IEEE CONTROL SYSTEMS SOCIETY TECHNICAL COMMITTEE ON DISCRETE EVENT SYSTEMS

Newsletter..... June 2015

Editor: (Samuel) Qing-Shan Jia
Chair, IEEE CSS Technical Committee on DES
Center for Intelligent and Networked Systems
Department of Automation
Tsinghua University
Beijing 100084
China

Phone: (+86) 10-6277-3006
Fax: (+86) 10-6279-6115
e-mail: jiaqs@tsinghua.edu.cn
WWW: http://cfins.au.tsinghua.edu.cn/personalhg/jiaqingshan/

Contents:

Editorial

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

Personal note from the editor:

WELCOME TO THE JUNE 2015 NEWSLETTER.

SAMUEL

Activities

1) Sponsored Activities

2015 IEEE Multi-Conference on Systems and Control (MSC)
Sep 21 to Sep 23, 2015, in Australia
http://www.msc2015.org/

54th IEEE Conference on Decision and Control
Dec 15 to Dec 18, 2015, in Japan
http://www.cdc2015.ctrl.titech.ac.jp/

2) Technically Co-Sponsored activities

2015 International Conference on Unmanned Aircraft Systems (ICUAS '15)
Jun 9 to Jun 12, 2015, in United States
http://www.uasconferences.com/

23rd Mediterranean Conference on Control and Automation (MED2015)
Jun 16 to Jun 19, 2015, in Spain
http://med2015.uma.es/INDEX.PHP/

10th International Workshop on Robot Motion and Control - RoMoCo '15
Jul 6 to Jul 8, 2015, in Poland
http://romoco.put.poznan.pl/

ICINCO 2015 - 12th International Conference on Informatics in Control, Automation and Robotics
Jul 21 to Jul 23, 2015, in France
http://www.icinco.org/

Journals

Contributed by: Zhenning Lang < langzn13@mails.tsinghua.edu.cn >

SELECTIONS FROM THE IEEE TRANSACTIONS ON AUTOMATIC CONTROL
VOLUME: 60 ISSUE: 6
JUNE 2015

1) State Attraction Under Language Specification for the Reconfiguration of Discrete Event Systems

A. Nooruldeen, K.W. Schmidt

Abstract

In this note, we study a particular setting for the reconfiguration of discrete event systems (DES) that is applicable to the control of reconfigurable manufacturing systems (RMS). We consider DES that can operate in different configurations and we are interested in the realization of configuration changes. Different from previous work, we intend to reach a set of plant states where a new configuration can be started in a bounded number of transitions and at the same time fulfill a behavioral specification before starting the new configuration. To this end, we introduce the concept of weak attraction under language specification (WALS) and derive necessary and sufficient conditions for its verification. Using WALS, we propose a polynomial-time algorithm for computing a supervisor that performs the described configuration changes. We demonstrate the applicability of our method using a workcell of an RMS.

http://ieeexplore.ieee.org/xpl/articleDetails.jsp?arnumber=6901229&searchWithin%3Devent%26filter%3DAND%28p_IS_Number%3A7111390%29

2) Stochastic Failure Prognosability of Discrete Event Systems

Jun Chen, R. Kumar

Abstract

We study the prognosis of fault, i.e., its prediction prior to its occurrence, in stochastic discrete event systems. We introduce the notion of m-steps Stochastic-Prognosability, called Sm-Prognosability, which allows the prediction of a fault at least m-steps in advance. We formalize the notion of a prognoser and also show that Sm-Prognosability is necessary and sufficient for the existence of a prognoser that can predict a fault at least m-steps prior to occurrence, while achieving any arbitrary false alarm and missed detection rates. We also provide a polynomial algorithm for the verification of Sm-Prognosability. Finally, we compare the notion of stochastic prognosability with that of stochastic diagnosability, and show that the former is a stronger notion, as can be expected.

http://ieeexplore.ieee.org/xpl/articleDetails.jsp?arnumber=6985729&searchWithin%3Devent%26filter%3DAND%28p_IS_Number%3A7111390%29

