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SYSTEMS

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IEEE ITS SOCIETY NEWSLETTER

Vol. 13, No. 4 October 2011 *Editor: Dr. Yaobin Chen,* yaobinchen@ieee.org

In This Issue

Web Archive and Electronic Newsletter Subscription

The IEEE ITS Society Newsletter is published quarterly in January, April, July, and October. The current and all past issues of the Newsletter may be downloaded at no charge from the Society's web site:

www.ewh.ieee.org/tc/its

You may subscribe to or unsubscribe from announcements at the same web site. Announcements are sent to approximately 10,000 ITS professionals from industry, academia, and government.

Information for Contributors

Announcements, feature articles, book and meetings reviews, opinions, letters to the editor, professional activities, Abstracts of reports, and other material of interest to the ITS community are solicited. Please submit electronic material for consideration in any of the following formats: Microsoft Word, OpenOffice, plain ASCII, rich text format (rtf), or portable document format (pdf) to the Editor-in-Chief at yaobinchen@ieee.org.

SOCIETY NEWS

From the Editor

by Yaobin Chen

This will be the last issue of the Newsletter in my first year as the Editor-in-Chief. We will soon approach the holiday season and enter another year. In October, we organized another successful IEEE ITS Conference in Washington, D.C. (see conference report in the upcoming Jan'12 issue). Several ITSS sponsored awards were presented at the conference award banquet (see this issue). The Board of Governors and the Executive Committee also met in the end of the conference. Several new officers have been elected by the board for another two-year terms. You can read more about these meetings and election results in the summary report in this issue. As usual, we have also included several important announcements in the Society News including the 2012 IEEE ITSS Call for Nominations of Awards. We have also included a section of Transactions on ITS Abstracts that have been recently accepted for publication in the ITS Transactions. I continue to encourage all of you to submit ITS related items to the Newsletter.

Announcement of Awards

IEEE ITS Institutional Lead Award
IEEE ITS Outstanding Application Award
IEEE ITS Outstanding Research Award

Purpose and Selection Criteria of Awards

The IEEE ITS Outstanding Research Award, IEEE ITS Outstanding Application Award, and IEEE ITS Lead Award are given annually for ITS researchers, practitioners, and research/development teams who have made significant contributions to research in ITS related fields (ITS Research Award), developed and deployed successful ITS systems or implementations (ITS Application Award), and demonstrated leadership in promoting ITS technologies (ITS Institutional Lead Award). These awards are established to recognize, promote, and publicize major research contribution, application innovations with real-world impact, and ITS institutional leadership.

Winners of 2011 IEEE ITS Awards

2011 IEEE ITS INSTITUTIONAL LEAD AWARD:
Dynamic Systems and Simulation Laboratory (DSSL) (www.dssl.tuc.gr)
The Technical University of Crete (TUC), Greece

2011 IEEE ITS OUTSTANDING APPLICATION AWARD:
DynaMIT (web.mit.edu/its/dynamit.html)
Intelligent Transportation Systems Program
Massachusetts Institute of Technology, USA

2011 IEEE ITS OUTSTANDING RESEARCH AWARD:
Dr. Feiyue Wang
CAST (Complex Adaptive Systems for Transportation) Lab
Chinese Academy of Sciences, Beijing, China

Announcement of Awards

2011 IEEE ITSS Best Ph.D. Dissertation Awards

Purpose and Selection Criteria of Awards

The prestigious IEEE ITSS Best Ph.D. Dissertation Award is given annually for the best dissertation in any ITS area that is innovative and relevant to practice. This award is established to encourage doctoral research that combines theory and practice, makes in-depth technical contributions, or is interdisciplinary in nature, having the potential to contribute to the ITSS and broaden the ITS topic areas from either the methodological or application perspectives.

Winners of the 2011 IEEE ITSS Best Dissertation Award:

First place:

Daniel B. Work (dbwork@illinois.edu),
"Real-time estimation of distributed parameters systems: Application to traffic monitoring"
Advisor: Alexandre M. Bayen,
UNIVERSITY OF CALIFORNIA, BERKELEY, USA

Second place:

Vicente Milanés (vicente.milanes@csic.es)
"Traffic management system based on V2X communication using automated vehicles"
Advisor: Carlos González
University of Alcalá, Madrid, Spain

October 2011 BOG and ExCom Meeting Summary Report

By Jeff Miller, VP for Administration

The ITSS Executive Committee (ExCom) and Board of Governors (BOG) met on October 8, 2011 in Washington DC for its fall meeting, immediately following the Intelligent Transportation Systems Conference. We currently have 21 voting members on the BOG, and the meeting was attended by 18 of those members. Two non-voting members also attended the meeting. As is beginning to become tradition, here is a picture of all of the attendees. The attendees were (from left to right in the picture) Yinhai Wang (BOG member), Jeffrey Miller (VP Administrative Activities), Yaobin Chen (Newsletter Editor-in-Chief), Jason Geng (VP Member Activities), Arnaud de La Fortelle (BOG member), Urbano Nunes (VP Technical Activities), Sudarthe Chawathe (BOG member), Rosaldo Rossetti (BOG member), Sergio Valastin (BOG member), Azim Eskandarian (BOG member), Bart van Arem (BOG member), Fei-Yue Wang (Transactions Editor-in-Chief), Daniel Dailey (VP Financial Activities), Matt Barth (BOG member), Daniel Zeng (VP Publication Activities), Umit Ozguner (former BOG and ExCom member), Reinhard Pfliegl (VP Conference Activities), Wei-Bin Zhang (BOG member), Alberto Broggi (President), and Christoph Stiller (President-Elect and Magazine Editor-in-Chief).

The facilities at George Washington University provided adequate support and were perfect for the meeting. I would like to thank Azim Eskandarian for reserving the conference room and helping me with arranging the facilities and events of the day. The ExCom had a dinner on the evening of Friday, October 7, 2011 just to wake up early on Saturday, October 8, 2011 for the ExCom meeting, which lasted from 8:00a.m. until noon. A quick lunch at noon followed by the BOG meeting from 1:00p.m. until around 5:30p.m. wrapped up the events of the day.

Each of the ExCom members gave a detailed presentation about all of the activities that have been and will be conducted. Discussion from the board on each item was encouraged, a few motions were made and voted on, and four ExCom positions were up for election. The minutes from the meeting are included in the Administrative Activities section of the ITSS web site (http://www.ewh.ieee.org/tc/its/aa/meetings/2011-10-08/). Some of the main topics are summarized here.

The Transactions continues to be a popular and highly-ranked publication, with the number of submissions continue to increase. The ISI impact factor is currently 2.258, which ranks the Transactions #1 in transportation journals and in intelligent transportation periodicals! The Magazine will have been in existence for three years at the end of 2011. It is receiving an increased number of submissions and is on-schedule for each issue.

The number of pages for both the Transactions and Magazine will be increased in 2012 due to the number of submissions. Since Christoph Stiller (the current Magazine Editor-in-Chief) will take over as President of the society in 2012, Alberto Broggi appointed Jeffrey Miller as the Editor-in-Chief of the Magazine beginning in October 2011. The BOG approved the appointment.

The ExCom meeting schedule for 2012 will be February, June (in conjunction with IVS), and September (in conjunction with ITSC). The BOG meeting schedule for 2012 will be June (in conjunction with IVS) and September (in conjunction with ITSC).

Some of the confirmed locations for future conferences include:

VNC 2011 will be in Amsterdam, the Netherlands in November 2011.
IVS 2012 will be in Spain in June 2012.
ITSC 2012 will in Anchorage, Alaska, USA in September 2012.
IVS 2013 will tentatively be in Brisbane, Australia in summer 2013.
ITSC 2013 will be in the Hague, the Netherlands in fall 2013.
Proposals for locations of future ITSCs include China, Las Palmas, and Los Angeles.

Financially the society is doing well.

It is projected that we will have around 1,150 members at the end of 2011. Society membership has increased by 6.3% this year. Christoph would like to see our society grow, so a push for membership development will be coming in the next few years.

The ITSS web site is being migrated to a Wordpress site supported by IEEE. Keep an eye on the web site to see a new look and more features in the near future.

