IEEE Control Systems Society
Technical Committee on Discrete Event Systems

Newsletter **August 2020**

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Welcome to the 2020 August 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.

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1 Selections of Journal Publications

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

1.1. Discrete Event Dynamic Systems: Theory and Applications

Volume: 30, Issue: 3, September 2020

- **Long time behaviour for Markovian branching-immigration systems**
  Authors: Junping Li ; Lan Cheng ; Liuyan Li
  Abstract: Let $\{X(t); t \geq 0\}$ be a continuous-time branching-immigration system with branching rates $\{b_k; k \neq 0, k \neq 1\}$ and immigration rates $\{a_k; k \geq 1\}$. We assume that $b_0 = 0$, $m =: \sum_{k=1}^{\infty} k b_k < \infty$ and $a =: \sum_{k=1}^{\infty} k a_k < \infty$. In this paper, we first discuss the martingale property and prove that it has a limit W. Furthermore, we show that $X(t+s)/X(t)$ converges to ems in probability, $W(t)$ converges to W in probability and $X(t+s)/X(t)$ converges to ems in probability conditioned on $W \geq \alpha$ (here α is a positive constant) as $t \to \infty$. The explicit estimates of the above three convergence rates are obtained under various moment conditions on $\{b_k; k \neq 0, k \neq 1\}$. It is shown that the rate of the first one is geometric, while the other two are supergeometric.
- **Diagnosis and Degradation Control for Probabilistic Systems**
  Authors: Nathalie Bertrand ; Serge Haddad ; Engel Lefaucheux
  Abstract: Systems prone to faults are often equipped with a controller whose aim consists in restricting the behaviour of the system in order to perform a diagnosis. Such a task is called active diagnosis. However to avoid that the controller degrades the system in view of diagnosis, a second objective in terms of quality of service is usually assigned to the controller. In the framework of stochastic systems, a possible specification, called safe active diagnosis requires that the probability of correctness of the infinite (random) run is non null. We introduce and study here two alternative specifications that are in many contexts more realistic. The notion of (γ, v)-fault freeness associates with each run a value depending on the discounted length of its correct prefix where the discounting factor is γ. The controller has to ensure that the average of this value is above the threshold v. The notion of α-resiliency requires that asymptotically, at every time step, a proportion greater than of correct runs remain correct. From a semantic point of view, we determine the equivalences and (non) implications between the three notions of degradations both for finite and infinite systems. From an algorithmic point of view, we establish the border between decidability and undecidability of the diagnosability problems. Furthermore in the positive case, we exhibit their precise complexity and propose a synthesis of the controller which may require an infinite memory.
- **Critical subsystems in time interval models**
  Authors: P. Declerck
  Abstract: The aim of this paper is the generation of the min-critical and max-critical subsystems which determine the optimal cycle times. Considering a Time Interval Model which can describe Timed Event Graphs and P-time Event Graphs completely, each critical subsystem depends on the lower and upper bounds of the time durations. The proposed approach which is based on linear programming makes a classification of the relations which describe the system. The application to a baking process in a plant bakery shows that the min-critical and max-critical subsystems are not limited to the critical circuits of the Event Graph.
- **Model decomposition of timed event graphs under periodic partial synchronization: application to output reference control**
  Authors: Johannes Trunk ; Bertrand Cottenceau ; Laurent Hardouin ; Joerg Raisch
  Abstract: Timed Event Graphs (TEGs) are a graphical model for decision free and time-invariant Discrete Event Systems (DESs). To express systems with time-variant behaviors, a new form of synchronization, called partial synchronization (PS), has been introduced for TEGs. Unlike exact synchronization, where two transitions t_1, t_2 can only fire if both transitions are simultaneously enabled, PS of transition t_1 by transition t_2 means that t_1 can fire only when transition t_2 fires, but t_1 does not influence the firing of t_2. This, for example can describe the synchronization between a local train and a long distance train. Of course it is reasonable to synchronize the departure of a local train by the arrival of long distance train in order to guarantee a smooth connection for

