

# CONTROL SYSTEMS SOCIETY



PUBLICATIONS CONTENT DIGEST

## Publications Activities

### Vice-President

**THOMAS PARISINI** *Imperial College, UK*

<http://www.ieeecss.org/publications/css-publications>

### Journal Editors

IEEE Transactions on Automatic Control

**ALESSANDRO ASTOLFI** *Imperial College, UK*

<http://www.ieeecss.org/publications/tac>

IEEE Transactions on Control Systems Technology

**ANDREA SERRANI** *Ohio State University*

<http://www.ieeecss.org/publications/tcst>

IEEE Transactions on Control of Network Systems

**IOANNIS PASCHALIDIS** *Boston University*

**JEFF SHAMMA** Deputy Editor-in-Chief *King Abdullah University of Science and Technology*

<http://www.ieeecss.org/publications/transactions-control-network-systems>

IEEE Control Systems Magazine

**JONATHAN HOW** *Massachusetts Institute of Technology*

<http://www.ieeecss.org/publications/csm>

IEEE Control Systems Letters

**MARIA ELENA VALCHER** *University of Padua*

<http://iee-csletters.dei.unipd.it/index.php>

### Electronics Editor

E-letter on Systems, Control and Signal Processing

**JIANGHAI HU** *Purdue University*

<http://www.ieeecss.org/publications/e-letter/e-letter>

**\*Submission and editorial instructions can be found on each publication's homepage**

For subscription to the monthly E-Letter, please visit:

<http://www.ieeecss.org/newsletter/subscriptions>

# IEEE TRANSACTIONS ON AUTOMATIC CONTROL

A PUBLICATION OF THE IEEE CONTROL SYSTEMS SOCIETY



FEBRUARY 2018

VOLUME 64

NUMBER 2

IETAA9 (ISSN 0018-9286)

Table of Contents

Full Text: [PDF](#)

IEEE Transactions on Automatic Control

Publication information

Full Text: [PDF](#)

Scanning the Issue

Full Text: [PDF](#)

## *Full Papers*

Sensor Choice for Minimum Error Variance Estimation

M. Zhang, K. Morris

[Abstract](#) | Full Text: [PDF](#)

The Kalman Decomposition for Linear Quantum Systems

E-W. Bai

[Abstract](#) | Full Text: [PDF](#)

Source Localization by a Binary Sensor Network in the Presence of Imperfection, Noise and Outliers

T. Tanaka, P. Mohajerin Esfahani, S. K. Mitter

[Abstract](#) | Full Text: [PDF](#)

Distributed Computation of Equilibria in Misspecified Convex Stochastic Nash Games

H. Jiang, U. V. Shanbhag, S. P. Meyn

[Abstract](#) | Full Text: [PDF](#)

Asynchronous Distributed Algorithms for Solving Linear Algebraic Equations

J. Liu, S. Mou, A. S. Morse

[Abstract](#) | Full Text: [PDF](#)

Causality Countermeasures for Anomaly Detection in Cyber-Physical Systems

D. Shi, Z. Guo, K. H. Johansson, L. Shi

[Abstract](#) | Full Text: [PDF](#)

Spectral Conditions for Stability and Stabilization of Positive Equilibria for a Class of Nonlinear Cooperative Systems

P. Ugo Abara, F. Ticozzi, C. Altafini

[Abstract](#) | Full Text: [PDF](#)

Distributed Active State Estimation with User-Specified Accuracy

C. Freundlich, S. Lee, M. M. Zavlanos

[Abstract](#) | Full Text: [PDF](#)

Convergence of Asynchronous Distributed Gradient Methods over Stochastic Networks

J. Xu, S. Zhu, Y. C. Soh, L. Xie

[Abstract](#) | Full Text: [PDF](#)

Taming Mismatches in Inter-Agent Distances for the Formation-Motion Control of Second-Order Agents

H. Garcia de Marina, B. Jayawardhana, M. Cao

[Abstract](#) | Full Text: [PDF](#)

A Comparative Study of Input-Output Stability Results

L. J. Bridgeman, J. R. Forbes

[Abstract](#) | Full Text: [PDF](#)

Production Control to Reduce Starvation in a Partially Flexible Production-Inventory System

C. Zhao, N. Kang, J. Li, J. A. Horst

[Abstract](#) | Full Text: [PDF](#)

## *Technical Notes and Correspondence*

Consensus of Discrete-Time Linear Multi-Agent Systems With Communication, Input and Output Delays

X. Xu, . Liu, G. Feng

[Abstract](#) | Full Text: [PDF](#)

