

Electronics MAGGZINI

Vol. 5, No. 3 July 2016 ISSN 2162-2248 http:ewh.ieee.org/soc/ces

FEATURES

48 Scanning LIDAR in Advanced Driver Assistance Systems and Beyond

Building a road map for next-generation LIDAR technology. By Rajeev Thakur

How Should the State of the Brain Be Described?

A call to standardize descriptions of brain states for data collection and research.

By Narisa N.Y. Chu

60 Everything You Wanted to Know About Smart Cities

> The Internet of Things is the backbone. By Saraju P. Mohanty, Uma Choppali, and Elias Kougianos

71 Palm Print as a Smartphone Biometric

Another option for digital privacy and security. By Adrian S. Ungureanu and Claudia Costache

79 My Electric Journey with a Nissan Leaf

A classic early-adopter experience. By Stanton Zeff

81 Rethinking Remote Power and Data Transfer

Harnessing conductive emissions. By Alex Rubin

85 The Ethical Impact of the Internet of Things in Social Relationships

Technological mediation on mutual trust.

By Guiou Kobayashi, Maria Eunice Quilici-Gonzalez,
Mariana Claudia Broens, and José Artur Quilici-Gonzalez

90 Citizen Actuation for Smart Environments

Evaluating how humans can play a part in smart environments. By David N. Crowley, Edward Curry, and John G. Breslin



95 The Implications of Iris-Recognition Technologies

> Will our eyes be our keys? By Anas Aloudat, Katina Michael, and Roba Abbas

103 RFID/NFC Implants for Bitcoin Transactions

An interview with Amal Graafstra. By Katina Michael

107 Whose Body Is It?

The body as physical capital in a techno-society. By Sharon R. Bradley-Munn and Katina Michael

ABOUT THE COVER

Make way for the smart city.

MAIN IMAGE: ©ISTOCKPHOTO.COM/COMOMOLAS PEOPLE: IMAGES LICENSED BY GRAPHIC STOCK

COLUMNS & DEPARTMENTS

- 3 NOTES FROM THE EDITOR
- 10 PRESIDENT'S MESSAGE
- 12 SOCIETY NEWS
- 27 CONFERENCE REPORTS
- 37 PUBLICATIONS ROUND-UP
- **40** FUTURE DIRECTIONS
- 115 IP CORNER
- 118 BITS VERSUS ELECTRONS
- 122 THE ART OF STORAGE
- 126 HARDWARE MATTERS
- 129 PRODUCT SAFETY PERSPECTIVES
- 132 CTA INSIGHTS
- 134 PRODUCT REVIEWS

IEEE Consumer Electronics Magazine (ISSN 2162-2248) (ICEM-CQ) is published quarterly by the Institute of Electrical and Electronics Engineers, Inc. Headquarters: 3 Park Avenue, 17th Floor, New York, NY 10016-5997 USA, Telephone: +1 212 419 7900. Responsibility for the content rests upon the authors and not upon the IEEE, the Society or its members. IEEE Service Center (for orders, subscriptions, address changes): 445 Hoes Lane, Piscataway, NJ 08855-1331 USA. Telephone: +1 732 981 0060. Individual copies: IEEE members US\$20.00 (first copy only), nonmembers US\$96.00 per copy. Subscription rates: Annual subscription rates included in IEEE Consumer Electronics Society member dues. Subscription rates available on request. Copyright and reprint permission: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limits of U.S. Copyright law for the 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 01923 USA; 2) pre-1978 articles without a fee. For other copying, reprint, or republication permission, write Copyrights and Permissions Department, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. Copyright © 2016 by the Institute of Electrical and Electronics Engineers Inc. All rights reserved. Periodicals post-age pending at New York and additional mailing offices. Postmaster: Send address changes to IEEE Consumer Electronics Magazine, IEEE, 445 Hoes Lane, Piscataway, NJ 08854 USA. Canadian GST #125634188 PRINTED IN THE U.S.A.

MISSION STATEMENT: To educate, inform, and entertain our community of IEEE Consumer Electronics Society members on technology, events, industry news, and general topics relating to consumer electronics and to further serve and support our Members in professional career development through tutorials and raising awareness of engineering tools and technologies.



