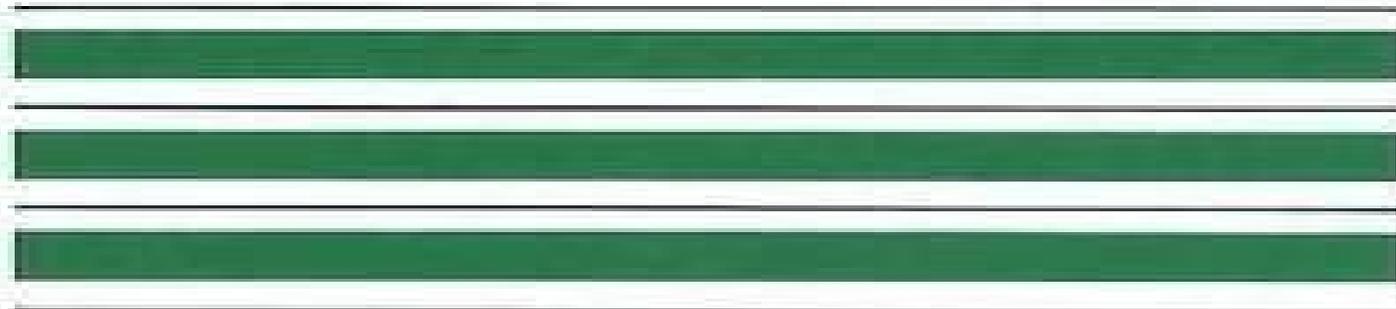

Supervisory Control of Discrete Event Systems Using Petri Nets

John O. MOODY
Panos J. ANTSAKLIS



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Supervisory Control of Discrete Event Systems Using Petri Nets John O. Moody, Panos J. Antsaklis, 2012-12-06

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, an 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

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 an 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

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

Soft Computing and Intelligent Systems Madan M. Gupta, 1999-10-28 The field of soft computing is emerging from the cutting

edge research over the last ten years devoted to fuzzy engineering and genetic algorithms The subject is being called soft computing and computational intelligence With acceptance of the research fundamentals in these important areas the field is expanding into direct applications through engineering and systems science This book cover the fundamentals of this emerging filed as well as direct applications and case studies There is a need for practicing engineers computer scientists and system scientists to directly apply fuzzy engineering into a wide array of devices and systems Supervisory Control of Concurrent Systems Marian Iordache,Panos J. Antsaklis,2007-06-04 Increasing complexity in engineering projects raises difficult challenges in industry and requires effective tools for correct by construction design or design verification This book addresses the design of such tools for correct by construction synthesis of supervisors for systems and specifications represented in the discrete event framework The approach employed uses Petri nets as discrete event models and structural methods for the synthesis of supervisors and may lead to significant computational benefits Highlighting recent progress in the design of supervisors by structural methods the book represents a novel contribution to the field One of the main features of the presentation is the demonstration that structural methods can address a variety of supervisor specifications under diverse supervision settings The work is self contained and includes necessary background on Petri nets and supervision Requiring only basic knowledge of undergraduate level discrete mathematics the text is accessible to a broad audience Researchers and developers from various engineering fields may find effective means to reduce the complexity of design problems in the discrete event setting Graduate students may use the work as a self study reference and portions of the text may be used in advanced courses on discrete event systems **Petri-net Based Supervisory Control of Discrete Event Systems and Ladder Logic Diagram Implementation** M. Uzam,1998 *Petri Net Synthesis for Discrete Event Control of Manufacturing Systems* MengChu Zhou,F. Dicesare,2012-12-06 Petri Net Synthesis for Discrete Event Control of Manufacturing Systems develops two essential resource sharing concepts parallel and sequential mutual exclusions and theoretical results in Petri synthesis A parallel mutual exclusion PME is defined to model a resource shared by independent distributed processes and a sequential mutual exclusion is a sequential composition of PMEs modeling a resource shared by sequentially related processes A hybrid synthesis methodology for Petri net models and controllers is proposed using top down modular and bottom up design ideas and the mutual exclusion theory An aggregate Petri net model is refined by replacing places and or transitions with basic design modules which are mathematically and graphically described Petri net design methods are presented for such buffers as automatic storage and retrieval systems Using the proposed method synthesizes both Petri net structure and feasible initial markings guaranteeing that resulting Petri nets have desirable system properties such as freedom from deadlock and cyclic behavior A Petri net controller is extended to error recovery for automated manufacturing systems The theory can guarantee that the desired system properties achieved by the original design will be preserved when the controller is augmented to deal with an error in the prescribed methods Control code has

