IEEE Control Systems Society
Technical Committee on Discrete Event Systems

Newsletter **December 2020**

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Welcome to the 2020 December issue of the newsletter, also available online at
http://discrete-event-systems.ieeecss.org/tc-discrete/newsletters

Editorial

You are welcome to submit new items to the newsletter (topics including schools, workshops, sessions, conferences, journals, books, software, positions). Also please encourage relevant colleagues and students to subscribe to this newsletter.

- To **submit a new item**, please use the following website:
  https://www.control.eng.osaka-cu.ac.jp/miscellaneous/css-tc-des/submission
  or email to kai.cai@eng.osaka-cu.ac.jp.
- To **subscribe**, please email to kai.cai@eng.osaka-cu.ac.jp.
- To **unsubscribe**, please reply to this email with the subject line UNSUBSCRIBE.

TC virtual meeting at CDC 2020:

- Date/time: December 18 (Friday), UTC 13:00—14:00
- Zoom link:
  https://list-osaka-cu-ac-jp.zoom.us/j/4899797657?pwd=NGJRQ2VHeFdHVTAydzZsaXAyNG9PUT09
  Meeting ID: 489 979 7657
  Passcode: cdc2020
- Tentative program:
  Kai Cai (chair report) 10min
  Anne-Kathrin Schmuck (co-chair report) 10min
  Eric Rutten (co-chair report) 10min
  Xiang Yin (co-chair report) 10min
  Stephane Lafortune (J-DEDS report) 10min
  Free discussions 10min

Contents

1 Selections of Journal Publications

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

1.1. IEEE Transactions on Automatic Control

Volume: 65, Issue: 12, December 2020

- **On Liveness Enforcing Supervisory Policies for Arbitrary Petri Nets**
  Authors: C. Chen ; A. Raman ; H. Hu ; R. S. Sreenivas
  Abstract: Neither the existence nor the nonexistence of a liveness enforcing supervisory policy (LESP) for an arbitrary Petri net (PN) is semidecidable. In an attempt to identify decidable instances, we explore the decidability of certain properties of the set of initial markings for which an LESP exists, and the decidability of the existence of a specific class of LESPs. We first prove that for an arbitrary PN structure, determining if there is an initial marking, or there are no initial markings, for which there is an LESP, is not semidecidable. Then, we characterize the class of PN structures for which the set of all initial markings for which an LESP exists is right-closed. We show that testing membership, or nonmembership, of an arbitrary PN in this class of PNs is not semidecidable. We then consider a restricted class of LESPs, called marking monotone LESPs (MM-LESPs). We show that the existence of an MM-LESP for an arbitrary PN is decidable.

- **Design of Supervisors for Active Diagnosis in Discrete Event Systems**
  Authors: Y. Hu ; Z. Ma ; Z. Li
  Abstract: In this article, we present an active diagnosis method to enhance diagnosability of a plant modeled by a finite-state automaton. Some properties of active diagnosis and silent blocking are studied. To avoid silent blocking, the notion of *stop*-free event set is proposed, and a *stop*-free control policy that does not introduce silent blocking is formulated. We develop a heuristic method based on the verifier of the plant to compute a feasible *stop*-free event set that guarantees the existence of a valid control policy. With the *stop*-free event set, the set of disabled edges is computed, and an online control policy that is based on the current diagnostic state is computed, which guarantees that the closed-loop system is diagnosable. The structural complexity of the proposed control structure is polynomial with respect to the number of states of the plant.

- **Efficient Verification of Observability and Reconstructibility for Large Boolean Control Networks With Special Structures**
  Authors: K. Zhang ; K. H. Johansson
  Abstract: Verifying observability and reconstructibility of Boolean control networks (BCNs) is NP-hard in the number of nodes. A BCN is observable (reconstructible) if one can use an input sequence and the corresponding output sequence to determine the initial (current) state. In this article, we study when a node aggregation approach can be used to overcome the computational complexity in verifying these properties. We first define a class of node aggregations with subnetworks being BCNs. For acyclic node aggregations in this class, all corresponding subnetworks being observable (reconstructible) implies that the whole BCN is observable (reconstructible), although the converse is not true. In general, for cyclic node aggregations, the whole BCN being observable (reconstructible) does not imply that all subnetworks are observable (reconstructible), or vice versa. We design an algorithm to search for all acyclic node aggregations in this class, and show that finding acyclic node aggregations with small subnetworks can significantly reduce the computational complexity in verifying observability (reconstructibility). We also define a second class of node aggregations with subnetworks being finite-transition systems (more general than BCNs), which compensates for the drawback of the first class when the BCN has only a small number of output nodes. Finally, we use a BCN T-cell receptor kinetics model from the literature with 37 state nodes and 3 input nodes to illustrate the efficiency of the results derived from the two node aggregation methods. For this model, we derive the unique minimal set of 16 state nodes needed to be directly measured to make the overall BCN observable. We also compute 5 of the 16 state nodes needed to be directly measured to make the model reconstructible.