IEEE CONSUMER ELECTRONICS MAGAZINE EDITORIAL BOARD

EMERITUS EIC

EDITOR Saraju P. Mohanty Department of Computer Science and Engineering, University of North Texas saraju.mohanty@unt.edu

SENIOR EDITORS

CE Societal Impacts Katina Michael

University of Wollongong katina@uow.edu.au

Future-Directions

Activities
Tom Coughlin
Coughlin Associates, Data
Storage Consulting
tom@tomcoughlin.com

Galway dr.peter.corcoran@ieee.org

Peter Corcoran College of Engineering and Informatics, National University of Ireland,

Emerging CE Technology and Industry Linkages Pallab Chatterjee Media & Entertainment Technologies pallab@mandetech.com

CE Products and

Technologies
Will Lumpkins
L-3 Communications
(Mission Integration),
Sr. Systems Engineer
xillia@ieee.org

CE Conferences and Industry Linkages Stephen Dukes President, Imaginary Universes LLC. stephendukes@ieee.org

Home Automation and Networking Stu Lipoff IP Action Partners LLC stu@ipaction.com

EXECUTIVE EDITORS

CE Conferences Editor and Internet-of-Things Soumya Kanti Datta EURECOM Research Center soumya-kanti.datta@eurecor

CE Chapter Activities & Events Editor

Robin Bradbeer rsbradbeer@gmail.com

CE Conferences Editor (Asia) and Automotive CE Bernard Fong Automotive Parts and Accesso-ry Systems R&D Centre bfong@ieee.org

CE Hardware Technology

(IP Cores) Anirban Sengupta Indian Institute of Technology Indore

Special Sections Himanshu Thapliyal University of Kentucky hthapliyal@uky.edu

CE News and Events Editor Konstantin Glasman Saint Petersburg State Uni-versity of Film and Television k.glasman@gmail.com

ASSOCIATE EDITORS

Innovation and

Innovation and
Entreprenneurship
Tom Wilson
Entrepreneur in Residence,
TandemLaunch Inc., Montreal
tomwilson@ieee.org

User Interaction and Augmented Reality Fabrizio Lamberti Politecnico di Torino fabrizio.lamberti@polito.it

Standards

Yu Yuan CATE Global Corp.

Consumer Audio Technologies Vincent Wang DTS Inc., Singapore Technology Center vincent.wang@dts.com

Video and Multimedia

Technologies
Euee S. Jang
Hanyang University
Seoul, Korea
profjang@gmail.com

Security and Privacy Hyoungshick Kim Sungkyunkwan University hyoung@skku.edu

Jong-Hyouk Lee Sangmyung University hurryon@gmail.com

Shiyan Hu Michigan Technological University shiyan@mtu.edu

Digital Imaging Technologies Petronel Bigioi FotoNation Ltd., Galway pbigioi@fotonation.com

Societal Impacts of CE Sally Applin University of Kent sally@sally.com

Communication Technolo-

gy for CE Bob Frankston IEEECEMag@bob.ma

Niranjan Ray Siliocn Instiutute of Technolo-gy, Bhubaneswar, India rayniranjan@gmail.com

Intellectual Property (IP)

Corner Susanne Wende Noerr LLP Susanne.Wende@noerr.com

Home Health Care and Accessibility Madhavi Ganpathiraju University of Pittsburgh madhavi@pitt.edu

Young Professionals Abdullah S. Almuttiri De Montfort University a.s.a@ieee.org

CE Education and

Outreach
Joseph Wei
SJW Consulting Inc.
joseph.wei@ieee.org

Mike Borowczak Erebus Labs mike@erebuslabs.com

Hardware Technology

Prasun Ghosal Indian Institute of Engineer-ing Science and Technology, Shibpur, India p_ghosal@it.iiests.ac.in

For CE
Shanq-Jang Ruan
National Taiwan University
of Science and Technology
(NTUST), Taiwan
sjruan@mail.ntust.edu.tw

Cyberinfrastructure and

Cloud Computing Muhammad K. Khan King Saud University mkhurram@ksu.edu.sa

Power Supply and Management in CE Santanu Mishra Indian Institute of Technology Kanpur santanum@iitk.ac.in

Bijaya K. Panigrahi Indian Institute of Technology Delhi bkpanigrahi@ee.iitd.ac.in

ADVERTISING SALES

Mark David Senior Manager Advertising and Business Development Tel: +1 732 465 6473 m.david@ieee.org

IEEE PERIODICALS MAGAZINES DEPARTMENT

445 Hoes Lane, Piscataway, NJ 08854 USA

Craig Causer Managing Editor Geraldine Krolin-Taylor Senior Managing Editor Janet Dudar Senior Art Director Gail A. Schnitzer Associate Art Director

Mark Morrissey Associate Art Director Theresa L. Smith Production Coordinator Felicia Spagnoli Advertising Production Manager

Peter M. Tuohy Production Director Dawn M. Melley Editorial Director Fran Zappulla Staff Director, Publishing Operations