passengers. In contrast, the long distance train should not be delayed due to the late arrival of a local train. Under the assumption that PS is periodic, we can show that the dynamic behavior of a TEG under PS can be decomposed into a time-variant and a time-invariant part. It is shown that the time-variant part is invertible and that the time-invariant part can be modeled by a matrix with entries in the dioid $\mathcal{M}_{in}^{ax}[\![\gamma, \delta]\!]$, i.e. the time-invariant part can be interpreted as a standard TEG. Therefore, the tools introduced for standard TEGs can be used to analyze and to control the overall system. In particular, in this paper output reference control for TEGs under PS is addressed. This control strategy determines the optimal input for a predefined reference output. In this case optimality is in the sense of the "just-in-time" criterion, i.e., the input events are chosen as late as possible under the constraint that the output events do not occur later than required by the reference output.

- **Pathwise stability of multiclass queueing networks**
  Authors: Kan Wu ; Yichi Shen
  Abstract: It has been shown that, under some service policies, a queueing network can be unstable even if the load of every station is less than one. Although the stability of queueing systems in some special cases (e.g. under First-Buffer-First-Served policy) has been well addressed, there are still difficulties in coping with more general networks. In this paper, we study the stability problem through depicting the mutual blocking effect among different classes and generalize the concept of servers in the context of queueing networks based on the sample path analysis. We show that the general servers have similar impacts on the system stability as physical stations and a queueing network is pathwise stable if and only if the effective traffic intensity of every general server does not exceed one. Through case studies, we show that the stability of queueing networks and the structure of general servers are sensitive and depend on various factors, including the service policies. Furthermore, we prove that queueing systems operating under the Work-in-Progress-Dependent service policies are always stable if every physical station has sufficient capacity.

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1.2. IEEE Transactions on Automatic Control

Volume: 65, Issue: 8, August 2020

- **Compositional and Abstraction-Based Approach for Synthesis of Edit Functions for Opacity Enforcement**
  Authors: Sahar Mohajerani ; Yiding Ji ; Stephane Lafortune
  Abstract: This article develops a novel compositional and abstraction-based approach to synthesize edit functions for opacity enforcement in modular discrete event systems. Edit functions alter the output of the system by erasing or inserting events in order to obfuscate the outside intruder, whose goal is to infer the secrets of the system from its observation. We synthesize edit functions to solve the opacity enforcement problem in a modular setting, which significantly reduces the computational complexity compared with the monolithic approach. Two abstraction methods called opaque observation equivalence and opaque bisimulation are first employed to abstract the individual components of the modular system and their observers. Subsequently, we propose a method to transform the synthesis of edit functions to the calculation of modular supremal nonblocking supervisors. We show that the edit functions synthesized in this manner correctly solve the opacity enforcement problem.

- **Information Relaxation Bounds for Partially Observed Markov Decision Processes**
  Authors: Martin B. Haugh ; Octavio Ruiz Lacedelli
  Abstract: Partially observed Markov decision processes (POMDPs) are an important class of control problems that are ubiquitous in a wide range of fields. Unfortunately, these problems are generally intractable, so, in general, we must be satisfied with suboptimal policies. But how do we evaluate the quality of these policies? This question has been addressed in recent years in the Markov decision process (MDP) literature through the use of information-relaxation-based duality, where the nonanticipativity constraints are relaxed, but a penalty is imposed for violations of these constraints. In this paper, we extend the information relaxation approach to POMDPs. It is of course well known that the belief-state formulation of a POMDP is an MDP, and therefore, the

previously developed results for MDPs also apply to POMDPs. Under the belief-state formulation, we use recently developed change-of-measure arguments to solve the so-called inner problems, and we use standard filtering arguments to identify the appropriate Radon-Nikodym derivatives. We also show, however, that dual bounds can also be constructed without resorting to the belief-state formulation. In this case, change-of-measure arguments are required for the evaluation of the so-called dual feasible penalties rather than for the solution of the inner problems. We compare dual bounds for both formulations and argue that, in general, the belief-state formulation provides tighter bounds. The second main contribution of this paper is to show that several value function approximations for POMDPs are in fact supersolutions . This is of interest because it can be particularly advantageous to construct penalties from supersolutions, since absolute continuity (of the change of measure) is no longer required, and therefore, significant variance reduction can be achieved when estimating the duality gap directly. Dual bounds constructed from supersolution-based penalties are also guaranteed to provide tighter bounds than the bounds provided by the supersolutions themselves. We use applications from robotic navigation and telecommunication to demonstrate our results.