At the end of the meeting, election for four ExCom positions ensued. The results are as follows:

VP Publication Activities from January 2012-December 2013 – Daniel Zeng
VP Conference Activities from January 2012-December 2013 – Matt Barth
VP Member Activities from January 2012-December 2013 – Jason Geng
Editor-in-Chief of Transactions from January 2012-December 2013 – Fei-Yue Wang

If you have any questions about anything covered at the meeting, feel free to contact the VP Administrative Activities, Jeffrey Miller, at jmiller@uaa.alaska.edu.

IEEE ITS Outstanding Research Award
IEEE ITS Outstanding Application Award
IEEE ITS Institutional Lead Award

Call for Nomination of Awards

Purpose and Selection Criteria

The IEEE ITS Outstanding Research Award, IEEE ITS Outstanding Application Award, and IEEE ITS Lead Award are given annually for ITS researchers, practitioners, and research/development teams who have made significant contributions to research in ITS related fields (ITS Research Award), developed and deployed successful ITS systems or implementations (ITS Application Award), and demonstrated leadership in promoting ITS technologies (ITS Institutional Lead Award). These awards are established to recognize, promote, and publicize major research contribution, application innovations with real-world impact, and ITS institutional leadership.

Application Materials

Each application must consist of the following materials:

(1) A 5-page summary statement providing sufficient detail for evaluation of the innovations and impacts of the work.

(2) At least 3 letters of recommendation from the recognized peer researchers, customers or users of the developed application, and organizations attesting to its significance and impact.

Please email applications before **December 31, 2011** to ITSS Vice President of Membership: jason.geng@ieee.org.

Dedicated selection committees will evaluate the applications for the IEEE ITS Awards and propose candidates for final approval by the ITSS Board of Governors.

Nomination Process for IEEE Fellow Class of 2013 is Now Open

The nomination period is now open for the IEEE Fellow Class of 2013 and will continue through 1 March 2012. Nominees for Fellow must be an IEEE Senior Member or IEEE Life Senior Member with contributions that have advanced engineering, science, and technology, bringing significant value to society. Members can be nominated in one of four categories: application engineer/practitioner, educator, research engineer/scientist, or technical leader.
Please visit the IEEE Fellow Web page (http://www.ieee.org/membership_services/membership/fellows/index.html) for more information, detailed instructions for preparing the application, and required forms. Please use the online application for nomination and be sure to review the Before You Submit Checklist (http://www.ieee.org/membership_services/membership/fellows/before_you_submit.html). Using the online process, once you have submitted the completed application, notification is automatically sent to references and endorsers, alerting them that they have been asked to help with the nomination. This online application will save you a great deal of time, and you can monitor replies throughout the entire process. Please e-mail IEEE Fellows Staff (fellows@ieee.org) with questions.

IEEE Senior Member Application

Senior Member is the highest grade for which IEEE members can apply. The IEEE encourages all members to upgrade their membership to Senior Member when they are eligible to demonstrate their professional standing.

Requirements

The requirements for Senior Member include 10 years of professional experience (Your educational experience is credited toward that time as follows: three years for a baccalaureate degree in an IEEE-designated field, 4 years if you hold a baccalaureate and masters degree, 5 years if you hold a doctorate) with five years of significant performance. Please see details on the Senior Member Requirements page at http://www.ieee.org/web/membership/senior-members/requirements.html

Benefits of IEEE Senior Membership

- The professional recognition of your peers for technical and professional excellence.
- Senior Member Plaque: Since January 1999, all newly elevated Senior Members have received an engraved Senior Member plaque to be proudly displayed for colleagues, clients and employers to see. The plaque, an attractive fine wood with bronze engraving, is sent within six to eight weeks after elevation.
- Up to $25.00 gift certificate toward one new Society membership.
- A letter of commendation to your employer on the achievement of senior member grade (upon the request of the newly elected Senior Member.)

- Announcement of elevation in Section/Society and/or local newsletters, newspapers and notices.
- Eligibility to hold executive IEEE volunteer positions. Can serve as Reference for Senior Member applicants. Invited to be on the panel to review Senior Member applications.

How to Apply for IEEE Senior Membership

- Contact qualifying references, and request them to fill out the required Reference Form on your behalf. You can download the form athttp://www.ieee.org/web/membership/senior-members/reference.html
- Complete online application/nomination form. You may submit your application in any of the formats provided, but for the quickest processing, use the online form. You can find the form at http://www.ieee.org/web/membership/senior-members/application.html

Note: The applicant must also provide three references from current IEEE members holding Senior Member, Fellow or Honorary Member grade. If you have difficulty in locating Senior Members or Fellows to serve as references, please contact one of the Section Officers (http://www.ieeecincinnati.org/section-officiers/). We will assist you in the application process and in identifying references for you. Please check out application deadlines and checklist at the link below
http://www.ieee.org/web/membership/senior-members/apply.html

Jason Geng
VP for Membership
jason.geng@ieee.org

IEEE

ITSC 2012

intelligent transportation systems conference

http://www.itsc2012.org

Anchorage, Alaska, USA
September 16-19, 2012

Intelligent Transportation Systems (ITS) hold the promise of improving mobility, safety, and security, while ensuring energy efficiency and reducing environmental impacts of transportation systems.

Call for Papers

Original and innovative contributions in ITS research and advanced implementations and deployments are sought for technical sessions. Please submit articles conveying new developments in theory, analytical, and numerical simulation and modeling, experimentation, advanced deployment and case studies, results of laboratory or field operational tests, and other related creative endeavors as well as special educational developments for ITS curricula. The conference theme is The Wild Frontier in Intelligent Transportation. The technical areas include but are not limited to the following:

- Traffic theory, modeling, simulation
- Intelligent algorithms
- Sensors and actuators
- Vision systems and processing
- Safety Systems
- Security Systems
- Evacuation Systems
- Traffic and Communications Networks
- Traffic Control Systems
- V2V and V2I Communications
- ITS User Services: ATMS, ATIS, AVCS, etc.
- Intelligent Vehicles
- Driver Assistance
- Vehicle Collision Avoidance
- Integrated Safety Systems
- Commercial Vehicle Operations
- Multi-modal ITS
- ITS Implementation
- Pedestrian and Bicyclist Safety and Mobility Systems
- ITS for Special Needs
- Emergency Services
- Environmental and Green Transportation

In the tradition of successful IEEE ITS Conferences, only the highest quality papers will be accepted through an on-line peer review process. The final version of the accepted papers will be included in the Conference proceedings only after at least one author officially registers and presents the paper at the Conference.

Important Dates

- Full-paper submission deadline: March 15, 2012
- Notification of acceptance: June 1, 2012
- Final paper submission deadline: July 1, 2012
- Special Session proposal submission deadline: February 25, 2012
- Workshop/Tutorial proposal submission deadline: March 15, 2012

Best Student Paper Award

Articles written and presented by a primary author who is a student will be specially selected for the *Best Student Paper Award* recognition during the Conference.

Special Issue of *IEEE Transactions on ITS*

Selected exceptional quality papers will be invited for submission to a special issue of the *IEEE Transactions on Intelligent Transportation Systems.* Authors will be asked to revise their papers according to the standards of the Transactions, which will be subjected to the Transactions' review process.

Workshops

Proposals are sought for Special Workshops and Tutorials realted to the topics and theme of the conference.

Organizing Committee

General Chair:	**Prof. Jeffrey Miller, University of Alaska Anchorage, USA**
Program Co-Chairs:	**Prof. Wei-Bin Zhang, University of California, Berkeley, USA**
	Prof. Yinhai Wang, University of Washington, USA
Finance Chair	**Prof. James Krogmeier, Purdue University, USA**
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Workshop/Tutorials Chair:	**Prof. Zhiheng Li, Tsinghua University, China**
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	Prof. Fei-Yue Wang, Chinese Academy of Sciences, China
	Prof. Matthew Barth, University of California, Riverside, USA

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Prof. Shankar	Penn State University
Prof. S. Ukkusuri	Purdue University
Prof. G. Zhang	University of New Mexico
Prof. Y. Wu	University of St. Louis

IEEE Intelligent Vehicles Symposium
June 3-7, 2012, Alcalá de Henares, Spain

Sponsored by the IEEE Intelligent Transportation Systems Society

Call for Papers

THE INTELLIGENT VEHICLES SYMPOSIUM (IV'12) is the premier annual forum sponsored by the **IEEE INTELLIGENT TRANSPORTATION SYSTEMS SOCIETY (ITSS)**. Researchers, academicians, practitioners, and students from universities, industry, and government agencies are invited to discuss research and applications for Intelligent Vehicles and Vehicle-Infrastructure Cooperation. The technical presentations are characterized by a single session format so that all attendees remain in a single room for multilateral communications in an informal atmosphere. Tutorials will be offered on the first day followed by three days of presentations and a vehicle demonstration day. An exhibition area will be available for the presentation of products and projects, as well as for small demonstrations.