- **p-Safe Analysis of Stochastic Hybrid Processes**
  Authors: R. Wisniewski ; M. L. Bujorianu ; C. Sloth

Abstract: We develop a method for determining whether a stochastic system is safe, i.e., whether its trajectories reach unsafe states. Specifically, we define and solve a probabilistic safety problem for Markov processes. Based on the knowledge of the extended generator, we are able to develop an evolution equation, as a system of integral equations, describing the connection between unsafe and initial states. Subsequently, using the moment method, we approximate the infinite-dimensional optimization problem searching for the largest set of safe states by a finite-dimensional polynomial optimization problem. In particular, we address the above safety problem to a special class of stochastic hybrid processes, namely piecewise-deterministic Markov processes. These are characterized by deterministic dynamics and stochastic jumps, where both the time and the destination of the jumps are stochastic. In addition, the jumps can be both spontaneous (in the style of a Poisson process) and forced (governed by guards). In this case, the extended generator of this process and its corresponding martingale problem turn out to be defined on a rather restricted domain. To circumvent this difficulty, we bring the generalized differential formula of this process into the evolution equation and, subsequently, formulate a polynomial optimization.

- **Compositional (In)Finite Abstractions for Large-Scale Interconnected Stochastic Systems**
  Authors: A. Lavaei ; S. Soudjani ; M. Zamani
  Abstract: This article is concerned with a compositional approach for constructing both infinite (reduced-order models) and finite abstractions [a.k.a. finite Markov decision processes (MDPs)] of large-scale interconnected discrete-time stochastic systems. The proposed framework is based on the notion of stochastic simulation functions enabling us to employ an abstract system as a substitution of the original one in the controller design process with guaranteed error bounds. In the first part of this article, we derive sufficient small-gain-type conditions for the compositional quantification of the probabilistic distance between the interconnection of stochastic control subsystems and that of their infinite abstractions. We then construct infinite abstractions together with their corresponding stochastic simulation functions for a particular class of discrete-time nonlinear stochastic control systems. In the second part of this article, we leverage small-gain-type conditions for the compositional construction of finite abstractions. We propose an approach to construct finite MDPs as finite abstractions of concrete models or their reduced-order versions satisfying an incremental input-to-state stability property. We also show that for the particular class of nonlinear stochastic control systems, the aforementioned property can be readily checked by matrix inequalities. We demonstrate the effectiveness of the proposed results by applying our approaches to a fully interconnected network of 20 nonlinear subsystems (totally 100 dimensions). We construct finite MDPs from their reduced-order versions (together 20 dimensions) with guaranteed error bounds on their output trajectories. We also apply the proposed results to a temperature regulation in a circular building and construct compositionally a finite abstraction of a network containing 1000 rooms. We employ the constructed finite abstractions as substitutes to compositionally synthesize policies regulating the temperature in each room for a bounded time horizon.
- **State Estimation for Stochastic Time-Varying Boolean Networks**
  Authors: H. Chen ; Z. Wang ; J. Liang ; M. Li
  Abstract: In this article, a general theoretical framework is developed for the state estimation problem of stochastic time-varying Boolean networks (STVBNs). The STVBN consists of a system model describing the evolution of the Boolean states and a model relating the noisy measurements to the Boolean states. Both the process noise and the measurement noise are characterized by sequences of mutually independent Bernoulli distributed stochastic variables taking values of 1 or 0, which imply that the state/measurement variables may be flipped with certain probabilities. First, an algebraic representation of the STVBNs is derived based on the semitensor product. Then, based on Bayes' theorem, a recursive matrix-based algorithm is obtained to calculate the one-step prediction and estimation of the forward-backward state probability distribution vectors. Owing to the Boolean nature of the state variables, the Boolean Bayesian filter is designed that can be utilized to provide the minimum MSE state estimate for the STVBNs. The fixed-interval smoothing filter is also obtained by resorting to the forward-backward technique. Finally, a simulation experiment is carried out for the context estimation problem of the $p53$-$MDM2$ negative-feedback gene regulatory network.

