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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: http://sites.ieee.org/itss/.

You may subscribe to or unsubscribe from announcements at the same web site. Announcements are sent to approximately 16,000 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 miguel.sotelo@uah.es.

**SOCIETY NEWS**

**From the Editor**
Miguel Ángel Sotelo

I would like to bring your attention to the following important announcements: (1) Prof. Tsuneo Takahashi has been recently awarded the 2013 IEEE Medal for Environmental and Safety Technologies, having donated his award to our ITS Society. On behalf of the IEEE ITS Society, I would like to express our recognition to Prof. Takahashi for this remarkable achievement as well as our utmost gratitude for his generosity. (2) Nominations and applications for the 2013 ITSS Awards and (3) the 2013 ITSS Best Ph.D. Dissertation Call for Application and Nomination. In addition, our ITS Society is sponsoring a major conference this summer. The 2013 IEEE Intelligent Vehicles Symposium (IV13) will be held in June 23-26, 2013, in Gold Coast, Australia. For the first time, this conference will be held back-to-back with the Intelligent Autonomous Vehicles conference, in June 26-28. I hope you will have the chance to attend these exciting events.
Message from President:

Young Professionals in ITS

By Dr. Christoph Stiller, President

It is in the nature of all communities that its sustainability is mainly procured by its young members. The Intelligent Transportation Systems Society is a youngster itself within IEEE who is steadily growing in reputation, activities, and size since its foundation in 2005. It is thus hardly a surprise that the ITSS Executive Committee has launched a set of activities that particularly foster young professionals in our Society. This includes the IEEE ITSS award for the best Ph.D. dissertation presented every year and our best paper awards at conferences. Recently, we have launched special events for ITSS student members at our flagship conferences IV (Intelligent Vehicles Symposium) and ITSC (Intelligent Transportation Systems Conference). I am grateful to Brendan Morris, who organizes these events as our Student Activities Chair. While the first excursion led a student group to glaciers before ITSC12 in Alaska, this year activities will gather our student members at special events at IV13 at Australia’s Gold Coast and at ITSC13 in the Netherlands. We are currently preparing activities for the GOLD (Graduates of the Last Decade) members as well as a new podcast on ITS.

Of course, since several decades, engineering is one of the fields where the number of young engineers seeking a position cannot cope with the large number of highly skilled professionals sought by industry. This finding is particularly true for emerging technologies like Intelligent Transportation Systems. But while this situation relaxes job search for young professionals to some extend, it is nevertheless important to carefully plan a career. Networking in a society like ITS is one of the most important career elements that I recommend my Master and Ph.D. students. ITS Conferences have become the major meeting points for technical discussions and for international contacts among ITS professionals. I personally know many researchers who met their future employers or colleagues at a conference. This actually holds for my own post-doc year as well as for my recent sabbatical. The best way to get involved in a community is active participation. A growing society like ITSS naturally seeks volunteers and offers excellent opportunities for them. For any stage of your career, we offer positions as reviewer or editor for our journals and conferences, organizer for an ITSS event, officer and member in our technical activity committees, etc. Just contact me if you would like to volunteer in IEEE ITSS.

You might read this message shortly before our Society’s first large conference on the new continent. We will have our IEEE Intelligent Vehicles Symposium 2013 at the Australian Gold Coast back to back with the IFAC Intelligent Autonomous Vehicles Conference allowing participants to combine these events conveniently.

See you in June in Australia!

Christoph Stiller
President IEEE ITSS
ITSS Executive Committee February’13 Meeting Report
By Daniel J. Dailey, VP for Administrative Activities

The ITSS Executive Committee (ExCom) held its winter meeting on February 13, 2012 in New Orleans, Louisiana, USA. The ExCom will be meeting four times this year – once in winter, once via a teleconference with the Board of Governors in spring, once in summer in conjunction with IV (followed immediately by a BOG meeting), and once in fall in conjunction with ITSC (followed immediately by a BOG meeting). The meeting was attended by 9 of the 11 members of the ExCom, although all 11 members prepared reports that were presented.

Brief Highlights of the IEEE Executive Committee Meeting:

- ITSS Membership >1300 and is growing at a 6% rate, plan to reach 2000.
- It was determined that student networking should happen at every conference, with excursions before or afterward.
- IEEE Foundation awarded Tsuneo Takahashi received 2013 Medal for Environmental Safety, Donated $20k prize to ITSS.
- New Constitution and Bylaws now in effect as of January 1, 2013 this means the Magazine editor is now a member of the Executive Committee.
- Publication Survey Results: Members generally satisfied. 300+ Replies 70% read Mag. On Paper.
- A Motion to recommend that BOG to approve new Magazine Associate Editors passed Unanimously.
- Bob French, a pioneering member of ITSS died in September and Rye Case will write an article for magazine. A moment of silence was held.

Up Coming events for ITSS administration:

IEEE ITSS Board of Governors June 23, 2013 Gold Coast, Australia
IEEE Intelligent Vehicles Symposium June 23-26, 2013 Gold Coast, Australia
IEEE ITSC October 6-9, 2013 the Hague, Netherlands
IEEE ITSS Executive Committee October 5, 2013 the Hague, Netherlands
IEEE ITSS Board of Governors October 6, 2013 the Hague, Netherlands
IEEE ITSC 2014 Qingdao, China
IEEE Intelligent Vehicles Symposium 2014 Detroit MI, USA
IEEE ITSC 2015 Las Palmas, Canary Islands

More information on a range of ITSS conferences can be found at:
http://sites.ieee.org/itss/introduction/ieee-itss-sponsored-conferences

Update your IEEE membership to include ITSS at: http://sites.ieee.org/itss/ and click “Join Us”.

Vol.15, No.2 April 2013
The ITSS Board of Governors (BOG) held its spring meeting on April 22, 2013 in a two hour teleconference. The BOG is meeting is being held three times this year – once via a teleconference in April, once in summer in conjunction with IV, and once in fall in conjunction with ITSC. The April 22, 2013 meeting was attended by 23 of the 25 members.

Brief Highlights of the Motions from the IEEE Board of Governors Meeting. The following Motions were passed:

- Increase 2013 Page Budget to 2048 pages and 2014 Page Budget to 2256 pages.
- The ITSS Magazine Page Budget is at 220 and is increased in 2013 to 320 and increased in 2014 to 352.
- Future conferences shall implement the membership discount scheme at ITSS conferences as done for ITSC 2012.
- IEEE will be sending out promotional letters to attract new members and ITSS will offer $\frac{1}{2}$ year membership for free, for this year, in the membership campaign letter.
- Budget $2k for both ITSC and IV, total of $4k per year for student activities in 2014.
- Provide $1000 as startup budget for an ITSS webcast for 2014.
- Change the Transactions from Full to Moderate editing. This saves $30k per year.
- Pass 2014 budget updated as a result of the motions at this BOG meeting.

