

# HYBRID SIMULATION MODELS OF PRODUCTION NETWORKS

VASSILIS S. KOUIKOGLOU  
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YANNIS A. PHILLIS

# Hybrid Simulation Models Of Production Networks

**Vassilis Kouikoglou, Yannis Phillis**



## **Hybrid Simulation Models Of Production Networks:**

Hybrid Simulation Models of Production Networks Vassilis S. Kouikoglou, Yannis A. Phillis, 2001-07-31 This book is concerned with a most important area of industrial production that of analysis and optimization of production lines and networks using discrete event models and simulation The book introduces a novel approach that combines analytic models and discrete event simulation Unlike conventional piece by piece simulation this method observes a reduced number of events between which the evolution of the system is tracked analytically Using this hybrid approach several models are developed for the analysis of production lines and networks The hybrid approach combines speed and accuracy for exceptional analysis of most practical situations A number of optimization problems involving buffer design workforce planning and production control are solved through the use of hybrid models

Hybrid Simulation Models of Production Networks Vassilis Kouikoglou, Yannis Phillis, 2013-08-21 Industrial production is one of the most basic human activities indispensable to the economic activity Due to its complexity production is not very well understood and modeled as opposed to traditional fields of inquiry such as physics This book aims at enhancing rigorous understanding of a particular area of production that of analysis and optimization of production lines and networks using discrete event models and simulation To our knowledge this is the first book treating this subject from the point of view mentioned above We have arrived at the realization that discrete event models and simulation provide perhaps the best tools to model production lines and networks for a number of reasons Analysis is precise but demands enormous computational resources usually unavailable in practical situations Brute force simulation is also precise but slow when quick decisions are to be made Approximate analytical models are fast but often unreliable as far as accuracy is concerned The approach of the book on the other hand combines speed and accuracy to an exceptional degree in most practical applications

**Hybrid Simulation Models of Production Networks** Vassilis S. Kouikoglou, Yannis A. Phillis, 2013-11-11 Industrial production is one of the most basic human activities indispensable to the economic activity Due to its complexity production is not very well understood and modeled as opposed to traditional fields of inquiry such as physics This book aims at enhancing rigorous understanding of a particular area of production that of analysis and optimization of production lines and networks using discrete event models and simulation To our knowledge this is the first book treating this subject from the point of view mentioned above We have arrived at the realization that discrete event models and simulation provide perhaps the best tools to model production lines and networks for a number of reasons Analysis is precise but demands enormous computational resources usually unavailable in practical situations Brute force simulation is also precise but slow when quick decisions are to be made Approximate analytical models are fast but often unreliable as far as accuracy is concerned The approach of the book on the other hand combines speed and accuracy to an exceptional degree in most practical applications

**Production Planning with Capacitated Resources and Congestion** Hubert Missbauer, Reha Uzsoy, 2020-02-26 This book presents a comprehensive overview of recent

developments in production planning The monograph begins with an introductory chapter reviewing the need for these production planning models that operate by determining time phased releases of work into the facility or supply chain relating these to the Manufacturing Planning and Control MPC and Advanced Planning and Scheduling APS frameworks that form the basis of most academic research and industrial practice The extensive body of work on Workload Control is also placed in this context and proves the need for improved models with a discussion of the difficulties these approaches encounter The next two chapters present a detailed review of the state of the art in optimization models based on exogenous planned lead times and examines the cases where these can take both integer and fractional values The difficulties arising in estimating planned lead times are consistent with factory behavior which are highlighted noting that many of these lead to non convex optimization models Attempts to address these difficulties by iterative multimodel approaches that combine simulation and mathematical programming are also discussed in detail The next three chapters of the volume address the set of techniques developed using clearing functions which represent the expected output of a resource in a planning period as a function of the expected workload of the resource during that period The chapters on this subject propose a basic optimization model for multiple products discuss the difficulties of this model and some possible solutions It also reviews prior work and discuss a number of alternative formulations of the clearing function concept with their respective advantages and disadvantages Applications to lot sizing decisions and a number of other specific problems are also described This volume concludes with an assessment of the state of the art described in the volume and several directions for future work

Robust Manufacturing Control Katja Windt, 2012-12-14 This contributed volume collects research papers presented at the CIRP Sponsored Conference Robust Manufacturing Control Innovative and Interdisciplinary Approaches for Global Networks RoMaC 2012 Jacobs University Bremen Germany June 18th 20th 2012 These research papers present the latest developments and new ideas focusing on robust manufacturing control for global networks Today Global Production Networks i e the nexus of interconnected material and information flows through which products and services are manufactured assembled and distributed are confronted with and expected to adapt to sudden and unpredictable large scale changes of important parameters which are occurring more and more frequently event propagation in networks with high degree of interconnectivity which leads to unforeseen fluctuations and non equilibrium states which increasingly characterize daily business These multi scale changes deeply influence logistic target achievement and call for robust planning and control strategies Therefore understanding the cause and effects of multi scale changes in production networks is of major interest New methodological approaches from different science disciplines are promising to contribute to a new level comprehension of network processes Unconventional methods from biology perturbation ecology or auditory display are gaining increasing importance as they are confronted with similar challenges Advancements from the classical disciplines such as mathematics physics and engineering are also becoming of continuing importance Energy-Related Material Flow