Program topics include but are not limited to:

- Advanced Driver Assistance Systems
- Automated Vehicles
- Vehicular Safety, Active and Passive
- Vehicle Environment Perception
- Driver State and Intent Recognition
- Eco-driving and Energy-Efficient Vehicles
- Impact on Traffic Flows
- Cooperative Vehicle-Infrastructure Systems
- Collision Avoidance
- Pedestrian Protection
- V2I / V2V Communication
- Assistive Mobility Systems
- Intelligent Ground, Air and Space Vehicles
- Autonomous / Intelligent Robotic Vehicles
- Image, Radar, Lidar Signal Processing
- Information Fusion
- Vehicle Control
- Telematics
- Human Factors and HMI
- Electric and Hybrid Technologies
- Novel Interfaces and Displays
- Intelligent Vehicle Software Infrastructure

Manuscripts of 6 pages in PDF format must be electronically submitted for peer-review in IEEE standard-format. For detailed submission instructions visit the conference website **www.robesafe.es/iv2012**

Important Dates

Special Session Proposal: **January 16th, 2012**
Paper submission deadline: **January 16th, 2012**
Notification of acceptance: **March 15th, 2012**
Final paper submission: **April 15th, 2012**

Contact

For proposal of a special session, demonstration, and exhibition contact the organization committee at **iv2012@robesafe.es**

General Chair
Miguel Ángel Sotelo
University of Alcalá, Spain
miguel.sotelo@uah.es

Program Chair
Meng Lu
Dinalog, The Netherlands
lu@dinalog.nl

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Yu, Hai (USA),
Zhao, Dongbin (China)

SCOPE

The 2012 IEEE International Conference on Vehicular Electronics and Safety (ICVES'12) which is an annual forum sponsored by the IEEE Intelligent Transportation Systems Society will take place in İstanbul during July 24-27, 2012. It brings together researchers and practitioners to discuss vehicle electronics, and safety systems research and practice. ICVES'12 welcomes papers dealing with any aspect of vehicle electronics and safety systems.

* * *

ICVES is the Conference the ITS Society has specifically identified for presentations on Electric Vehicles, Hybrid and Plug-In Hybrid Vehicle related presentations. Researchers in these areas are especially encouraged to submit their latest results and attend.

* * *

The motto for ICVES'12 is: *Let's meet where the continents meet. İstanbul connecting the two continents of Europe and Asia and being a cross-road of civilizations for many centuries is an ideal location for the IEEE International Conference on Vehicular Electronics and Safety. The conference venue is Military Museum and Cultural Center located at the center of Istanbul.*

TOPICS

Original contributions are solicited in all Vehicular Electronics and Safety research and applications. Contributions for industry and application sessions are also solicited. Topics include, but are not limited to:

* *Active and Passive Safety Systems*
* *Telematics*
* *Vehicular Power Networks*
* *X*By Wire Technology*
* *System*On*a*Chip*
* *Vehicular Sensor*
* *Vehicle Bus*
* *Sensor Network*
* *Electro Magnetic Compatibility*
* *Inter*Vehicular Network*
* *Vehicle Testing*
* *Vehicle Hardware / Software System*
* *Navigation and Localization Systems*
* *Vehicular Measurement Technology*
* *Vehicular Signal Processing*
* *Micro*electromechanical Systems*
* *Image Sensor*
* *Vehicle / Engine Control*
* *Embedded Operation System*
* *Driver Assistance Systems*
* *Adaptive Cruise Control Systems*
* *Pattern Recognition for Vehicles*
* *Human Machine Interaction*
* *Diagnostics on Line*
* *Virtual / Digital System*
* *Others*

PAPER SUBMISSION

Prospective authors are requested to submit their paper as a pdf file in IEEE two column format through The IEEE Intelligent Transportation Systems Society Conference Management System no later than February 15, 2012. A LaTeX style file and a Microsoft Word template are available at the website: http://its.papercept.net/conferences/index.html.

IMPORTANT DATES

* ***Submission deadline*** *: February 15, 2012*
* ***Notification of acceptance*** *: May 15, 2012*
* ***Final Manuscript due*** *:June 1, 2012*
* ***Workshop proposals due*** *:June 8, 2012*

Workshop organization is encouraged. Prospective organizers should contact the program chair at icves2012@gsu.edu.tr and please visit the web site.

http://icves2012.gsu.edu.tr,
For e-mail correspondence: icves2012@gsu.edu.tr

International Conference on ITS Telecommunications
Taipei, Taiwan, November 5-8, 2012 (ITST-2012)
Call for Paper

Wireless communication for intelligent transportation systems (ITSs) is a promising technology to improve driving safety, reduce traffic congestion and support information services in vehicles. A new era of vehicular technology that includes vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communication is approaching, and this era will be driven by both (pre-competitive) public-sector and private-sector funding. Safety-related applications are not only taken into consideration, but non-safety multimedia content providers are also becoming a new topic of research. Key players in the industry, such as automobile companies and government agencies, are investing heavily in the advanced research and development of many ITS technologies and applications. This research effort primarily focuses on the system development and standardization of telematics. During recent ITS developments, transportation telematics techniques have exhibited much progress, e.g., interaction between automobiles and the infrastructure for delivering services such as road-side assistance, automatic crash notification, concierge assistance and vehicle condition reports. A number of IEEE 802.11p-like equipment prototypes have been built, and several technical reports based on field trials have demonstrated the lack of cutting-edge techniques to improve system performance. Technology and applications for ITSs and telematics design are rapidly emerging, and there is a critical need to bring together professional researchers, intelligent engineers, academia, industry, standard committees, the private sector and the public sector to exchange new ideas. This conference aims to spur research progress by serving as a forum in which both academia and industry can share experiences and report original work regarding all aspects of vehicular communication, e.g., Vehicular Ad hoc Networks (VANETs), information dissemination, road safety, ITS and emergency services. Our primary goal is to promote meaningful research in the cross-layered design of architectures, algorithms and applications for inter-vehicular communication environments.

Track1: Smart Vehicle
- Video/Audio signal processing for driver-assistance systems
- In-Car communications/telematics
- Analog/Digital circuit design for in-car smart systems
- SoC architecture/platform for smart car systems
- Green design techniques for smart cars
- Security and privacy in vehicular networks
- Field operational tests and testbeds for smart vehicular
- Vehicle collision avoidance
- Sensors and actuators

Track2: Intelligent Transportation Systems (ITS)
- Data-collection, organization and dissemination methods
- New ITS/Telematics applications
- Ongoing ITS/Telematics activities

Track3: Telecommunications
- V2V, V2I and V2X communications
- Network protocols
- Design with multiple wireless data links (802.11p, WiMAX, WiFi, cell phone, GPS)
- Mobility or handover technology
- System-level, board-level and chip-level electronics
- PHY issues
- Physical layer and antenna technologies for vehicular networks
- RF propagation models for vehicular networks
- Radio resource management for vehicular networks

Track4: Green Life Toward Blue Planet
- Field operational tests and testbeds for vehicular networks
- Assessment of impact of vehicular networks on transportation efficiency and safety
- Emission modeling and environmental impact assessment
- Regional requirements and their consequences
- Interference-Management and Spectrally-Efficient Technologies
- Resource-Efficient Networking Technology and Application Design
- Cross-Layer Design/Optimization and Green Transceiver Design
- Novel technologies to reduce human electromagnetic exposure and electromagnetic pollution

Important Notes

PDF format via http://www.edas.info

Author's guidelines are announced on conference web site http://www.itst2012.org

Important Dates

- **Manuscript Submission Due: May 31, 2012**
- **Final Acceptance notification: July 31, 2012**
- **Final Manuscript Due: August 31, 2012**
- **Early Registration: August 31, 2012**

General Chair: Jia-Chin Lin jiachin@ieee.org
Contact: Chi-Sheng Lin info@nucomm.org

Taiwan Telematics Industry Association

http://www.itst2012.org

Deadline extended! Please check updated submission schedule!