- **Compositional Supervisory Control via Reactive Synthesis and Automated Planning**
  Authors: Daniel Alfredo Ciolek ; Victor Braberman ; Nicolas D'Ippolito ; Sebastian Sardina ; Sebastian Uchitel
  Abstract: We show how reactive synthesis and automated planning can be leveraged effectively to find nonmaximal solutions to deterministic supervisory control problems of discrete event systems. To do so, we propose efficient translations of the supervisory control problem into the reactive synthesis and planning frameworks. Notably, our translation methods capture the compositional and reactive nature of control specifications, avoiding a potential exponential explosion found in alternative translation approaches. Additionally, we report on experimental results comparing the efficacy of different tools from the three disciplines, for a particular supervisory control benchmark.

- **Relative Network Observability and Its Relation With Network Observability**
  Authors: Yunfeng Hou ; Weilin Wang ; Yanwei Zang ; Feng Lin ; Miao Yu ; Chaohui Gong
  Abstract: In order to control a discrete-event system (DES), the supervisory controller observes event sequences. Observability, together with controllability, is required for obtaining the exact specification language via supervisory control. By extending observability, relative observability was recently investigated. In this article, relative network observability, which accommodates observation incompleteness and delay in relative observability, is defined. An algorithm is proposed to transform relative network observability to network observability. This leverages existing solutions to problems concerning network observability to solve problems concerning relative network observability. In particular, we propose techniques for checking relative network observability and calculating supremal controllable and relatively network observable sublanguage.

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1.3. Automatica

Volume: 117 August 2020

- **Event-triggered distributed state estimation over wireless sensor networks**
  Authors: Dongdong Yu ; Yuanqing Xia ; Li Li ; Di-Hua Zhai
  Abstract: This paper focuses on the event-triggered distributed state estimation over sensor networks, in which each sensor node selectively transmits the local information to its neighbors for the reduced communication bandwidth and the prolonged network lifetime. Based on an individual stochastic triggering condition, an event-triggered minimum mean square error (MMSE) estimator is proposed in a recursive form, and then an event-triggered distributed state estimation algorithm is developed by repeatedly fusing the local information and the event-triggered information. It is shown that, under network connectivity, collective observability and large enough triggering parameters, the distributed estimator in each sensor node is stable with the uniformly bounded estimation error in mean square. Finally, a target tracking example is provided to illustrate the practical effectiveness of the proposed technique.

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1.4. IEEE Transactions on Control Systems Technology

Volume: 17, Issue: 4, July 2020

- **Wafer Residency Time Analysis for Time-Constrained Single-Robot-Arm Cluster Tools With Activity Time Variations**
  Authors: Fajun Yang ; Xin Tang ; Naiqi Wu ; Chunjiang Zhang ; Liang Gao
  Abstract: For a time-constrained single-robot-arm cluster tool with unfixed scheduling strategy, necessary and sufficient conditions under which a feasible cyclic schedule exists are presented in the literature. However, the results are obtained under the assumption that the activity time is deterministic. In practice, the activity time could be subject to fluctuation, leading to that an originally feasible schedule obtained based on such an assumption may be infeasible. Hence, it is critically important to reveal how the wafer residency time (WRT) varies with the variation of activity time. To solve this problem, this paper first proposes an operational strategy and a real-time control policy. Based on them, the exact upper bound of WRT delay resulted from the activity time variation (ATV) is presented, with which one can check if a given schedule is feasible. Finally, illustrative examples are given to demonstrate the application of the derived method.
- **Distributing Sequential Control for Manufacturing Automation Systems**
  Authors: Zivana Jakovljevic ; Vuk Lesi ; Stefan Mitrovic ; Miroslav Pajic
  Abstract: Recent trends in manufacturing require the use of reconfigurable equipment that facilitates rapid and cost-effective change of functionality through modular design, which supports fast integration. Intelligent devices (e.g., sensors, actuators) with integrated computation and communication capabilities enable high-level modularity, not only with the respect to hardware components but also in terms of control functionality; this can be achieved by distributing control to different network-connected devices. Thus, to enable fast and reliable system reconfigurations, in this brief, we introduce a method for distribution of control tasks and generation of control code for the devices in the control network. Our approach is based on the control interpreted Petri nets (CIPNs) formalism. We start from a CIPN capturing the centralized (overall) control system, and the mapping of input and output signals to local controllers (LCs) (i.e., smart devices) that have direct physical access to system sensors and actuators. From these, our method automatically designs distributed control tasks for LCs in the network, as well as generates control code for each LC. The applicability of the proposed method is experimentally verified on two real-world case studies.

