IEEE CONTROL SYSTEMS SOCIETY
TECHNICAL COMMITTEE ON DISCRETE EVENT SYSTEMS

Newsletter..... April 2019

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1. Editorial

Welcome to the 2019 April issue of the newsletter,
also available electronically at
http://discrete-event-systems.ieeecss.org/tc-discrete/newsletters

You are welcome to submit new items to the newsletter (topics including schools, workshops, sessions, conferences, journals, books, software, positions).
To submit a new item, please email to kai.cai@eng.osaka-cu.ac.jp.

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2. Positions

2.1. Postdocs: Nanyang Technological University, Singapore

Contributed by: Rong Su (rsu@ntu.edu.sg)

Two postdoc positions are available on DES-base modelling and performance optimisation for on-demand manufacturing, which aim for template-based modelling that facilitates a drag-and-play design, and real-time synthesis for behavioural correctness and performance optimality. All developed results are required to be demonstrated in a real flexible manufacturing system. Any candidate who has substantial knowledge on discrete event modelling, supervisory control and/or DES-based performance optimisation (in particular, on temporal metrics such as makespan) is welcome to apply.

The salary is competitive including a base salary and an annual performance bonus, plus a free group medical insurance and other benefits. The tax rate in Singapore is very low, and a postdoc salary is almost tax-free. The first contract will be 1 year, but can be renewed up to 2.5 years.

If you need more details about the position please do not hesitate to contact Dr. Rong Su (rsu@ntu.edu.sg).

3. Selections of Journal Publications

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

3.1. Selections of the IEEE Transactions on Automatic Control

VOLUME: 64, ISSUE: 4, April 2019

(1) Markov Chains With Maximum Entropy for Robotic Surveillance

Authors: Mishel George ; Saber Jafarpour ; Francesco Bullo

Abstract: This paper provides a comprehensive analysis of the following optimization problem: Maximize the entropy rate generated by a Markov chain over a connected graph of order n and subject to a prescribed stationary distribution. First, we show that this problem is strictly convex with global optimum lying in the interior of the feasible space. Second, using Lagrange multipliers, we provide a closed-form expression for the maxentropic Markov chain as a function of an n -dimensional vector, referred to as the maxentropic vector; we provide a provably converging iteration to compute this vector. Third, we show that the maxentropic Markov chain is reversible, compute its entropy rate and describe special cases, among other results. Fourth, through analysis and simulations, we show that our proposed procedure is more computationally efficient than semidefinite programming methods. Finally, we apply these results to robotic surveillance problems. We show realizations of the maxentropic Markov chains over prototypical robotic roadmaps and find that maxentropic Markov chains outperform minimum mean hitting time Markov chains for the so-called °∞intelligent intruders°± with short attack durations. A comprehensive analysis of the following optimization problem: maximize the entropy rate generated by a Markov chain over a connected graph of order n and subject to a prescribed stationary distribution.

Full-text available at: https://ieeexplore.ieee.org/document/8371596

(2) Event-Based Distributed Filtering Over Markovian Switching Topologies

Authors: Qinyuan Liu ; Zidong Wang ; Xiao He ; Donghua Zhou

Abstract: In this paper, we consider the distributed filtering problem for continuous-time stochastic systems over sensor networks subject to Markovian switching topologies. Due to limited communication energy and bandwidth, an event-based communication scheme is proposed with the aim to decrease the transmission frequency. An individual triggering condition is put forward to regulate the communication rates for each component of the system state in order to better reflect the engineering requirements. The aim of this paper is to design a distributed filter over sensor networks with Markovian switching topologies such that the dynamics of the estimation error is exponentially mean-square bounded. It is shown that, with the proposed event-based distributed filtering algorithm, the exponential mean-square boundedness of the estimation errors is guaranteed if the sensor network is distributively detectable and the combined communication topology is strongly connected. A numerical example is presented to illustrate the usefulness of the developed algorithm.

