IEEE Control Systems Society
Technical Committee on Discrete Event Systems

Newsletter **January 2025**

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Welcome to the 2025 January issue of the newsletter, also available online at
https://ieeecss.org/tc/discrete-event-systems/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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Contents

1 Selections of Journal Publications

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

1.1. Discrete Event Dynamic Systems Theory and Applications

Volume: 34, Issue: 4, December 2024

- **Reliable decentralized failure diagnosis of discrete event systems using single-level inference**
  Authors: Takumi Hamada ; Shigemasa Takai
  Abstract: We consider a reliable decentralized diagnosis problem for discrete event systems in the inference-based framework. This problem requires us to synthesize local diagnosers such that the occurrence of any failure string is correctly detected within a finite number of steps, even if local diagnosis decisions of some local diagnosers are not available. In the case of single-level inference, we introduce a notion of reliable 1-inference-diagnosability and show that reliable 1-inference-diagnosability is a necessary and sufficient condition for the existence of a solution to the reliable decentralized diagnosis problem. Then, we show how to verify reliable 1-inference-diagnosability effectively. When the system to be diagnosed is reliably 1-inference-diagnosable, we compute the delay bound within which the occurrence of any failure string can be detected. Local diagnosers can be constructed using the computed delay bound.

- **Automatic detection of Android crypto ransomware using supervisor reduction**
  Authors: Christopher Jun Wen Chew ; Robi Malik ; Vimal Kumar ; Panos Patros
  Abstract: This paper proposes a finite-state machine based approach to recognise crypto ransomware based on their behaviour. Malicious and benign Android applications are executed to capture the system calls they generate, which are then filtered and tokenised and converted to finite-state machines. The finite-state machines are simplified using supervisor reduction, which generalises the behavioural patterns and produces compact classification models. The classification models can be implemented in a lightweight monitoring system to detect malicious behaviour of running applications quickly. An extensive set of cross validation experiments is carried out to demonstrate the viability of the approach, which show that ransomware can be classified accurately with an F1 score of up to 93.8%.

- **Tracking dynamic deadlines in switched max-plus linear systems with uncontrollable workloads**
  Authors: Roohallah Azarmi ; Mohsen Alirezaei ; Dip Goswami ; Twan Basten
  Abstract: Modern safety-critical cyber-physical systems such as medical imaging equipment or autonomous vehicles need to respect strict deadlines on received data-processing workloads. These deadlines and workloads are dynamic and uncontrollable and the systems typically have only a limited discrete number of system configurations to respond to dynamic changes. The number and types of processors allocated to a data-processing task, their operating voltage and frequency, and the resolution and frequency of sensing (e.g., images) are examples of controllable configuration parameters. Guaranteeing dynamically changing deadlines under uncontrollable workloads with a limited discrete number of response options can be phrased as a multi-objective tracking problem for a switched max-plus linear system. This results in a combined scheduling and control problem. We propose an integrated state-feedback and model-predictive control solution that minimizes the number of deadline misses and the cost of implementation (e.g., energy consumption). We demonstrate the effectiveness of our approach through simulation.

- **Offline supervisory control synthesis: taxonomy and recent developments**
  Authors: Wan Fokkink ; Martijn Goorden
  Abstract: This paper surveys recent advances in supervisory control theory since its 30^{th} anniversary in 2017. We performed a systematic literature search and selected 272 relevant papers, with a focus on automata-based approaches. These were fitted into coherent narratives, based in part on a taxonomy of supervisor synthesis methods. The obtained papers show the fast and vast progress of the field, where recent research covers a wide range of new synthesis optimization techniques, different aspects such as fault tolerance, security, and timing, and new and diverse application do-

mains. This survey refrains from in-depth descriptions of techniques, instead focusing on high-level contributions of recent works, how they relate to each other, and future directions for research.