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1.2. Automatica

Volume: 122, December 2020

- **Detection-averse optimal and receding-horizon control for Markov decision processes**
  Authors: Nan Li ; Ilya Kolmanovsky ; Anouck Girard
  Abstract: In this paper, we consider a Markov decision process (MDP) in which the ego agent intends to hide its state from detection by an adversary while pursuing a nominal objective. After formulating the detection-averse MDP problem, we first describe a value iteration (VI) approach to exactly solve it. To overcome the "curse of dimensionality" and thus gain scalability to larger-sized problems, we then propose a receding-horizon optimization (RHO) approach to compute approximate solutions. Numerical examples are reported to illustrate and compare the VI and RHO approaches, and show the potential of the proposed problem formulation for practical applications.

- **Event-triggered robust state estimation for systems with unknown exogenous inputs**
  Authors: Jiarao Huang ; Dawei Shi ; Tongwen Chen
  Abstract: An event-triggered robust state estimation problem for linear time-varying systems subject to Gaussian noises and non-stochastic unknown exogenous inputs is investigated in this work. To design the estimator, the state estimation problem is formulated as an optimization problem with a risk-sensitive cost function. This problem is solved by constructing a reference probability measure, under which the cost function has a simpler form and an information state can be developed. The obtained robust state estimator is shown to have a recursive form parameterized by a Riccati-type time-varying matrix equation. The effectiveness of the proposed event-based robust state estimator is illustrated with numerical examples.

- **Event-triggered attitude consensus with absolute and relative attitude measurements**
  Authors: Xin Jin ; Yang Shi ; Yang Tang ; Xiaotai Wu
  Abstract: In this paper, we consider the event-triggered attitude consensus of multiple rigid-body systems. Two event-triggered attitude consensus protocols are designed under the absolute attitude and relative attitude measurement, respectively. For the first case, the gnomonic projection is utilized to project the attitude to the Euclidean plane almost globally. Then, a distributed attitude consensus protocol based on the projections is proposed under the event-triggered mechanism. By using the proposed protocol and event-triggered condition (ETC), the almost global attitude consensus is achieved on a positively invariant set. Next, in order to remove the requirement of the absolute attitude information, we propose an event-triggered attitude protocol with relative attitude measurements. The Riemannian gradient descent approach is utilized to design the attitude consensus protocol on a geodesically convex set of attitude configuration space. Moreover, to overcome the continuous monitoring in the event-detection, a self-triggered strategy is presented based on the event-triggered protocol only with the relative attitude measurement. Finally, simulation studies are conducted to verify the effectiveness of the proposed protocols.

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1.3. Control Engineering Practice

Volume: 105, December 2020

- **Fault detection of Discrete-Event Systems based on an identified timed model**
  Authors: Ryan P.C. de Souza ; Marcos V. Moreira ; Jean-Jacques Lesage
  Abstract: In this paper, a method for fault detection of Discrete-Event Systems (DES) based on a timed model called Timed Automaton with Outputs and Conditional Transitions (TAOCT), obtained by identification, is presented. The TAOCT is an extension of a recent untimed model proposed in the literature, called Deterministic Automaton with Outputs and Conditional Transitions (DAOCT). Differently from the DAOCT, where only the logical behavior of the DES is considered, the TAOCT takes into account information about the time that the events are observed, and, for this reason, it can be used for the detection of faults that cannot be detected by using untimed

models, such as faults that lead the fault detector to deadlocks. The TAOCT represents the fault-free system behavior, and a fault is detected when the observed behavior is different from the one predicted by the model, considering both logical and timing information. A practical example is used to illustrate the results of the paper.

