

Applied Simulation Modeling And Analysis Using Flexsim

This book constitutes the refereed proceedings of the workshops which complemented the 13th International Conference on Practical Applications of Agents and Multi-Agent Systems, PAAMS 2015, held in Salamanca, Spain, in June 2015. The 36 revised full papers presented were carefully reviewed and selected from 91 submissions. This volume presents the papers that have been accepted for the following workshops: Workshop on Agents and multi-agent Systems for AAL and e-HEALTH, Workshop on Agent-Based Solutions for Manufacturing and Supply Chain, Workshop on MAS for Complex Networks and Social Computation, Workshop on Intelligent Systems for Context-based Information Fusion, Workshop on Multi-agent based Applications for Smart Grids and Sustainable Energy Systems, Workshop on Multiagent System based Learning Environments, Workshop in Intelligent Human-Agent Societies.

This book outlines the benefits and limitations of simulation, what is involved in setting up a simulation capability in an organization, the steps involved in developing a simulation model and how to ensure that model results are implemented. In addition, detailed example applications are provided to show where the tool is useful and what it can offer the decision maker. In *Simulating Business Processes for Descriptive, Predictive, and Prescriptive Analytics*, Andrew Greasley provides an in-depth discussion of Business process simulation and how it can enable business analytics. How business process simulation can provide speed, cost, dependability, quality, and flexibility metrics. Industrial case studies including improving service delivery while ensuring an

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efficient use of staff in public sector organizations such as the police service, testing the capacity of planned production facilities in manufacturing, and ensuring on-time delivery in logistics systems State-of-the-art developments in business process simulation regarding the generation of simulation analytics using process mining and modeling people's behavior Managers and decision makers will learn how simulation provides a faster, cheaper and less risky way of observing the future performance of a real-world system. The book will also benefit personnel already involved in simulation development by providing a business perspective on managing the process of simulation, ensuring simulation results are implemented, and that performance is improved. The purpose of this book is first to study MATLAB programming concepts, then the basic concepts of modeling and simulation analysis, particularly focus on digital communication simulation. The book will cover the topics practically to describe network routing simulation using MATLAB tool. It will cover the dimensions' like Wireless network and WSN simulation using MATLAB, then depict the modeling and simulation of vehicles power network in detail along with considering different case studies. Key features of the book include: Discusses different basics and advanced methodology with their fundamental concepts of exploration and exploitation in NETWORK SIMULATION. Elaborates practice questions and simulations in MATLAB Student-friendly and Concise Useful for UG and PG level research scholar Aimed at Practical approach for network simulation with more programs with step by step comments. Based on the Latest technologies, coverage of wireless simulation and WSN concepts and implementations Enjoy learning a key technology. Undergraduates and beginning graduates in both first and second simulation courses have responded positively to the approach taken in

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this text, which illustrates simulation principles using the popular Simio product. This economy version substitutes grayscale interior graphics to keep costs low for students. Content: This textbook explains how to use simulation to make better business decisions in application domains from healthcare to mining, heavy manufacturing to supply chains, and everything in between. It is written to help both technical and non-technical users better understand the concepts and usefulness of simulation. It can be used in a classroom environment or in support of independent study. Modern software makes simulation more useful and accessible than ever and this book illustrates simulation concepts with Simio, a leader in simulation software. Author Statement: This book can serve as the primary text in first and second courses in simulation at both the undergraduate and beginning-graduate levels. It is written in an accessible tutorial-style writing approach centered on specific examples rather than general concepts, and covers a variety of applications including an international flavor. Our experience has shown that these characteristics make the text easier to read and absorb, as well as appealing to students from many different cultural and applications backgrounds. A first simulation course would probably cover Chapter 1 through 8 thoroughly, and likely Chapters 9 and 10, particularly for upper class or graduate level students. For a second simulation course, it might work to skip or quickly review Chapters 1-3 and 6, thoroughly cover all other chapters up to Chapter 10, and use Chapter 11 as reinforcing assignments. The text or components of it could also support a simulation module of a few weeks within a larger survey course in programs without a stand-alone simulation course (e.g., MBA). For a simulation module that's part of a larger survey course, we recommend concentrating on Chapters 1, 4, and 5, and then perhaps lightly touch on Chapters 7 and 8. The extensibility introduced in Chapter 10