- **Discrete-time hybrid control with risk-sensitive discounted costs**
  Authors: Rubén Blancas-Rivera ; Héctor Jasso-Fuentes
  Abstract: This paper studies discrete-time hybrid control problems where the controller's payoff function follows a risk-sensitive discounted model. The associated discount factor can depend on state and action variables, which can even take values of zero or one. We prove the existence of optimal control policies under two different hypotheses. The following technique is the dynamic programming method, where we characterize the minimum cost as the solution of the so-called dynamic programming equations and find the above optimal policies through these equations. We illustrate our theory with practical examples involving inventory-manufacturing systems, and pollution management.
- **Reducing the computational effort of symbolic supervisor synthesis**
  Authors: Sander Thuijsman ; Dennis Hendriks ; Michel Reniers
  Abstract: Supervisor synthesis is a means to algorithmically derive a supervisory controller from a discrete-event model of a system and a requirements specification. For large systems, synthesis suffers from state space explosion. To mitigate this, synthesis can be applied to a symbolic representation of the models by using Binary Decision Diagrams (BDDs). Peak used BDD nodes and BDD operation count are introduced as deterministic and platform independent metrics to express the computational effort of a symbolic synthesis. These BDD-based metrics are useful to analyze the efficiency of the synthesis algorithm. From this analysis, modifications can be made to how BDDs are handled during synthesis, improving synthesis efficiency. We demonstrate this approach by introducing and analyzing: DCSH, a variable ordering heuristic; several edge ordering heuristics; and an approach to efficiently enforce state exclusion requirements in synthesis. These methods were recently implemented in our open source supervisory control tool: Eclipse ESCET. The analysis is based on large scale experiments of performing synthesis on a variety of models from literature. We show that: (1) by using DCSH, synthesis with high computational effort can be avoided, and generally low computational effort is required, relative to the variable ordering heuristics that were used prior to this work; (2) applying reverse-model edge order realizes relatively low synthesis effort; and (3) state exclusion requirements can efficiently be enforced by restricting edge guards prior to synthesis. While these methods reduce computational effort in practice, it should be noted that they do not affect the theoretical (worst-case) complexity of synthesis.

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1.2. IEEE Transactions on Automatic Control

Volume: 70, Issue: 1, January 2025

- **Opacity Versus Security in Linear Dynamical Systems**
  Authors: Varkey M. John ; Vaibhav Katewa
  Abstract: Opacity is a notion of privacy that is well studied in computer science and discrete-event systems. It describes an eavesdropper's inability to infer a system's "secret" states by observing the system's outputs. In this article, we consider opacity in linear dynamical systems and study four opacity classes—initial-state, current-state, K-step and infinite-step opacity, and show that they are fundamentally connected to two subspaces of the linear system—the weakly unobservable subspace and the weakly unconstructible subspace. With these subspaces, we derive conditions for the opacity of secret states under constrained and unconstrained state and input sets. Further, we establish that a tradeoff exists between opacity and security in the system. We show this in two ways: 1) We prove that an opaque system always permits undetectable attacks. 2) We show that expanding the set of opaque states in the system expands the set of undetectable attacks. Our work provides the necessary mathematical foundation for system designers to build opaque systems, while ensuring adequate security.
- **Verification of State-Based Timed Opacity for Constant-Time Labeled Automata**
  Authors: Jun Li ; Dimitri Lefebvre ; Christoforos N. Hadjicostis ; Zhiwu Li

Abstract: This article proposes and verifies two types of state-based timed opacity notions for constant-time labeled automata (a class of timed models with partially observable transitions), called $[T_l, T_u]$-opacity and $[T_l, +\infty)$-opacity . A system is said to be $[T_l, T_u]$-opaque (respectively, $[T_l, +\infty)$-opaque) if no timed observation can lead to the exposure of specified states (called secret states) within a finite time window (respectively, an infinite time window) starting at the time instant T_l . Based on the design principle of a timed observer developed in our previous work, we show that the timed observer of a system can be used to estimate the set of states in which the system may stay within certain (finite or infinite) time windows. The key of this approach is to determine whether a given time value is a possible elapsed time value from one observer state to another according to the structural information of the timed observer. From this methodology, we present two algorithms to verify the proposed opacity notions. The complexities of the algorithms are $O(2^{|X|})$ and $O(2^{3\cdot|X|})$, respectively, and the complexity of the structural analysis of the observer is $O((|Q|+2)\cdot 2^{2\cdot|X|})$, where $|X|$ and $|Q|$ are the numbers of states and labels in a plant.