All motions passed unanimously.
Launching of “ITS Now”  
By Daniel Zeng, VP for Publications

We are happy to announce the official launch of “ITS Now,” a new online publication initiative of our society. Thanks to the leadership and great support from the ITS Society BOG and Executive Committee, hard work from the ITS Now editorial team, and significant help from the IEEE Technical Activities Periodicals Group and the IEEE Xplore team, ITS Now has been officially online and fully functioning since April 7, 2013, through our society’s website at http://sites.ieee.org/itss/. If you click on the “ITS Now” button, on the top of the left panel, you will be presented the first issue of ITS Now, on “Mechatronic and Embedded Systems Pave the Way for Autonomous Driving,” guest edited by Martin Horauer, Bo Chen, and Primo Zingaretti.

So exactly what is ITS Now, and why should you care about it? ITS Now is intended to be a one-stop source for free, limited-time access to articles from IEEE ITSS publications and conference proceedings on a technical topic of timely relevance. Every 3 months, the VP for Publications Activities recruits an ad-hoc ITS Now theme editorial team on an ITS research topic, in consultation with various ITSS technical sub-committees and special issue editors from our transactions and magazine. The appointed editorial team will select 10-15 papers from ITSS publications and conferences on the given topic and write a short introductory editorial. Then this theme-based set of papers, along with the editorial, will be made available on the ITS Society’s website. Arrangements have been made with the IEEE Xplore team such that during a 3-month time window, anyone, regardless whether they have Xplore subscriptions, will be able to access the full text of these ITS papers, through the Xplore links posted on the ITS Now page. After 3 months, a new ITS Now theme issue will be posted while the old one archived. An archived issue will still have the editorial and the references to all the papers selected. However, one would need to have an Xplore subscription to access the full text of these papers.

ITS Now is part of the ongoing IEEE “curation” initiative to provide a value-added service to IEEE and IEEE society members. As the number of the publication outlets and published work continues to grow rapidly, IEEE recognizes the increasing importance of providing meta-level services for publications and other intellectual properties to the interested readers through theme-based packaging, semantically meaning tagging, and crowd-based recommendations and feedback. ITS Now is a small but tangible step in this direction. ITS Now is also planned as a recruiting and promotional tool, exposing our fellow ITS researchers and practitioners, and the general public, to cutting-edge ITS research we do in a cohesive manner. Furthermore, ITS Now offers a theme-based venue to create synergy across multiple ITSS publications and conference proceedings, and help foster meaningful linkage among ITSS technical sub-committees and publications.

The second issue on “ITS and Road Safety”, guest edited by Angelos Amditis, Mauro Da Lio, and Roy Goudy, will be posted online from July—September. The third issue on “Mobile Communication Networks”, guest edited by Liuqing Yang, will be posted online from October—December. You are encouraged to visit http://sites.ieee.org/itss/ to check out our very first issue of ITS Now. We are eager to hear your feedback and suggestions about this new initiative; please email them to me at zeng@email.arizona.edu. You are also very welcome to contact us via email, discussing possible themes for ITS Now issues in 2014 and volunteering as guest editors!
Call for Nomination of Awards

Purpose and Selection Criteria

The prestigious 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 (for ITS Research Award), developed and deployed successful ITS systems or implementations (for ITS Application Award), and demonstrated leadership in promoting ITS technologies (for 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.

A dedicated selection committee will evaluate all qualified applications for the IEEE ITS Awards and make selections. Award selections will be announced October 2013 at the ITSC 2013 conference in Hague, Netherland, where the recipients will be asked to give featured presentations of their work.

Please email applications before June 1, 2013 to ITSS Vice President of Membership: jason.geng@ieee.org.
Purpose and Selection Criteria

The prestigious IEEE ITSS Best Ph.D. Dissertation Award is given annually for the best dissertations in any ITS areas that are 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.

Eligibility of Applicant

Applicant should pass his/her doctoral degree defense within the period no more than 18 months prior to the date of application (June 15, 2013). Applicant must be a member or student member of IEEE ITSS by the date of application.

Application materials

Each application must consist of the following materials:
1. A doctoral dissertation written by the applicant in any language no more than 18 months prior to the submission deadline.
2. A summary of the dissertation in English of up to 3 pages in length written by the Ph.D. candidate highlighting the significance of the problem, the technical approach taken, application context and potential, and the scope of the dissertation.
3. Published paper(s) in English based on the dissertation written primarily by the Ph.D. candidate on scientific journals such as the IEEE Transactions on ITS or the IEEE ITS Magazine.
4. All publications by the applicant in the related field(s).
5. A letter of recommendation from the applicant’s dissertation advisor that comments on the significance of the research, attests to the originality of the work, and comments on the engagement of the student in the field of ITS and the ITSS.

Award Prizes and Presentations:

The first place prize winners will receive awards of USD 1,000. The second place prize winner will receive USD 500. Award selections will be announced October 2013 at the ITSC 2013 conference in Hague, Netherland, where the recipients will be asked to give brief presentations of their work. Awardees work will be featured in ITSS Transactions, ITS Magazine, and ITS Newsletter, when appropriate.

Applications and Selection Processes for Awards

A dedicated selection committee will evaluate all qualified applications for the IEEE ITS Best Ph.D. Dissertation Awards and make selections.