IEEE Transactions on Intelligent Transportation Systems

Special Issue Call for Papers

Machine Learning for Traffic Sign Recognition

Recognition of traffic signs is a challenging real-world problem relevant for intelligent transportation systems. It is a multi-category classification problem with unbalanced class frequencies. Traffic signs show a wide range of variations between classes in terms of color, shape, and the presence of pictograms or text. However, there exist subsets of classes (e.g., speed limit signs) that are very similar to each other. Further, the classifier has to cope with large variations in visual appearances due to illumination changes, partial occlusions, rotations, weather conditions etc.

Although first commercial systems have reached the market and several studies on sign detection have been published, systematic comparisons of different approaches are scarce.

The special issue focuses on unbiased evaluation of new and existing methods from computer vision, machine learning, and related fields for traffic sign recognition. Empirical evaluation should be based on freely available benchmark data.

The special issue is organized in the context of the German Traffic Sign Recognition Benchmark (GTSRB), a competition at this year's IEEE International Joint Conference on Artificial Neural Networks (IJCNN 2011). The GTSRB data is freely available from `http://benchmark.ini.rub.de`.

Important dates

First submission deadline:	January 11, 2012
Notification of first decision:	March 15, 2012
Revision submission deadline:	May 15, 2012
Notification of final decision:	August 15, 2012
Final manuscript (camera ready) submission deadline:	September 1, 2012
Publication:	Fourth issue 2012 (December)

Submission

Manuscripts should be submitted at `http://mc.manuscriptcentral.com/t-its` by selecting the manuscript type "Special Issue on MLFTSR".

Guest editors

Johannes Stallkamp, Ruhr-Universität Bochum, Germany
Marc Schlipsing, Ruhr-Universität Bochum, Germany
Jan Salmen, Ruhr-Universität Bochum, Germany
Christian Igel, University of Copenhagen, Denmark

Contact

tsr-benchmark@ini.ruhr-uni-bochum.de


Conference Calendar

Massimo Bertozzi / Paolo Grisleri

This section lists upcoming ITS-related conferences, workshops, or exhibits.
Contributions are welcome; please send announcements to itsconfs@ce.unipr.it.

2012

February 6-8
1st International Conference on Pattern Recognition Applications and Methods
Vilamoura, Algarve, Portugal
ICPRAM website: http://www.icpram.org/

February, 24-26
VISIGRAPP 2012 7th International Joint COnference on Computer Vision, Imaging and Computer Graphics Theory and Applications
Rome, Italy
http://www.visigrapp.org/

March 4-8
2012 IEEE International Electrical Vehicle Conference (IEVC)
Technology, Engineering, Standards – Challenges and Opportunities
Greenville, South Carolina, USA
http://electricvehicle.ieee.org

March 19-21,
IEEE International Conference on Industrial Technology - ICIT'2012
Kos Island, Greece
Conference web site: http://icit2012.isi.gr/
Submission due by: October 20th, 2010

April 24-26
SAE 2012 World Congress
Cobo Center
Detroit, Michigan, USA
http://www.sae.org/congress

May 6-9
IEEE 73rd Vehicular Technology Conference:
Yokohama, Japan

http://www.ieeevtc.org/vtc2012spring/
Submission due by October 20, 2011

May 14-18
2012 IEEE International Conference on Robotics and Automation
St. Paul, USA
Submissions due by: September 16, 2011
http://www.icra2012.org/

May 28-31
ISIE 2011 - IEEE International Symposium on Industrial Electronics
Hangzhou, Zhejiang, China
http://www.isie2012.com/
Submission due by: October 30th, 2011

June 3-7
2012 IEEE Intelligent Vehicles Symposium
Alcalá de Henares, Spain
www.robesafe.es/iv2012
Special Session Proposal: **January 16th, 2012**
Paper submission deadline: **January 16th, 2012**

June 20-25
Computer Vision and Pattern Recognition: CVPR 2012
Providence, Rode Island, USA
http://www.cvpr2012.org/
Submission due by: Nov. 21, 2011

July 24-27
2012 IEEE International Conference on Vehicular Electronics and Safety (ICVES12)
Istanbul, Turkey
http://www.ICVES2012.gsu.edu.tr
Paper submission deadline: Feb 15, 2012

September 16-19, 2012
2012 IEEE Intelligent Transportation Systems Conference
Anchorage, Alaska, USA
Submissions due by March 31, 2012
http://www.itsc2012.com

October 3-5
2012 IEEE Multi-Conference on Systems and Control
Dubrovnik, Croatia
http://www.msc2012.org/
Submission due by: February 10, 2012

EARLY ACCESS

A New Vehicle Motion Model for Improved Predictions and Situation Assessment

Sörstedt, J.; Svensson, L.; Sandblom, F.; Hammarstrand, L.;

Reliable and accurate vehicle motion models are of vital importance for automotive active safety systems for a number of reasons. First of all, these models are necessary in tracking algorithms that provide the safety system with information. Second, the motion model is often used by the safety application to make long-term predictions about the future traffic situation. These predictions are then part of the basic data used by the system to determine if, when, and how to intervene. In this paper, we suggest a framework for designing accurate vehicle motion models. The resulting models differ from conventional models in that the expected control input from the driver is included. By also providing a methodology for a formal treatment of the uncertainties, a model structure well suited, e.g., in a tracking algorithm, is obtained. To utilize the framework in an application will require careful design and validation of submodels to calculate the expected driver control input. We illustrate the potential of the framework by examining the performance for a specific model example using real measurements. The properties are compared with those of a constant acceleration model. Evaluations indicate that the proposed model yields better predictions and that it has an ability to estimate the prediction uncertainties.

A Case Study of Evaluating Traffic Signal Control Systems Using Computational Experiments

Zhu, F.; Li, G.; Li, Z.; Chen, C.; Wen, D.;

A new traffic signal control system (TSCS) evaluation method that uses computational experiments based on artificial transportation systems (ATSs) is proposed in this paper. Some basic ideas of the method are discussed, i.e., generating reasonable travel demand, modeling the influence of environment, and designing communication interface. Using a 30-day computational experiment on ATSs, a case study is carried out to evaluate three TSCSs, which are implemented using fixed-time (FT), queue-based responsive (QBR), and adaptive dynamic program (ADP) algorithms, respectively. Aside from normal weather, three types of adverse weather, i.e., rain, wind, and fog, are modeled in the computational experiment. After analyzing aggregate data and detailed operating record, reliable evaluation results are obtained from this case study. Furthermore, several interesting phenomena are observed in this case study, which have yet to be noticed by previous work.

Data-Driven Intelligent Transportation Systems: A Survey

Zhang, J.; Wang, F.-Y.; Wang, K.; Lin, W.-H.; Xu, X.; Chen, C.;

For the last two decades, intelligent transportation systems (ITS) have emerged as an efficient way of improving the performance of transportation systems, enhancing travel security,and providing more choices to travelers. A significant change in ITS in recent years is that much more data are collected from a variety of sources and can be processed into various forms for different stakeholders. The availability of a large amount of data can potentially lead to a revolution in ITS development, changing an ITS from a conventional technology-driven system into a more powerful multifunctional data-driven intelligent transportation system (D2ITS): a system that is vision, multisource, and learning algorithm driven to optimize its performance. Furthermore, D2ITS is trending to become a privacy-aware people-centric more intelligent system. In this paper, we provide a survey on the development of D2ITS, discussing the functionality of its key components and some deployment issues associated with D2ITS. Future research directions for the development of D2ITS is also presented.