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1.5. IEEE Transactions on Systems, Man, and Cybernetics: Systems

Volume: 50, Issue: 8, August 2020

- **An Evaluation Framework for Comparative Analysis of Generalized Stochastic Petri Net Simulation Techniques**
  Authors: Ricardo J. Rodriguez ; Simona Bernardi ; Armins Zimmermann
  Abstract: Availability of a common, shared benchmark to provide repeatable, quantifiable, and comparable results is an added value for any scientific community. International consortia provide benchmarks in a wide range of domains, being normally used by industry, vendors, and researchers for evaluating their software products. In this regard, a benchmark of untimed Petri net models was developed to be used in a yearly software competition driven by the Petri net community. However, to the best of our knowledge there is not a similar benchmark to evaluate solution techniques for Petri nets with timing extensions. In this paper, we propose an evaluation framework for the comparative analysis of generalized stochastic Petri nets (GSPNs) simulation techniques. Although we focus on simulation techniques, our framework provides a baseline for a comparative analysis of different GSPN solvers (e.g., simulators, numerical solvers, or other techniques). The evaluation framework encompasses a set of 50 GSPN models including test cases and case studies from the literature, and a set of evaluation guidelines for the comparative analysis. In order to show the applicability of the proposed framework, we carry out a comparative analysis of steady-state simulators implemented in three academic software tools, namely, GreatSPN, PeabraiN, and TimeNET.

The results allow us to validate the trustfulness of these academic software tools, as well as to point out potential problems and algorithmic optimization opportunities.

- **Refinement-Based Hierarchical Modeling and Correctness Verification of Cross-Organization Collaborative Emergency Response Processes**
  Authors: Hua Duan ; Cong Liu ; Qingtian Zeng ; Mengchu Zhou
  Abstract: When an emergency occurs, one of the important challenges is how to form an effective and timely response. An emergency disposal plan is usually organized as a series of emergency response processes manipulated by one emergency command center and several subordinate emergency organizations. Moreover, these subordinate organizations are usually geographically dispersed and need to collaborate with each other. In this case, designing and verifying such cross-organizational collaborative emergency response processes are complicated and time-consuming. To address this problem, we propose a hierarchical modeling and correctness verification approach. A general framework for hierarchical modeling and correctness verification of such processes is first introduced. Then, a top-level model and two kinds of bottom-level models (complex and simple bottom-level ones) are proposed to model such processes and collaboration patterns from different abstraction levels. Next, Petri net refinement operation is adopted to refine the top-level model by using its corresponding bottom-level models to obtain the refined model. Finally, the correctness of the refined model is verified based on reachability graph. A typical running case of cross-organization collaborative fire emergency response processes is given to validate our proposed method.

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1.6. IEEE/CAA Journal of Automatica Sinica