Please email single-package application before June 15, 2013 to ITSS Vice President of Membership: jason.geng@ieee.org.
Tsuneo Takahashi

Recipient of the 2013 IEEE Medal for Environmental and Safety Technologies

The IEEE ITS Society would like to congratulate one of its members, Tsuneo Takahashi, for receiving the 2013 IEEE Medal for Environmental and Safety Technologies. This award is given for outstanding accomplishments in the application of technology in the fields of interest to IEEE that improve the environment and/or public safety. Mr. Takahashi was recognized for his pioneering work in the development of navigation technology in automobiles:

Tsuneo Takahashi’s pioneering work has enabled automobile navigation systems providing real-time information for increased transportation efficiency and safety. During the 1970s, at a time when GPS navigation for automobiles was not yet practical, Takahashi developed a self-position navigation system using a highly efficient microprocessor and an inertial sensor for determining position. He demonstrated the first practical use of the navigation system in a passenger car in 1981, which was able to display current information on a map. His patented contributions have enabled the navigation systems that are standard in today’s automobiles for providing real-time positioning data important for efficient and safe travel. The navigation technology that Takahashi helped to introduce and commercialize also has important implications for emerging vehicle-to-vehicle and vehicle-to-infrastructure communications systems that are key to the development of intelligent transportation systems. In these systems, vehicles acting as “floating cars” or “probes” can exchange dynamic data such as traffic information and safety warnings with each other or roadside nodes (such as traffic centers). Takahashi’s work has been a key enabler in the development of intelligent transportation systems. Takahashi has also played a leading role in managing the development of GPS-based automobile navigation systems. (see http://www.ieee.org/about/awards/bios/envsaf_recipients.html#sect1)

Mr. Takahashi graciously donated his entire honorarium to the IEEE ITS Society. We are truly appreciative of the generosity of one of our outstanding ITSS members.

Matthew Barth
President-Elect IEEE ITSS
Some notes on Society Governance

Each year the Intelligent Transportation Systems Society elects five of the fifteen Board of Governors (BOG) Members for a three year term. Professor Alberto Broggi who is Chair of the Nominations Committee, appoints Nominations Committee members described by the Bylaws to:

“consists of a Chair and three more members of the Society. At least two of the four shall not be members of the BOG. The current Society Officers may not serve on the Nominations Committee, or be ex officio members. No member of the Nominations Committee shall be a candidate for any office.”

The Bylaws also require that the call for nominations be publicized to the membership and that nominations be submitted to the committee by May 1 of that year. Nominations may be submitted to the committee by Email to broggi@ce.unipr.it by May first. The committee identifies qualified individuals from the nominees and places them on the ballot for the BOG.

An alternative way to be placed on the BOG Ballot is through petition. The Bylaws state:

“A nomination by petition from the Society membership must contain Valid signatures of at least twenty five (25) Society members, excluding Students and Affiliates, and must be received by the President of the Society on or before May 15. The reception of any such valid petition shall automatically place that nominee on the slate, provided he/she is an IEEE and Society Member in good standing and meets all other requirements of the Constitution and these Bylaws.”

So if you have an interest in participating in the Governance of the ITS Society it is timely to submit a nomination to broggi@ce.unipr.it or a petition to stiller@mrt.uka.de.

Daniel J. Dailey
Vice-President Administrative Activities
IEEE ITSS
**Featured Article:**

**interactIVe Project: Next Generation Vehicle Safety Systems**  
By Aria Etemad (Project Coordinator) and Angelos Amditis (Technical Manager)

**Overview**

The interactIVe project is a large scale integrating project part of the FP7-ICT for Safety and Energy Efficiency in Mobility. The project addresses the development and evaluation of next-generation safety systems for Intelligent Vehicles based on active interventions. Active safety systems have shown considerable potential for large improvements in road safety and support the driver in hazardous situations. Despite their capabilities, currently available systems are typically implemented as independent functions. This results in multiple expensive sensors and unnecessary redundancy, limiting their scope to premium-class vehicles. The project is based on the concept that by integrating applications together, drivers can be supported more effectively in a larger range of scenarios; moreover vehicle components may be shared among the various safety systems. This is accomplished in interactIVe by discrete architectural layers that are common to all applications. Seven demonstrator vehicles – six passenger cars of different vehicle classes and one truck – have been built up to develop, test, and evaluate the next generation of safety systems.

In the following, the different fields of research and development within interactIVe are presented:

**Driving Environment Perception:** The main objective is the creation of an innovative model and platform for enhancing the perception of the driving situation all around the vehicle. The work includes the development of an integrated reference platform with well defined I/O interfaces that are designed to support different types of input sources and combined fusion outputs respectively. Road geometry estimation and road entities tracking are supported by different Perception platform modules, each of which is responsible for the fusion and processing of specific data input subset. Moreover, advanced research activities on sensor data fusion and processing are developed and evaluated.

**Information, Warning and Intervention (IWI) strategies:** The focus is to improve decision strategies for active safety and driver-vehicle interaction. In order to achieve this goal, iterative design, prototyping and user testing of IWI strategies, both in driving simulators and in a test vehicle is performed in collaboration with the application development. The investigation and design of individual alerts and warnings takes place under a principle of a global management of information, warnings and interventions from multiple applications.

**Safety Enhancement through Continuous driver support:** Driving assistance applications following the principle of continuous support from the system to the driver through natural interactions (e.g. haptic feedback is preferred) are developed. The objective of these systems is to improve the driver’s reaction time covering a wide range of driving scenarios.
Both longitudinal lateral vehicle controls have been integrated, with a focus on joint steering and braking actuations. Specific efforts have been devoted for improving the decision strategies, particularly by a dynamic prediction of the path ahead of the vehicle and identification of a safe trajectory.

**Integrated Collision Avoidance and Vehicle Path Control:** In an emergency situation, in-vehicle warning systems intervene and aim to make the driver to take a suitable action. If the risk of an accident persists, then an autonomous collision avoidance manoeuvre can prevent it. Path and speed controls are developed in order to enable such a manoeuvre by using steering and braking actuators respectively.

**Cost-efficient emergency intervention for collision mitigation:** Collision mitigation systems are the next step towards active safety. Whereas collision avoidance requires expensive environmental perception, collision mitigation can be realized at reasonable costs. The goal is to develop solutions for collision mitigation that are able to improve the market potential towards low segments.

**Evaluation and legal aspects:** interactIVe also takes care of providing a basis for testing and assessing the developed integrated applications. The method developed allows for a quantitative comparison and conducts an impact assessment of the various ADAS developed in interactIVe, taking into account legal aspects associated with the innovative active intervention applications.

**Challenges**

As one of the major European initiatives for developing technological solutions in advance intelligent vehicle systems, interactIVe faced a number of challenges outlined hereafter:

The interaction between the driver and the assistance applications has to be naturally integrated into day-to-day driving behavior in order to gain the driver’s acceptance. Both simulations and field experiments have been conducted in order to ensure that system support and active intervention occurs in a continuous and natural approach.

Dynamic environment perception in an integrated platform with real-time constrains poses hard implementation challenges involving parallel processing, multi-threading approaches and time-optimization techniques for the processing modules.

