IEEE CONTROL SYSTEMS SOCIETY TECHNICAL COMMITTEE
ON DISCRETE EVENT SYSTEMS

Newsletter..... March 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/

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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 MARCH 2015 NEWSLETTER.

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Activities

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1) Sponsored Activities

2015 American Control Conference
Jul 1 to Jul 3, 2015, in the United States
http://acc2015.a2c2.org/

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

18th International Conference on Hybrid Systems: Computation and Control (HSCC 2015)
Apr 14 to Apr 16, 2015, in the United States
http://ljk.imag.fr/hscc2015/

4th 2015 International Conference on Systems and Control (ICSC'15)
Apr 28 to Apr 30, 2015, in Tunisia
http://lias.labo.univ-poitiers.fr/icsc/icsc2015/

The 27th Chinese Control and Decision Conference (2015CCDC)
May 23 to May 25, 2015, in China
http://www.ccdc.neu.edu.cn/

13th International Symposium on Modeling and Optimization in Mobile, Ad Hoc, and Wireless

Networks (WiOpt 2015)
May 25 to May 29, 2015, in India
http://www.wi-opt.org/

Asian Control Conference 2015
May 31 to Jun 3, 2015, in Malaysia
http://ascc2015.com/

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/

Announcement

DESpot 1.5.0 Released With Support for Simulation of Counter Examples

DESpot is a discrete-event system (DES) software research tool. It supports both flat projects

(collection of plant and supervisor DES), and Hierarchical Interface-Based Supervisory Control

(HISC) projects.

New to DESpot 1.5.0 is the addition of support for per-component simulation and the simulation

of automatically generated counterexamples. Now, when a verification such as controllability

fails, the user can either load the simulator at the first state that failed the test, or

DESpot can automatically generate a sequence of events from the initial state to the failed

state and load these into the simulator for analysis.

DESpot Features:

* Supports flat DES projects and HISC projects, including low data events.

* DESpot comes with a detailed help browser. A web version, including many screen shots, can

be found here:

http://www.cas.mcmaster.ca/~leduc/despotHF/resources/helpfiles/HelpBrowser.html

* DESpot has a graphical DES editor, including export to postscript, and PNG graphic formats.

* DESpot can verify the three main HISC properties individually, or as a group using the

"Check Project" menu item. Check project runs each property check in a separate thread, so if

you have a quad-core CPU, you could see around a 3x speedup.

* DESpot now includes the bddHISC algorithms. bddHISC can verify an HISC project, or do HISC

synthesis using binary-decision diagram (BDD) based algorithms capable of handling individual

components at least as large as 10^15 states.

* DESpot allows the entry of timed DES (TDES) projects for use with sampled-data supervisory

control.

* DESpot has a built in DES simulator that includes graphical simulation of the DES. DESpot

can also use the HISC structure to accelerate the simulation.

* DESpot supports multi-level HISC projects including experimental support for multi-level HISC

with low data events for the non-BDD algorithms. Multi-level synthesis is not yet supported.

* The Linux version of DESpot supports distributed algorithms allowing DESpot verification and

synthesis operations to be distributed over a network of computers. MPI libraries are used for

this.

* DESpot is open source software, released under the GNU General Public license (GPL), version

2.

DESpot is written in C++ and uses the QT GUI libraries. At the moment, DESpot is available as

source code and as a Windows' installer. It runs under Linux, Windows, and Mac OS X.

See below for more details and to download a copy:
http://www.cas.mcmaster.ca/~leduc/DESpot.html

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Journals

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

SELECTIONS FROM THE IEEE TRANSACTIONS ON AUTOMATIC CONTROL
VOLUME: 60 ISSUE: 3
MARCH 2015

1) Relative Observability of Discrete-Event Systems and Its Supremal Sublanguages

Kai Cai, Renyuan Zhang, W.M. Wonham

Abstract

We identify a new observability concept, called relative observability, in supervisory control

of discrete-event systems under partial observation. A fixed, ambient language is given,

relative to which observability is tested. Relative observability is stronger than

observability, but enjoys the important property that it is preserved under set union; hence

there exists the supremal relatively observable sublanguage of a given language. Relative

observability is weaker than normality, and thus yields, when combined with controllability, a

generally larger controlled behavior; in particular, no constraint is imposed that only

observable controllable events may be disabled. We design new algorithms which compute the

supremal relatively observable (and controllable) sublanguage of a given language, which is

generally larger than the normal counterpart. We demonstrate the new observability concept and

algorithms with a Guideway and an AGV example.

http://ieeexplore.ieee.org/xpl/articleDetails.jsp?arnumber=6861977&searchWithin%3Devent

%26filter%3DAND%28p_IS_Number%3A7045467%29

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

SELECTIONS FROM THE CONTROL ENGINEERING PRACTICE
VOLUME 38
MAY 2015

1) Qualitative event-based diagnosis applied to a spacecraft electrical power distribution

system

Matthew J. Daiglea, Indranil Roychoudhury, Anibal Bregon

Abstract

Quick, robust fault diagnosis is critical to ensuring safe operation of complex engineering

systems. A fault detection, isolation, and identification framework is developed for three

separate diagnosis algorithms: the first using global model; the second using minimal

submodels, which allows the approach to scale easily; and the third using both the global model

and minimal submodels, combining the strengths of the first two. The diagnosis framework is

applied to the Advanced Diagnostics and Prognostics Testbed that functionally represents

spacecraft electrical power distribution systems. The practical implementation of these

algorithms is described, and their diagnosis performance using real data is compared.

