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Formal Methods in Manufacturing Systems: Recent Advances

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Formal Methods in Manufacturing Systems

Recent Advances

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Evolving technologies in mass production have led to the development of advanced techniques in the field of manufacturing. These technologies can quickly and effectively respond to various market changes, necessitating processes that focus on small batches of multiple products rather than large, single-product lines.

Formal Methods in Manufacturing Systems: Recent Advances explores this shifting paradigm through an investigation of contemporary manufacturing techniques and formal methodologies that strive to solve a variety of issues arising from a market environment that increasingly favors flexible systems over traditional ones. This book will be of particular use to industrial engineers and students of the field who require a detailed understanding of current trends and developments in manufacturing tools. This book is part of the Advances in Civil and Industrial Engineering series collection.

Topics Covered:

- Automated Manufacturing Systems
- Deadlock Control
- Dynamic Models
- Flexible Manufacturing Systems (FMS)
- Formal Modeling Tools

- Hybrid Optimization Techniques
- Intelligent Computation
- Manufacturing Technologies
- Petri Nets
- Planning and Scheduling

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Section 1: Supervisory Control in FMS

Chapter 1

Nonblocking Supervisory Control of Flexible Manufacturing Systems Based on State Tree Structures Chao Wujie (Xi'an Jiaotong University, China) Gan Yongmei (Xi'an Jiaotong University, China) Wonham W. M. (University of Toronto, Canada) Wang Zhaoan (Xi'an Jiaotong University, China)

Chapter 2

Petri Net Supervisory Method for Linear Constraints and its Applications to Flexible Manufacturing Systems Luo Jiliang (Huaqiao University, China)

Chapter 3 Distributed Maximally Permissive Nonblocking Control of Flexible Manufacturing Systems Zhang Renyuan (Xi'an Jiaotong University, China) Gan Yongmei (Xi'an Jiaotong University, China) Wonham W. M. (University of Toronto, Canada) Wang Zhaoan (Xi'an Jiaotong University, China)

Chapter 4 *A Computationally Improved Control Policy for FMS Using Crucial Marking/Transition-Separation Instances* Huang Yi-Sheng (National Ilan University, Taiwan, R.O.C.) Pan Yen-Liang (Air Force Academy, Taiwan, R.O.C.)

Section 2: Production Planning and Scheduling

Chapter 5 Hybrid Optimization Techniques for Industrial Production Planning Vasant Pandian (University Technology Petronas, Malaysia)

Chapter 6

MDA-Based Methodology for Verifying Distributed Execution of Embedded Systems Models Costa Anikó (Universidade Nova de Lisboa, Portugal) Barbosa Paulo E. S. (Universidade Estadual da Paraiba, Brazil) Moutinho Filipe (Universidade Nova de Lisboa, Portugal) Pereira Fernando (Instituto Politécnico de Lisboa, Portugal) Ramalho Franklin (Universidade Federal de Campina Grande, Brazil) Figueiredo Jorge C. A. (Universidade Federal de Campina Grande, Brazil) Gomes Luis (Universidade Nova de Lisboa, Portugal)

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A Resource-Oriented Petri Net Approach to Scheduling and Control of Time-Constrained Cluster Tools in Semiconductor Fabrication

Wu NaiQi (Guangdong University of Technology, China) Zhou MengChu (New Jersey Institute of Technology, USA & Tongji University, China)

Chapter 8

Real-Time Scheduling and Control of Single-Arm Cluster Tools with Residency Time Constraint and Activity Time Variation by Using Resource-Oriented Petri Nets Qiao Yan (Guangdong University of Technology, China)

Wu NaiQi (Guangdong University of Technology, China)

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Chapter 9 Intelligent Computation for Manufacturing Afify Ashraf (King Saud University, Saudi Arabia & Zagazig University, Egypt)

Chapter 10 Feasible Dynamic Reconfigurations of Petri Nets Zhang Jia Feng (Xidian University, China) Mosbahi Olfa (University of Carthage, Tunisia) Khalgui Mohamed (University of Carthage, Tunisia & National Council of Research, Italy) Gharbi Atef (University of Carthage, Tunisia)

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Chapter 12 Iterative Deadlock Control for Petri Net Models of Automated Manufacturing Systems: Wang Anrong (Xidian University, China) Zhou MengChu (New Jersey Institute of Technology, USA & Tongji University, China)

Chapter 13 Design of Optimized Petri Net Supervisors for Flexible Manufacture Systems Based on Elementary Siphons Yan Mingming (University of Electronic Science and Technology of China, China)

Chapter 14 Deadlock Control in Generalized Petri Nets Zhao Mi (Shihezi University, China) Hou Yifan (Xidian University, China)

Chapter 15 Deadlock Prevention for Automated Manufacturing Systems with Uncontrollable and Unobservable Transitions: Qin Meng (Xidian University, China)

Chapter 16 Solving Siphons with the Minimal Cardinality for Deadlock Control Li Shaoyong (Lanzhou University of Technology, China)

Chapter 17 Composition of Functional Petri Nets Zaitsev Dmitry A. (International Humanitarian University, Ukraine)

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