- **Optimal Control of Logically Constrained Partially Observable and Multiagent Markov Decision Processes**
  Authors: Krishna C. Kalagarla ; Dhruva Kartik ; Dongming Shen ; Rahul Jain ; Ashutosh Nayyar ; Pierluigi Nuzzo
  Abstract: Autonomous systems often have logical constraints arising, for example, from safety, operational, or regulatory requirements. Such constraints can be expressed using temporal logic specifications. The system state is often partially observable. Moreover, it could encompass a team of multiple agents with a common objective but disparate information structures and constraints. In this article, we first introduce an optimal control theory for partially observable Markov decision processes with finite linear temporal logic constraints. We provide a structured methodology for synthesizing policies that maximize a cumulative reward while ensuring that the probability of satisfying a temporal logic constraint is sufficiently high. Our approach comes with guarantees on approximate reward optimality and constraint satisfaction. We then build on this approach to design an optimal control framework for logically constrained multiagent settings with information asymmetry. We illustrate the effectiveness of our approach by implementing it on several case studies.

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1.3. Automatica

Volume: 171, January 2025

- **Tamper-tolerant diagnosability analysis and tampering detectability in discrete event systems under cost constraints**
  Authors: Yuting Li ; Christoforos N. Hadjicostis ; Naiqi Wu ; Zhiwu Li
  Abstract: This paper addresses fault diagnosis and tampering detection in discrete event systems modeled with nondeterministic finite automata under malicious attacks. We propose a novel structure to simultaneously track the occurrence of fault events and tampering actions in systems compromised by attacks (i.e., by arbitrary deletions, insertions, or substitutions of observed symbols). Assuming that each deletion, insertion, or substitution bears a positive cost to the attacker, two scenarios are taken into account: (1) a bounded number of attacks or, more generally, a total cost constraint on tampering actions, and (2) an unbounded number of attacks or, more generally, no constraints on the total cost of tampering actions. Several examples are presented to demonstrate the influence of cost constraints on tamper-tolerant diagnosis and tampering detection. A state isolation technique is developed to deal with the fault and/or tampering action detection problem via an external observer that aims to isolate the estimated states within a certain subset of states based on a given sequence of observations. We also report a technique of polynomial complexity for verifying tamper-tolerant diagnosability and tampering detectability.
- **Control of max-plus linear systems using feedback cycle shaping**
  Authors: Vinicius Mariano Gonçalves ; Prashanth Krishnamurthy ; Anthony Tzes ; Farshad Khorrami
  Abstract: For “Timed Event Graphs", linear equations can be written in the max-plus algebra that describe the firing dynamics. In some cases, independent events/inputs can be used to influence

the system dynamics in order to achieve a desired specification. In this setting, significant attention has been devoted to the mathematical development of controllers that achieve these desired specifications. In this article, a methodology is provided for solving a max-plus linear control problem as an extension of the result in Gonçalves et al. (2017). A condition is provided that induces into the system a periodic behavior in steady state and also shapes the response to comply with the specifications. Furthermore, the controller's causality is addressed.

- **On the set-estimation of uncertain Max-Plus Linear systems**
  Authors: Guilherme Espindola-Winck ; Laurent Hardouin ; Mehdi Lhommeau
  Abstract: The paper focuses on the set-estimation for uncertain Max-Plus Linear systems, with bounded random parameters. This estimation process involves determining the conditional reach set, which is a compact set of all possible states that can be reached from a previous set through the transition model (dynamics) and can lead to the observed measurements through the observation model. In the context of Bayesian estimation theory, this set represents the support of the posterior probability density function of the system's state. We compare two approaches, a disjunctive approach, presented in literature, and a concise approach, presented as a contribution of this paper, to exactly compute this set. Even if both approaches are with an exponential theoretical complexity, it is shown that the concise approach is more efficient.

