufficiently detailed treatment of concurrent simulation. A first reason to welcome into print the effort of the authors is, therefore, that it provides a much needed account of an important topic in design automation. This book is, however, unique for several other reasons. It is safe to state that no individual has contributed more than Ernst Ulrich to the development of digital logic simulation. For concurrent simulation, one may say that Ernst has contributed more than the rest of the world. We would find such a claim difficult to dispute. The unique experience of the authors confers a special character to this book: It is authoritative, inspired, and focused on what is conceptually important. Another unique aspect of this book, perhaps the one that will be the most surprising for many readers, is that it is strongly projected towards the future. Concurrent simulation is presented as a general

experimentation methodology and new intriguing applications are analyzed. The discussion of multi-domain concurrent simulation – recent work of Karen Panetta Lentz and Ernst Ulrich – is fascinating.

Modeling and Simulation of Discrete Event Systems CRC Press

An insightful presentation of the key concepts, paradigms, and applications of modeling and simulation. Modeling and simulation has become an integral part of research and development across many fields of study, having evolved from a tool to a discipline in less than two decades. Modeling and Simulation Fundamentals offers a comprehensive and authoritative treatment of the topic and includes definitions, paradigms, and applications to equip readers with the skills needed to work successfully as developers and users of modeling and simulation. Featuring contributions written by leading experts in the field, the book's fluid presentation builds from topic to topic and provides the foundation and theoretical underpinnings of modeling and simulation. First, an introduction to the topic is presented, including related terminology, examples of model development, and various domains of modeling and simulation. Subsequent chapters develop the necessary mathematical background needed to understand modeling and simulation topics, model types, and the importance of visualization. In addition, Monte Carlo simulation, continuous simulation, and discrete event simulation are thoroughly discussed, all of which are significant to a complete understanding of modeling and simulation. The book also features chapters that outline sophisticated methodologies, verification and validation, and the importance of interoperability. A related FTP site features color representations of the book's numerous figures. Modeling and Simulation Fundamentals encompasses a comprehensive study of the discipline and is an excellent book for modeling and simulation courses at the upper-undergraduate and graduate levels. It is also a valuable reference for researchers and practitioners in the fields of computational statistics, engineering, and computer science who use statistical modeling techniques.

Conceptual Modeling for Discrete-Event Simulation CRC Press

In recent years, there has been a growing debate, particularly in the UK and Europe, over the merits of using discrete-event simulation (DES) and system dynamics (SD); there are now instances where both methodologies were employed on the same problem. This book details each method, comparing each in terms of both theory and their application to various problem situations. It also provides a seamless treatment of various topics – theory, philosophy, detailed mechanics, practical implementation – providing a systematic treatment of the methodologies of DES and SD, which previously have been treated separately.

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Object-Oriented Discrete-Event Simulation with Java BoD – Books on Demand

In any production environment, discrete event simulation is a powerful tool for the analysis, planning, and operating of a manufacturing facility. Operations managers can use simulation to improve their production systems by eliminating bottlenecks, reducing cycle time and cost, and increasing capacity utilization. Offering a hands-on tutorial on how to model traditional applications to optimize production operations, Simulation of Industrial Systems: Discrete Event Simulation Using Excel/VBA— · Introduces the Design Environment for Event Driven Simulation (DEEDS), an original simulator, which facilitates the modeling of complex situations using four (self-contained) nodes: source, queue, facility, and delay. · Demonstrates how to use discrete event simulation as a powerful tool for the analysis, planning, design, and operation of diverse production systems · Shows how to model application areas such as facilities layout, material handling, inventory control, scheduling, maintenance, quality control, and supply chain logistics · Integrates the design of experiments and optimization techniques for improving production systems With the comprehensive instruction provided within these pages, in combination with the flexibility of the DEEDS program environment, operations managers will be able to harness the power of discrete event simulation to streamline their production environments. The authors have created a website with a variety of teaching aids that professors will be able to access

Springer Science & Business Media

Discrete Event Simulation is a process-oriented text/reference that utilizes an eleven-step model to represent the simulation process from problem formulation to implementation and documentation. The book presents the necessary level of detail required to fully develop a model that produces meaningful results and considers the tools necessary to interpret those results. Sufficient background information is provided so that the underlying concepts of simulation are understood. Major topics covered in Discrete Event Simulation include probability and distributional theory, statistical estimation and inference, the generation of random variates, verification and validation techniques, time management methods, experimental design, and programming language considerations. The book also examines distributed simulation and issues related to distributing the physical process over a network of tightly coupled processors. Topics covered in this area include deadlock, synchronization, rollback, event management, and communication processes. Fully worked examples and numerous practical exercises have been drawn from the engineering disciplines and computer science, although they have been structured so that they will be useful as well to other disciplines such as economics, business administration, and management science. The presentation of techniques and methods in Discrete Event Simulation make it an ideal text/reference for all practitioners of discrete event simulation.