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could provide some interesting project work for a graduate student with some programming background, as it could be easily linked to other research topics. Likewise Appendix A could be used as the lead-in to some advanced study or research in the latest techniques in simulation-based planning and scheduling. Supplemental course material is also available on-line. Third Edition: The new third edition adds sections on Randomness in Simulation, Model Debugging, and Monte Carlo simulation. In addition, the coverage of animation, input analysis and output analysis has been significantly expanded. There is a new appendix on simulation-based scheduling, end-of-chapter problems have been improved and expanded, and we have incorporated many reader suggestions. We have reorganized the material for improved flow, and have updates throughout the book for many of the new Simio features recently added. A new format better supports our e-book users, and a new publisher supports significant cost reduction for our readers.

Teaches basic and advanced modeling and simulation techniques to both undergraduate and postgraduate students and serves as a practical guide and manual for professionals learning how to build simulation models using WITNESS, a free-standing software package. This book discusses the theory behind simulation and demonstrates how to build simulation models with WITNESS. The book begins with an explanation of the concepts of simulation modeling and a “guided tour” of the WITNESS modeling environment. Next, the authors cover the basics of building simulation models using WITNESS and modeling of material-handling systems. After taking a brief tour in basic probability and statistics, simulation model input analysis is then examined in detail, including the importance and techniques of fitting closed-form distributions to observed data. Next, the authors present simulation output analysis including determining run controls

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and statistical analysis of simulation outputs and show how to use these techniques and others to undertake simulation model verification and validation. Effective techniques for managing a simulation project are analyzed, and case studies exemplifying the use of simulation in manufacturing and services are covered. Simulation-based optimization methods and the use of simulation to build and enhance lean systems are then discussed. Finally, the authors examine the interrelationships and synergy between simulation and Six Sigma. Emphasizes real-world applications of simulation modeling in both services and manufacturing sectors Discusses the role of simulation in Six Sigma projects and Lean Systems Contains examples in each chapter on the methods and concepts presented Process Simulation Using WITNESS is a resource for students, researchers, engineers, management consultants, and simulation trainers.

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This book constitutes the refereed proceedings of the 11

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workshops co-located with the 16th International Conference on Practical Applications of Agents and Multi-Agent Systems, PAAMS 2018, held in Toledo, Spain, in June 2018. The 47 full papers presented were carefully reviewed and selected from 72 submissions. The volume presents the papers that have been accepted for the following workshops: Workshop on Agents and Multi-agent Systems for AAL and e-HEALTH; Workshop on Agent based Applications for Air Transport; Workshop on Agent-based Artificial Markets Computational Economics; Workshop on Agent-Based Solutions for Manufacturing and Supply Chain; Workshop on MAS for Complex Networks and Social Computation; Workshop on Intelligent Systems and Context Information Fusion; Workshop on Multi-agent based Applications for Energy Markets, Smart Grids and Sustainable Energy Systems; Workshop on Multiagent System based Learning Environments; Workshop on Smart Cities and Intelligent Agents; Workshop on Swarm Intelligence and Swarm Robotics; Workshop on Multi-Agent Systems and Simulation. The two-volume set IFIP AICT 566 and 567 constitutes the refereed proceedings of the International IFIP WG 5.7 Conference on Advances in Production Management Systems, APMS 2019, held in Austin, TX, USA. The 161 revised full papers presented were carefully reviewed and selected from 184 submissions. They discuss globally pressing issues in smart manufacturing, operations management, supply chain management, and Industry 4.0. The papers are organized in the following topical sections: lean production; production management in food supply chains; sustainability and reconfigurability of manufacturing systems; product and asset life cycle management in smart factories of industry 4.0; variety and complexity management in the era of industry 4.0; participatory methods for supporting the career choices in industrial engineering and management