- **Polynomial logical zonotope: A set representation for reachability analysis of logical systems**
  Authors: Amr Alanwar ; Frank J. Jiang ; Karl H. Johansson
  Abstract: In this paper, we introduce a set representation called polynomial logical zonotopes for performing exact and computationally efficient reachability analysis on logical systems. We prove that through this polynomial-like construction, we are able to perform all of the fundamental logical operations (XOR, NOT, XNOR, AND, NAND, OR, NOR) between sets of points exactly in a reduced space, i.e., generator space with reduced complexity. Polynomial logical zonotopes are a generalization of logical zonotopes, which are able to represent up to 2^γ binary vectors using only γ generators. Due to their construction, logical zonotopes are only able to support exact computations of some logical operations (XOR, NOT, XNOR), while other operations (AND, NAND, OR, NOR) result in over-approximations in the generator space. In order to perform all fundamental logical operations exactly, we formulate a generalization of logical zonotopes that is constructed by dependent generators and exponent matrices. While we are able to perform all of the logical operations exactly, this comes with a slight increase in computational complexity compared to logical zonotopes. To illustrate and showcase the computational benefits of polynomial logical zonotopes, we present the results of performing reachability analysis on two use cases: (1) safety verification of an intersection crossing protocol and (2) reachability analysis on a high-dimensional Boolean function. Moreover, to highlight the extensibility of logical zonotopes, we include an additional use case where we perform a computationally tractable exhaustive search for the key of a linear feedback shift register.

- **Set-based value operators for non-stationary and uncertain Markov decision processes**
  Authors: Sarah H.Q. Li ; Assalé Adjé ; Pierre-Loïc Garoche ; Behçet Açıkmeşe
  Abstract: This paper analyzes finite-state Markov Decision Processes (MDPs) with nonstationary and uncertain parameters via set-based fixed point theory. Given compact parameter ambiguity sets, we demonstrate that a family of contraction operators, including the Bellman operator and the policy evaluation operator, can be extended to set-based contraction operators with a unique fixed point—a compact value function set. For non-stationary MDPs, we show that while the value function trajectory diverges, its Hausdorff distance from this fixed point converges to zero. In parameter uncertain MDPs, the fixed point's extremum value functions are equivalent to the min–max value function in robust dynamic programming under the rectangularity condition. Furthermore, we show that the rectangularity condition is a sufficient condition for the fixed point to contain its own extremum value functions. Finally, we derive novel guarantees for probabilistic path planning in capricious wind fields and stratospheric station-keeping.

- **Randomized greedy methods for weak submodular sensor selection with robustness considerations**

Authors: Ege Can Kaya ; Michael Hibbard ; Takashi Tanaka ; Ufuk Topcu ; Abolfazl Hashemi
Abstract: We study a pair of budget- and performance-constrained weak submodular maximization problems. For computational efficiency, we explore the use of stochastic greedy algorithms which limit the search space via random sampling instead of the standard greedy procedure which explores the entire feasible search space. We propose a pair of stochastic greedy algorithms, namely, Modified Randomized Greedy (MRG) and Dual Randomized Greedy (DRG) to approximately solve the budget- and performance-constrained problems, respectively. For both algorithms, we derive approximation guarantees that hold with high probability. We then examine the use of DRG in robust optimization problems wherein the objective is to maximize the worst-case of a number of weak submodular objectives and propose the Randomized Weak Submodular Saturation Algorithm (Random-WSSA). We further derive a high-probability guarantee for when Random-WSSA successfully constructs a robust solution. Finally, we showcase the effectiveness of these algorithms in a variety of relevant uses within the context of Earth-observing LEO constellations which estimate atmospheric weather conditions and provide Earth coverage.

