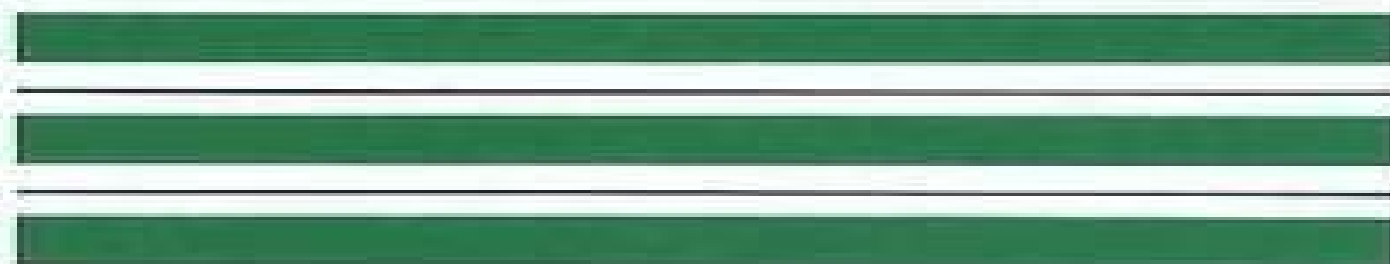

Supervisory Control of Discrete Event Systems Using Petri Nets

John O. MOODY
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Branislav Hruz, MengChu Zhou



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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.

Control of Discrete-Event Systems Carla Seatzu, Manuel Silva, Jan H. van Schuppen, 2012-07-27 *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 and 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.

Supervision of Petri Nets Geert Stremersch, 2012-12-06 *Supervision of Petri Nets* presents supervisory control theory for Petri nets with a legal set as the control goal. Petri nets model discrete event systems, dynamic systems whose evolution is completely determined by the occurrence of discrete events. Control laws which guarantee that the system meets a set of specifications in the presence of uncontrollable and unobservable events are studied and constructed using application areas such as automated manufacturing and transportation systems. *Supervision of Petri Nets* introduces a new and mathematically sound approach to the subject. Existing results are unified by proposing a general mathematical language that makes extensive use of order theoretical ideas and numerous new results are described.

including ready to use algorithms that construct supervisory control laws for Petri nets Supervision of Petri Nets is an excellent reference for researchers and may also be used as a supplementary text for advanced courses on control theory

Supervisory Control of Discrete-Event Systems W. Murray Wonham, Kai Cai, 2018-08-17 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 Modeling and Control

of Discrete-event Dynamic Systems Branislav Hruz, MengChu Zhou, 2007-08-17 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 Synthesis and Control of Discrete Event Systems Benoît Caillaud, Philippe

Darondeau, Luciano Lavagno, Xiaolan Xie, 2013-04-17 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 Theories 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

Optimal Supervisory Control of Automated Manufacturing Systems Yufeng Chen,Zhiwu Li,2013-01-23 This monograph presents the state of the art developments in the design of behaviorally and structurally optimal liveness enforcing Petri net supervisors with computationally tractable approaches It details optimal supervisory control problems arising in automated production systems and outlines a methodology to achieve the optimality purposes of

Control Systems, Robotics and Automation - Volume XV Heinz D. Unbehauen,2009-10-11 This Encyclopedia of Control Systems Robotics and Automation is a component of the global Encyclopedia of Life Support Systems EOLSS which is an integrated compendium of twenty one Encyclopedias This 22 volume set contains 240 chapters each of size 5000 30000 words with perspectives applications and extensive illustrations It is the only publication of its kind carrying state of the art knowledge in the fields of Control Systems Robotics and Automation and is aimed by virtue of the several applications at the following five major target audiences University and College Students Educators Professional Practitioners Research Personnel and Policy Analysts Managers and Decision Makers and NGOs