Simulation in Production and Logistics Sigrid Wenzel, Markus Rabe, Steffen Strassburger, Christoph von Viebahn, 2023-12-14

This book provides for the first time an overview on the current approaches and applications of energy aspects in production and logistics by the use of simulation techniques. During the last decade the importance of energy in the material flow processes has become more and more important. The pressure to reduce the environmental footprint of production and logistics systems will even intensify in future. Therefore enterprises have started to integrate the use of energy into their planning processes much more than before even designing feedback loops e.g. from energy control to production control. This receives additional attention with the increasing use of renewable but less reliable energy sources. Care must be taken to establish processes that aim to use energy when it is available. As an example many industrial processes like melting or coating have significant energy demands but could vary the point of time of its consumption within specific limits leading to a very high complexity. It discusses the construction and application of energy specific performance indicators and analyzes the input information that needs to be acquired before implementing suitable models. On this basis concrete technical solutions are introduced.

**Electronic Supply Network Coordination in Intelligent and Dynamic Environments: Modeling and Implementation** Mahdavi, Iraj, Mohebbi, Shima, Cho, Namjae, 2010-10-31 This book presents cutting edge knowledge on scientific approaches to the management of supply networks in a highly informed global environment with abundant dynamic and uncertain challenges. Provided by publisher.

**Control and Dynamic Systems V47: Manufacturing and Automation Systems: Techniques and Technologies** C.T. Leonides, 2012-12-02 Control and Dynamic Systems Advances in Theory and Applications Volume 47 Manufacturing and Automation Systems Techniques and Technologies Part 3 of 5 deals with techniques and technologies in manufacturing and automation systems. This book discusses techniques in modeling and control policies for production networks effective planning and control of day to day operations evaluation of automated manufacturing systems the use of Petri Nets in modeling control and performance analysis of automated manufacturing systems and concurrent engineering and evaluation of concurrency in engineering design. The final chapter discusses the algorithm for solving allocation problems. This book will provide a uniquely significant reference source for practitioners in the field who want a comprehensive source of techniques with significant applied implications.

**Logistics of Production and Inventory** S.C. Graves, A.H.G. Rinnooy Kan, P.H. Zipkin, 1993-05-27 Handbook  
**Management in Logistics Networks and Nodes** Thorsten Blecker, Wolfgang Kersten, Carsten Gertz, 2008  
**NBS Special Publication**, 1968

**Digitalization of Society, Economics and Management** Evgeny Zaramenskikh, Alena Fedorova, 2022-04-15 This book gathers the best papers presented at the third conference held by the Russian chapter of the Association for Information Systems AIS which took place in December 2021. The book shows the path to digital transformation of organizations and how possible obstacles can be overcome. With contributions from digital experts in both academia and IT and management it presents practical frameworks and planning tools for new business models. It offers executives at the

forefront of strategic initiatives a guide on how to implement key disruptive technologies in their organizations while following an established digital strategy Overall the book is relevant for scientists digital technology users companies and public institutions *Unlocking the Power of OPNET Modeler* Zheng Lu,Hongji Yang,2012-01-19 For fast easy modeling this practical guide provides all the essential information you need to know A wide range of topics is covered including custom protocols programming in C External Model Access EMA modeling and co simulation with external systems giving you the guidance not provided in the OPNET documentation A set of high level wrapper APIs is also included to simplify programming custom OPNET models whether you are a newcomer to OPNET or an experienced user needing to model efficiently From the basic to the advanced you will find topics are easy to follow with theory kept to a minimum many practical tips and answers to frequently asked questions spread throughout the book and numerous step by step case studies and real world network scenarios included *Advanced Manufacturing and Sustainable Logistics* Wilhelm

Dangelmaier,Alexander Blecken,Robin Delius,Stefan Klöpfer,2010-04-15 This book constitutes the proceedings of the 8th International Heinz Nixdorf Symposium IHNS 2010 held in Paderborn Germany April 21 22 2010 under the title Changing Paradigms Advanced Manufacturing and Sustainable Logistics The 27 full and two short papers presented in this book were carefully reviewed and selected from a total of 63 submissions They are grouped in five parts on Supply Chain Management Production Logistics and Industrial Engineering Operations Research Techniques Humanitarian Logistics and Simulation The presentation is completed by nine invited keynote papers from renowned international experts in these fields

Applications of Multi-Criteria and Game Theory Approaches Lyes Benyoucef,Jean-Claude Hennet,Manoj Kumar Tiwari,2013-10-17 Aligning the latest practices innovations and case studies with academic frameworks and theories the broad area of multi criteria and game theory applications in manufacturing and logistics is covered in comprehensive detail Divided into two parts part I is dedicated to multi criteria applications and includes chapters on logistics with a focus on vehicle routing problems a multi objective decision making approach to select the best storage policy and an exploratory study to predict the most important factors that can lead to successful mobile supply chain management adoption for manufacturing firms Part II covers game theory applications and encompasses the process of forming a coalition within a corporate network to the problem of integrating inventory and distribution optimization together with game theory to effectively manage supply networks Providing a forum to investigate exchange novel ideas and disseminate knowledge covering the broad area of multi criteria and game theory applications in manufacturing and logistics *Applications of Multi Criteria and Game Theory Approaches* is an excellent reference for students researchers but also managers and industry professionals working with manufacturing and logistics issues **Analysis and Design of Discrete Part Production**