Volume: 7 July 2020

- **Approximate dynamic programming for stochastic resource allocation problems**
  Authors: Ali Forootani ; Raffaele Iervolino ; Massimo Tipaldi ; Joshua Neilson
  Abstract: A stochastic resource allocation model, based on the principles of Markov decision processes (MDPs) , is proposed in this paper. In particular, a general-purpose framework is developed, which takes into account resource requests for both instant and future needs. The considered framework can handle two types of reservations (i.e., specified and unspecified time interval reservation requests) , and implement an overbooking business strategy to further increase business revenues. The resulting dynamic pricing problems can be regarded as sequential decision-making problems under uncertainty, which is solved by means of stochastic dynamic programming (DP) based algorithms. In this regard, Bellman's backward principle of optimality is exploited in order to provide all the implementation mechanisms for the proposed reservation pricing algorithm. The curse of dimensionality, as the inevitable issue of the DP both for instant resource requests and future resource reservations, occurs. In particular, an approximate dynamic programming (ADP) technique based on linear function approximations is applied to solve such scalability issues. Several examples are provided to show the effectiveness of the proposed approach.
- **Solving multitrip pickup and delivery problem with time windows and manpower planning using multiobjective algorithms**
  Authors: Jiahai Wang ; Yuyan Sun ; Zizhen Zhang ; Shangce Gao
  Abstract: The multitrip pickup and delivery problem with time windows and manpower planning (MTPDPTW-MP) determines a set of ambulance routes and finds staff assignment for a hospital. It involves different stakeholders with diverse interests and objectives. This study firstly introduces a multiobjective MTPDPTW-MP (MO-MTPDPTWMP) with three objectives to better describe the real-world scenario. A multiobjective iterated local search algorithm with adaptive neighborhood selection (MOILS-ANS) is proposed to solve the problem. MOILS-ANS can generate a diverse set of alternative solutions for decision makers to meet their requirements. To better explore the search space, problem-specific neighborhood structures and an adaptive neighborhood selection strategy are carefully designed in MOILS-ANS. Experimental results show that the proposed MOILS-ANS significantly outperforms the other two multiobjective algorithms. Besides, the nature of objective functions and the properties of the problem are analyzed. Finally, the proposed MOILS-ANS is

compared with the previous single-objective algorithm and the benefits of multiobjective optimization are discussed.

- **AI-Based Modeling and Data-Driven Evaluation for Smart Manufacturing Processes**
  Authors: Mohammadhossein Ghahramani; Yan Qiao; MengChu Zhou; Adrian O'Hagan; James Sweeney
  Abstract: Smart manufacturing refers to optimization techniques that are implemented in production operations by utilizing advanced analytics approaches. With the widespread increase in deploying industrial internet of things (IIOT) sensors in manufacturing processes, there is a progressive need for optimal and effective approaches to data management. Embracing machine learning and artificial intelligence to take advantage of manufacturing data can lead to efficient and intelligent automation. In this paper, we conduct a comprehensive analysis based on evolutionary computing and neural network algorithms toward making semiconductor manufacturing smart. We propose a dynamic algorithm for gaining useful insights about semiconductor manufacturing processes and to address various challenges. We elaborate on the utilization of a genetic algorithm and neural network to propose an intelligent feature selection algorithm. Our objective is to provide an advanced solution for controlling manufacturing processes and to gain perspective on various dimensions that enable manufacturers to access effective predictive technologies.

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2 Conferences

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

2.1 **2020 International Workshop on Discrete Event Systems**
Rio de Janeiro, Brazil, 2020 (Postponed)
https://wodes2020.eventos.ufrj.br https://codit2020.com

2.2 **2020 IEEE International Conference on Control & Automation**
Sapporo, Hokkaido, Japan, July 6-9, 2020 (Postponed)
http://www.ieee-icca.org

2.3 **2020 IEEE Conference on Automation Science and Engineering**
Hong Kong, China, August 20-24, 2020 (Virtual)
https://www.imse.hku.hk/case2020

2.4 **2020 IEEE Conference on Control Technology and Applications**
Montréal, Canada, August 24-26, 2020 (Virtual)
https://ccta2020.ieeecss.org

2.5 **2020 IEEE Conference on Decision and Control**
Jeju Island, Republic of Korea, December 8-11, 2020 (Virtual)
https://cdc2020.ieeecss.org

2.6 **2021 Mediterranean Conference on Control and Automation**
Specchiolla (Carovigno), Brindisi, Italy, June 22-25, 2021.
http://med2021.poliba.it/

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3 Books

3.1 **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

3.2 **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

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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.

Important Submission Dates (tentative):

- Open: October 1, 2020
- Due: December 31, 2020

Manuscript should be submitted to https://ees.elsevier.com/nahs

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
- Due: December 15, 2020

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.

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