InteractIVe covers rear-end collisions as well as lateral and head-on collision situations. The system will be able to autonomously apply brakes and perform steering maneuvers to avoid the accident. Both oncoming vehicles and vulnerable road users are considered in the situation assessment.

**Vision and future trends**

The ultimate goal of interactIVe is accident-free traffic realised by affordable integrated safety systems available for all vehicle classes. The systems developed will not only react to driving situations, but will also be able to actively intervene in order to protect occupants and vulnerable road users.
**Future trends** in the field of ITS comprise vehicles that integrate automated driving functionality and perform monotonous and demanding driving tasks in a safe and automated manner. Also "talking" vehicles forming ad-hoc networks and cooperating with each other and with the transport infrastructure is another trend, which can be achieved taking into account the latest advances in internet and communication technologies. The convergence of these two trends, namely automated driving and cooperative systems, is now considered, by the majority of ITS experts, as the most viable solution that will lead us in a more safe, energy efficient and sustainable mobility.

**Final event**

On the **20th and 21st of November 2013** interactIVe is inviting the expert community and interested members of the public to its **final two-day event**, including a conference and live demonstration to be held at the **Eurogress Convention Center in Aachen (Germany)** and the **Ford Proving Ground in Lommel (Belgium)**. The event will be combined with the partner project eCoMove, which has created an integrated cooperative solution for energy efficiency in road transport, through eco-driving support and eco-traffic management. For more detailed information and registration guidelines the interested reader may visit the project's website: [http://www.interactive-ip.eu/](http://www.interactive-ip.eu/)

CALL FOR PAPERS

Special Issue on "Human Factors in Intelligent Vehicles"
IEEE Transactions on Intelligent Transportation Systems

An initiative of the Artificial Transportation Systems & Simulation (ATSS) Technical Activities Sub-Committee of IEEE ITS Society

Scope & Topics of Interest

The Special Issue on "Human Factors in Intelligent Vehicles" (HFIV) of IEEE Transactions on Intelligent Transportation Systems (IEEE T-ITS) aims to address issues related to the analysis of human factors in the design and evaluation of intelligent vehicles (IV) technologies, in a wide spectrum of applications and in different dimensions. We are pleased to welcome and to encourage prospective authors to contribute with manuscripts reporting on original research in different fields concerning HFIV.

HFIV Special Issue is planned and expected to build upon a proper environment to disseminate knowledge and motivate active discussion and interaction among the technical and the scientific communities, practitioners and students, leveraging state-of-the-art concepts, methodologies and cutting-edge results both to academia and to the Industry. Some topics of interest include (but are not limited to) the following:

- Intelligent user interfaces
- Human-machine interaction
- Human-in-the-loop simulation
- Cognitive and cultural aspects of driving
- Personality and emotions in driver interactions
- Human behavior and capability, affecting system design and operation
- Modeling and simulation in driver behavior analysis
- Ergonomics of traveler information systems
- Tools and approaches to analyze human factors
- Anthropometric layout of vehicular technical systems
- Methodologies to test, validate, calibrate and optimize overall system performance

Manuscript Submission & Publication

Prospective authors are invited to submit contributions reporting on their current research on HFIV related areas and topics. Each paper will be analyzed by at least three reviewers of IEEE T-ITS according to their technical quality, relevance, results and contributions. Accepted papers will be included in the Special Issue on "Human Factors in Intelligent Vehicles" of IEEE T-ITS. Manuscripts must be submitted electronically at http://mc.manuscriptcentral.com/t-its

Important Dates

The tentative schedule for the HFIV Special Issue is as follows:

- First submission deadline: Sept 15\textsuperscript{th}, 2013.
- Notification of first decision: Nov 15\textsuperscript{th}, 2013.
- Revision submission deadline: Jan 15\textsuperscript{th}, 2014.
- Notification of final decision: Apr 15\textsuperscript{th}, 2014.
- Final manuscript (camera ready) submission: May 1\textsuperscript{st}, 2014.
- Issue of Publication: September 2014.

Guest Editors

Dr. Cristina Olaverri Monreal (olaverri@ife.mw.tum.de)
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Dr. Rosaldo J. F. Rossetti (rossetti@fe.up.pt)
Artificial Intelligence and Computer Science Laboratory, DE/FEUP, University of Porto, Portugal

For more details and up-to-date information, please visit the HFIV Web page: http://hfiv.ife.mw.tum.de/HFIV IEEE T-ITS/
IEEE Transactions on Intelligent Transportation Systems
Special Issue Call for Papers

Next Generation Rail Operations

Throughout the world, many rails are heavily congested, resulting in services being very susceptible to minor delays and disturbances. Furthermore, there is pressure for rail to reduce their costs and carbon footprints. There is an opportunity for rail to adopt new methods to make better use of the existing capability of the system through improved rail operational strategies to reduce the impact of disruptions and to reduce energy utilisation. At a system level, in order to realise such approaches it is necessary to integrate a number of rail disciplines, for example, rail timetabling, rail operations, signalling and train control. This special issue will provide a platform for the communication of recent advances in rail transportation technology. The publication of this special issue follows the organization of IEEE International Conference on Intelligent Rail Transportation 2013 (IEEE ICIRT 2013), which is one of top international conferences on modern rail technology. IEEE ICIRT 2013 will centre on the topic of “Safe, Green & Intelligent Rail” and provide a forum for engineers and scientists in academia, industry and government to present their latest findings in any aspects of rail transportation. Those excellent papers which accepted by IEEE ICIRT 2013 will be recommended in first priority to publish in this special issue. The details of IEEE ICIRT 2013 can be found at http://www.ieee-icirt.org/

This special issue focuses on papers that present the ‘Next Generation of Rail Operations’. Papers could include, but not be limited to:

- Rail traffic operational control;
- Train control system;
- Human factors;
- Tools for system modelling, simulation and analysis;
- Automatic train operation;
- Train location technology;
- Real-time train scheduling and optimisation;
- Rail network complexity analysis.

Important dates
Revision submission deadline: Feb 15th, 2014.
Final manuscript (camera ready) submission deadline: June 15th, 2014.
Issue of Publication: December 2014.

Submission
Manuscripts should be submitted at http://mc.manuscriptcentral.com/t-its by selecting the manuscript type ‘Special Issue on RailOps’.