**Lines** Chrissoleon T. Papadopoulos,Michael E. J. O'Kelly,Michael J. Vidalis,Diomidis Spinellis,2009-05-30 *Analysis and Design of Discrete Part Production Lines* provides a complete overview of production systems investigating several production line

problems and describing the best approaches to the analysis of production line performance Written by experts in the field of production and manufacturing research this book also presents numerous techniques that can be used to describe and model various types of production lines Special Features Includes access to a supplementary web based software package providing algorithms and examples developed by distinguished experts of the field Describes new results for evaluative techniques and design algorithms as well as several open problems in production line optimization Presents in detail the theory and techniques that underlie production system management design and analysis allowing the book to serve as an excellent introduction to newcomers in the field Has potential for use in a graduate level course in industrial or manufacturing engineering or in a business course with a manufacturing focus Contains appendices providing an overview of several mathematical techniques employed to design and evaluate production line models Computer Literature Bibliography:

1964-1967 W. W. Youden,1965 **The 17th International Conference Interdisciplinarity in Engineering** Liviu Moldovan,Adrian Gligor,2024-03-28 This book contains research papers that were accepted for presentation at the 17th International Conference on Interdisciplinarity in Engineering INTER ENG 2023 which was held on 5 6 October 2023 in the city of T rgu Mure Romania The general scope of the conference Towards transition for a more competitive European industry in a smart safe and sustainable future is proposing a new approach related to the development of a new generation of smart factories grounded on the manufacturing and assembly process digitalization It is related to advance manufacturing technology lean manufacturing sustainable manufacturing additive manufacturing manufacturing tools and equipment It is a leading international professional and scientific forum of great interest for engineers and scientists who can read in this book research works contributions and recent developments as well as current practices in advanced fields of engineering

Encyclopedia of Production and Manufacturing Management Paul M. Swamidass,2006-09-21 The Encyclopedia of Production and Manufacturing Management is an encyclopedia that has been developed to serve this field as the fundamental reference work Over the past twenty years the field of production and operations management has grown more rapidly than ever and consequently its boundaries have been stretched in all directions For example in the last two decades production and manufacturing management absorbed in rapid succession several new production management concepts manufacturing strategy focused factory just in time manufacturing concurrent engineering total quality management supply chain management flexible manufacturing systems lean production and mass customization to name a few This explosive growth makes the need for this volume abundantly clear The manufacturing industry thinks and acts more broadly than it did several decades ago The most notable change has been the need for manufacturing managers to think in technological strategic and competitive terms This is a very favorable development and it leads to manufacturing success The entries in this encyclopedia include the most recent technical and strategic innovations in production and manufacturing management The encyclopedia consists of articles of varying lengths The longer articles on important concepts and practices range from

five to fifteen pages There are about 100 such articles written by nearly 100 authors from around the world In addition there are over 1000 shorter entries on concepts practices and principles The range of topics and depth of coverage is intended to suit both student and professional audiences The shorter entries provide digests of unfamiliar and complicated subjects Difficult subjects are made intelligible to the reader without oversimplification The strategic and technological perspectives on various topics give this Encyclopedia its distinctiveness and uniqueness The world of manufacturing today is increasingly competitive It is apparent that manufacturers must respond to these competitive pressures with technical and strategic innovation This encyclopedia has been developed to help researchers students and those in the manufacturing industry to understand and implement these ongoing changes in the field

### **Biopharmaceutical Manufacturing** Ralf

Pörtlner, 2024-01-10 This volume Cell Engineering 11 Biopharmaceutical Manufacturing Progress Trends and Challenges is a source of the latest innovative research and technical development in biomanufacturing systems It is organised into 2 parts 1 Manufacturing of recombinant therapeutic proteins e g therapeutic antibodies biosimilars biogenerics and 2 Manufacturing aspects of cell and gene therapy Each with selected chapters on the following topics for both up and downstream such as Advanced process strategies especially continuous manufacturing Advanced culture techniques especially single use systems Process transfer scale up scale down models Processing advances Manufacturing productivity efficiency Model assisted process understanding and development Digital Twins Process controls and analytics Quality control Quality by design Facility design and full scale commercial systems manufacturing technology innovation The book comprises contributions of experts from academia and industry active in the field of cell culture development for the production of recombinant proteins cell therapy and gene therapy with consideration of Digital Twin s and facility design The knowledge and expertise of the authors cover disciplines like cell biology engineering biotechnology and biomedical sciences Inevitably some omissions will occur in the text but the authors have sought to avoid duplications by extensive cross referencing to chapters in other volumes of this series and elsewhere We hope the volume provides a useful compendium of techniques for scientists in industrial and research laboratories active in this field



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