Predictive Threat Assessment via Reachability Analysis and Set Invariance Theory

Falcone, P.; Ali, M.; Sjöberg, J.;

We propose two model-based threat assessment methods for semi-autonomous vehicles, i.e., human-driven vehicles with autonomous driving capabilities. Based on information about the surrounding environment, we introduce a set of constraints on the vehicle states, which are satisfied under “safe” driving conditions. Then, we formulate the threat assessment problem as a constraint satisfaction problem. Vehicle and driver mathematical models are used to predict future constraint violation, indicating the possibility of accident or loss of vehicle control, hence, the need to assist the driver. The two proposed methods differ in the models used to predict vehicle motion within the surrounding environment. We demonstrate the proposed methods in a roadway departure application and validate them through experimental data.

Multiband Image Segmentation and Object Recognition for Understanding Road Scenes

Kang, Y.; Yamaguchi, K.; Naito, T.; Ninomiya, Y.;

This paper presents a novel method for semantic segmentation and object recognition in a road scene using a hierarchical bag-of-textons method. Current driving-assistance systems rely on multiple vehicle-mounted cameras to perceive the road environment. The proposed method relies on integrated color and near-infrared images and uses the hierarchical bag-of-textons method to recognize the spatial configuration of objects and extract contextual information from the background. The histogram of the hierarchical bag-of-textons is concatenated to textons extracted from a multiscale grid window to

automatically learn the spatial context for semantic segmentation. Experimental results show that the proposed method has better segmentation accuracy than the conventional bag-of-textons method. By integrating it with other scene interpretation systems, the proposed system can be used to understand road scenes for vehicle environment perception.

Acoustic Hazard Detection for Pedestrians With Obscured Hearing

Lee, J.; Rakotonirainy, A.;

Pedestrians' use of MP3 players or mobile phones can pose the risk of being hit by motor vehicles. We present an approach for detecting a crash-risk level using the computing power and the microphone of mobile devices that can be used to alert the user in advance of an approaching vehicle to avoid a crash. A single-feature extractor classifier is not usually able to deal with the diversity of risky acoustic scenarios. In this paper, we address the problem of the detection of vehicles that are approaching a pedestrian by a novel simple nonresource-intensive acoustic method. The method uses a set of existing statistical tools to mine signal features. Audio features are adaptively thresholded for relevance and are classified with a three-component heuristic. The resulting acoustic-hazard-detection (AHD) system has a very low false-positive detection rate. The results of this paper could help mobile-device manufacturers to embed the presented features into future portable devices and contribute to road safety.

Intelligent Highway Traffic Surveillance With Self-Diagnosis Abilities

Cheng, H.-Y. ; Hsu, S.-H. ;

In this paper, we propose a self-diagnosing intelligent highway surveillance system and design effective solutions for both daytime and nighttime traffic surveillance. For daytime surveillance, vehicles are detected via background modeling. For nighttime videos, headlights of vehicles need to be located and paired for vehicle detection. An algorithm based on likelihood computation is developed to pair the headlights of vehicles at night. Moreover, to balance between the robustness and abundance of acquired information, the proposed system adapts different strategies under different traffic conditions. Performing tracking would be preferred when traffic is smooth. However, under congestion conditions, it is better to obtain traffic parameters by estimation. We utilize a time-varying adaptive system state transition matrix in Kalman filter for better prediction in a traffic surveillance scene when performing tracking. We also propose a mechanism for estimating the traffic flow parameter via regression analysis. The experimental results have shown that the self-diagnosis ability and the modules designed for the system make the proposed system robust and reliable.

An Introduction to Parallel Control and Management for High-Speed Railway Systems

Ning, B. ; Tang, T. ; Dong, H. ; Wen, D. ; Liu, D. ; Gao, S. ; Wang, J. ;

This paper introduces a framework of parallel control and management for high-speed railway systems (HRSs). First, based on multiagent modeling, an artificial HRS that is consistent with realistic operations of the actual HRS is constructed. Then, different kinds of computational experiments are performed on the artificial HRS, followed by analysis and synthesis with a case. Finally, through an interactive and parallel operation between the actual and artificial HRSs, a set of practical control and management strategies can be achieved for the actual HRS. With the primary objective of ensuring reliability and safety of HRSs, this study could enhance the quality of services and the integrated transportability with other existing modes of transportation systems to provide appropriate recommendations and strategies for forming an overall effective comprehensive transportation system.

A Multiple-Hypothesis Map-Matching Method Suitable for Weighted and Box-Shaped State Estimation for Localization

Abdallah, F. ; Nassreddine, G. ; Denoeux, T. ;

The goal of map-matching algorithms is to identify the road taken by a vehicle and to compute an estimate of the vehicle position on that road using a digital map. In this paper, a map-matching algorithm based on interval analysis and the belief function theory is proposed. The method combines the outputs from existing bounded-error estimation techniques with piecewise rectangular roads that are selected using evidential reasoning. A set of candidate roads is first defined at each time step using the topology of the map and a similarity criterion, and a mass function on the set of candidate roads is computed. An overall estimate of the vehicle position is then derived after the most probable candidate road has been selected. This method allows multiple road junction hypotheses to efficiently be handled and can cope with missing data. In addition, the implementation of the method is quite simple, because it is based on geometrical properties of boxes and rectangular road segments. Experiments with simulated and real data demonstrate the ability of this method to handle junction situations and to compute an accurate estimate of the vehicle position.

Trajectory Clustering and an Application to Airspace Monitoring

Gariel, M. ; Srivastava, A. N. ; Feron, E. ;

This paper presents a framework aimed at monitoring the behavior of aircraft in a given airspace. Trajectories that constitute typical operations are determined and learned using

data-driven methods. Standard procedures are used by air traffic controllers (ATCs) to guide aircraft, ensure the safety of the airspace, and maximize runway occupancy. Even though standard procedures are used by ATCs, control of the aircraft remains with the pilots, leading to large variability in the flight patterns observed. Two methods for identifying typical operations and their variability from recorded radar tracks are presented. This knowledge base is then used to monitor the conformance of current operations against operations previously identified as typical. A tool called AirTrajectoryMiner is presented, aiming at monitoring the instantaneous health of the airspace, in real time. The airspace is "healthy" when all aircraft are flying according to typical operations. A measure of complexity is introduced, measuring the conformance of current flight to typical flight patterns. When an aircraft does not conform, the complexity increases as more attention from ATC is required to ensure safe separation between aircraft.

Probabilistic Rail Vehicle Localization With Eddy Current Sensors in Topological Maps

Hensel, S. ; Hasberg, C. ; Stiller, C. ;

Precise localization of rail vehicles is a key element toward the development and deployment of novel train control systems that offer enhanced security and efficiency. Typically, research on train navigation systems approaches this task either by data fusion of an increasing number of onboard sensors or by additional infrastructure installations that are combined with the localization of a global navigation satellite system (GNSS). The former approach is cost intensive and only gradually improves reliability and availability of localization information, whereas the latter approach suffers from the absence of satellite signals in places that are important for railroad applications such as tunnels or railway stations. In contrast, this paper employs a novel single eddy current sensor (ECS) mounted on the rail vehicle that directly pursues observations of the rail on a topological map. The localization task is formulated in a model-based probabilistic framework that enables us to derive signal processing techniques for board-autonomous speed estimation and recognition of particular events such as railroad switches by pattern recognition. In particular, turnouts are detected by Bayesian inference based on hidden Markov models (HMMs). In the final step, position on a topological map is estimated by sequential Monte Carlo sampling that combines speed and event information acquired from the ECS signal. Experiments with simulated and real-world data from an experimental rail vehicle indicate that the proposed system yields position and speed information of high reliability in real time.

On the Effectiveness of an Opportunistic Traffic Management System for Vehicular Networks

Leontiadis, I. ; Marfia, G. ; Mack, D. ; Pau, G. ; Mascolo, C. ; Gerla, M. ;

Road congestion results in a huge waste of time and productivity for millions of people. A possible way to deal with this problem is to have transportation authorities distribute

traffic information to drivers, which, in turn, can decide (or be aided by a navigator) to route around congested areas. Such traffic information can be gathered by relying on static sensors placed at specific road locations (e.g., induction loops and video cameras) or by having single vehicles report their location, speed, and travel time. While the former approach has been widely exploited, the latter has come about only more recently; consequently, its potential is less understood. For this reason, in this paper, we study a realistic test case that allows the evaluation of the effectiveness of such a solution. As part of this process, (a) we designed a system that allows vehicles to crowd-source traffic information in an ad hoc manner, allowing them to dynamically reroute based on individually collected traffic information; (b) we implemented a realistic network-mobility simulator that allowed us to evaluate such a model; and (c) we performed a case study that evaluates whether such a decentralized system can help drivers to minimize trip times, which is the main focus of this paper. This study is based on traffic survey data from Portland, OR, and our results indicate that such navigation systems can indeed greatly improve traffic flow. Finally, to test the feasibility of our approach, we implemented our system and ran some real experiments at UCLA's C-Vet test bed.