- **Corrigendum to "Assessment of initial-state-opacity in live and bounded labeled Petri net systems via optimization techniques" [Automatica 152 (2023) 110911]**
Authors: Francesco Basile ; Gianmaria De Tommasi ; Carlo Motta

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1.4. IEEE Control Systems Letter

Volume: 8, Issue: 12, December 2024

- **Fitted Q-Iteration via Max-Plus-Linear Approximation**
Authors: Yichen Liu ; Mohamad Amin Sharifi Kolarijani
Abstract: In this letter, we consider the application of max-plus-linear approximators for Q-function in offline reinforcement learning of discounted Markov decision processes. In particular, we incorporate these approximators to propose novel fitted Q-iteration (FQI) algorithms with provable convergence. Exploiting the compatibility of the Bellman operator with max-plus operations, we show that the max-plus-linear regression within each iteration of the proposed FQI algorithm reduces to simple max-plus matrix-vector multiplications. We also consider the variational implementation of the proposed algorithm which leads to a per-iteration complexity that is independent of the number of samples.
- **Safety Verification of Discrete-Time Systems via Interpolation-Inspired Barrier Certificates**
Authors: Mohammed Adib Oumer ; Vishnu Murali ; Ashutosh Trivedi ; Majid Zamani
Abstract: Barrier certificates provide an effective automated approach to verifying the safety of dynamical systems. A barrier certificate is a real-valued function over states of the system whose zero level set separates the unsafe region from all possible trajectories starting from a given set of initial states. Typically, the system dynamics must be nonincreasing in the value of the barrier certificate with each transition. Thus, the states of the system that are nonpositive with respect to the barrier certificate act as an over-approximation of the reachable states. The search for such certificates is typically automated by first fixing a template of functions and then using optimization and satisfiability modulo theory (SMT) solvers to find them. Unfortunately, it may not be possible to find a single function in this fixed template. To tackle this challenge, we propose the notion of interpolation-inspired barrier certificate. Instead of a single function, an interpolation-inspired barrier certificate consists of a set of functions such that the union of their sublevel sets over-approximate the reachable set of states. We show how one may find interpolation-inspired barrier certificates of a fixed template, even when we fail to find standard barrier certificates of the same template. We present sum-of-squares (SOS) programming as a computational method to find this set of functions and demonstrate effectiveness of this method over a case study.
- **Optimal Risk-Sensitive Scheduling Policies for Remote Estimation of Autoregressive Markov Processes**
Authors: Manali Dutta ; Rahul Singh

Abstract: We consider a remote estimation setup, where data packets containing sensor observations are transmitted over a Gilbert-Elliot channel to a remote estimator, and design scheduling policies that minimize a risk-sensitive cost, which is equal to the expected value of the exponential of the cumulative cost incurred during a finite horizon, that is the sum of the cumulative transmission power consumed, and the cumulative squared estimation error. More specifically, consider a sensor that observes a discrete-time autoregressive Markov process, and at each time decides whether or not to transmit its observations to a remote estimator using an unreliable wireless communication channel after encoding these observations into data packets. Modeling the communication channel as a Gilbert-Elliot channel allows us to take into account the temporal correlations in its fading. We pose this dynamic optimization problem as a Markov decision process (MDP), and show that there exists an optimal policy that has a threshold structure, i.e., at each time t it transmits only when the current channel state is good, and the magnitude of the current "error" exceeds a certain threshold.

- **Signal Temporal Logic Planning With Time-Varying Robustness**
  Authors: Yating Yuan ; Thanin Quartz ; Jun Liu
  Abstract: This letter aims to generate a continuous-time trajectory consisting of piecewise Bézier curves that satisfy signal temporal logic (STL) specifications with piecewise time-varying robustness. The time-varying robustness is less conservative than the real-valued robustness, which enables more effective tracking in practical applications. Specifically, continuous-time trajectories account for dynamic feasibility, leading to smaller tracking errors and ensuring that the STL specifications can be met by the tracking trajectory. Comparative experiments demonstrate the efficiency and effectiveness of the proposed approach. The implementation is available at https://github.com/ViviaY/TimeVaryingBound_STL.