Discrete-Time Predictor Feedback for Consensus of Multi-Agent Systems with Delays

A. Ponomarev, Z. Chen, H-T. Zhang

[Abstract](#) | Full Text: [PDF](#)

Structure Preserving  $H^2$  Optimal Model Reduction Based on Riemannian Trust-Region Method

K. Sato, H. Sato

[Abstract](#) | Full Text: [PDF](#)

Sparsity of Linear Discrete-Time Optimal Control Problems with  $l_1$  Objectives

C. V. Rao

[Abstract](#) | Full Text: [PDF](#)

The K-P Problem on Tensor Products of Lie Groups and Time Optimal Control of  $n$  Quantum Bits With A Bounded Field

F. Albertini, D. D'Alessandro

[Abstract](#) | Full Text: [PDF](#)

A Numerically Stable Solver for Positive Semi-Definite Quadratic Programs Based on Nonnegative Least Squares

A. Bemporad

[Abstract](#) | Full Text: [PDF](#)

A Randomized Algorithm for Parsimonious Model Identification

B. Yilmaz, K. Bekiroglu, C. M. Lagoa, M. Sznaier

[Abstract](#) | Full Text: [PDF](#)

Structural Analysis and Optimal Design of Distributed System Throttlers

M. Siami, J. Skaf

[Abstract](#) | Full Text: [PDF](#)

Cooperative Output Regulation of Linear Multi-Agent Systems by Intermittent Communication: A Unified Framework of Time- and Event-Triggering Strategies

W. Hu, L. Liu, G. Feng

[Abstract](#) | Full Text: [PDF](#)

Robust Stability Analysis and State Feedback Synthesis for Discrete-Time Systems Characterized by Random Polytopes

Y. Hosoe, T. Hagiwara, D. Peaucelle

[Abstract](#) | Full Text: [PDF](#)

Fixed-Time Consensus Tracking for Multi-Agent Systems with High-Order Integrator Dynamics

Z. Zuo, B. Tian, M. Defoort, Z. Ding

[Abstract](#) | Full Text: [PDF](#)

Output-Feedback Lyapunov-based Predictive Control of Stochastic Nonlinear Systems

T. Homer, P. Mhaskar

[Abstract](#) | Full Text: [PDF](#)

A Characterization of Integral ISS for Switched and Time-varying Systems

H. Haimovich, J. L. Mancilla-Aguilar

[Abstract](#) | Full Text: [PDF](#)

Recursive Spectral Meta-Learner for Online Combining Different Fault Classifiers

M. Chen, J. Shang

[Abstract](#) | Full Text: [PDF](#)

A Novel Adaptive Kalman Filter with Inaccurate Process and Measurement Noise Covariance Matrices

Y. Huang, Y. Zhang, Z. Wu, N. Li, J. Chambers

[Abstract](#) | Full Text: [PDF](#)

Complexity of Verifying Nonblockingness in Modular Supervisory Control

T. Masopust

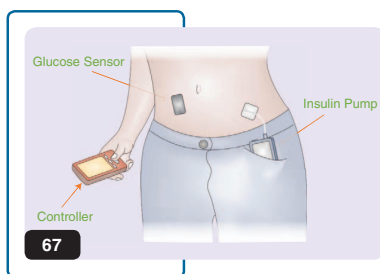
[Abstract](#) | Full Text: [PDF](#)

Event-Based Model Predictive Tracking Control of Nonholonomic Systems with Coupled Input Constraint and Bounded Disturbances

Z. Sun, L. Dai, Y. Xia, K. Liu

[Abstract](#) | Full Text: [PDF](#)

» FEATURES



Cover credit: The landscape and evolution of the artificial pancreas. The “tape” starts with the 1960s technologies (lower left) and rolls through the present out to the future with embedded devices and Internet of Things wearables. The background conveys a stylized human with device(s), with highlighted chips/circuits/devices/simulations underlying the artificial pancreas. Image courtesy of Lauren M. Huyett, Eyal Dassau, Howard C. Zisser, and Francis J. Doyle III.