3) Failure Detection Framework for Stochastic Discrete Event Systems With Guaranteed Error Bounds

Jun Chen, R. Kumar

Abstract

This paper studies the online fault detection for stochastic discrete-event systems (DESs) under partial observability of events. Prior works have only studied the verification of the stochastic diagnosability (S-Diagnosability) property. To the best of our knowledge, this is a first paper that investigates the online detection schemes and also introduces the notions of their missed detections (MDs) and false alarms (FAs). Due to the probabilistic nature of the problem, MDs and FAs are possible even for S-Diagnosable systems, and we

establish that S-Diagnosability is a necessary and sufficient condition for achieving any desired levels of MD and FA rates. We also provide a detection scheme, that can achieve the specified MD and FA rates, based on comparing a suitable detection statistic, that we define, with a suitable detection threshold, that we algorithmically compute. We also algorithmically compute the corresponding detection delay bound. The detection scheme also works for non-S-Diagnosable systems, with the difference that in this case there exists a lower bound for achievable MD rate, that increases as the FA rate requirement is made more stringent by decreasing it.

http://ieeexplore.ieee.org/xpl/articleDetails.jsp?arnumber=6990548&searchWithin%3Devent%26filter%3DAND%28p_IS_Number%3A7111390%29

_.---._

Contributed by: Zhenning Lang < langzn13@mails.tsinghua.edu.cn >

SELECTIONS FROM THE IEEE TRANSACTIONS ON CONTROL SYSTEMS TECHNOLOGY
VOLUME: 23 ISSUE: 3
MAY 2015

1) Markov Chain Approximation Algorithm for Event-Based State Estimation

Sangjin Lee, Weiyi Liu, Inseok Hwang

Abstract

This brief presents a general framework for the continuous-time nonlinear event-based state estimation problem. Using the information from observations made by event-based sampling, the goal of the event-based estimation problem is to estimate the state of stochastic differential equations which represent the uncertain system dynamics. This problem is challenging because measurements are taken only if some events happen rather than with a fixed sampling interval. In this brief, a theoretical solution for the event-based state estimation problem is derived and a numerical algorithm based on Markov chain approximation is proposed. The proposed algorithm for the event-based state estimation is demonstrated with an illustrative example.

http://ieeexplore.ieee.org/xpl/articleDetails.jsp?arnumber=6906271&searchWithin%3Devent%26filter%3DAND%28p_IS_Number%3A7087415%29

_.---._

Contributed by: Zhenning Lang < langzn13@mails.tsinghua.edu.cn >

SELECTIONS FROM THE AUTOMATICA
VOLUME: 57
JULY 2015

1) Event-based networked control and scheduling codesign with guaranteed performance

Sanad Al-Areqi, , Daniel G?rges, , Steven Liu

Abstract

Besides a fair distribution of limited resources among competing plants in a networked embedded control system (NECS) an efficient utilization of such scarce resources is crucial. Therefore, a novel event-based codesign concept for NECSs with limited communication bandwidth and computation capacity is presented in this paper. The codesign concept involves a joint design of an event-based controller and scheduler (EBCS) for improving the control performance provided that the limited resources are used efficiently. The NECS with a set of interacting continuous-time LTI plants is modeled as a discrete-time switched linear system. The EBCS codesign problem is then formulated as a linear matrix inequality (LMI) optimization problem minimizing an associated quadratic cost function. The EBCS strategy is then evaluated and compared with existing codesign strategies in literature for a simulation study involving a simultaneous stabilization of two mechanically coupled inverted pendulums. It should be remarked finally that the proposed EBCS strategy is generally applicable to discrete-time switched linear systems.

http://www.sciencedirect.com/science/article/pii/S0005109815001545

_.--
_____._
Contributed by: Zhenning Lang < langzn13@mails.tsinghua.edu.cn >

SELECTIONS FROM THE IEEE TRANSACTIONS ON SYSTEMS, MAN, AND CYBERNETICS: SYSTEMS

VOLUME 45, ISSUE 7
JUNE 2015

1) A Transaction and QoS-Aware Service Selection Approach Based on Genetic Algorithm