Prediction of Lane Clearance Time of Freeway Incidents Using the M5P Tree Algorithm

Zhan, C. ; Gan, A. ; Hadi, M. ;

A number of existing studies have attempted to predict freeway incident duration or incident clearance time. Because lane blockage is the main cause of congestion during freeway incidents, it is more beneficial to predict the lane clearance time instead of the incident clearance time for incidents that involve lane blockages. However, previous studies have not developed prediction models for the lane clearance time. This paper utilizes the M5P tree algorithm for lane clearance time prediction, which has advantages, compared with traditional prediction algorithms. These advantages include the M5P tree algorithm's ability to deal with categorical and continuous variables and variables with missing values. The developed model shows that there are a number of variables that affect the lane clearance time, including the number of lanes blocked, time of day, types and number of vehicles involved, the response by the Severe Incident Response Vehicle (SIRV), and traffic management center response and verification times. Comparison results show that the developed model can generally achieve better prediction results than the traditional regression and decision tree models.

A Novel Geodetic Engineering Method for Accurate and Automated Road/Railway Centerline Geometry Extraction Based on the Bearing Diagram and Fractal Behavior

Gikas, V. ; Stratakos, J. ;

This paper describes a novel approach for extracting the centerline geometry of road/railway alignments in the form of traditional design elements (i.e., straight lines, circle arcs, and clothoids). As opposed to previous research, the proposed method

attempts a completely general and a fully automated solution to the problem in a rigorous mathematical manner. Centerline locations originate in a ground-based mobile mapping system (e.g., global navigation satellite system/inertial navigation system vehicle trajectory or kinematic laser scanning profiles of the road/railway corridor). The core of the algorithm resides on the use, manipulation, and suitable reformulations of the bearing diagram of the centerline locations and its first- and second-order derivatives. To ensure highly accurate and consistent results, the algorithm practices a series of specifically designed/dynamically tuned filters that fully adhere to the fractal properties of the centerline location data. Extended test runs were undertaken to validate the correctness of the mathematical model and the feasibility of the algorithms and associated software. In this paper, test results using a simulated and a real (based on a multisensor geodetic survey) subset of a railway track data are discussed.

Parameter and State Estimation in Vehicle Roll Dynamics

Rajamani, R. ; Piyabongkarn, D. ; Tsourapas, V. ; Lew, J. Y. ;

In active rollover prevention systems, a real-time rollover index, which indicates the likelihood of the vehicle to roll over, is used. This paper focuses on state and parameter estimation for reliable computation of the rollover index. Two key variables that are difficult to measure and play a critical role in the rollover index are found to be the roll angle and the height of the center of gravity of the vehicle. Algorithms are developed for real-time estimation of these variables. The algorithms investigated include a sensor fusion algorithm and a nonlinear dynamic observer. The sensor fusion algorithm requires a low-frequency tilt-angle sensor, whereas the dynamic observer utilizes only a lateral accelerometer and a gyroscope. The stability of the nonlinear observer is shown using Lyapunov's indirect method. The performance of the developed algorithms is investigated using simulations and experimental tests. Experimental data confirm that the developed algorithms perform reliably in a number of different maneuvers that include constant steering, ramp steering, double lane change, and sine with dwell steering tests.

A Dynamic Privacy-Preserving Key Management Scheme for Location-Based Services in VANETs

Lu, R. ; Lin, X. ; Liang, X. ; Shen, X. ;

In this paper, to achieve a vehicle user's privacy preservation while improving the key update efficiency of location-based services (LBSs) in vehicular ad hoc networks (VANETs), we propose a dynamic privacy-preserving key management scheme called DIKE. Specifically, in the proposed DIKE scheme, we first introduce a privacy-preserving authentication technique that not only provides the vehicle user's anonymous authentication but enables double-registration detection as well. We then present efficient LBS session key update procedures: 1) We divide the session of an LBS into several time slots so that each time slot holds a different session key; when no vehicle user departs from the service session, each joined user can use a one-way hash function to autonomously update the new session key for achieving forward secrecy. 2) We also

integrate a novel dynamic threshold technique in traditional vehicle-to-vehicle (V-2-V) and vehicle-to-infrastructure (V-2-I) communications to achieve the session key's backward secrecy, i.e., when a vehicle user departs from the service session, more than a threshold number of joined users can cooperatively update the new session key. Performance evaluations via extensive simulations demonstrate the efficiency and effectiveness of the proposed DIKE scheme in terms of low key update delay and fast key update ratio.

Iterative Quadratic Optimization for the Bus Holding Control Problem

Koehler, L. A. ; Kraus, W. ; Camponogara, E. ;

A multiple control-point strategy for holding control of a bus transit system is presented. The model developed is deterministic and assumes the availability of real-time information and historical data of the system. Stochastic effects are disturbances to be compensated by the feedback nature of the control. The objective is to minimize total user delay, which is modeled by a nonconvex cost function and nonlinear constraints. To efficiently solve the problem, simplifications of the original model are introduced, together with an iterative quadratic programming (IQP) optimization procedure. A numerical example illustrates the application of the method, indicating its feasibility for real-time applications and the good approximation of the global optimum provided by the heuristic solution.

Stereo-Camera-Based Urban Environment Perception Using Occupancy Grid and Object Tracking

Nguyen, T.-N. ; Michaelis, B. ; Al-Hamadi, A. ; Tornow, M. ; Meinecke, M.-M. ;

This paper deals with environment perception for automobile applications. Environment perception comprises measuring the surrounding field with onboard sensors such as cameras, radar, lidars, etc., and signal processing to extract relevant information for the planned safety or assistance function. Relevant information is primarily supplied using two well-known methods, namely, object based and grid based. In the introduction, we discuss the advantages and disadvantages of the two methods and subsequently present an approach that combines the two methods to achieve better results. The first part outlines how measurements from stereo sensors can be mapped onto an occupancy grid using an appropriate inverse sensor model. We employ the Dempster–Shafer theory to describe the occupancy grid, which has certain advantages over Bayes' theorem. Furthermore, we generate clusters of grid cells that potentially belong to separate obstacles in the field. These clusters serve as input for an object-tracking framework implemented with an interacting multiple-model estimator. Thereby, moving objects in the field can be identified, and this, in turn, helps update the occupancy grid more effectively. The first experimental results are illustrated, and the next possible research intentions are also discussed.

A Dynamic-Zone-Based Coordinated Ramp-Metering Algorithm With Queue Constraints for Minnesota's Freeways

Geroliminis, N. ; Srivastava, A. ; Michalopoulos, P. ;

Following about 40 years of successful deployment of coordinated traffic-responsive ramp control, a new generation is being developed for Minnesota's freeways based on density measurements, rather than flow rates. This was motivated from recent research indicating that the critical value of density at which capacity is observed is less sensitive and more stable than capacity, thereby allowing the opportunity for more effective control. The main goals of the new approach are to delay the onset of the breakdown and accelerate system recovery when ramp metering is disabled due to the violation of maximum allowable ramp waiting times. This is obtained by a dynamic zone partitioning of the freeway network to identify critical bottleneck locations and coordinated balancing of ramp delays, which aims to avoid mainline breakdown. The effectiveness of the new control strategy is assessed by comparison with the currently deployed version of the stratified zone metering algorithm through microscopic simulation of a real 12-mi 17-ramp freeway section. Simulations show a decrease in delays of mainline and ramp traffic and an improvement of 8% in overall system delays while avoiding maximum ramp delay violations.