**26 Artificial Pancreas Systems**

An introduction to the special issue  
ALI CINAR

**30 Glucose Sensor Dynamics and the Artificial Pancreas**

The impact of lag on sensor measurement and controller performance  
LAUREN M. HUYETT, EYAL DASSAU, HOWARD C. ZISSER, and FRANCIS J. DOYLE III

**47 Insulin Estimation and Prediction**

A review of the estimation and prediction of subcutaneous insulin pharmacokinetics in closed-loop glucose control  
JORGE BONDIA, SERGIO ROMERO-VIVÓ, BEATRIZ RICARTE, and JOSÉ LUIS DÍEZ

**67 The Artificial Pancreas and Meal Control**

An overview of postprandial glucose regulation in type 1 diabetes  
ANAS EL FATHI, MOHAMED RAEF SMAOUI, VÉRONIQUE GINGRAS, BENOIT BOULET, and AHMAD HAIDAR

**86 Individualized Model Predictive Control for the Artificial Pancreas**

In silico evaluation of closed-loop glucose control  
MIRKO MESSORI, GIAN PAOLO INCREMONA, CLAUDIO COBELLI, and LALO MAGNI

**105 Multimodule, Multivariable Artificial Pancreas for Patients with Type 1 Diabetes**

Regulating glucose concentration under challenging conditions  
KAMURAN TURKSOY, ELIZABETH LITTLEJOHN, and ALI CINAR

**125 Overnight Hypoglycemia and Hyperglycemia Mitigation for Individuals with Type 1 Diabetes**

How risks can be reduced  
B. WAYNE BEQUETTE, FAYE CAMERON, BRUCE A. BUCKINGHAM, DAVID M. MAAHS, and JOHN LUM



14



140



**IEEE PERIODICALS  
MAGAZINES DEPARTMENT**  
445 Hoes Lane, Piscataway,  
NJ 08854 USA

*Senior Managing Editor*  
Geraldine Krolin-Taylor

*Senior Art Director*  
Janet Dudar

*Associate Art Director*  
Gail A. Schnitzer

*Production Coordinator*  
Theresa L. Smith

*Advertising Production Manager*  
Felicia Spagnoli

*Production Director*  
Peter M. Tuohy

*Director, Business Development –  
Media & Advertising*  
Mark David

*Editorial Services Director*  
Kevin Lisankie

*Staff Director  
Publishing Operations*  
Dawn M. Melley

*IEEE prohibits discrimination, harassment,  
and bullying. For more information, visit  
[http://www.ieee.org/web/aboutus/whatis/  
policies/p9-26.html](http://www.ieee.org/web/aboutus/whatis/policies/p9-26.html).*

**3 FROM THE EDITOR**

Getting Involved in the IEEE Control Systems Society

**5 ABOUT THIS ISSUE**

Special Issue on Artificial Pancreas Systems

**9 PRESIDENT'S MESSAGE**

The Visible Values of Volunteering in the Hidden  
Technology World

**11 CSS NEWS**

**12 25 YEARS AGO**

**14 TECHNICAL ACTIVITIES**

IEEE Technical Committee on Intelligent Control  
IEEE Technical Committee on Aerospace Control

**18 PEOPLE IN CONTROL**

John S. Baras  
Jacqueline M.A. Scherpen  
Ketan Savla

**135 BOOKSHELF**

*Hydrodynamic Control of Wave Energy Devices*  
Book Announcements

**140 CONFERENCE REPORTS**

CCTA 2017—The Inaugural IEEE Conference  
on Control Technology and Applications  
The 2017 Summer School on Sliding Mode Control

**146 OBITUARY**

A Tribute to Roberto Tempo

**151 CONFERENCE CALENDAR**

**156 ON THE LIGHTER SIDE**

The Adaptive Professional

**MISSION STATEMENT AND SCOPE:** As the official means of communication for the IEEE Control Systems Society, *IEEE Control Systems Magazine* publishes interesting, useful, and informative material on all aspects of control system technology for the benefit of control educators, practitioners, and researchers. With this mission statement in mind, *IEEE Control Systems Magazine* encourages submissions, both feature articles and columns, on all aspects of control system technology.

**SUBMISSION OF MANUSCRIPTS:** A feature article typically provides an in-depth treatment of either an application of control technology, a tutorial on some area of control theory, or an innovation in control education.

*IEEE Control Systems Magazine* publishes a variety of columns. "Applications of Control" columns are industrially oriented summaries of innovations in control technology. "Focus on Education" typically describes some aspect of education such as novel control experiments. "Lecture Notes" can be theoretical in nature as long as they have clear tutorial value and intent. See recent issues for examples of these and other types of columns. Authors are encouraged to contact the editor-in-chief about the suitability of potential columns.

A detailed Author's Guide, a sample formatted manuscript, and LATEX template can be found at <http://www.ieeeccs.org/publications/csm/submissions>. The specifications in this Guide should be followed by all submissions.

All manuscripts should be submitted electronically to the *IEEE Control Systems Magazine* website, <https://css.paperplaza.net/conferences/scripts/start.pl>, with inquiries on appropriateness of content emailed to [jhow@mit.edu](mailto:jhow@mit.edu).