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education; blockchain in supply chain management; designing and delivering smart services in the digital age; operations management in engineer-to-order manufacturing; the operator 4.0 and the Internet of Things, services and people; intelligent diagnostics and maintenance solutions for smart manufacturing; smart supply networks; production management theory and methodology; data-driven production management; industry 4.0 implementations; smart factory and IIOT; cyber-physical systems; knowledge management in design and manufacturing; collaborative product development; ICT for collaborative manufacturing; collaborative technology; applications of machine learning in production management; and collaborative technology.

"This book opens up the world of simulation to you by providing the basics of general simulation technology, identifying the skills needed for successful simulation projects, and introducing a state-of-the-art simulation package." --

The volume presents a collection of 44 peer-reviewed articles from the First International Conference on Intelligent Systems in Production Engineering and Maintenance (ISPEM 2017). ISPEM 2017 was organized by the Faculty of Mechanical Engineering, Wrocław University of Science and Technology and was held in Wrocław (Poland) on 28–29 September 2017. The main topics of the conference included the possibility of using widely understood intelligent methods in production engineering. New solutions for innovative plants, research results and case studies taking into account advances in production and maintenance from the point of view of Industry 4.0 were presented and discussed—with special attention paid to applications of intelligent systems, methods and tools in production engineering, maintenance, logistics, quality management, information systems, and product development. The volume is divided into two parts: 1.

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Intelligent Systems in Production Engineering 2. Intelligent Systems in Maintenance This book is an excellent reference resource for scientists in the field of manufacturing engineering and for top managers in production enterprises. Modeling and Analysis of Local Area Networks fills a void in the array of books on Local Area Networks (LANs) in that it reviews the state of LAN technology from a hardware and software perspective, develops a set of metrics that can be used to evaluate LANs for end applications, and investigates methodologies for evaluating LANs from these perspectives. The book discusses LAN evaluation techniques utilizing analysis, operational analysis, hardware testbeds, and simulations. Simulations will be stressed in greater detail and a tool available for evaluating LANs performance (called MALAN) is presented and the details of its structure developed.

The new edition of this successful textbook provides a comprehensive introduction to simulation, foregrounding the topic as an applied problem-solving tool. Guiding readers through the key stages in a simulation project in terms of both the technical requirements and the project management issues surrounding it, the book will enable students to develop appropriate valid conceptual models, perform simulation experiments, analyse the results and draw insightful conclusions. The author's engaging style and authoritative knowledge of the subject make the book as accessible as it is essential, drawing on case studies and complementary online content to encourage a critical engagement with the topic. This is an ideal textbook for those studying on upper level undergraduate and postgraduate degree courses in business and management and MBA programmes, and is a core text for those specialising in operations management. In addition, it is an important text for students taking Simulation modules on engineering, computer

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science or mathematics degree programmes. New to this Edition: - A practical step-by-step guide to preparing a simple model - Improved cross referencing, navigation and design - Updated referencing and the inclusion of select new case studies - New material available via the companion website - Key concepts, on-page glossary terms and relevant further reading lists for each chapter

This fifth edition explains how to use simulation to make better business decisions in application domains from healthcare to mining, heavy manufacturing to supply chains, and everything in between. It is written to help both technical and non-technical users better understand the concepts and usefulness of simulation.

This book presents the outcomes of the 15th International Conference on Distributed Computing and Artificial Intelligence, held in Toledo (Spain) from 20th to 22nd June 2018 and hosted by the UCLM, and which brought together researchers and developers from industry, education and the academic world to report on the latest scientific research, technical advances and methodologies. Highlighting multi-disciplinary and transversal aspects, the book focuses on the conferences Special Sessions, including Advances in Demand Response and Renewable Energy Sources in Smart Grids (ADRESS); AI- Driven Methods for Multimodal Networks and Processes Modeling (AIMPM); Social Modelling of Ambient Intelligence in Large Facilities (SMALF); Communications, Electronics and Signal Processing (CESP); Complexity in Natural and Formal Languages (CNFL); and Web and Social Media Mining (WASMM).