Full-text available at: https://ieeexplore.ieee.org/document/8404069

(3) Inventory Control for a Coproduction System Under Demand Uncertainty

Authors: He Xu ; Pengyu Chen ; Yong Zhang

Abstract: We consider a coproduction system that uses a common input to produce multiple products in multiple periods. The demands for these products are stochastic in every period. We determine the optimal production plan in order to minimize the total expected discounted cost over a finite time horizon. Using L-convexity, we demonstrate that the optimal production quantity is state dependent and obeys several structural properties, such as monotonicity, threshold, and boundedness.

Full-text available at: https://ieeexplore.ieee.org/document/8444686

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3.2. Selections of the IEEE Transactions on Cybernetics
VOLUME: 49, ISSUE: 4, April 2019

(1) Decentralized Fault Prognosis of Discrete-Event Systems Using State-Estimate-Based Protocols

Authors: Xiang Yin ; Zhaojian Li

Abstract: We investigate the problem of decentralized fault prognosis in the context of discrete-event systems. In this problem, the system is monitored by a set of local agents; each of them sends its local information to a coordinator in order to issue a fault alarm before the occurrence of fault. Two new decentralized protocols are proposed by exploiting the state-estimate of each local agent. For each protocol, a necessary and sufficient condition for its correctness is proposed; they are termed as positive state-estimate-prognosability and negative state-estimate prognosability. Verification algorithms for the necessary and sufficient conditions are also provided. We show that the proposed new protocols are incomparable with any of the existing protocols in the literature. Therefore, they provide new opportunities for correctly predicting the fault when all existing protocols fail.

Full-text available at: https://ieeexplore.ieee.org/document/8290579

(2) Distributed Event-Triggered Cooperative Control for Frequency and Voltage Stability and Power Sharing in Isolated Inverter-Based Microgrid

Authors: Shengxuan Weng ; Dong Yue ; Chunxia Dou ; Jing Shi ; Chongxin Huang

Abstract: The distributed cooperative control for frequency and voltage stability and power sharing in microgrid considering the

limitation of communication network is concerned in this paper. Two types of novel event-triggered mechanism with distributed architecture are first proposed, which can greatly reduce the communication burdens among power source inverters. Based on the event-triggered schemes, distributed restoration mechanism is constructed, which can restore the frequency and voltage magnitude of microgrid and realize the fair utilization of all power sources with comparative less requirements for the transmission data. Simulation is carried out to verify the effectiveness of the proposed method.

Full-text available at: https://ieeexplore.ieee.org/document/8302860

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3.3. Selections of Systems & Control Letters
VOLUME: 126, April 2019

(1) Stabilizing Boolean networks by optimal event-triggered feedback control

Author: QunxiZhu ; Wei Lin

Abstract: In this paper, we focus on the topic of stabilizing the Boolean control network (BCN) by an optimal event-triggered feedback control. By routinely transforming the BCN into its algebraic form, constructing the (reverse) weighted digraph and the hypergraph for the BCN, applying the shortest path algorithm to the hypergraph, we obtain an optimal event-triggered control strategy that can stabilize the BCN starting from any given initial state to a priorly-specified approachable equilibrium and simultaneously can minimize a quality index combining control time with control variability. To avoid the case where the obtained optimal strategy is dependent on the initial state, we establish necessary and sufficient conditions for finding a unified control law which can steer the BCN starting from all initial states to the given equilibrium with a minimal quality index. Furthermore, all the existence results are extended further to the BCNs under the control laws of event-triggered delayed state feedback, event-triggered output feedback, and the event-triggered delayed output feedback. Particularly, the control law of event-triggered delayed feedback can cope with the optimization problem that the unified control law without delay cannot address. Additionally, we derive the necessary and sufficient condition under which the event-triggered state (resp., output) feedback control law degenerates into the conventional state (resp., output) feedback control law. Finally, we provide an illustrative example of biological significance to demonstrate the potential usefulness of the obtained analytical results.