Estimation and Inference in Discrete Event Systems Christoforos N. Hadjicostis,2019-10-02 Estimation and Inference in Discrete Event Systems chooses a popular model for emerging automation systems finite automata under partial observation and focuses on a comprehensive study of the key problems of state estimation and event inference The text includes treatment of current delayed and initial state estimation Related applications for assessing and enforcing resiliency fault detection and diagnosis and security privacy and opacity properties are discussed enabling the reader to apply these techniques in a variety of emerging applications among them automated manufacturing processes intelligent vehicle highway systems and autonomous vehicles The book provides a systematic development of recursive algorithms for state estimation and event inference The author also deals with the verification of pertinent properties such as the ability to determine the exact state of a system detectability the ability to ensure that certain classes of faults can be detected identified diagnosability and the ability to ensure that certain internal state variables of the system remain hidden from the outside world regardless of the type of activity that is taking place opacity This book allows students researchers and practicing engineers alike to grasp basic aspects of state estimation in discrete event systems aspects like distributivity and probabilistic inference quickly and without having to master the entire breadth of models that are available in the

literature Discrete Event Systems R. Boel, Geert Stremersch, 2012-12-06 Discrete Event Systems Analysis and Control is the proceedings of WODES2000 the 5th Workshop on Discrete Event Systems held in Ghent Belgium on August 21-23 2000. This book provides a survey of the current state of the art in the field of modeling, analysis, and control synthesis of discrete event systems; lecture notes for a mini course on sensitivity analysis for performance evaluation of timed discrete event systems; and 48 carefully selected papers covering all areas of discrete event theory and the most important applications domains. Topics include automata theory and supervisory control; 12 Petri net based models for discrete event systems and their control synthesis; 11 max and timed automata models; 9 applications papers related to scheduling, failure detection, and implementation of supervisory controllers; 7 formal descriptions of PLCs; 6 and finally stochastic models of discrete event systems; 3.

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Table of Contents Supervisory Control Of Discrete Event Systems Using Petri Nets

1. Understanding the eBook Supervisory Control Of Discrete Event Systems Using Petri Nets
 - The Rise of Digital Reading Supervisory Control Of Discrete Event Systems Using Petri Nets
 - Advantages of eBooks Over Traditional Books
2. Identifying Supervisory Control Of Discrete Event Systems Using Petri Nets
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Supervisory Control Of Discrete Event Systems Using Petri Nets
 - User-Friendly Interface
4. Exploring eBook Recommendations from Supervisory Control Of Discrete Event Systems Using Petri Nets
 - Personalized Recommendations
 - Supervisory Control Of Discrete Event Systems Using Petri Nets User Reviews and Ratings
 - Supervisory Control Of Discrete Event Systems Using Petri Nets and Bestseller Lists

5. Accessing Supervisory Control Of Discrete Event Systems Using Petri Nets Free and Paid eBooks
 - Supervisory Control Of Discrete Event Systems Using Petri Nets Public Domain eBooks
 - Supervisory Control Of Discrete Event Systems Using Petri Nets eBook Subscription Services
 - Supervisory Control Of Discrete Event Systems Using Petri Nets Budget-Friendly Options
6. Navigating Supervisory Control Of Discrete Event Systems Using Petri Nets eBook Formats
 - ePub, PDF, MOBI, and More
 - Supervisory Control Of Discrete Event Systems Using Petri Nets Compatibility with Devices
 - Supervisory Control Of Discrete Event Systems Using Petri Nets Enhanced eBook Features
7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Supervisory Control Of Discrete Event Systems Using Petri Nets
 - Highlighting and Note-Taking Supervisory Control Of Discrete Event Systems Using Petri Nets
 - Interactive Elements Supervisory Control Of Discrete Event Systems Using Petri Nets
8. Staying Engaged with Supervisory Control Of Discrete Event Systems Using Petri Nets
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Supervisory Control Of Discrete Event Systems Using Petri Nets
9. Balancing eBooks and Physical Books Supervisory Control Of Discrete Event Systems Using Petri Nets
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Supervisory Control Of Discrete Event Systems Using Petri Nets
10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
11. Cultivating a Reading Routine Supervisory Control Of Discrete Event Systems Using Petri Nets
 - Setting Reading Goals Supervisory Control Of Discrete Event Systems Using Petri Nets
 - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of Supervisory Control Of Discrete Event Systems Using Petri Nets
 - Fact-Checking eBook Content of Supervisory Control Of Discrete Event Systems Using Petri Nets
 - Distinguishing Credible Sources
13. Promoting Lifelong Learning

- Utilizing eBooks for Skill Development
- Exploring Educational eBooks

14. Embracing eBook Trends

- Integration of Multimedia Elements
- Interactive and Gamified eBooks

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