Guest editors
Professor Bin Ning, Beijing Jiaotong University
Professor Tao Tang, Beijing Jiaotong University
Professor Clive Roberts, University of Birmingham
Professor Hairong Dong, Beijing Jiaotong University
Professor Felix Schmid, University of Birmingham

Contact Email: ieeeicirt@gmail.com
Special Issue on "Emerging techniques for the management of uncertainty in computational traffic models"

Scope of Topics and Interest

Reliability of predictions made by traffic simulation models and artificial transportation systems, has become a major concern recently with the increasing use of complex models in real world applications. To deal with such problems, the scientific community has started to shift focus from the adequacy of models themselves, to issues related to management of the system/model uncertainty, which in-turn, are attracting the attention of many academic communities, becoming part of a rising transversal discipline in simulation modelling.

Models in the field of traffic simulation and artificial transportation systems, in particular, are often complex systems with diverse types of inputs and parameters. A few of these can be directly measured in the real world, while suitable probability density functions need to be estimated for most others. Such processes are essential to replicate measured conditions and account for the variability in the real world. Originally, this involved trial-and-error type approaches, however in the last decade processes for the management of uncertainty in simulation models have become formalised. Additionally, tools and frameworks have been developed for systematic calibration and validation of models, and sensitivity analysis is now receiving increasing attention as the main tool for providing the necessary feedback on the whole process, and additional insight into the model properties and behaviours.

Recently, the EU COST ‘MULTITUDE’, has been promoting a coherent vision and harmonised approaches to cope with such problems, and building on such achievements, this call aims at gathering papers on methodologies for the management of uncertainty in traffic simulation and artificial transportation systems and their practical application. These include, but are not limited to:

- On-line and off-line calibration
- Risk assessment in decision making
- Disaggregate and aggregate calibration of microscopic traffic flow models
- Time dependent OD matrix estimation and prediction
- Uncertainty quantification: probabilistic frameworks and uncertainty settings, Monte Carlo simulations and other propagation methods
- Global sensitivity analysis: variance-decomposition methods, screening methods, meta-modelling, etc.
- Model validation

Manuscript Submission & Publication

Prospective authors are invited to submit contributions reporting on their current research on the above topics. Each paper will be analyzed by at least three reviewers of IEEE T-ITS according to their technical quality, relevance, results and contributions. Manuscripts must be submitted electronically at http://mc.manuscriptcentral.com/t-its.

Important Dates

Tentative schedule for the Special Issue is as follows:

- First submission deadline: July 1st, 2013.
- Revision submission deadline: Dec 15th, 2013.
- Final manuscript deadline: Apr 15th, 2014.
- Issue of Publication: June 2014.

Guest Editors

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Dr. Constantinos Antoniou (antoniou@central.ntua.gr). Assistant Professor, National Technical University of Athens, Greece.
The IEEE Conference on Intelligent Transportation Systems is the annual flagship conference of the IEEE Intelligent Transportation Systems Society. IEEE-ITSC2013 welcomes articles in the field of Intelligent Transportation Systems, conveying new developments in theory, analytical and numerical simulation and modeling, experimentation, advanced deployment and case studies, results of laboratory or field operational tests.

The theme of the IEEE-ITSC2013 conference is Intelligent Transportation Systems for All Transportation Modes. Major advances in information and communication technology are enabling a vast array of new possibilities in transportation. ITS are emerging worldwide to make transportation more efficient, reliable, cleaner and safer. ITS are used in road, water, rail and air transportation to collect information about transportation flows from a multitude of sources and manage them effectively, shifting collective traffic and transportation management paradigms towards end user orientation.

**Organizing committee**

**General Chair**
Bart van Arem

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Charelle Heuser

**Regional Program Chairs**
Mathew Barth (America)
Shunsuke Kamijo (Asia/ Australia)
Miguel Angel Sotelo (Europe)

**Program Topics**

The technical areas include but are not limited to the following:

- Multi-modal ITS
- Advanced Public Transportation Management
- Ports, Waterways, Inland navigation, and Vessel Traffic Management
- Modeling, Simulation, and Control of Pedestrians and Cyclists
- Air, Road, and Rail Traffic Management
- ITS User services
- Emergency Management
- Transportation Networks
- Emissions, Noise, Environment
- Management of Exceptional Events: Incidents, Evacuation, Emergency Management
- Security Systems
- Safety Systems
- Driver and Traveler Support Systems
- Commercial Vehicle Operations
- Intelligent logistics
- Sensing and Intervening, Detectors and Actuators
- Data Management Systems
- Communication in ITS
- Cooperative Techniques and Systems
- Intelligent Vehicles
- Vision, and Environment Perception
- Electric Vehicle Transportation Systems
- Electronic Payment Systems
- Intelligent Techniques in ITS
- Traffic Theory for ITS
- Modeling, Control and Simulation
- Human Factors, Travel Behavior
- ITS Field Tests and Implementation

**Paper submission**

Complete manuscripts in PDF format must be electronically submitted for peer-review in IEEE standard format. Detailed submission instructions can be found through conference website.

**Special Sessions, Tutorials, and Workshops**

Special session organization is encouraged. Proposals for workshops, tutorials, and special sessions should be submitted via the conference submission website.

**Best Paper Award and Best Student Paper Award**

A "Best Paper Award" and a "Best Student Paper Award" will be conferred to the author(s) of a full paper presented at the conference, selected by the Awards Committee. The "Best Student Paper Award" will be given to a paper of which the first author is an MSc or PhD student.

**Journal and Magazine Publication of Selected Papers**

Selected papers of exceptional quality will be invited for submission to a special issue of the IEEE Transactions on Intelligent Transportation Systems or the IEEE Intelligent Transportation Systems Magazine. Authors will be asked to revise their papers according to the standards of the Transactions or the Magazine. The papers will be subject to the Transactions’ and Magazine’s review process.

**Important Dates**

The IEEE Conference on Intelligent Transportation Systems is the annual flagship conference of the IEEE Intelligent Transportation Systems Society. IEEE-ITSC2013 welcomes articles in the field of Intelligent Transportation Systems, conveying new developments in theory, analytical and numerical simulation and modeling, experimentation, advanced deployment and case studies, results of laboratory or field operational tests.

The Organizing Committee of ITSC 2013 "Intelligent Transportation Systems for All Transport Modes" solicits proposals for full and half-day tutorials and workshops to be held on Sunday, 6th October 2013. This day of tutorials and workshops will precede the main conference, which takes place from Monday, 7th October through Wednesday, 9th October 2013. We solicit tutorial and workshop proposals that address important and new topics related to the conference.