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1.4. International Journal of Control

Volume: 93, Issue: 12, December 2020

- **Recomposable restricted finite state machines: definition and solution approaches**
  Authors: Jinwoo Seok ; Anouck Girard
  Abstract: Many real-world systems operate and make decisions using limited resources in dynamically changing environments, where the changes can be unpredictable. In this paper, the Restricted Finite State Machine is defined, and its optimality studied; it is a composed finite state machine with input restrictions that can handle limited resources. Then, the Recomposable Restricted Finite State Machine is defined, and its optimality investigated; it can handle unpredictably dynamically changing environments, by reacting to environment changes. In general, the local optimal policies do not generate the global optimal policy of the Recomposable Restricted Finite State Machine and global optimality cannot be achieved without knowledge of future. Thus, a heuristic method, Limited Breath First Search, is developed. The numerical simulation results indicate that the heuristic method performs well with proper parameters, and also indicates that local sub-optimal solutions can be better than the local optimal policies for the global policy/solution of Recomposable Restricted Finite State Machines.

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1.5. Systems & Control Letters

Volume: 145, December 2020

- **Detectability of Boolean networks with disturbance inputs**
  Authors: Biao Wang ; Jun-e Feng
  Abstract: This paper concerns the detectability problem of Boolean networks with disturbance inputs using the semi-tensor product approach. Detectability like observability describes the ability of the system state to be indirectly measured, which is an important issue to be considered in designing the controller. Four kinds of detectability, weak, weak periodical, strong and strong periodical ones, are defined. A systematic matrix method is developed and formed via three tools respectively called detection operator, detection matrix and detectable set. The former is used to generate the state estimate at each time. The other two are derived from the dynamics of the system and produce several necessary and sufficient conditions for checking detectability. Two examples are provided to demonstrate the effectiveness of the main results. Furthermore, how the proposed methods can be applied and extended to other kinds of disturbance is briefly discussed.
- **On reducible state variables of logical control networks**
  Authors: Haitao Li ; Wenhui Dou
  Abstract: Reducible state variables are important for the study of reduced-order observer and control design of logical control networks (LCNs). This paper studies the number of reducible state variables of LCNs. Based on the upper bound of reducible state variables, several sufficient/necessary conditions are presented for the number of reducible state variables. In addition, using the regular subspace theory, the coordinate transformation as well as the swap matrix are constructed, and some new criteria are proposed to calculate reducible state variables.
- **K-memory-embedded insertion mechanism for opacity enforcement**
  Authors: Rongjian Liu ; Liujuan Mei ; Jianquan Lu
  Abstract: Opacity is a privacy property which aims to determine whether the “secret" of a system can be deduced by an outside intruder. In this paper, we investigate the enforcement of opacity using insertion functions which insert additional events if necessary to modify the output of the system. Inspired by the existing insertion mechanisms, we propose a mechanism named k-memory-embedded insertion mechanism for the enforcement of opacity. In our k-memory-embedded insertion mechanism, the insertion functions are determined based on the knowledge of system's

exact states and the stored next sequence of events with length k. Especially, we define the property of ik-E-enforceability that a k-memory-embedded insertion function needs to satisfy for opacity enforcement, and further construct a verifier to determine whether a given opacity notion of the system is ik-E-enforceable or not. Our mechanism improves the embedded insertion mechanism by applying to a broader class of systems. Also, we improve the k-memory insertion mechanism by requiring a smaller number of consecutive events which need to be stored.

- **Sequential Online Dispatch in Design of Experiments for Single- and Multiple-Response Surrogate Modeling**
  Authors: Mohammadkazem Sadoughi ; Chao Hu ; Behnam Moghadassian ; Anupam Sharma ; Joseph Beck ; Danielle Mathiesen
  Abstract: As parallel computing becomes increasingly important in many real-world applications, a batch sequential experimental design (BSED), which adds a batch of computer experiments per iteration and runs these simulations in parallel, is gaining popularity in surrogate modeling. This article proposes sequential online dispatch in design of experiments (SODDE) for single- and multiple-response surrogate modeling when multiple processors work in parallel but not independently. The proposed method includes several unique features: 1) it works with any popular acquisition function to select a single new sample point at each iteration; 2) it minimizes the idle time of all processors; 3) it rapidly updates the surrogate model; and 4) it dynamically reconstructs the surrogate model when a simulation process aborts, minimizing the impact incurred by the abortion. The effectiveness of SODDE is evaluated in one mathematical example and one industrial problem. The latter problem considers blade design of horizontal axis wind turbines (HAWTs). The cost of finding blade geometry that results in the desired aerodynamic behavior of HAWTs is estimated for BSED and SODDE. Relative to BSED, SODDE reduces the costs by up to approximately 31%.