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This practical book presents fundamental concepts and issues in computer modeling and simulation (M&S) in a simple and practical way for engineers, scientists, and managers who wish to apply simulation successfully to their real-world problems. It offers a concise approach to the coverage of generic (tool-independent) M&S concepts and enables engineering practitioners to easily learn, evaluate, and apply various available simulation concepts. Worked out examples are included to illustrate the concepts and an example modeling application is continued throughout the chapters to demonstrate the techniques. The book discusses modeling purposes, scoping a model, levels of modeling abstraction, the benefits and cost of including randomness, types of simulation, and statistical techniques. It also includes a chapter on modeling and simulation projects and how to conduct them for customer and engineer benefit and covers the stages of a modeling and simulation study, including process and system investigation, data collection, modeling scoping and production, model verification and validation, experimentation, and analysis of results.

Emphasizes a hands-on approach to learning statistical analysis and model building through the use of comprehensive examples, problems sets, and software applications With a unique blend of theory and applications, *Simulation Modeling and Arena®*, Second Edition integrates coverage of statistical analysis and model building to emphasize the importance of both topics in simulation. Featuring introductory coverage on how simulation works and why it matters, the Second

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Edition expands coverage on static simulation and the applications of spreadsheets to perform simulation. The new edition also introduces the use of the open source statistical package, R, for both performing statistical testing and fitting distributions. In addition, the models are presented in a clear and precise pseudo-code form, which aids in understanding and model communication. Simulation Modeling and Arena, Second Edition also features: Updated coverage of necessary statistical modeling concepts such as confidence interval construction, hypothesis testing, and parameter estimation Additional examples of the simulation clock within discrete event simulation modeling involving the mechanics of time advancement by hand simulation A guide to the Arena Run Controller, which features a debugging scenario New homework problems that cover a wider range of engineering applications in transportation, logistics, healthcare, and computer science A related website with an Instructor's Solutions Manual, PowerPoint® slides, test bank questions, and data sets for each chapter Simulation Modeling and Arena, Second Edition is an ideal textbook for upper-undergraduate and graduate courses in modeling and simulation within statistics, mathematics, industrial and civil engineering, construction management, business, computer science, and other departments where simulation is practiced. The book is also an excellent reference for professionals interested in mathematical modeling, simulation, and Arena.

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FlexSim Applied Simulation Modeling and Analysis Using FlexSim Applied Simulation Modeling Duxbury Press
This book covers a variety of topics in manufacturing, with a special emphasis on product design, production planning, and implementation of both resources and production processes. The content is based on papers presented at the 6th International Scientific Technical Conference MANUFACTURING 2019, held in Poznan, Poland on May 19-22, 2019. The main focus is on showing best practices to use tools currently available in the enterprises to effectively improving industrial processes. Knowledge and production flow management, decision-making systems, production leveling, enterprise efficiency, as well as maintenance, modeling and simulation of production processes are just some of the topics discussed in this book, which offers a timely and practice-oriented reference guide for applied researchers, product engineers and product managers. The purpose of the 4th International Asia Conference on Industrial Engineering and Management Innovation (IEMI 2013) is to bring together researchers, engineers and practitioners interested in the application of informatics to usher in new advances in the industrial engineering and management fields.