- **Decomposition-Based Chance-Constrained Control for Timed Reach-Avoid Tasks**
  Authors: Li Tan ; Wei Ren ; Junlin Xiong
  Abstract: This letter addresses the control problem of mobile robots with random noises under timed reach-avoid (TRA) tasks. TRA tasks are expressed as signal temporal logic (STL) formulas, and an optimization problem (OP) is formulated such that the chance constraint (CC) is embedded. To deal with the OP in the continuous-time setting, a local-to-global control strategy is proposed. We first decompose the STL formula into a finite number of local ones, and then decompose and convert the CC into deterministic constraints such that a finite number of local OPs are established and solved efficiently. The feasibility of all the local OPs implies the feasibility of the original OP, which results in a control strategy for the task accomplishment. The proposed strategy is further extended to the multi-robot case. Finally, numerical examples and comparisons are presented to illustrate the efficacy of the proposed control strategy.

- **Model Predictive Control for Systems With Partially Unknown Dynamics Under Signal Temporal Logic Specifications**
  Authors: Zhao Feng Dai ; Yash Vardhan Pant ; Stephen L. Smith
  Abstract: In this letter, we design a model predictive controller (MPC) for systems to satisfy Signal Temporal Logic (STL) specifications when the system dynamics are partially unknown, and only a nominal model and past runtime data are available. Our approach uses Gaussian process regression to learn a stochastic, data-driven model of the unknown dynamics, and manages uncertainty in the STL specification resulting from the stochastic model using Probabilistic Signal Temporal Logic (PrSTL). The learned model and PrSTL specification are then used to formulate a chance-constrained MPC. For systems with high control rates, we discuss a modification for improving the solution speed of the control optimization. In simulation case studies, our controller increases the frequency of satisfying the STL specification compared to controllers that use only the nominal dynamics model.

- **Safety Verification of Stochastic Systems: A Set-Erosion Approach**
  Authors: Zishun Liu ; Saber Jafarpour ; Yongxin Chen
  Abstract: We study the safety verification problem for discrete-time stochastic systems. We propose an approach for safety verification termed set-erosion strategy that verifies the safety of a stochastic system on a safe set through the safety of its associated deterministic system on an

eroded subset. The amount of erosion is captured by the probabilistic bound on the distance between stochastic trajectories and their associated deterministic counterpart. Building on recent development of stochastic analysis, we establish a sharp probabilistic bound on this distance. Combining this bound with the set-erosion strategy, we establish a general framework for the safety verification of stochastic systems. Our method is versatile and can work effectively with any deterministic safety verification techniques. We exemplify our method by incorporating barrier functions designed for deterministic safety verification, obtaining barrier certificates much tighter than existing results. Numerical experiments are conducted to demonstrate the efficacy and superiority of our method.

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1.5. International Journal of Control

Volume: 98, Issue: 1, January 2025

- **Bisimulations of nonlinear feedback shift registers**

  Authors: Zhe Gao ; Jun-e Feng

  Abstract: This work investigates how to reduce nonlinear feedback shift registers (NFSRs) in combination with bisimulation method via semi-tensor product (STP). By considering a large-scale NFSR as a smaller-scale Boolean system utilising bisimulation relations, the computing complexity of the system can be decreased. On the one hand, the properties of the bisimulation relation between two different NFSRs are examined, while on the other hand, a necessary and sufficient condition is discovered, as well as a reduction strategy utilising bisimulation. Besides, it is talked about how NFSR properties spread throughout the reduction process. The nonsingularity, driven stability and other aspects of the original NFSR are confirmed to be preserved by the reduced Boolean system.

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2 Call for Participants

2.1 Invited Session at CCTA'25–Current Advances of Discrete Event System Applications

Dear Colleagues,

We are considering to propose a special session for CCTA 2025 (https://ccta2025.ieeecss.org) organized in San Diego, CA, USA, August 25-27.

The objective of the special session is to present the current advances of discrete event system (DES) applications from a control perspective with emphasis on methods and/or software tools enabling efficient handling of real-sized systems. We welcome contributions that demonstrate the impact of DES control on any aspects of (engineering) practice. Applications including manufacturing systems, transportation systems, logistic systems, power production, distributed systems, health-related topics are welcome, but contributions in any field where a discrete-event based problem formulation can play a crucial role and has a significant impact on real world are solicited.