Organizing committee

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Shunsuke Kamijo (Asia/ Australia)
Miguel Ángel Sotelo (Europe)

Call for Workshop and Tutorial Proposals

Workshops

Workshops should focus on areas of active research, not usually covered by the standard tracks of IEEE ITSC conferences, in order to provide an informal forum for participants to exchange developing research results and ideas.

Workshop topics may include, but are not limited to:
- Intelligent train-related developments
- Human to vehicle interaction (including disabled people oriented new improvements)
- Human factors (including even psychological developments...)
- Smart new energy/sustainability approaches towards mobility
- Breaking new/experimental traffic and transportation approaches
- Aerial intelligent/unmanned developments

Tutorials

Tutorials should target established fields of research, in order to provide descriptions on its state of the art, by individuals who are recognized researchers of the field. We also solicit for instructive tutorials on software tools, new simulation frameworks, new sensors, new hardware, etc.

We encourage state of the art programs with high level of interest, impact, creativity and innovation that will attract a broad audience. The primary criteria for selection are anticipated level of interest, impact, novelty or creativity, and technical background of presenters.

We also foster the submission of not just scientific/technical tutorial proposals, but also pragmatic personal skills tutorials like "how to present a topic in 60 seconds", or "scientific speed dating".

Proposal submissions

For submissions and inquiries, please send an email to Prof. Javier J. Sanchez-Medina (javier[dot]sanchez[dot]medina[at]ieee[dot]org) with "[ITSC2013 Workshops/Tutorials]" in the subject. In case you want to submit a Workshop or Tutorial proposal please add a pdf file with the following information:

- Title
- Format (indicate full or half day, workshop or tutorial)
- Organizers (complete address, phone, and email)
- Abstract (up to 300 words)
- List of topics
- Tentative list of presenter

Upon approval the organizers may produce a workshop webpage, if they want to.

We suggest to bring the final written material for each workshop or tutorial will in the form of a single pdf file that should include a cover page, table of contents and workshops-papers, or tutorials-lecture materials.

Important Dates

Please visit the conference website at http://ieee-itsc13.org/ for the deadlines.
Call for Papers

2013 IEEE International Conference on Vehicular Electronics and Safety

Sponsored by the IEEE Intelligent Transportation Systems Society

Dongguan, China, July 28-30, 2013

http://www.ieeeves.org

[ VENUE ]

ICVES'13 will be held jointly with 2013 IEEE International Conference on Service Operations and Logistics, and Informatics (IEEE SOLI 2013) in Dongguan, Guangdong Province, China.

[ CONFERENCE SCOPE AND THEMES ]

The International Conference on Vehicular Electronics and Safety (ICVES’13) is an annual forum sponsored by the IEEE Intelligent Transportation Systems (ITS) Society. It brings together researchers and practitioners to discuss vehicle electronics, and safety systems research and practice. ICVES’13 welcomes papers dealing with any aspect of vehicle electronics and safety systems.

[ TOPICS OF INTEREST ]

- Active and Passive Safety Systems
- Telematics
- Vehicular Power Networks
- X-By Wire Technology
- System-on-a-Chip
- Vehicular Sensor
- Vehicle Bus
- Sensor Network
- Embedded Operation System
- 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
- Driver Assistance Driving Systems
- Adaptive Cruise Control Systems
- Pattern Recognition for Vehicles
- Human Machine Interaction
- Diagnostics on Line
- Virtual/Digital System

[ IMPORTANT DATES ]

- April 20, 2013 ---------- Paper submission deadline
- May 15, 2013 ---------- Notification of acceptance
- May 31, 2013 ---------- Camera-ready copy due

[ PAPER SUBMISSION ]

Complete manuscripts in PDF must be electronically submitted at the conference website: http://www.ieeeves.org

Manuscripts should be at most six (6) pages in the IEEE two-column format including figures, tables, and references.

Please refer to the conference website for the most up-to-date information http://www.ieeeves.org.

Contact us at: ieeeicves2013@gmail.com

For detail and most updated information, please visit the conference web site at

http://www.ieeeves.org
IEEE SOLI’2013
Call for Papers

2013 IEEE International Conference on Service Operations and Logistics, and Informatics (IEEE SOLI’2013)

July 28-30, 2013, Dongguan, China
http://www.ieeesoli.org
Sponsored by IEEE/ITSS, Technical-sponsored by INFORMS

Venue

SOLI’13 will be held together along with 2013 IEEE International Conference on Vehicular Electronics and Safety (IEEE ICVES 2013) in Dongguan, Guangdong Province, China.

Conference Scope and Themes

Service science, service operations, logistics, and informatics are becoming ever more complex and interdependent. They are playing an increasingly important role in today’s world economy. Information and communications technology provides cyber-infrastructure and platforms to achieve more efficient and productive services operations. New types of service offerings are also emerging to meet the needs of customers and consumers. The IEEE Service Operations and Logistics, and Informatics (SOLI) conference series aims to bring together researchers and practitioners to discuss issues, challenges and future directions, share their R&D findings and experiences in relevant areas.

Areas of Interest

Papers relating to Services/Logistics Design, Innovations, Marketing, Operations, and Engineering; Information Technology / Systems, and their specific applications are strongly encouraged. Special sessions on specific service topics are also welcome. Topics include, but are not limited to:

- **Service Design, Engineering, Operations, and Innovations**
  - Service planning and design
  - Service process engineering
  - Expedited services and extreme logistics
  - Healthcare systems
  - Financial services
  - Retail and services management
  - Quality and customer satisfaction
  - Metrics and benchmarks
  - Security & safety-related services and management
  - Contingency planning
  - Operations research
  - Production engineering
  - Intelligent traffic
  - Engineering consulting
  - Traffic planning
  - Integrated transportation
  - Service operations

- **Logistics & Supply Chain Management**
  - On-demand delivery
  - Logistics planning
  - Freight forwarding and customs clearance
  - Venue logistics management
  - Warehouse and distribution
  - Transportation management systems
  - Reverse logistics
  - Logistics visibility and control
  - Procurement
  - Supply chain collaboration
  - Supply chain process
  - Logistics network

- **Material Flow (MF) Science and Technology**
  - MF fundamental sciences (MF mathematics, physics, chemistry, biology, etc.)
  - Comprehensive MF theory
  - MF in the natural world
  - Material flow in the social world
  - Material flow in the economic world
  - MF element theory
  - MF nature
  - MF engineering
  - MF industry
  - MF Technological economics
  - Cycle MF System
  - X party material flow (XPMF)
  - The MF complexity and emergence
  - The MF information and simulation technology
  - MF systems and networks
  - Financial Measures of MF