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

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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

Enjoy learning a key technology. Undergraduates and beginning graduates in both first and second

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simulation courses have responded positively to the approach taken in this text, which illustrates simulation principles using the popular Simio product. The full color interior graphics provides a superior learning experience. Content: This textbook explains how to use simulation to make better business decisions in application domains from healthcare to mining, heavy manufacturing to supply chains, and everything in between. It is written to help both technical and non-technical users better understand the concepts and usefulness of simulation. It can be used in a classroom environment or in support of independent study. Modern software makes simulation more useful and accessible than ever and this book illustrates simulation concepts with Simio, a leader in simulation software. Author Statement: This book can serve as the primary text in first and second courses in simulation at both the undergraduate and beginning-graduate levels. It is written in an accessible tutorial-style writing approach centered on specific examples rather than general concepts, and covers a variety of applications including an international flavor. Our experience has shown that these characteristics make the text easier to read and absorb, as well as appealing to students from many different cultural and applications backgrounds. A first simulation course would probably cover Chapter 1 through 8 thoroughly, and

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likely Chapters 9 and 10, particularly for upper class or graduate level students. For a second simulation course, it might work to skip or quickly review Chapters 1-3 and 6, thoroughly cover all other chapters up to Chapter 10, and use Chapter 11 as reinforcing assignments. The text or components of it could also support a simulation module of a few weeks within a larger survey course in programs without a stand-alone simulation course (e.g., MBA). For a simulation module that's part of a larger survey course, we recommend concentrating on Chapters 1, 4, and 5, and then perhaps lightly touch on Chapters 7 and 8. The extensibility introduced in Chapter 10 could provide some interesting project work for a graduate student with some programming background, as it could be easily linked to other research topics. Likewise Appendix A could be used as the lead-in to some advanced study or research in the latest techniques in simulation-based planning and scheduling. Supplemental course material is also available on-line. Third Edition Changes: The new third edition adds sections on Randomness in Simulation, Model Debugging, and Monte Carlo simulation. In addition, the coverage of animation, input analysis and output analysis has been significantly expanded. There is a new appendix on simulation-based scheduling, end-of-chapter problems have been improved and expanded, and we have incorporated many reader suggestions. We

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have reorganized the material for improved flow, and have updates throughout the book for many of the new Simio features recently added. A new format better supports our e-book users, and a new publisher supports significant cost reduction for our readers.

As the world's population continues to grow and economic conditions continue to improve, more solid and liquid waste is being generated by society. Improper disposal methods can not only lead to harmful environmental impacts but can also negatively affect human health. To prevent further harm to the world's ecosystems, there is a dire need for sustainable waste management practices that will safeguard the environment for future generations.

Waste Management: Concepts, Methodologies, Tools, and Applications is a vital reference source that examines the management of different types of wastes and provides relevant theoretical frameworks about new waste management technologies for the control of air, water, and soil pollution. Highlighting a range of topics such as contaminant removal, landfill treatment, and recycling, this multi-volume book is ideally designed for environmental engineers, waste authorities, solid waste management companies, landfill operators, legislators, environmentalists, policymakers, government officials, academicians, researchers, and students.

In Industry 4.0, industrial productions are adjusted to

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complete smart automation, which means introducing self-automation methods, self-configuration, self-diagnosis of problems and removal, cognition, and intelligent decision making. This implementation of Industry 4.0 brings about a change in business paradigms and production models, and this will be reflected at all levels of the production process including supply chains and will involve all workers in the production process from managers to cyber-physical systems designers and customers as end-users. The Handbook of Research on Integrating Industry 4.0 in Business and Manufacturing is an essential reference source that explores the development and integration of Industry 4.0 by examining changes and innovations to manufacturing processes as well as its applications in different industrial areas. Featuring coverage on a wide range of topics such as cyber physical systems, integration criteria, and artificial intelligence, this book is ideally designed for mechanical engineers, electrical engineers, manufacturers, supply chain managers, logistics specialists, investors, managers, policymakers, production scientists, researchers, academicians, and students at the postgraduate level.