**SPECIAL ISSUES:** *IEEE Control Systems Magazine* encourages proposals for special issues. Proposers are encouraged to contact the editor-in-chief to discuss potential topics.

**BOOKS AND CONFERENCES:** Submit information about recently published books to the associate editor for book reviews. Submit information about past and future conferences to the corresponding editor for conferences.

**ADVERTISING:** *IEEE Control Systems Magazine* accepts advertising for educational products, books, software, conferences, employment, and control-related technology. For information about advertising, contact Mark David, [m.david@ieee.org](mailto:m.david@ieee.org), +1 732 465 6473.

**IEEE CONTROL SYSTEMS MAGAZINE**—(ISSN 1066-033X) (ISMAD7) is published bimonthly by The Institute of Electrical and Electronics Engineers, Inc. Headquarters: 3 Park Avenue, 17th Floor, New York, NY 10016-5997, U.S.A. +1 212 419 7900. Responsibility for the contents rests upon the authors and not upon the IEEE, the Society, or its members. The magazine is a membership benefit of the IEEE Control Systems Society, and subscriptions are US\$4.00 per member per year (included in Society fee). Replacement copies for members are available for US\$20.00 (one copy only). Nonmembers can purchase individual copies for US\$106.00. Nonmember subscription prices are available on request. Copyright and Reprint Permissions: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limits of the U.S. Copyright law for private use of patrons: 1) those post-1977 articles that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01970, U.S.A.; and 2) pre-1978 articles without fee. For other copying, reprint, or republication permission, write to: Copyrights and Permissions Department, IEEE Service Center, 445 Hoes Lane, Piscataway NJ 08854, U.S.A. Copyright © 2018 by The Institute of Electrical and Electronics Engineers, Inc. All rights reserved. Periodicals postage paid at New York, NY and at additional mailing offices. Postmaster: Send address changes to *IEEE Control Systems Magazine*, IEEE, 445 Hoes Lane, Piscataway, NJ 08854 U.S.A. Canadian GST #125634188 Printed in U.S.A.

# IEEE TRANSACTIONS ON CONTROL OF NETWORK SYSTEMS

A PUBLICATION OF THE IEEE CONTROL SYSTEMS SOCIETY



COSPONSORED BY  
IEEE CIRCUITS AND SYSTEMS SOCIETY  
IEEE COMMUNICATIONS SOCIETY  
IEEE COMPUTER SOCIETY  
IEEE ROBOTICS AND AUTOMATION SOCIETY



DECEMBER 2017

VOLUME 4

NUMBER 4

ITCNAY

(ISSN 2325-5870)

The contents of the IEEE-Transactions on Control of Network Systems, with links to the abstracts of the papers are available on

<http://sites.bu.edu/tcns/december-2017/>

Formation Control and Obstacle Avoidance of Multiple Rectangular Agents with Limited Communication Ranges

Thang Nguyen, Hung La, Tuan Dzung Le, Mohammad Jafari

.....p. 680 .....[PDF](#)

Optimal Energy-Efficient Downlink Transmission Scheduling for Real-Time Wireless Networks  
Lei Miao, Jianfeng Mao, Christos G. Cassandras

.....p. 692 .....[PDF](#)

Distributed Control of Active-Passive Networked Multiagent Systems

Tansel Yucelen, John Daniel Peterson

.....p. 707 .....[PDF](#)

A Truncated Prediction Approach to Consensus Control of Lipschitz Nonlinear Multi-Agent Systems with Input Delay

Chunyan Wang, Zongyu Zuo, Zongli Lin, Zhengtao Ding

.....p. 716 .....[PDF](#)

