IEEE CONTROL SYSTEMS SOCIETY TECHNICAL COMMITTEE ON DISCRETE EVENT SYSTEMS

Newsletter..... February 2018

Editor: Hai Lin
Chair, IEEE CSS Technical Committee on DES
Associate Professor
Distributed Cooperative Systems Research (DISCOVER) Lab
Department of Electrical Engineering
University of Notre Dame
Notre Dame, IN 46556, USA

Phone: (+1) 574-631-3177
Fax: (+1) 574-631-4393
e-mail: hlin1@nd.edu
Website: http://www3.nd.edu/~hlin1/

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Editorial

Welcome to the newsletter of the IEEE Control Systems Technical Committee on Discrete Event Systems!

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2.1 Sponsored Activities

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2018 American Control Conference
Milwaukee, Wisconsin, United States, June 27–29, 2018
http://acc2018.a2c2.org/

2018 Conference on Control Technology and Applications
Copenhagen, Denmark, August 21-24, 2018
http://ccta2018.ieeecss.org/

2018 Conference on Decision and Control
Miami Beach, FL, USA, December 17-19, 2018
https://cdc2018.ieeecss.org/

2.2 Technically Co-Sponsored activities

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2018 SICE International Symposium on Control Systems
Tokyo, Japan, March 9-11, 2018
http://iscs2018.sice-ctrl.jp/

The 14th Workshop on Discrete Event Systems
Sorrento Coast, Italy, May 30 - June 1, 2018
http://wodes2018.unisa.it/

30th Chinese Control and Decision Conference (2018 CCDC)
Shenyang, China, June 9-11, 2018
http://www.ccdc.neu.edu.cn/

2018 International Conference on Unmanned Aircraft Systems
Dallas, TX, USA, June 12-15, 2018
http://www.uasconferences.com/

37th Chinese Control Conference (CCC2018)
Wuhan, China, July 25-27, 2018
http://ccc2018.cug.edu.cn/

23rd International Conference on Methods and Models in Automation and Robotics
Międzyzdroje, Poland, August 27-30, 2018
http://mmar.edu.pl/

22nd International Conference on System Theory, Control and Computing
Sinaia, Romania, October 10-12, 2018
http://www.icstcc.ugal.ro/2018/

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Selections of Journal Publications

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Contributed by: Xiang Yin (yinxiang@sjtu.edu.cn)

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SELECTIONS OF THE IEEE TRANSACTIONS ON AUTOMATIC CONTROL
VOLUME: 63 ISSUE: 2
February 2018

(1) Production Control to Reduce Starvation in a Partially Flexible Production-Inventory System

Author: Cong Zhao ; Ningxuan Kang ; Jingshan Li ; John A. Horst

Abstract

In this paper, we study production control problems in a partially flexible production-inventory system. In such a system, the upstream flexible production subsystem can make two different products, with nonnegligible setup time during changeover. The downstream inflexible production subsystem consists of two manufacturing facilities, with each dedicated to one product type only. The two production subsystems are connected by two dedicated buffers, which comprise the inventory subsystem. Using a renewal model, an optimal control policy is developed to switch products by predefined thresholds for inventory levels to minimize starvation (idle) time of downstream productions. Closed formulas are derived, and sensitivity analyses with respect to setup time change, machine reliability variation, and demand fluctuation are carried out. Finally, an application study in a door manufacturing line at an automotive assembly plant making two distinct types of doors is introduced

Full-text available at: http://ieeexplore.ieee.org/document/7954720/

(2) Complexity of Verifying Nonblockingness in Modular Supervisory Control

Author: Tomáš Masopust

Abstract

Complexity analysis becomes a common task in supervisory control. However, many results of interest are spread across different topics. The aim of this paper is to bring several interesting results from complexity theory and to illustrate their relevance to supervisory control by proving new nontrivial results concerning nonblockingness in modular supervisory control of discrete event systems modeled by finite automata.

