

Technical Committee on Intelligent Control

Established in 1985, the IEEE Control Systems Society (CSS) Technical Committee on Intelligent Control (TCIC) now has 120 members from academia, research laboratories, and industry. The purpose of the TCIC is to develop a collegial community of members who advance science and technology as well as provide forums for theoretical and practical concerns of intelligent control techniques and their application to devices and systems.

Specifically, intelligent control has been an important field of study in which control designs inspired by numerous biological system properties and driven by recent advances in computing technology are produced. As a result, this field has paved the way for important multidisciplinary technological advancements based on adaptation and learning as well as planning under uncertainty and managing large amounts of data. For instance, adaptation and learning have the capacity to not only address adverse conditions (such as degraded modes of operation, loss of control, and imperfect system modeling) but also lower system development costs. In addition, planning under uncertainty enables resilience in the presence of limited or inaccurate data using estimation and predictive methodologies. Utilizing real-time optimization and sensor fusion approaches to manage large amounts of data also enables the continual system-level enhancements required for long-term autonomy.

The TCIC aims to make diverse research contributions to the intelligent control area, support the development of next-generation feedback control architectures for systems with growing complexity, and foster research and interaction in a collegial environment. The topics related to our TC include architectures for intelligent

control, hierarchical intelligent control, autonomous systems and control, distributed intelligent systems, modeling intelligent systems, mathematical analysis of intelligent systems, hybrid systems, design techniques for intelligent controllers, neural networks, fuzzy control, genetic algorithms, particle swarm optimization, machine learning and adaptive systems, knowledge-based and expert systems, planning systems, reconfigurable control, multisensory fusion and integration, and failure detection and identification with applications to, for example, space systems and robotics, manufacturing systems, automotive systems and automated highway systems, aircraft and spacecraft, underwater and land vehicles, process control systems, consumer products, and health care.

Members of the TCIC gather periodically at the American Control Conference and/or IEEE Conference on Decision and Control to discuss how the TCIC will affect the future of intelligent control. In these productive gatherings, we propose invited and tutorial sessions at leading conferences. In addition, we discuss nominations to the IEEE CSS Conference Editorial Board, how to recruit student members (that is, the next generation of intelligent control researchers), increase diversity, and organize virtual workshops and talks. Moreover, TCIC members are active contributors to leading control systems journals, including *IEEE Transactions on Automatic Control*, *IEEE Transactions on Control Systems Technology*, *Automatica*, and *International Journal of Control*, to name a few. TCIC members also contribute to the control systems community by working as editors and associate editors at important journals. During the past year, the related contributions of the TCIC include the following:

» American Control Conference Invited Session: "Cybersecurity

in Connected and Autonomous Vehicles," A. Mohammadi

- » American Institute of Aeronautics and Astronautics SciTech Invited Session: "Advances in Feedback Control Architectures for Autonomous Systems," K.M. Dogan, B.C. Gruenwald, J.A. Muse, and T. Yucelen
- » American Control Conference Workshop: "Smart Control Engineering, Digital Twins, and Industrial AI," Y.Q. Chen, P. Domanski, J. Wang, and J. Viola
- » IFAC Mechatronics Workshop: "Smart Predictive Maintenance of Mechatronic Systems Based on Smart Big Data and Digital Twins," Y. Chen, F. Guc, P. Domanski, J. Viola, and J. Wang
- » IFAC Modeling, Estimation and Control Conference Workshop: "Advanced Big Data Analytics for Control Performance Assessment in Industry 4.0 Era," Y. Chen, J. Viola, P. Domanski, and J. Wang
- » *Frontiers in Robotics and AI Special Issue*: "Safety in Collaborative Robotics and Autonomous Systems," A. Dani, Z. Kan, R. Kamalapurkar, and N. Gans
- » *Annual Reviews in Control Special Issue*: "Estimation and Control of Quantum Systems," I. Petersen and D. Dong
- » *Transactions of the Institute of Measurement and Control Special Issue*: "Recent Developments on Event-Triggered and Event-Based Techniques for Control, Observation, and Networking," M.V. Basin, C.K. Ahn, P. Shi, H. Sun, and X. Yu
- » Book: "Resilient Control Architectures and Power Systems," C.G. Rieger
- » Book: "Learning and Robust Control in Quantum Technology," D. Dong and I. Petersen

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» TECHNICAL ACTIVITIES *(continued from p. 19)*

- » Book: "Dynamic System Modeling and Analysis with Matlab and Python: For Control Engineers," J. Kim.

We would also like to draw attention to the online seminars held by Tansel Yucelen and K. Merve Dogan at the Forum on Robotics and Control Engineering [(FoRCE) <http://force.eng.usf.edu/>] before wrapping up this article. Specifically, the mission of FoRCE is to provide free, high-quality, online seminars to reach broader robotics and control engineering communities around

the globe. Recently, the FoRCE online seminars received CSS support and are listed in the IEEE CSS Video and Webinar Library at <http://ieeecs.org/videos-webinars>. FoRCE includes a wide array of online seminars related to our TC, such as the following ones from last year:

- » "Multiple-Time-Scale Nonlinear Output Feedback Control of Systems With Model Uncertainties," J. Valasek
- » "Cooperative Output Regulation of Heterogeneous Multiagent Systems:

A Global Distributed Control Synthesis Approach," A.T. Koru

- » "A Generalized Time Transformation Approach for Finite-Time Control and Beyond," D. Tran
- » "Fixed-Time Control Barrier Functions for Safety-Critical Control Under Uncertainty," D. Panagou.

CSS members who are interested in joining the TCIC are encouraged to contact TC Chair Yucelen at yucelen@usf.edu.

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