Full-text available at: https://www.sciencedirect.com/science/article/pii/S0167691119300313

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3.4. Selections of Information Sciences
VOLUME: 480, April 2019

(1) Robust deadlock control of automated manufacturing systems with multiple unreliable resources

Author: JianChao Luo; ZhiQiang Liu; MengChu Zhou; KeYi Xing; XinNi Wang; XiaoLing Li; HuiXi Liu

Abstract: Over the past decade or so, the deadlock control problem of automated manufacturing systems (AMSs) with unreliable resources received a great deal of research attention. Most existing work to date assumes that the studied AMSs contain a single unreliable resource. Most existing control methods belong to the class of deadlock avoidance ones. This paper focuses on deadlock prevention for AMS with multiple unreliable resources. Our goal is to guarantee the continuous production of those parts not requiring any of the failed resources in case of any resource failure. A Petri net model is developed to characterize the failure and repair of unreliable resources. Based on it, a robust deadlock prevention controller that satisfies the above desired property is proposed. Experimental results indicate its effectiveness and superiority over the state-of-the-art methods.

Full-text available at: https://www.sciencedirect.com/science/article/pii/S0020025518309381

(2) Bicriterion scheduling with a negotiable common due window and resource-dependent processing times

Author: Dujuan Wang ; Zhiwu Li

Abstract: We investigate scheduling problems with a negotiable common due window where the job processing times are controllable by allocating extra resources to process the jobs and the resource amounts can be either discrete or continuous. We adopt a bicriterion analysis, where one criterion is a cost function consisting of the weighted numbers of early and late jobs, and due window assignment cost (DWAC), whereas the other criterion is the total resource consumption cost (TRSC). We investigate four problems resulting from different treatments of the two criteria as follows: P1, which minimizes the sum of the two criteria; P2 and P3, which minimize one of the two criteria subject to a constraint on the value of the other criterion, respectively; and P4, which identifies the set of Pareto-optimal points of the two criteria. We show that P1 is polynomially solvable, while P2®CP4 with both resource types are all NP-hard. With the discrete resource type, we propose pseudo-polynomial-time algorithms for P4, establishing that P2®CP4 are all binary NP-hard. With the continuous resource type, we provide an optimal algorithm for P2®CP4 by solving a series of mixed integer linear programming (MILP) models. We also provide a two-dimensional fully polynomial-time approximation scheme (FPTAS) to approximate

the Pareto set. Finally, we perform computational experiments to verify the effectiveness of the developed solution procedures.

Full-text available at: https://www.sciencedirect.com/science/article/pii/S0020025518309034

4. Conferences

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

4.1 2019 European Control Conference
Naples, Italy, Jun 25 - Jun 28, 2019
https://ecc19.eu/

4.2 27th Mediterranean Conference on Control and Automation
Akko, Israel, Jul 1 - Jul 4, 2019
https://med19.net.technion.ac.il/

4.3 2019 American Control Conference
Philadelphia, Pennsylvania, United States, Jul 10 - Jul 12, 2019
http://acc2019.a2c2.org/

4.4 38th Chinese Control Conference (CCC 2019)
Guangzhou, China, Jul 27 - Jul 30, 2019
http://www.ccc2019.cn/en/index.html

4.5 2019 Conference on Control Technology and Applications
Hong Kong, China, Aug 19 - Aug 21, 2019
http://ccta2019.ieeecss.org/

4.6 15th International Conference on Automation Science and Engineering
Vancouver, British Columbia, Canada, Aug 22 - Aug 26, 2019
http://case2019.hust.edu.cn/index.htm

4.7 57th Allerton Conference on Communication, Control, and Computing
Urbana-Champaign campus of the University of Illinois, United States, Sep 24 - Sep 27, 2019

4.8 8th International Conference on Systems and Control
University of CADDI AYYAD, Marrakech, Morocco, Oct 23 - Oct 25, 2019
https://controls.papercept.net/conferences/scripts/start.pl

4.9 2019 Conference on Decision and Control
Nice, France, December 11-13, 2019
https://cdc2019.ieeecss.org/