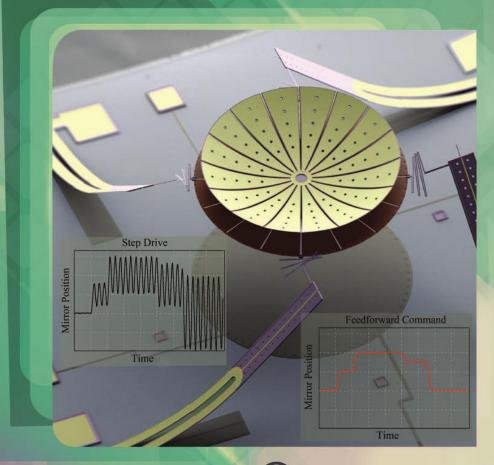
CONTROL CONTRO

OCTOBER 2016 VOLUME 36 NUMBER 5

Control Applications





Control Systems Society Advancing Control Science and Technology



MAGAZINE



>> FEATURES

October 2016 Volume 36 Number 5
WWW.IEEECSS.ORG/PUBLICATIONS/CSM

28 The Artificial Pancreas

How closed-loop control is revolutionizing diabetes **AHMAD HAIDAR**

48 High-Speed Control of Electromechanical Transduction

Advanced drive techniques for optimized step-and-settle response of MEMS micromirrors

MATTHIAS IMBODEN, JACKSON CHANG, COREY POLLOCK,
EVAN LOWELL, MEHMET AKBULUT, JESSICA MORRISON,
THOMAS STARK, THOMAS G. BIFANO, and DAVID J. BISHOP



DEPARTMENTS



Cover credit: A varifocal mirror driven by electrothermal bimorphs used for beamsteering in a smart lighting application (image courtesy of Matthias Imboden).

Digital Object Identifier 10.1109/MCS.2016.2584546

- 3 FROM THE EDITOR Technical Surprises
- 5 ABOUT THIS ISSUE Control Applications
- 8 PRESIDENT'S MESSAGE
 Reflections on the Convergence Paradigm
- 11 CSS NEWS
- 12 25 YEARS AGO
- 14 TECHNICAL ACTIVITIES

Technical Committee on Systems with Uncertainty Technical Committee on Power Generation

16 PEOPLE IN CONTROL

Antonella Ferrara Ian Postlethwaite Mario Sznaier Luca Zaccarian





77 HISTORICAL PERSPECTIVES

Origin of Stability Analysis: "On Governors" by J.C. Maxwell

89 BOOKSHELF

A First Course in the Calculus of Variations Book Announcements

CONFERENCE REPORTS

19th International Conference on Hybrid Systems: Computation and Control

The 2016 International Conference on Unmanned Aircraft Systems (ICUAS'16) The 28th Chinese Control and Decision Conference

100 CONFERENCE CALENDAR

102 **RANDOM INPUTS**

Puzzling Control

104 ON THE LIGHTER SIDE

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

Senior Managing Editor Geraldine Krolin-Taylor

Senior Art Director Janet Dudar

Associate Art Directors Gail A. Schnitzer, Mark Morrissev

Production Coordinator

Theresa L. Smith

Advertising Production Manager

Felicia Spagnoli Production Director

Peter M. Tuohy

Sr. Manager Advertising & Business

Development Mark David

Editorial Director

Dawn M. Melley

Staff Director **Publishing Operations**

Fran Zappulla

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

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 tech-

nology, a tutorial on some area of control theory, or an innovation in control decirion technical application of control technology. 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

A detailed Author's Guide, a sample formatted manuscript, and LATEX template can be found at http://www.ieeecss.org/publica-tions/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/onferences/scripts/start.pl, with inquiries on appropriateness of content emailed to 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. Sub-

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, +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 USSA.00 per member per year (included in Society fee). Replacement copthe 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 (one copy only). Nonmembers can purchase individual copies for US\$96.00. 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 without society and through the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01970, U.S.A.; and 2) pre-1978 articles without fee. For other copyring, reprint, or republication permission, write to: Copyrights and Permissions Department, IEEE Service Center, 445 Hoes Lane, Piscataway NJ 08854, U.S.A. Copyright © 2016 by The Institute of Electrical and Electronics Engineers, Inc. All Fights reserved. Periodicals postage and at New York, NY and at additional realition of the protections. 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