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2 Conferences

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

2.1 **2020 IEEE Conference on Decision and Control**
Jeju Island, Republic of Korea, December 8-11, 2020 (Virtual)
https://cdc2020.ieeecss.org

2.2 **2021 Mediterranean Conference on Control and Automation**
Bari, Italy, June 22-25, 2021 (Hybrid)
http://med2021.poliba.it/

2.3 **2021 American Control Conference**
New Orleans, Louisiana, USA, May 26-28, 2021.
http://acc2021.a2c2.org/

2.4 **2021 IEEE International Conference on Automation Science and Engineering**
Lyon Centre de Congres, Lyon, France, August 23-27, 2021
https://www.ieee-ras.org/component/rseventspro/event/1935-case-2021

2.5 **2021 IEEE Conference on Control Technology and Applications**
San Diego, August 8-11, 2021
https://ccta2021.ieeecss.org/

2.6 **2021 IEEE International Conference on Systems, Man, and Cybernetics**
South Wharf, Victoria, Australia, October 17-20, 2021
http://ieeesmc2021.org/

2.7 **2021 ACM International Conference on Hybrid Systems: Computation and Control**
Nashville, USA, May 19-21, 2021.
https://hscc.acm.org/2021/

2.8 **2021 Learning for Dynamics and Control**
ETH Zurich, Switzerland, June 7-8, 2021
https://l4dc.ethz.ch/

2.9 **2021 Chinese Control Conference**
Shanghai, China, July 26-28, 2021
https://conf2021.shu.edu.cn/index.htm

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3 Books

3.1 **Foundations of Average-Cost Nonhomogeneous Controlled Markov Chains**
Authors: Xi-Ren Cao
Description: This Springer brief addresses the challenges encountered in the study of the optimization of time-nonhomogeneous Markov chains. It develops new insights and new methodologies for systems in which concepts such as stationarity, ergodicity, periodicity and connectivity do not apply.

This brief introduces the novel concept of confluencity and applies a relative optimization approach. It develops a comprehensive theory for optimization of the long-run average of time-nonhomogeneous Markov chains. The book shows that confluencity is the most fundamental concept in optimization, and that relative optimization is more suitable for treating the systems under consideration than standard ideas of dynamic programming. Using confluencity and relative optimization, the author classifies states as confluent or branching and shows how the under-selectivity issue of the long-run average can be easily addressed, multi-class optimization implemented, and Nth biases and Blackwell optimality conditions derived. These results are presented in a book for the first time and so may enhance the understanding of optimization and motivate new research ideas in the area.

ISBN: 978-3-030-56678-4
https://www.springer.com/gp/book/9783030566777

3.2 **Estimation and Inference in Discrete Event Systems — A Model-Based Approach with Finite Automata**
Author: Christoforos N. Hadjicostis
Description: Estimation and Inference in Discrete Event Systems chooses a popular model for emerging automation systems—finite automata under partial observation—and focuses on a comprehensive study of the key problems of state estimation and event inference. The text includes treatment of current, delayed, and initial state estimation. Related applications for assessing and enforcing resiliency—fault detection and diagnosis—and security—privacy and opacity—properties are discussed, enabling the reader to apply these techniques in a variety of emerging applications, among them automated manufacturing processes, intelligent vehicle/highway systems, and autonomous vehicles.

The book provides a systematic development of recursive algorithms for state estimation and event inference. The author also deals with the verification of pertinent properties such as:
• the ability to determine the exact state of a system, "detectability";
• the ability to ensure that certain classes of faults can be detected/identified, "diagnosability"; and
• the ability to ensure that certain internal state variables of the system remain "hidden" from the outside world regardless of the type of activity that is taking place, "opacity".
This book allows students, researchers and practicing engineers alike to grasp basic aspects of state estimation in discrete event systems, aspects like distributivity and probabilistic inference, quickly and without having to master the entire breadth of models that are available in the literature.