http://www.sciencedirect.com/science/article/pii/S0967066115000258

VOLUME 39
JUNE 2015

1) Event-driven receding horizon control for energy-efficient container handling

Jianbin Xin, Rudy R. Negenborn, Gabriel Lodewijks

Abstract

The performance of container terminals needs to be improved to adapt the growth of containers

while maintaining sustainability. This paper provides a methodology for determining the

trajectory of interacting machines that transport containers between the quayside area and the

stacking area in an automated container terminal. The behaviors of the interacting machines are

modeled as a combination of discrete-event dynamics and continuous-time dynamics. An event-

driven receding horizon controller (RHC) is proposed for achieving energy efficient container

handling. The underlying control problems are hereby formulated as a collection of small

optimization problems that are solved in a receding horizon way. Simulation studies illustrate

that energy consumption of container handling can indeed be reduced by the proposed

methodology. Moreover, an assessment is made of performance of the proposed RHC controller

under different types of uncertainties.

http://www.sciencedirect.com/science/article/pii/S0967066115000234

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

SELECTIONS FROM THE DISCRETE EVENT DYNAMIC SYSTEMS: THEORY AND APPLICATIONS

FEBRUARY 2015

1) Synchronization of a class of cyclic discrete-event systems describing legged locomotion

Gabriel A. D. Lopes, Bart Kersbergen, Bart De Schutter, Ton van den Boom, Robert

Babu?ka

Abstract

It has been shown that max-plus linear systems are well suited for applications in

synchronization and scheduling, such as the generation of train timetables, manufacturing, or

traffic. In this paper we show that the same is true for multi-legged locomotion. In this

framework, the max-plus eigenvalue of the system matrix represents the total cycle time,

whereas the max-plus eigenvector dictates the steady-state behavior. Uniqueness of the

eigenstructure also indicates uniqueness of the resulting behavior. For the particular case of

legged locomotion, the movement of each leg is abstracted to two-state circuits: swing and

stance (leg in flight and on the ground, respectively). The generation of a gait (a manner of

walking) for a multi-legged robot is then achieved by synchronizing the multiple discrete-event

cycles via the max-plus framework. By construction, different gaits and gait parameters can be

safely interleaved by using different system matrices. In this paper we address both the

transient and steady-state behavior for a class of gaits by presenting closed-form expressions

for the max-plus eigenvalue and max-plus eigenvector of the system matrix and the coupling

time. The significance of this result is in showing guaranteed stable gaits and gait switching,

and also a systematic methodology for synthesizing controllers that allow for legged robots to

change rhythms fast.

http://link.springer.com/article/10.1007/s10626-014-0206-6

2) Special issue on recent advances in control of discrete event systems

Antonio Ramírez-Trevi?o, Manuel Silva, Stéphane Lafortune

Content

This special issue of J-DEDS on Recent Advances in Control of Discrete Event Systems contains

13 papers that cover a wide range of recent advances on the modeling, analysis, control, and

optimization of discrete event systems, for untimed, timed, and stochastic models. These

submissions were carefully reviewed, following the standard editorial process for full papers

in J-DEDS. Finally, all 13 papers were selected for this special issue. We note that a

complementary special section dealing with fluid and hybrid approximations of discrete event

systems modeled by Petri nets, appears in the journal Nonlinear Analysis: Hybrid Systems,

volume 12, 2014.
A brief description of each paper in this special issue follows.
In “Multi-intersection Traffic Light Control with blocking”, Yanfeng Geng and Christos G.

Cassandras develop a stochastic flow model for a set of traffic intersections in vehicular

networks. Using Infinitesimal Perturbation Analysis techniques, they obtain estimators that are

use ...

http://link.springer.com/article/10.1007/s10626-015-0210-5

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

SELECTIONS FROM THE IEEE TRANSACTIONS ON SYSTEMS, MAN, AND CYBERNETICS: SYSTEMS
VOLUME 45, ISSUE 4
APRIL 2015

1) A Modeling Approach for Cloud Infrastructure Planning Considering Dependability and Cost

Requirements

E. Sousa, F. Lins, E. Tavares, P. Cunha, P. Maciel,

Abstract

Cloud computing is a model in which resources such as storage, applications, and networking

infrastructures can be offered as services over the internet. Cloud applications are becoming

even bigger and more complex with a high availability requirement. This paper presents a

modeling strategy based on a hierarchical and heterogeneous modeling for cloud infrastructure

planning. This modeling strategy allows the selection of cloud infrastructures according to

dependability and cost requirements. Additionally, a stochastic model generator for cloud

infrastructure planning provides automatic generation of dependability and cost models for

representing cloud infrastructures. A case study based on Moodle hosted on a Eucalyptus

platform is adopted to demonstrate the feasibility of the proposed solution (modeling strategy

and tooling).

http://ieeexplore.ieee.org/xpl/articleDetails.jsp?arnumber=6913553&searchWithin%3Dpetri

%26filter%3DAND%28p_IS_Number%3A7060775%29

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

SELECTIONS FROM THE INTERNATIONAL JOURNAL OF CONTROL
ACCEPTED AUTHOR VERSION POSTED ONLINE: MAR. 10, 2015

1) Feedback Control for a class of Discrete Event Systems with Critical-Time

S. Amari

Abstract

This paper presents an algebraic approach for control laws synthesis of timed event graphs

subjected to strict temporal constraints. This class of discrete event systems is

deterministic, in the sense that its behavior only depends on the initial marking and on the

control that is applied. This behavior can be modeled by a linear equations system in Min-Plus

algebra. The temporal constraint is represented by an inequality that is also linear in the

Min-Plus algebra. Then, a method for the synthesis of control laws ensuring the respect of

constraints is described. We give explicit formulas characterizing a control law, which ensures

the validity of the temporal constraints. It is a causal feedback control, involving delays.

The method is illustrated on an example.

http://www.tandfonline.com/doi/abs/10.1080/00207179.2015.1025430#abstract

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