been directly generated from Petri net definitions The algorithm and implementation details are given for a flexible manufacturing system Using the approach presented in Petri Net Synthesis for Discrete Event Control of Manufacturing Systems engineers and research workers can develop their own discrete event control applications and experiments

Formal Methods in Manufacturing Systems: Recent Advances Li, Zhiwu,2013-05-31 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 **Proceedings, IEEE Control Systems Society ... Symposium on Computer-Aided Control System Design (CACSD)**, 2002 **Application and Theory of Petri Nets**, 2004 **Computations on Distributed Discrete-event Systems** Kurt Ryan Rohloff,2004 Hybrid Systems, 1993 Vols for 1996 consist of papers presented at the 4th International Conference on Hybrid Systems **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 **11th International Conference on Analysis and Optimization of Systems** Guy Cohen, Jean-Pierre Quadrat, 1994 The conference coorganized by INRIA and Ecole des Mines de Paris focuses on Discrete Event Systems DES and is aimed at engineers scientists and mathematicians working in the fields of Automatic Control Operations Research and Statistics who are interested in the modelling analysis and optimization of DES Various methods such as Automata theory Petri nets etc are proposed to describe and analyze such systems Comparison of these different mathematical approaches and the global confrontation of theoretical approaches with applications in manufacturing telecommunications parallel computing transportation etc are the goals of the conference **Proceedings of the 1997 American Control Conference** American Automatic Control Council, 1997

Formal Specification and Synthesis of Procedural Controllers for Process Systems Arturo Sanchez, 1996-03-20 The operation of process plants involves a large number of event driven activities such as the start up and shut down of the plant the execution of emergency procedures and equipment interlocking These activities are normally carried out by

procedural control systems such as PLCs or DCSs Despite the extent to which these control systems are used in practice limited theoretical frameworks exist to support their analysis and design This is particularly relevant in flexible production environments which are characterised by frequent changes in the product recipes production modes and equipment configuration The book outlines a formal framework for the synthesis of control systems employed in the automation of event driven process operations The approach used builds on other theories initially proposed in computing and control disciplines

COMPSAC 96 IEEE Computer Society,1996 Deriving from the August 1996 Annual International Computer Software and Applications Conference in Seoul Korea these proceedings reproduce three keynote addresses 23 regular paper sessions nine panel sessions and one plenary closing session Sessions address the processes supporting software development parallelism in Petri Net metrics in s **Proceedings of the ... Midwest Symposium on Circuits and Systems** ,1993

Unveiling the Magic of Words: A Report on "**Supervisory Control Of Discrete Event Systems Using Petri Nets**"

In some sort of defined by information and interconnectivity, the enchanting power of words has acquired unparalleled significance. Their capability to kindle emotions, provoke contemplation, and ignite transformative change is truly awe-inspiring. Enter the realm of "**Supervisory Control Of Discrete Event Systems Using Petri Nets**," a mesmerizing literary masterpiece penned by way of a distinguished author, guiding readers on a profound journey to unravel the secrets and potential hidden within every word. In this critique, we shall delve in to the book is central themes, examine its distinctive writing style, and assess its profound impact on the souls of its readers.

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