More details: https://www.springer.com/gp/book/9783030308209

3.3 **Path Planning and Control of Cooperative Mobile Robots Using Discrete Event Models**
Authors: Cristian Mahulea, Marius Kloetzer, Ramon Gonzalez
ISBN: 978-1-119-48632-9, January 2020, Wiley-IEEE Press, 240 Pages
https://bit.ly/2MYphKe

3.4 **Discrete-Time and Discrete-Space Dynamical Systems**
Authors: Kuize Zhang, Lijun Zhang, Lihua Xie
ISBN: 978-3-030-25971-6, Springer
https://link.springer.com/book/10.1007/978-3-030-25972-3

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4 Call for Papers

4.1 Security, Privacy and Safety of Cyber-Physical Systems

Nonlinear Analysis: Hybrid Systems

Guest Editors: Kai Cai ; Maria Prandini ; Xiang Yin ; Majid Zamani

Call for Papers: Cyber-physical systems are engineered systems that are built from and depend upon the synergy of computational and physical components. They are pervasive in today's technological society. Cyber-physical systems usually involve complex interactions of continuous dynamics with discrete logic, referred to as "hybrid" behavior. The development of controller design and verification algorithms for such complex systems are crucial and challenging tasks, due in particular to the theoretical difficulties of analyzing hybrid behavior and to the computational challenges associated with the synthesis of hybrid controllers.

Ever-increasing demands for safety, privacy, security and certification of cyber-physical systems put stringent constraints on their analysis and design, and necessitate the use of formal model-based approaches. In recent years, we have witnessed a substantial increase in the use of formal techniques for the verification and design of privacy-sensitive, safety-critical cyber-physical systems.

The main objective of this special issue to gather recently developed novel approaches devoted to analysis and enforcement of security, privacy and safety of cyber-physical systems using formal techniques. We seek submissions including but not limited to the following topics:

- Security and privacy analysis of cyber-physical systems, including opacity, differential privacy, non-interference and other related notions
- Fault diagnosis, intrusion detection, and attack mitigation of cyber-physical systems
- Supervisory control for safety of discrete-event systems
- Formal methods and reactive synthesis for safety of cyber-physical systems
- Data-driven verification and synthesis of cyber-physical systems
- Distributed approaches for large scale cyber-physical systems and hybrid systems
- Algorithms and tools for verification and synthesis of safety-critical systems
- Applications in security and/or safety of manufacturing systems, transportation systems, energy systems, robotic networks, telecommunications, and computer networks.

Submission Information

- Extended deadline: January 31, 2021 (no further extension)
- Website: https://www.editorialmanager.com/NAHS/default.asp
- Article type (identifier of this special issue): VSI: Security

4.2 Modeling, Analysis and Control for Cybersecurity of Discrete Event Systems

Discrete Event Dynamic Systems: Theory and Applications

Guest Editors: Rong Su ; Joao Carlos Basilio

Call for Papers: The recent advancement of information and communication technologies and Internet-of-Things infrastructure make a fully connected society a reality, leading to much improved living quality and production efficiency. However, the price paid for such unprecedented connectivity is an increase in cybercrime and violations, making cybersecurity a key research focus in many different research communities. Generally speaking, cybersecurity is the protection of computer systems and networks from the theft of or damage to their hardware, software, or electronic data, as well as from the disruption or misdirection of the services they provide. Discrete event systems (DES) are particularly vulnerable to cyber intrusions, because their enumerative and typically qualitative formal models lack of necessary details and effective representations of (temporal) correlation among data, and they heavily depend on the accuracy of data to ensure absolutely correct interpretation of actions in the system to achieve correct tracking, analysis and control, making it difficult for them to handle data corruptions. An intruder to a DES may intercept sensor and/or command signals and interrupt the execution order of events (or functions). This special topical collection focuses on two key cybersecurity concerns, i.e., cyber attacks and privacy/confidentiality breaching (including but not limited to opacity violations), and aims to report the latest DES research and application results pertinent to cybersecurity.

This special topical collection solicits papers, addressing relevant theoretical issues and important application issues related to cybersecurity, with an evident DES model and relevant technical treatments, possibly complemented with other frameworks to deal with interdisciplinary issues. A non-exhaustive list of some potential topics is provided below:

- New modeling frameworks for cyber attacks
- Analysis of impacts of attacks on closed-loop system behaviors
- Formal synthesis of attack models
- New concepts and models of resilience of supervisors
- Formal synthesis of supervisors resilient to specific attacks
- Game theoretical frameworks for analysis and resilient control
- Fault diagnosis in the presence of cyber attacks
- New modeling frameworks for privacy and confidentiality (e.g., opacity)
- New analysis methods to determine system ability of preserving privacy and confidentiality (e.g., new opacity analysis methods)
- Formal synthesis of supervisors for privacy/confidentiality preservation
- Applications of cybersecurity methods in real discrete event systems

Important Submission Dates:

- Open: July 15, 2020
- Extended deadline: January 15, 2021

Manuscript should be submitted to `http://DISC.edmgr.com` Back to the contents

5 Software Tool

5.1 IDES: An Open-Source Software Tool

IDES, the discrete-event systems software tool in Karen Rudie's lab is now available as open-source software at https://github.com/krudie/IDES. More information on IDES can also be found at https://www.ece.queensu.ca/people/K-Rudie/qdes.html#fndtn-software.