Tracking and Pairing Vehicle Headlight in Night Scenes

Zhang, W. ; Wu, Q. M. J. ; Wang, G. ; You, X. ;

Traffic surveillance is an important topic in computer vision and intelligent transportation systems and has intensively been studied in the past decades. However, most of the state-of-the-art methods concentrate on daytime traffic monitoring. In this paper, we propose a nighttime traffic surveillance system, which consists of headlight detection, headlight tracking and pairing, and camera calibration and vehicle speed estimation. First, a vehicle headlight is detected using a reflection intensity map and a reflection suppressed map based on the analysis of the light attenuation model. Second, the headlight is tracked and paired by utilizing a simple yet effective bidirectional reasoning algorithm. Finally, the trajectories of the vehicle's headlight are employed to calibrate the surveillance camera and estimate the vehicle's speed. Experimental results on typical sequences show that the proposed method can robustly detect, track, and pair the vehicle headlight in night scenes. Extensive quantitative evaluations and related comparisons demonstrate that the proposed method outperforms state-of-the-art methods.

Interpolating Sparse GPS Measurements Via Relaxation Labeling and Belief Propagation for the Redeployment of Ambulances

Phan, A. ; Ferrie, F. P. ;

One major challenge for traffic management systems is the inference of traffic flow in regions of the network for which there are little data. In this paper, Global-Positioning-

System (GPS)-based vehicle locator data from a fleet of 40–60 roving ambulances are used to predict the most likely ambulance speeds in a network of 20 000 stree city of Ottawa, ON, Canada. First, the road network is represented as a directed graph data structure. Then, we compare two algorithms, i.e., relaxation labeling and belief propagation, that interpolate the sparse and noisy measurements from the fleet to obtain dense locally consistent ambulance speeds. Unlike several other systems in the literature, we model all of the city's freeways and surface streets, and both road types are treated with equal importance. Furthermore, the data structure and algorithms described in this paper are not only extended to real-world needs such as road closures and the incorporation of live data with historical data but are also computationally efficient, providing updates in intervals of less than 5 min on commodity hardware. Presented experimental results address the key issue of validating the performance and reliability of the system.

Viewpoint-Independent Object Detection Based on Two-Dimensional Contours and Three-Dimensional Sizes

Lee, P.-H. ; Lin, Y.-L. ; Chen, S.-C. ; Wu, C.-H. ; Tsai, C.-C. ; Hung, Y.-P. ;

We propose a viewpoint-independent object-detection algorithm that detects objects in videos based on their 2-D and 3-D information. Object-specific quasi-3-D templates are proposed and applied to match objects' 2-D contours and to calculate their 3-D sizes. A quasi-3-D template is the contour and the 3-D bounding cube of an object viewed from a certain panning and tilting angle. Pedestrian templates amounting to 2660 and 1995 vehicle templates encompassing 19 tilting and 35 panning angles are used in this study. To detect objects, we first match the 2-D contours of object candidates with known objects' contours, and some object templates with large 2-D contour-matching scores are identified. In this step, we exploit some prior knowledge on the viewpoint on which the object is viewed to speed up the template matching, and the viewpoint likelihood for each contour-matched template is also assigned. Then, we calculate the 3-D widths, heights, and lengths of the contour-matched candidates, as well as the corresponding 3-D-size-matching scores. The overall matching score is obtained by combining the aforementioned likelihood and scores. The major contributions of this paper are to explore the joint use of 2-D and 3-D features in object detection. It shows that, by considering 2-D contours and 3-D sizes, one can achieve promising object detection rates. The proposed algorithms were evaluated on both pedestrian and vehicle sequences. It yielded significantly better detection results than the best results reported in PETS 2009, showing that our algorithm outperformed the state-of-the-art pedestrian-detection algorithms.

Leveraging Electronic Ticketing to Provide Personalized Navigation in a Public Transport Network

Aguiar, A. ; Nunes, F. M. C. ; Silva, M. J. F. ; Silva, P. A. ; Elias, D. ;

Public transport networks (PTNs) are difficult to use when the user is unfamiliar with the area she is traveling to, as shown by a user survey that we present in this paper. This is true for both infrequent users (including visitors) and regular users who need to travel to areas with which they are not acquainted. In these situations, adequate on-trip navigation information can substantially ease the use of public transportation and be the driving factor in motivating travelers to prefer it over other modes of transportation. However, estimating the localization of a user is not trivial, although it is critical for providing relevant information. In this paper, we propose the use of an electronic ticketing infrastructure of a PTN operator for positioning within the context of the PTN to give on-trip personalized navigation cues. To our knowledge, this is an innovative contribution that has not been described or deployed, to date, elsewhere. We assess relevant design issues for a modular cost-efficient user-friendly on-trip navigation service that uses position sensors and present the details of a proof-of-concept prototype running in our laboratory. We also present and analyze the results of a user survey on the usefulness of the service and its acceptance by users.

Real-Time Driver's Stress Event Detection

Rigas, G. ; Goletsis, Y. ; Fotiadis, D. I. ;

In this paper, a real-time methodology for the detection of stress events while driving is presented. The detection is based on the use of physiological signals, i.e., electrocardiogram, electrodermal activity, and respiration, as well as past observations of driving behavior. Features are calculated over windows of specific length and are introduced in a Bayesian network to detect driver's stress events. The accuracy of the stress event detection based only on physiological features, evaluated on a data set obtained in real driving conditions, resulted in an accuracy of 82%. Enhancement of the stress event detection model with the incorporation of driving event information has reduced false positives, yielding an increased accuracy of 96%. Furthermore, our methodology demonstrates good adaptability due to the application of online learning of the model parameters.

International Large-Scale Vehicle Corpora for Research on Driver Behavior on the Road

Takeda, K. ; Hansen, J. H. L. ; Boyraz, P. ; Malta, L. ; Miyajima, C. ; Abut, H. ;

This paper considers a comprehensive and collaborative project to collect large amounts of driving data on the road for use in a wide range of areas of vehicle-related research centered on driving behavior. Unlike previous data collection efforts, the corpora collected here contain both human and vehicle sensor data, together with rich and continuous transcriptions. While most efforts on in-vehicle research are generally focused within individual countries, this effort links a collaborative team from three diverse regions (i.e., Asia, American, and Europe). Details relating to the data collection paradigm, such as sensors, driver information, routes, and transcription protocols, are discussed, and a preliminary analysis of the data across the three data collection sites from the U.S. (Dallas), Japan (Nagoya), and Turkey (Istanbul) is provided. The usability of the corpora

has been experimentally verified with a Cohen's kappa coefficient of 0.74 for transcription reliability, as well as being successfully exploited for several in-vehicle applications. Most importantly, the corpora are publicly available for research use and represent one of the first multination efforts to share resources and understand driver characteristics. Future work on distributing the corpora to the wider research community is also discussed.

Dynamic All-Red Extension at a Signalized Intersection: A Framework of Probabilistic Modeling and Performance Evaluation

Zhang, L. ; Wang, L. ; Zhou, K. ; Zhang, W. ;

Dynamic all-red extension (DARE) has recently attracted research interest as a nontraditional intersection collision-avoidance method, for which the prediction of red-light running (RLR) and its related hazardous situations is a crucial part. We propose a probabilistic framework to model and predict RLR hazards for DARE. The RLR hazard, which is quantified by a predictive encroachment time, has contributory factors, including the speed, distance, and car-following status of the violator and the empirical distribution of the entry time of conflict traffic. An offline data analysis procedure is developed to set the parameters for RLR hazard prediction. Online-wise, a 2-D normal model is developed to predict the vehicle's stop–go maneuver based on speeds at advanced detectors and the car-following status. Additionally, unlike most prediction models that are designed to minimize mean errors, our model identifies two types of errors, namely, the false alarm and a missed report. The capability of distinguishing these two types of errors is crucial to the effectiveness of dynamic operations. To quantify the tradeoff between these two types of errors in DARE, a system operating characteristic (SOC) function is then defined. Effectiveness of the proposed model and its prediction algorithm is demonstrated using data collected from a field intersection. At a false-alarm rate of less than 5% (or equivalently about one false trigger per 8 h), the algorithm reached a correct detection rate of over 70% to more than 80%. Performance evaluation results showed that the proposed DARE framework can effectively predict the RLR hazards.