Robust Connectivity Preserving Rendezvous of Multirobot Systems Under Unknown Dynamics and Disturbances Zhi Feng, Chao Sun, Guoqiang Hu .....	p. 725	<a href="#">PDF</a>
Distributed Deployment Algorithms for Coverage Improvement in a Network of Wireless Mobile Sensors: Relocation by Virtual Force Hamid Mahboubi, Amir G. Aghdam .....	p. 736	<a href="#">PDF</a>
Sustainability of Service Provisioning Systems under Stealth DoS Attacks George Paschos, Leandros Tassioulas .....	p. 749	<a href="#">PDF</a>
Average State Observers for Large-Scale Network Systems Tomonori Sadamoto, Takayuki Ishizaki, Jun-ichi Imura .....	p. 761	<a href="#">PDF</a>
Optimality of Fast Matching Algorithms for Random Networks with Applications to Structural Controllability Mohamad Kazem Shirani Faradonbeh, Ambuj Tewari, George Michailidis .....	p. 770	<a href="#">PDF</a>
Hybrid Control of Multiagent Systems with Contingent Temporal Tasks and Prescribed Formation Constraints Meng Guo, Charalampos P. Bechlioulis, Kostas J. Kyriakopoulos, Dimos V. Dimarogonas .....	p. 781	<a href="#">PDF</a>
Optimal Routing for Lifetime Maximization of Wireless Sensor Networks with a Mobile Source Node Sepideh Pourazarm, Christos G. Cassandras .....	p. 793	<a href="#">PDF</a>
Optimal Targeting and Contract Offering for Load Curtailment in Nega-Watt Markets Angeliki Anastopoulou, Iordanis Koutsopoulos, George D. Stamoulis .....	p. 805	<a href="#">PDF</a>
Attitude Coordinated Control of Multiple Underactuated Axisymmetric Spacecraft Ziyang Meng, Dimos V. Dimarogonas, Karl H. Johansson .....	p. 816	<a href="#">PDF</a>
Near-optimal Distributed Detection in Balanced Binary Relay Trees Zhenliang Zhang, Edwin K. P. Chong, Ali Pezeshki, Bill Moran, Stephen David Howard .....	p. 826	<a href="#">PDF</a>



Efficient Clustering and Path Planning Strategies for Robotic Data Collection Using Space-Filling Curves

Yuan Yan, Yasamin Mostofi

.....p. 838 .....[PDF](#)

Distributed Dynamic Coverage and Avoidance Control Under Anisotropic Sensing

Dimitra Panagou, Dusan M. Stipanovic, Petros G. Voulgaris

.....p. 850 .....[PDF](#)

Optimal Pricing to Manage Electric Vehicles in Coupled Power and Transportation Networks

Mahnoosh Alizadeh, Hoi-To Wai, Mainak Chowdhury, Andrea Goldsmith, Anna Scaglione, Tara Javidi

.....p. 863 .....[PDF](#)

Analysis of Price of Total Anarchy in Congestion Games via Smoothness Arguments

Xuehe Wang, Nan Xiao, Lihua Xie, Emilio Frazzoli, Daniela Rus

.....p. 876 .....[PDF](#)

The Impact of Stealthy Attacks on Smart Grid Performance: Tradeoffs and Implications

Yara Abdallah, Zizhan Zheng, Ness B. Shroff, Hesham El Gamal, Tarek El-Fouly

.....p. 886 .....[PDF](#)

# UPCOMING CONFERENCES



## American Control Conference

### IMPORTANT DATES:

~~September 17, 2017: All Submissions Due (Passed)~~

~~January 15, 2018: Acceptance/Rejection (Passed)~~

February 26, 2018: Final Manuscript Submission

**JUNE 27-29, 2018**

**MILWAUKEE, WISCONSIN, USA**

**ACC 2018**

**<http://acc2018.a2c2.org/>**



## Important Dates

**Paper Submissions Open:**  
November 1, 2017

**Invited Session Proposals Due:**  
~~January 15, 2018~~ (PASSED)

**Contributed and Invited Papers Due:**  
~~January 15, 2018~~ (PASSED)

**Acceptance Notice:**  
April 23, 2018

**Final Submissions Due:**  
-May 21, 2018

## CONFERENCE ON TECHNOLOGY AND APPLICATIONS

**AUGUST 21-24, 2018**  
**Copenhagen, Denmark**

CCTA 2018 will be held at the Scandic Hotel Copenhagen Scandic Copenhagen is located in central Copenhagen, with views of one of the three lakes and the city, and close to the Tivoli Gardens and the pedestrian street, StrÅget. With its leafy parklands and canalside living, Copenhagen is a green and liveable city to visit. Summer jazz and street food markets fill the city during summer months, and there is never far to a sandy beach or harbour bar.

<http://ccta2018.ieeecss.org/>

# DECEMBER 17-19, 2018

## MIAMI, FLORIDA, USA

### conference on decision and control



### Important Dates

**Invited Session Proposals Due:**  
March 10, 2018

**Paper Submissions Due:**  
March 20, 2018

**Workshop Proposals Due:**  
May 1, 2018

**Paper and Workshop Decision  
Notification:**  
Mid-July 2018

**Accepted Papers Due:**  
September 20, 2018

<https://cdc2018.ieeecss.org>



# American Control Conference

**JULY 10-12, 2019**  
**PHILADELPHIA, PENNSYLVANIA, USA**  
**ACC 2019**