5.2 Supremica 2.6, New Version

The development team has just released a new version of Supremica, Waters/Supremica IDE 2.6.

Supremica is a DES and SCT drawing and calculation tool, that includes a multitude of efficient algorithms for modeling, verification, and synthesis of maximally permissive supervisors. In addition there are general algorithms for standard operations like synchronization, minimization, determinization, etc. Supremica also handles finite automata extended with bounded discrete variables. A feature-full simulation tool is also included.

New in this version:

- Scaling of the GUI
- Revamped configuration dialog
- New analyzer user interface
- Logging can now be done directly to file, in addition to the log output pane
- Automaton variables have been introduced, so that guards and actions can refer to the state of an automaton
- The normalizing compiler is now the default
- Plenty of bug fixes, including more graceful termination when out of memory

Supremica is free to use for education and research; for commercial use, please contact fabian@chalmers.se. Download from www.supremica.org.

5.3 UltraDES 2.2 Release

UltraDES is an open-source library to the modeling, analysis and control of DES, written using C# in .NET Standard 2.0, which allows its use in multiple platforms, such as Windows, Linux, Mac, IOS, Android, so on. The library is under development at LACSED (Laboratory of Analysis and Control of Discrete Event Systems, at the Universidade Federal de Minas Gerais, Brazil) and has basic operations with automata as long as the monolithic, modular and local modular supervisory control (Alves et. al., 2017).

The main improvements of the UltraDES 2.2 version are:

- Supervisor Reduction Algorithm (Su and Wonham, 2004)
- Supervisor Localization (Cai and Wonham, 2010)
- Basic Petri Nets Functions (incidence matrix, coverability/reachability graph, Petri Net marking simulation, etc.)

Knowing that many researchers/students are not familiar with the C# language, we created an experimental python wrapper, that is less object oriented and easier to use.

Another initiative to improve the usability of UltraDES was the creation of a Web Application, developed using Blazor/WebAssembly, that allows the use of UltraDES online. This version is more limited in processing power and memory but it is useful for small examples and teaching.

We invite the community to download and contribute. Algorithms implemented may be integrated to the main distribution. Just let us know. Contact Lucas Alves lucasvra@ufmg.br or Patricia Pena ppena@ufmg.br for more information. Bugs should be informed using the UltraDES GitHub page.
Link: https://github.com/lacsed/UltraDES.

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6 Positions

6.1 PhD/Postdoc: National Institute of Informatics, Tokyo, Japan

We are seeking a postdoc researcher and 2 Ph.D. candidates who collaborate with us in the project "CyPhAI: Formal Analysis and Design of AI-intensive Cyber-Physical Systems" funded by JST. The detail of the call can be found at: https://hackmd.io/HqD7t6atQyuXzMyKuLX3UQ?view

This project aims at establishing mathematically-solid methodologies to model, verify, test, monitor, and control a cyber-physical system in which AI plays crucial role (AI-CPS), and consists of several teams with different expertise. This call is for positions in control theory team led by Masako Kishida (National Institute of Informatics, Tokyo, Japan). The contract will initially run until the end of March 2021, with the possibility of annual renewal at maximum 5 years.

Applications should be sent to application-cyphai@fos.kuis.kyoto-u.ac.jp, with the subject CREST Job Application. Please include

- your brief CV,
- short description of research interests (can be very informal and short),
- the list of papers (a dblp or Google scholar link will do, for example),
- a couple of representative papers (in pdf), and
- (preferably) the contact of two references

We will contact you for further material and interview, provided that we find sufficient relevance in your application. Starting dates are flexible. The positions will remain open until filled. The project ends in March 2026.

Inquiries should also be sent to application-cyphai@fos.kuis.kyoto-u.ac.jp, with the subject CREST Job Inquiry.