Inertial Navigation Aiding by Stationary Updates

Ramanandan, A. ; Chen, A. ; Farrell, J. A. ;

Sensor-aided inertial navigation has successfully been used for decades for localization of a roving body. When the rover is known to be stationary, artificial “stationary” measurements (i.e., zero velocity and/or zero angular rate) may be imposed. This corrects the velocity, attitude, and inertial measurement unit (IMU) biases, which decreases the rate of drift of the position and attitude. Implementation requires reliable automated tests to detect periods when the vehicle is stationary. Due to cost concerns, methods that use sensors that are already on the vehicle are preferred. This paper reviews existing stationary detection methods and proposes a new frequency domain approach, using only IMU data, to detect stationarity, with specifications and analysis for land vehicles. The performance of this new approach is evaluated in both theory and practice. In addition,

this paper presents analytic and numeric evaluations of the observability of the inertial navigation system (INS) error states with stationary updates. Improvements in localization performance in an INS with stationary detection and aiding is shown experimentally.

Pedestrian Detection in Video Images via Error Correcting Output Code Classification of Manifold Subclasses

Ye, Q. ; Liang, J. ; Jiao, J. ;

Pedestrian detection in images and video frames is challenged by the view and posture problem. In this paper, we propose a new pedestrian detection approach by error correcting output code (ECOC) classification of manifold subclasses. The motivation is that pedestrians across views and postures form a manifold and that the ECOC method constructs a nonlinear classification boundary that can discriminate the manifold from negative samples. The pedestrian manifold is first constructed with a local linear embedding algorithm and then divided into subclasses with a K-means clustering algorithm. The neighboring relationships of these subclasses are used to make the encoding rule for ECOCs, which we use to train multiple base classifiers with histogram of oriented gradient features and linear support vector machines. In the detection procedure, image windows are tested with all base classifiers, and their output codes are fed into an ECOC decoding procedure to decide whether it is a pedestrian or not. Experiments on three data sets show that the results of our approach improve the state of the art.

Optimal Aviation Security Screening Strategies With Dynamic Passenger Risk Updates

Nikolaev, A. G. ; Lee, A. J. ; Jacobson, S. H. ;

Passenger screening is a critical component of aviation security systems. This paper introduces the multistage sequential passenger screening problem (MSPSP), which models passenger and carry-on baggage screening operations in an aviation security system with the capability of dynamically updating the perceived risk of passengers. The passenger screening operation at an airport terminal is subdivided into multiple screening stages, with decisions made to assign each passenger to one of several available security classes at each such stage. Each passenger's assessed threat value (initially determined by an automated passenger prescreening system) is updated after the passenger proceeds through each screening stage. The objective of MSPSP is to maximize the total security of all passenger screening decisions over a fixed time period, given passenger perceived risk levels and security device performance parameters. An optimal policy for screening passengers in MSPSP is obtained using optimal sequential assignment theory. A Monte Carlo simulation-based heuristic is presented and compared with stochastic sequential assignment and feedback control algorithms. Computational analysis of a two-stage security system provides an assessment of the total security performance.

A Note on the ITS Topic Evolution in the Period 2000–2009 at T-ITS

Cobo, M. J. ; Lo pez-Herrera, A. G. ; Herrera, F. ; Herrera-Viedma, E. ;

In this paper, we extend the study of the intelligent transportation system (ITS) topic evolution presented by Li et al. To do so, we apply an approach that combines both H-index-based performance analysis and science mapping to detect, visualize, and evaluate conceptual ITS themes and ITS thematic areas published by the journal IEEE Transactions on Intelligent Transport Systems during the decade (2000–2009). The primary consequence of this is the detection of three important thematic areas: COMPUTER-VISION and TRAFFIC-FLOW, which are related to research in ITS applied to vehicles, and AIRCRAFT-TRAFFIC, which is related to research in ITS applied to aircraft/airport.

On the Impact of Virtual Traffic Lights on Carbon Emissions Mitigation

Ferreira, M. ; d'Orey, P. M. ;

Considering that the transport sector is responsible for an increasingly important share of current environmental problems, we look at Intelligent Transportation Systems (ITS) as a feasible means of helping in solving this issue. In particular, we evaluate the impact in terms of Carbon Dioxide (CO2) emissions of Virtual Traffic Light (VTL), which is a recently proposed infrastructureless traffic control system solely based on Vehicle-to-Vehicle (V2V) communication. Our evaluation uses a real-city scenario in a complex simulation framework, involving microscopic traffic, wireless communication, and emission models. Compared with an approximation of the physical traffic light system deployed in the city, our results show a significant reduction on CO2 emissions when using VTLs, reaching nearly 20% under high-density traffic.

A FIFO Rule Consistent Model for the Continuous Dynamic Network Loading Problem

Castillo, E. ; Menendez, J. M. ; Nogal, M. ; Jimenez, P. ; Sanchez-Cambronero, S. ;

This paper presents a first-in–first-out (FIFO) rule consistent model for the continuous dynamic network loading problem. The model calculates the link travel time functions at a basic finite set of equally spaced times that are used to interpolate a monotone spline for all the other times. The model assumes a nonlinear link travel time function of the link volumes, but some corrections are made to satisfy the FIFO rule at the basic set. Furthermore, the use of monotone cubic splines preserving monotonicity guarantees that the FIFO rule is satisfied at all points. The model consists of five units: 1) a path origin flow wave definition unit; 2) a path wave propagation unit; 3) a congestion analysis unit; 4) a network flow propagation unit; and 5) an inference engine unit. The path flow intensity wave, which is the basic information, is modeled as a linear combination of basic waves. Next, the individual path waves are propagated throughout the paths by using a

conservation equation that stretches or enlarges the wave lengths and increases or reduces the wave heights, depending on the degree of congestion at different links. Then, the individual path waves are combined together to generate the link and node waves. Finally, the inference engine unit combines all information items to make them compatible in times and locations using the aforementioned iterative method until convergence. The method is illustrated by some examples. The results seem to reproduce the observed trends closely. The required CPU times oscillated between seconds and a few minutes.

Intelligent Management Functionality for Improving Transportation Efficiency by Means of the Car Pooling Concept

Dimitrakopoulos, G. ; Demestichas, P. ; Koutra, V. ;

Information and communication technologies (ICTs) have long been attracting research interest, which is reflected in the design and development of powerful and complex network infrastructures, advanced applications/services, efficient power management, and extensions in the business model. A field of applications where ICTs find prosperous ground is transportation, in the sense of utilizing ITC findings in developing intelligent transportation systems (ITSs), i.e., systems for increasing transportation efficiency. This is motivated by the fact that transportation is associated with several drawbacks, e.g., with regard to continuously increasing traffic congestion in large cities worldwide. A transportation alternative to address congestion is the concept of car pooling, i.e., sharing a vehicle toward a common destination, based on a priori agreements. The goal of this paper is to present novel management functionality for dynamic ride matching, within a car-pooling context. The functionality uses previous knowledge in proposing valid car-pooling matches. Knowledge is obtained through the exploitation of Bayesian networking concepts, specifically the Naïve-based model. Simulation results showcase the effectiveness of the proposed functionality, the advantage of which lies in the fact that the reliability of the knowledge-based selection decisions is higher. This means that there is higher probability of satisfying the drivers' and passengers' preferences through the selected matches.

Microsimulation Model for Motorway Merges With Ramp-Metering Controls

Al-Obaedi, J. ; Yousif, S. ;

This paper presents a newly developed microsimulation model for motorway merge traffic, focusing on issues that relate to ramp-metering (RM) control and its effectiveness. The model deals with general and more specific drivers' behavioral tasks, such as the drivers' cooperative nature in allowing other drivers to merge in front of them either by decelerating or shifting to adjacent lanes. The main criteria of this model are governed by the application of car-following, lane-changing, and gap-acceptance rules. The model has been calibrated and validated mainly using real traffic data taken from loop detectors for two-, three-, and four-lane motorways. Compared with the S-PARAMICS software, using

the same data, the model showed better results. The effectiveness of some of the widely used RM control algorithms, such as Demand-Capacity, ALINEA, and ANCONA, were also assessed after finding the optimum parameters (such as critical occupancy and position of loop detectors).

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