Deadline for submission of invited papers is now February 24, 2025. If you can contribute to this special session, please inform me (fbasile@unisa.it) or (cai@omu.ac.jp) as soon as possible. I would like to receive tentative title and tentative list of authors. Your cooperation is highly appreciated.

Forwarding this message to potentially interested colleagues is also appreciated.

Organizers
1. Francesco Basile (Università di Salerno, Italy)
2. Kai Cai (Osaka Metropolitan University, Japan)

Best regards,
Francesco Basile

3 Conferences

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

2.1 **2025 ACM International Conference on Hybrid Systems: Computation and Control (HSCC)**
Irvine, California, USA, May 6-9, 2025.
https://hscc.acm.org/2025/

2.2 **2025 IEEE International Conference on Robotics and Automation (ICRA)**
Atlanta, USA, May 19-23, 2025.
https://2025.ieee-icra.org/

2.3 **2025 Annual Learning for Dynamics & Control Conference (L4DC)**
Ann Arbor, Michigan, USA, June 4-6, 2025.
https://sites.google.com/umich.edu/l4dc2025/

2.4 **2025 IFAC Workshop on Smart Energy Systems for Efficient and Sustainable Smart Grids and Smart Cities (SENSYS 2025)**
Bari, Italy, June 18-20, 2025.
https://conferences.ifac-control.org/sensys2025/

2.5 **2025 European Control Conference (ECC)**
Thessaloniki, Greece, June 24-27, 2025.
https://ecc25.euca-ecc.org/

2.6 **2025 American Control Conference (ACC)**
Denver, Colorado, USA, July 8-10, 2025.
https://acc2025.a2c2.org/

2.7 **2025 International Conference on Automation Science and Engineering (CASE)**
Los Angeles, California, USA, August 17-21, 2025.
https://2025.ieeecase.org/

2.8 **2025 IEEE Conference on Control Technology and Applications (CCTA)**
San Diego, California, USA, August 25-27, 2025.
https://ccta2025.ieeecss.org/

2.9 **2025 IEEE International Conference on Emerging Technologies and Factory Automation (ETFA)**
Porto, Portugal, September 9-12, 2025.
https://etfa2025.ieee-ies.org/

2.10 **2025 International Conference on Systems, Man, and Cybernetics (SMC)**
Vienna, Austria, October 5-8, 2025.
https://www.ieeesmc2025.org/

2.11 **2025 IEEE Conference on Decision and Control (CDC)**
Rio de Janeiro, Brazil December 9-12, 2025.
https://cdc2025.ieeecss.org/

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4 Books

4.1 Invitation to Supervisory Control of Discrete-Event Systems with Hands-On Python Software Tool

Author: Kai Cai, Osaka Metropolitan University.

Publish Information: Kindle Direct Publishing, 2024, ISBN: 9798373331449

Book website:
https://www.caikai.org/invitation-scdes

About the book:
This book is for anyone who is interested in getting a quick start with the supervisory control theory of discrete-event systems. A companion software package PyTCT (python-based TCT) is available for the reader to get hands-on experience with the theory.
Your feedback comments on how the book materials may be improved are highly appreciated and please send them to: cai@omu.ac.jp

4.2 Cybersecurity of Discrete Event Systems—From Smart Attacks to Resilient Defence

Author: Rong Su, Nanyang Technological University.

Description: This book describes analysis and control against smart cyberattacks in discrete event systems (DES), modelled by regular languages or finite-state automata. "Smart attacks" cannot be detected by the supervisor until an irreversible process towards ensured damage occurs. An attack may be conducted either in the observation channel (i.e., the input of the supervisor) or in the command channel (i.e., the output of the supervisor), or both simultaneously. Therefore, defense strategies against these attacks are urgently needed. This book provides an overview of the latest theories and includes empirical examples to illustrate concepts and methods. By centering on what information is available and how such information is used, the readers are provided with methods to evaluate the cyber vulnerability of a given system and to design a resilient supervisor against relevant smart attacks. By focusing on a conceptual introduction and systematic analysis, this book provides a solid theoretical foundation for future exploration by researchers and graduate students who are interested in cybersecurity research, not necessarily limited to those in the DES community. Readers are recommended to have a background in formal language theory.