Z. Ding, J. Liu, Y. Sun, C. Jiang, M. Zhou

Abstract

As there are various risks of failure in its execution, a composite web service (CWS) requires a transactional mechanism to guarantee its reliable execution. Though the existing service selection methods have considered that its transactional properties may affect its quality of service (QoS) such as its execution time, some of these methods can just give the locally optimal transactional CWS while others can give globally optimal CWS only under a given fixed transactional workflow. This paper addresses the issue of selecting and composing web services via a genetic algorithm (GA) and gives a transaction and QoS-aware selection approach. First, it introduces transactional properties of a single web service and CWS and the transactional rules used to compose them. Next, it conducts the performance analysis of basic workflow patterns such as sequential, parallel, selectable, and loop patterns and develops an algorithm to compute the execution time of a complex CWS. Then, it presents a GA-based approach, which takes into account the execution time, price, transactional

property, stability, and penalty-factor, to achieve globally optimal service selection. Finally, this paper reports experimental results that compare the proposed approach with the exhaustive search algorithm, transactional-QoS-driven selection algorithm, and transactional service selection algorithm. The experimental results show that the proposed algorithm is efficient and effective and can give a globally optimal transactional CWS.

http://ieeexplore.ieee.org/xpl/articleDetails.jsp?arnumber=7047222&searchWithin%3Devent%26filter%3DAND%28p_IS_Number%3A7123014%29

_.----------._
Contributed by: Zhenning Lang < langzn13@mails.tsinghua.edu.cn >

SELECTIONS FROM THE IEEE TRANSACTIONS ON CYBERNETICS
VOLUME 45, ISSUE 7
JULY 2015

1) Fault Diagnosis in Discrete-Event Systems with Incomplete Models: Learnability and Diagnosability

R. H. Kwong, D. L. Yonge-Mallo

Abstract

Most model-based approaches to fault diagnosis of discrete-event systems require a complete and accurate model of the system to be diagnosed. However, the discrete-event model may have arisen from abstraction and simplification of a continuous time system, or through model building from input-output data. As such, it may not capture the dynamic behavior of the system completely. In a previous paper, we addressed the problem of diagnosing faults given an incomplete model of the discrete-event system. We presented the learning diagnoser which not only diagnoses faults, but also attempts to learn missing model information through parsimonious hypothesis generation. In this paper, we study the properties of learnability and diagnosability. Learnability deals with the issue of whether the missing model information can be learned, while diagnosability corresponds to the ability to detect and isolate a fault after it has occurred. We provide conditions under which the learning diagnoser can learn missing model information. We define the notions of weak and strong diagnosability and also give conditions under which they hold.

http://ieeexplore.ieee.org/xpl/articleDetails.jsp?arnumber=6891318&searchWithin%3Devent%26filter%3DAND%28p_IS_Number%3A7122378%29

_.----------._
Contributed by: Zhenning Lang < langzn13@mails.tsinghua.edu.cn >

SELECTIONS FROM THE INTERNATIONAL JOURNAL OF CONTROL
PUBLISHED ONLINE: JUNE 2015

1) Supervisory control of (max,+) automata: extensions towards applications

Sébastien Lahaye, Jan Komenda & Jean-Louis Boimond

Abstract

In this paper, supervisory control of (max,+) automata is studied. The synthesis of maximally permissive and just-in-time supervisor, as well as the synthesis of minimally permissive and just-after-time supervisor, are proposed. Results are also specialised to non-decreasing solutions, because only such supervisors can be realised in practice. The inherent issue of rationality raised recently is discussed. An illustration of concepts and results is presented through an example of a flexible manufacturing system.

http://www.tandfonline.com/doi/full/10.1080/00207179.2015.1048295#abstract

_.---._

The End

_.---._