[Out-of-order Parallel Discrete Event Simulation for Electronic System-level Design](#) BoD - Books on Demand

Considered by many authors as a technique for modelling stochastic, dynamic and discretely evolving systems, this technique has gained widespread acceptance among the practitioners who want to represent and improve complex systems. Since DES is a technique applied in incredibly different areas, this book reflects many different points of view about DES, thus, all authors describe how it is understood and applied within their context of work, providing an extensive understanding of what DES is. It can be said that the name of the book itself reflects the plurality that these points of view represent. The book embraces a number of topics covering theory, methods and applications to a wide range of sectors and problem areas that have been categorised into five groups. As well as the previously explained variety of points of view concerning DES, there is one additional thing to remark about this book: its richness when talking about actual data or actual data based analysis. When most academic areas are lacking application cases, roughly the half part of the chapters included in this book deal with actual problems or at least are based on actual data. Thus, the editor firmly believes that this book will be interesting for both beginners and practitioners in the area of DES.

[A Quick Course in Simulation Modeling](#) World Scientific

Bringing together an international group of researchers involved in military, business, and health modeling and simulation, Conceptual Modeling for Discrete-Event Simulation presents a comprehensive view of the current state of the art in the field. The book addresses a host of issues, including: What is a conceptual model? How is conceptual modeling performed in general and in specific modeling domains? What is the role of established approaches in conceptual modeling? Each of the book's six parts focuses on a different aspect of conceptual modeling for simulation. The first section discusses the purpose and requirements of a conceptual model. The next set of chapters provides frameworks and tools for conceptual modeling. The book then describes the use of soft systems methodology for model structuring as well as the application of software engineering methods and tools for model specification. After illustrating how conceptual modeling is adopted in the military and semiconductor manufacturing, the book concludes with a discussion on future research directions. This volume offers a broad, multifaceted account of the field by presenting diverse perspectives on what conceptual modeling entails. It also provides a basis upon which these perspectives can be compared.

[Simulation Techniques for Discrete Event Systems](#) Pearson College Division

To perform computer simulation successfully, two rather different sets of skills are required. One of these relates to programming: a simulation program should do what its author intends and do it efficiently. The other is concerned with the collection and analysis of data: statistical tools have to be used in order to obtain with a minimum of effort, accurate and reliable estimates for the desired performance measures. Dr Mitrani covers both of these aspects of the simulation method. The important topics of point and interval estimation, simulation efficiency and the analysis of simulation experiments are discussed in detail. This book, first published in 1982, will be useful to both undergraduate and postgraduate students taking courses on simulation in departments of computer science, operations research and statistics in universities and polytechnics. It will be of benefit also to practitioners in the field.

[Discrete Event Simulations](#) Pearson Higher Ed

"This book provides a comprehensive overview of theory and practice in simulation systems focusing on major breakthroughs within the technological arena, with particular concentration on the accelerating principles, concepts and applications"--Provided by publisher.

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[Introduction to Discrete Event Systems](#) John Wiley & Sons

The book presents a philosophy for simulation modeling and a new simulation language. It gives an overview of the development of (mainly discrete event) simulation, the techniques and data structures that this development brought along and the impact it had on general computer science. In fact many seminal ideas coming up in modern operating systems and concurrent programming like data structures that make algorithms fast have their origin in discrete simulation.

[Simulation Modeling and Arena](#) Springer Science & Business Media

Most current Unmanned Vehicle (UV) systems consist of teams of operators controlling a single UV. Technological advances will likely lead to the inversion of this ratio, and automation of low level tasking. These advances will also lead to a growth in UV use in large-scale applications such as urban search and rescue, which will require the use of both teams of operators and teams of UVs. This growth will in turn require research and development in the area of team supervisory control of multiple UVs. Human-in-the- loop experimentation is often used during this research but can be time consuming and expensive. The time and cost of experimentation can often be drastically reduced by using predictive models. However there is a lack of such models in the area of multiple-operator supervisory control of multiple- UVs. This problem is addressed in this thesis through the following method: First, current predictive models of human supervisory control of UVs are analyzed, and attributes of systems related to this modeling space are identified. Second, a queuing-based multiple-operator multiple-vehicle discrete event simulation model (MO-MUVDES) is developed which captures these attributes, including the ability to predict performance in situations with low observable exogenous event arrivals.

MO-MUVDES also incorporates traditional system variables such as level of vehicle autonomy, vehicle and operator team structure, and operator switching strategy. The accuracy and robustness of the MO-MUVDES model were measured by a two-stage validation process using data from a human-in-the-loop supervisory control experiment, and a Monte Carlo simulation. The first stage of the validation process used data from the experiment as input for the MOMUVDES model which was then used to generate predictions of operator performance. In the second stage of validation, a sensitivity analysis was performed on the MO-MUVDES model. This validation process achieved confidence in the model's ability to predict operator performance and a measurement of the robustness of the model under varying input conditions. Additionally, the process indicated that discrete event simulation is an effective technique for modeling team supervisory control of UVs in a situation where exogenous event arrivals are not clearly observable. As a result, the MO-MUVDES model could be used to reduce development time for systems within its modeled space.