- **Service/Event Management & Manufacturing**
  - Demand forecasting
  - Customer relationship management
  - Event communication and alerting
  - Services training
  - Services sustaining
  - Services quality
  - Services bundling
  - E-market for services
  - Event management system
  - Event sponsorship
  - Event-based production
  - Supply chain
  - Event-based products and manufacturing
  - Intelligent manufacturing
  - Customization

- **Information & Communications Technology and Systems (ICTS)**
  - ICTS services design and management
  - ICTS services standards, locating, composition, and bundling
  - Process modeling, augmentation, and automation
  - Real time identification & tracking
  - Pervasive and ubiquitous computing in logistics
  - Decision support systems
  - Software agent based systems
  - RFID
  - Data warehousing and data/Web mining
  - Business intelligence
  - Systems interoperability and integration
  - Information security
  - IT Project Management
  - Information Management in construction project

- **Electronic Commerce & Knowledge Management**
  - Wireless communication and mobile commerce
  - Mobile services
  - Electronic government
  - Information resource management
  - IT and enterprise innovation management
  - IT and strategy for the sustainable development of enterprises
  - Semiotics
  - Business performance management
  - Customer relationship management
  - Information economics
  - Network culture and harmonious society
  - Distributed computing
  - Sensor networks

Important Dates

- **April 20, 2013**
  - Paper submission deadline

- **May 15, 2013**
  - Notification of acceptance

- **May 31, 2013**
  - Camera-ready copy due

Contact us at: ieesoli2013@gmail.com
For detail and most updated information, please visit the conference web site at http://www.ieeesoli.org

April 2013
CALL FOR PAPERS

SCOPE
2013 IEEE International Conference on Intelligent Rail Transportation (IEEE ICIRT 2013) will be held on Aug.30-Sept.1, 2013 at Beijing Friendship Hotel. Requirements and challenges for implementing safe, green and intelligent rail systems have been steadily increasing, driven by the continuous advancement in computing, communication and control technologies. IEEE ICIRT 2013 provides a forum for engineers and scientists in academia, industry and government to present their latest research findings in any aspects of rail transportation. The special topic for IEEE ICIRT 2013 is ‘Safe, Green & Intelligent Rail’. We invite research papers, workshop proposals (if workshop is scheduled), and panel proposals on, but not limited to the following topics:

- Intelligent rail transportation technology
- Rail network complexity analysis
- Rail traffic operation control
- Train scheduling and optimization
- Communicated based train control system
- Full automatic train operation
- Next generation train control
- Rail energy saving and optimal control
- Vehicle dynamics and control
- Train location technology
- Intelligent detection of rail systems
- Communication technology and its application
- Human factor of rail systems
- Pedestrian dynamics
- RAMS design and analysis of rail systems
- Safety and security of rail systems
- Emergency management of rail systems
- Verification and validation of rail system
- Rail system modeling and simulation
- Parallel control and management for rail system

PAPER SUBMISSION
Research papers should describe original work and be 20 double-spaced pages (5,000 words) or less in length. At least one of the authors of each accepted paper must register and present the paper at IEEE ICIRT 2013. Authors must submit their manuscripts electronically following the instructions at IEEE ICIRT 2013 website at: http://www.ieee-icirt.org. Contact us at ieeeicirt@gmail.com.

All accepted papers will be published by IEEE, which will be indexed by EI and ISTP and excellent papers will be selected to special issue of IEEE Transactions on Intelligent Transportation Systems.

IMPORTANT DATES
Proposal submission deadline for invited session: Nov. 30, 2012
Full paper due: Feb. 15, 2013
Notification of acceptance: Apr. 15, 2013
Camera-ready copy due: May 1, 2013

April 2013
Call for Participation

The International Conference on Advanced Logistics and Transport (ICALT’2013) aims to bring together researchers and practitioners from industry and academia and to provide them with a platform to report on recent developments, achievements, deployments, technology trends and research results, as well as initiatives related to Logistics & Transport and their applications. The conference is technically co-sponsored by the IEEE Intelligent Transportation Systems Society.

**Symposiums:**

- **Symposium on Accessibility, Mobility, Security, and Safety (AMSS)**
  Chairs: D. Alt-Kadi (U. Laval, CA); M. El-Kousri (INRETS, FR); R. Garbi (U. Tunisia, TN)

- **Symposium on Intelligent Transportation Systems (ITS)**
  Chairs: K. Ghedira (U. Tunis, TN); A. Allahroum (ENSA, MA); D. Trentesaux (U. Valenciennes, FR)

- **Symposium on Information & Communications Technology and Systems (ICTS)**
  Chairs: N. B. H. Alouane (U. Mannouba, TN); S. Vanderdonckt (UC Louvain, BE); A. Rivenq (U. Val, FR)

- **Symposium on Modeling the Complexity of Logistics Systems (MCLS)**
  Chairs: C. Bertelle (U. La Havre, FR); C. Chu (EC Paris, FR); S. E. Elmohagredy (NCS Univ., USA)

- **Symposium on Logistics & Supply Chain Management (LSCM)**
  Chairs: A. Bouras (U. Lyon 2, FR); V. Duran-Grados (U. Cadiz, ES); A. Hadj-Alouane (U. Tunisia, TN)

- **Symposium on Optimization and Logistics Challenges (OLC)**
  Chairs: T. Loukil (U. Sfax, TN); M. Prilat (U. de Mons, BE); A. Youssef (U. Le Havre, FR)

- **Symposium on Machine Intelligence: Theory and Applications (SIMTA)**
  Chairs: F. Drira (U. Sfax, TN); F. Labourgeois (INS Lyon, FR); M. B. Ayed (U. Sfax, TN)

**Keynote Speakers:**

- Prof. Essameddin Badreddin, Universität Heidelberg, Germany
- Prof. Atieb B. Hadj-Alouane, University of Tunis El-Manar, Tunisia
- Prof. Glenn Geers, Neville Roach Laboratory, Australia
- Prof. Bernard Grabot, National Engineering School of TARBES, France
- Prof. Juan Moreno-Gutiérrez, University of Cadiz, Spain
- Prof. Vincenzo Piuri, University of Milan, Italy
- Prof. Klaus Schilling, University Würzburg, Germany
- Prof. Christoph Stiller, President of the IEEE ITS Society, KIT, Germany

**Special Sessions / Workshops / Tutorials:**

To enhance the technical program and open the door to specific topics and areas, ICALT’2013 will include the following special sessions and workshops:

- **SS1- Advanced Supply Chain Simulation in Practice and Theory**
- **SS2- Optimization and Decision Making in Transportation Systems**
- **SS3- Ambient Intelligence in Industry**
- **W1- ITS for Mobility Governance in Smart Cities**
- **T1- RFID Technology: A Methodology of Evaluating its Impact through Modelling and Simulation**
- **T2- Designing Robust Value-Creating Supply Chain Networks**

**Exhibitions:**

ICALT’2013 will feature a technical exhibition. If your manufacture distributes or sells products or services related to logistics and transports, the ICALT’2013 exhibit is the place for you.

