

IEEE



VOLUME 8 NUMBER 1
SPRING 2016

Intelligent Transportation Systems

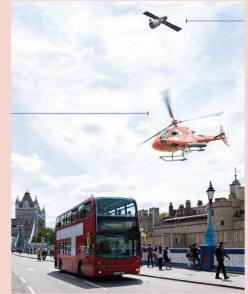
MAGAZINE

Holistic ITS

Public Transportation
Applications



 IEEE



ON THE COVER:

ALL IMAGES ©ISTOCKPHOTO.COM,
BACKGROUND, COSPV, SPACE STATION,
3DSCULPTOR, HELICOPTER, NULLPLUS

IEEE Intelligent Transportation Systems Magazine (ISSN 1959-1590) (ITTSBO) is published quarterly by The Institute of Electrical and Electronics Engineers, Inc. Headquarters: 5 Park Avenue, 17th Floor, New York, NY 10016-5997, USA +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 Intelligent Transportation Systems Society, and subscriptions are included in Society fee. Replacement copies for members are available for US\$20 (one copy only). Nonmembers can purchase individual copies for US\$114. 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, USA; 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 © 2016 by The Institute of Electrical and Electronics Engineers, Inc. All rights reserved. Postmaster: Send address changes to *IEEE Intelligent Transportation Systems Magazine*, IEEE, 445 Hoes Lane, Piscataway, NJ 08854 USA. Canadian GST #125634188

Printed in USA

SCOPE—*IEEE Intelligent Transportation Systems Magazine (ITSM)* publishes peer-reviewed articles that provide innovative research ideas and application results, report significant application case studies, and raise awareness of pressing research and application challenges in all areas of intelligent transportation systems. In contrast to the highly academic publication of *IEEE Transactions on Intelligent Transportation Systems*, *ITS Magazine* focuses on providing needed information to all members of ITS Society, serving as a dissemination vehicle for ITS Society members and the others to learn the state of the art development and progress on ITS research and applications. High quality tutorials, surveys, successful implementations, technology reviews, lessons learned, policy and societal impacts, and ITS educational issues will also be published as well. *ITS Magazine* will also serve as an ideal media communication vehicle between the governing body of ITS Society and its membership and promote ITS community development and growth.

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



FEATURES

- 10 A Kind of Novel ITS Based on Space-Air-Ground Big-Data**
Gang Xiong, Fenghua Zhu, Xisong Dong, Haisheng Fan, Bin Hu, Qing-jie Kong, Wenwen Kang, and Teng Teng
- 23 Vision-Based Turning Movement Monitoring: Count, Speed & Waiting Time Estimation**
Mohammad Shokrolah Shirazi and Brendan Tran Morris
- 35 Reliable Path Planning for Bus Networks Considering Travel Time Uncertainty**
Yichen Zheng, Yi Zhang, and Li Li
- 51 A New e-Bus System Using Two-Way Government Radio Networks**
Shu-Hui Lin, Chung-Yu Chen, Eric Hsiao-Kuang Wu, Ching-Yao Chan, and Emery Jou
- 61 Spherical Coordinates Based Methods of Ground Extraction and Objects Segmentation Using 3-D LiDAR Sensor**
Huilin Yin, Xiaohan Yang, and Chao He

DEPARTMENTS & COLUMNS

- 2** EDITOR'S COLUMN
3 PRESIDENT'S MESSAGE
4 EDUCATION
69 ITS PEOPLE
72 ITS RESEARCH LAB
77 BOOK REVIEW
79 CALENDAR