AnyLogic 7 in Three Days CRC Press

Discrete event simulation and agent-based modeling are increasingly recognized as critical for diagnosing and solving process issues in complex systems. *Introduction to Discrete Event Simulation and Agent-based Modeling* covers the techniques needed for success in all phases of simulation projects. These include:

- **Definition** – The reader will learn how to plan a project and communicate using a charter.
- **Input analysis** – The reader will discover how to determine defensible sample sizes for all needed data collections. They will also learn how to fit distributions to that data.
- **Simulation** – The reader will understand how simulation controllers work, the Monte Carlo (MC) theory behind them, modern verification and validation, and ways to speed up simulation using variation reduction techniques and other methods.
- **Output analysis** – The reader will be able to establish simultaneous intervals on key responses and apply selection and ranking, design of experiments (DOE), and black box optimization to develop defensible improvement recommendations.
- **Decision support** – Methods to inspire creative alternatives are presented, including lean production. Also, over one hundred solved problems are provided and two full case studies, including one on voting machines that received international attention.

Introduction to Discrete Event Simulation and Agent-based Modeling demonstrates how simulation can facilitate improvements on the job and in local communities. It allows readers to competently apply technology considered key in many industries and branches of government. It is suitable for undergraduate and graduate students, as well as researchers and other professionals.

Discrete Event Simulation Using Excel/VBA Springer Science & Business Media

Simulation Modeling and Analysis with Arena is a highly readable textbook which treats the essentials of the Monte Carlo discrete-event simulation methodology, and does so in the context of a popular Arena simulation environment. It treats simulation modeling as an in-vitro laboratory that facilitates the understanding of complex systems and experimentation with what-if scenarios in order to estimate their performance metrics. The book contains chapters on the simulation modeling methodology and the underpinnings of discrete-event systems, as well as the relevant underlying probability, statistics, stochastic processes, input analysis, model validation and output analysis. All simulation-related concepts are illustrated in numerous Arena examples, encompassing production lines, manufacturing and inventory systems, transportation systems, and computer information systems in networked settings.

- Introduces the concept of discrete event Monte Carlo simulation, the most commonly used methodology for modeling and analysis of complex systems
- Covers essential workings of the popular animated simulation language, ARENA, including set-up, design parameters, input data, and output analysis, along with a wide variety of sample model applications from production lines to transportation systems

Reviews elements of statistics, probability, and stochastic processes relevant to simulation modeling * Ample end-of-chapter problems and full Solutions Manual * Includes CD with sample ARENA modeling programs

[A Practical Introduction](#) John Wiley & Sons

The only complete guide to all aspects and uses of simulation-from the international leaders in the field There has never been a single definitive source of key information on all facets of discrete-event simulation and its applications to major industries. The Handbook of Simulation brings together the contributions of leading academics, practitioners, and software developers to offer authoritative coverage of the principles, techniques, and uses of discrete-event simulation. Comprehensive in scope and thorough in approach, the Handbook is the one reference on discrete-event simulation that every industrial engineer, management scientist, computer scientist, operations manager, or operations researcher involved in problem-solving should own, with an in-depth examination of:

- * Simulation methodology, from experimental design to data analysis and more
- * Recent advances, such as object-oriented simulation, on-line simulation, and parallel and distributed simulation
- * Applications across a full range of manufacturing and service industries
- * Guidelines for successful simulations and sound simulation project management
- * Simulation software and simulation industry vendors

[Discrete-Event Simulation and System Dynamics for Management Decision Making](#) CRC Press

Discover How to Apply DES to Problems Encountered in HTA Discrete event simulation (DES) has traditionally been used in the engineering and operations research fields. The use of DES to inform decisions about health technologies is still in its infancy. Written by specialists at the forefront of this area, *Discrete Event Simulation for Health Technology Assessment* is the first book to make all the central concepts of DES relevant for health technology assessment (HTA). Accessible to beginners, the book requires no prerequisites and describes the concepts with as little jargon as possible. The book first covers the essential concepts and their implementation. It next provides a fully worked out example using both a widely available spreadsheet program (Microsoft Excel) and a popular specialized simulation package (Arena). It then presents approaches to analyze the simulations, including the treatment of uncertainty; tackles the development of the required equations; explains the techniques to verify that the models are as efficient as possible; and explores the indispensable topic of validation. The book also covers a variety of non-essential yet handy topics, such as the animation of a simulation and extensions of DES, and incorporates a real case study involving screening strategies for breast cancer surveillance. This book guides you in leveraging DES in your assessments of health technologies. After reading the chapters in sequence, you will be able to construct a realistic model designed to help in the assessment of a new health technology.

REVIEW OF DISCRETE EVENT SIMULATION A FIRST COURSE

- I found the first half of this book to be fairly monotonous. While the concept for the novel--following a painting's owners all the way back to the painter--is interesting, Vreeland didn't really get me hooked in the first hundred pages. The stories got more interesting toward the end, but if I were a less voracious reader I might not have made it there.
- Jennifer Crusie has a knack for fun and witty language! I read this story in 1 1/2 days. I was glad that, for a change, Cal, the gorgeous hunk was attracted to Minerva, a big boned woman who was not the typical dainty, naive and delicate girl even if he was pushed to notice her only because of a bet!