APPLIED SIMULATION MODELING provides the student with both a conceptual introduction to the concepts of simulation modeling and practical experience with real examples using popular

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commercial simulation packages ARENA and @Risk. The coverage includes Risk Simulation, Dynamic Systems, and Discrete Event Simulation models. Throughout the text, the authors show readers how they can use simulation in the context of decision making. Practical examples from Operations Management, Manufacturing, Health Care, and Finance are included throughout to give students an appreciation for the wide scope of application and the robust nature of simulation modeling. Special student editions of ARENA and @Risk are packaged with the text.

The supply of material to a manufacturing facility obviously has a major impact on enterprise performance, whether measured in terms of cost, timeliness, quality, etc. Most material that is input to a manufacturing process is transported to the manufacturing facility via multiple modes of transportation, i.e., it involves intermodal transportation. Since the material must be acquired from outside of the manufacturing site, sourcing decisions have significant impact on overall enterprise performance. Critical elements of those sourcing decisions include specifying from where to acquire the material, in what quantity, etc. It may also involve deciding the modes that should be used to transport the material from the source to the manufacturer. Even if specifying the mode is not part of the decision process, it is a significant driver in terms of cost, reliability, timeliness, etc. These issues pertain to domestic supply, but more importantly to international supply. The

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sourcing decision is complex since it involves a large number of factors and considerations, as well as interdependencies between the factors, and considerable variability and uncertainty. This is especially true when considering international sourcing options, but is important in assessing alternative domestic intermodal paths as well. This project provides the capability, through a software toolset, to deal with these issues. Simulation modeling and analysis is commonly applied to complex problems similar to those in the sourcing decision. Simulation provides the means to perform sophisticated what-if analyses on complex problems, such as assessing alternative intermodal supply paths. The toolset provides a means to quickly develop simulation models of both domestic and international supply chains. The project also provides a case study that illustrates how the toolset can be applied in a real setting.

Building on the author's earlier *Applied Simulation and Optimization*, this book presents novel methods for solving problems in industry, based on hybrid simulation-optimization approaches that combine the advantages of both paradigms. The book serves as a comprehensive guide to tackling scheduling, routing problems, resource allocations and other issues in industrial environments, the service industry, production processes, or supply chains and aviation. Logistics, manufacturing and operational problems can either be modelled using optimization techniques or approaches based on simulation methodologies. Optimization techniques have the advantage of performing efficiently when the

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problems are properly defined, but they are often developed through rigid representations that do not include or accurately represent the stochasticity inherent in real systems. Furthermore, important information is lost during the abstraction process to fit each problem into the optimization technique. On the other hand, simulation approaches possess high description levels, but the optimization is generally performed through sampling of all the possible configurations of the system. The methods explored in this book are of use to researchers and practising engineers in fields ranging from supply chains to the aviation industry.

This book describes a variety of teaching and academic research applications that effectively utilize FlexSim to: (1) provide guidelines, methods and tools for simulation modeling and analysis in a variety of educational settings and (2) address a variety of important design and operational issues in industry. Simulation is increasingly proving to be an important tool for supporting decision-making and problem-solving processes in many disparate domains, including the design, management and improvement of a wide range of operations systems in manufacturing, logistics, healthcare, etc. Achieving resource efficiency and minimizing negative externalities from operations represent two of today's greatest challenges; modern simulation methods can help to overcome them. FlexSim is a prominent software package for developing discrete-event, agent-based, continuous, and hybrid simulations.

Recently there has been considerable interest in qualitative methods in simulation and mathematical

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model- ing. Qualitative Simulation Modeling and Analysis is the first book to thoroughly review fundamental concepts in the field of qualitative simulation. The book will appeal to readers in a variety of disciplines including researchers in simulation methodology, artificial intelligence and engineering. This book boldly attempts to bring together, for the first time, the qualitative techniques previously found only in hard-to-find journals dedicated to single disciplines. The book is written for scientists and engineers interested in improving their knowledge of simulation modeling. The "qualitative" nature of the book stresses concepts of invariance, uncertainty and graph-theoretic bases for modeling and analysis.

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