Full-text available at: http://ieeexplore.ieee.org/document/7979596/

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SELECTIONS OF AUTOMATICA
VOLUME: 88
February 2018

(1) Mean–variance optimization of discrete time discounted Markov decision processes

Author: Li Xia

Abstract

In this paper, we study a mean–variance optimization problem in an infinite horizon discrete time discounted Markov decision process (MDP). The objective is to minimize the variance of system rewards with the constraint of mean performance. Different from most of works in the literature which require the mean performance already achieve optimum, we can let the discounted performance equal any constant. The difficulty of this problem is caused by the quadratic form of the variance function which makes the variance minimization problem not a standard MDP. By proving the decomposable structure of the feasible policy space, we transform this constrained variance minimization problem to an equivalent unconstrained MDP under a new discounted criterion and a new reward function. The difference of the variances of Markov chains under any two feasible policies is quantified by a difference formula. Based on the variance difference formula, a policy iteration algorithm is developed to find the optimal policy. We also prove the optimality of deterministic policy over the randomized policy generated in the mean-constrained policy space. Numerical experiments demonstrate the effectiveness of our approach.

Full-text available at: https://www.sciencedirect.com/science/article/pii/S0005109817305538

(2) A probabilistic framework for the control of systems with discrete states and stochastic excitatio

Author: Gianluca Meneghello; Paolo Luchini; Thomas Bewley

Abstract

A probabilistic framework is proposed for the optimization of efficient switched control strategies for physical systems dominated by stochastic excitation. In this framework, the equation for the state trajectory is replaced with an equivalent equation for its probability distribution function in the constrained optimization setting. This allows for a large class of control rules to be considered, including hysteresis and a mix of continuous and discrete random variables. The problem of steering atmospheric balloons within a stratified flowfield is a motivating application; the same approach can be extended to a variety of mixed-variable stochastic systems and to new classes of control rules.

Full-text available at: https://www.sciencedirect.com/science/article/pii/S0005109817305332

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SELECTIONS OF THE IEEE TRANSACTIONS ON SYSTEMS, MAN AND CYBERNETICS: SYSTEMS
VOLUME: 48 ISSUE: 2
February 2018

(1) Optimal One-Wafer Cyclic Scheduling of Hybrid Multirobot Cluster Tools With Tree Topology

Author: FaJun Yang ; NaiQi Wu ; Yan Qiao ; MengChu Zhou

Abstract

A hybrid multirobot cluster tool is composed of both single and dual-arm robotic cluster tools. Since the behavior of different individual tools is different, it is very challenging to coordinate their activities in such a tool and to schedule it optimally. To find a one-wafer cyclic schedule to reach the shortest cycle time for a treelike hybrid multirobot cluster tool whose bottleneck tool is process-bound, this paper extends resource-oriented Petri nets to model it such that a schedule can be parameterized by its robots' waiting time. Based on the model, this paper then establishes the conditions under which there is a one-wafer cyclic schedule such that the shortest cycle time can be obtained. An efficient algorithm is also given to test the existence of such a schedule and to find it if existing. At last, examples are used to illustrate the proposed approaches.

Full-text available at: http://ieeexplore.ieee.org/document/7801948/

(2) Lean Reachability Tree for Unbounded Petri Nets

Author: FaJun Yang ; NaiQi Wu ; Yan Qiao ; MengChu Zhou

Abstract

Elaborate efforts have been made to eliminate fake markings and refine ω-markings in the existing modified or improved Karp-Miller trees for various classes of unbounded Petri nets since the late 1980s. The main issues fundamentally are incurred due to the generation manners of the trees that prematurely introduce some potentially unbounded markings with ω symbols and keep their growth into new ones. Aiming at addressing them, this work presents a non-Karp-Miller tree called a lean reachability tree (LRT). First, a sufficient and necessary condition of the unbounded places and some reachability properties are established to reveal the features of unbounded nets. Then, we present an LRT generation algorithm with a sufficiently enabling condition (SEC). When generating a tree, SEC requires that the components of a covering node are not replaced by ω symbols, but continue to grow until any transition on an output path of an unbounded place has been branch-enabled at least once. In return, no fake marking is produced and no legal marking is lost during the tree generation. We prove that LRT can faithfully express by folding, instead of equivalently representing, the reachability set of an unbounded net. Also, some properties of LRT are examined and a sufficient condition of deadlock existence based on it is given. The case studies show that LRT outperforms the latest modified Karp-Miller trees in terms of size, expressiveness, and applicability. It can be applied to the analysis of the emerging discrete event systems with infinite states.

Full-text available at: http://ieeexplore.ieee.org/document/7513384/

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