Additional information on the book can be found at
https://www.routledge.com/Cybersecurity-of-Discrete-Event-Systems-From-Smart-Attacks-to-Resilient
Su/p/book/9781032368108?srsltid=AfmBOor9fqjhOR7YfMgGE8coz0rHXF6YyKhoucc7UzqYlY9GhcWpQBg3,
where an inspection copy is possible for educational institutions.

4.3 Graph-Theoretical Methods in Systems Theory and Control

Author: Jan Lunze, Ruhr-University, Germany

Description: The book describes for numerous scenarios how to use the structural properties of a system represented by a graph to simplify modelling, analysis, and design tasks. For example, block diagrams and coupling graphs can be used to decompose systems, automata graphs to analyse discrete-event systems and Markov chains, structure graphs to find generic properties of linear systems or communication graphs to design networked control systems. The book includes many examples derived from diverse fields of application, exercises with solutions and MATLAB scripts to implement graph-theoretical methods for systems analysis.

Additional information on the book can be found at
www.editionmora.de/gmsc

The book is produced as "print-on-demand" and can be ordered directly at the printer:
https://publish.bookmundo.de/books/349971

4.4 Safe Autonomy with Control Barrier Functions: Theory and Applications

Authors: Wei Xiao, Christos G. Cassandras, and Calin Belta

Description: The book presents the concept of Control Barrier Function (CBF), which captures the evolution of safety requirements during the execution of a system and can be used to enforce safety. Safety is central to autonomous systems since they are intended to operate with minimal or no human supervision. The book includes both theoretical and application perspectives on how safety can be guaranteed. It explains how the CBF approach is computationally efficient and can easily deal with nonlinear models and complex constraints used in a wide spectrum of applications, including autonomous driving, robotics, and traffic control. Safety guarantees can be integrated into the operation of such autonomous systems, including typical safety requirements that involve collision avoidance, technological system limitations, and bounds on real-time executions. Adaptive and event-driven approaches for safety are also discussed for time-varying execution bounds and noisy dynamics, as well as for systems with unknown dynamics.

Additional information on the book can be found at
https://link.springer.com/book/10.1007/978-3-031-27576-0
where an eBook version can also be downloaded (free for some educational institutions).

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5 Software Tools

5.1 Eclipse ESCET™ version 6.0 release

The Eclipse Supervisory Control Engineering Toolkit (Eclipse ESCET) project provides a model-based approach and toolkit for the development of supervisory controllers. It includes the languages CIF, Chi and ToolDef. ESCET, initially developed by Eindhoven University of Technology, is since January 2020 an Eclipse Foundation open-source project. More information can be found on the toolkit's website at https://www.eclipse.dev/escet/.

In December 2024, ESCET version 6.0 has been released and can be downloaded from https://www.eclipse.dev/escet/download.html. he main changes in this version are

- The CIF PLC code generator that was previously labeled as the 'experimental' version is now the 'stable' version. Support for some targets is still experimental. The CIF PLC code generator that was previously labeled as the 'stable' version is now the 'deprecated' version. Furthermore, the now 'stable' version includes several bug fixes and improvements.
- The performance of data-based synthesis as well as the bounded response, confluence and non-blocking under control checks may have slightly improved due to fixing a BDD variable leak in computing edge support variable sets. Furthermore, the printed output of several checks have been improved.
- A new Convert to interface transformation is now available that converts a CIF specification to its interface. It comes in two flavors: one to generate a full interface and one to generate a reduced interface.
- Several improvements to the HTML code generator. Furthermore, the generator generates now by default HTML code and not Simulink code.

The full ESCET release notes, including links to the language specific release notes and release notes from previous versions, are available from https://www.eclipse.dev/escet/release-notes.html.

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