**Venue:**

ICALT’2013 will be held in a five star hotel in Sousse, (known as the jewel of the beach coast of Tunisia). Tunisia is situated in North Africa and is known for its golden beaches, sunny weather and affordable luxuries.

**Organized by:**

**Partners:**

**Supported by:**
Conference Calendar

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

2013

April 16-18
SAE 2013 World Congress
Detroit, Michigan, USA
http://www.sae.org/congress/

April 22-24
ITS America Annual Meeting and Exposition
Nashville, TN, USA
http://itswc.confex.com/itswc/AM2013/cfp.cgi

May 6-10
2013 IEEE International Conference on Robotics and Automation (ICRA 2013)
Karlsruhe - Germany
http://www.icra2013.org/

May 27-31
IEEE International Symposium on Industrial Electronics (ISIE 2013)
http://www.isie2013.org/

June 2-5
IEEE Vehicular Technology Conference: VTC2013-Spring
Dresden, Germany
http://www.ieeevtc.org/vtc2013spring/index.php

June 4-7
9th ITS European Congress
Dublin, Ireland
Submissions due by: January 14
http://itsineurope.com/its9/
June, 17-18
17th International Forum on Advanced Microsystems for Automotive Applications (AMAA 2013)
Smart Systems for Safe and Green Vehicles
Kaiserin Friedrich-House, Berlin (Germany)
http://www.amaa.de/

June 23-26
The 2013 IEEE Intelligent Vehicles Symposium
Gold Coast, Australia
http://www.iv2013.org/

June 26-28
IFAC Intelligent Autonomous Vehicles Conference IAV'13
Gold Coast, Australia
Submissions due by January 6
http://www.iaav2013.org

June 23-28
26th IEEE Conference on Computer Vision and Pattern Recognition (CVPR 2013)
Portland OR, USA
http://www.pamitc.org/cvpr13/

July 15-16
International Conference on Vehicular Electronics and Safety (ICVES 2013)
Stockholm, Sweden
Submissions due by: April 20
http://www.waset.org/conferences/2013/stockholm/icves/

July, 17-19
ISTTT20 – the 20th International Symposium on Transportation and Traffic Theory
Grand Hotel Huis ter Duin in Noordwijk, the Netherlands
http://www.isttt.net/isttt20/

August 24-27
National Rural ITS Conference
St. Cloud, MN, USA
http://www.nritsconference.org/

August 28-30
2013 IEEE Multi-Conference on Systems and Control (MSC)
Hyderabad, India
http://msc2013.org

September 1-4
IEEE Vehicular Technology Conference: VTC2013-Fall
Las Vegas, NV, USA
http://www.ieeevtc.org/vtc2013fall/

September 5-6
ICCARV 2013: International Conference on Control, Automation, Robotics and Vision
Luzern, Switzerland
Submission due by: May 31
https://www.waset.org/conferences/2013/luzern/iccarv/

September 6-9
IEEE Intelligent Transportation Systems Conference
Submission due by: April 5
The Hague, The Netherlands
http://ieee-itsc13.org

September 11-13
ICIAP 2013 : International Conference on Image Analysis and Processing
Naples, Italy
http://www.iciap2013-naples.org/

September 25-27
International Conference on Sustainable Automotive Technologies
Ingolstadt, Germany
http://www.icsat2013.com

October 14-18
20th World Congress on ITS
Tokyo, Japan
http://www.itsworldcongress.jp

October 16-18
13th International Conference on ITS Telecommunication
Tampere, Finland
Submission due by: June 21, 2013
http://www.itst2013.org/

November 3-7
IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2013)
Tokyo Big Sight, Tokyo, Japan
http://www.iros2013.org

November 9-13
17th IRF World Meeting and Exhibition
Riyadh, Saudi Arabia
Submission due by: April 15
http://irfnews.org/files/pdfs/121016_IRF_bro_H_WEB.pdf
2014

January 5-8, 2014
Lisbon Portugal, Submission due by: June 25, 2013
http://www.visigrapp.org/

November 14-15, 2014
ICTTE 2014 : International Conference on Traffic and Transportation Engineering
Italy, Venice
Submission due by: April 30, 2014
https://www.waset.org/conferences/2014/italy/ictte/index.php

November 20-21, 2014
ICIAP 2014: International Conference on Image Analysis and Processing
Capetown, South Africa
Submissions due by: April 30, 2014
https://www.waset.org/conferences/2014/capetown/iciap/
Abstracts of forthcoming papers on IEEE Transactions on ITS

AN OBJECT TRACKING ALGORITHM FOR 3D RANGE DATA USING MOTION AND SURFACE ESTIMATION

ZENG, SHUQING

Given a series of point sets sampled from a rigid surface by a 3D rangefinder, we study the problem of estimating the motion and surface structure of a dynamic object. This target tracking problem with 3D data can be formulated as maximizing the likelihood of the data (the scan map) and the Gaussian mixture model (GMM) (object model up to the previous time step). We choose the prior for the object model from the conjugate distribution family of GMM to yield a trackable posterior distribution for the object model. This GMM based non-parametric model can be indexed by a hash lookup table, and we show that the method's complexity scales linearly with the number of scan points. Quantitative performance evaluation demonstrates that the proposed method substantially outperforms others. Results of road tests in divided freeway and urban scenes show accuracy and robustness of the system which can enable many vehicle active safety and driver assistance applications.

GRADIENT ENHANCING CONVERSION FOR ILLUMINATION-ROBUST LANE DETECTION

YOO, HUNJAE; YANG, UKIL; SOHN, KWANGHOON

Lane detection is important in many advanced driver assistance systems. Vision-based lane detection algorithms are widely used and generally use gradient information as a lane feature. However, gradient values between lanes and roads vary with illumination change, which degrades the performance of lane detection systems. In this paper, we propose a gradient enhancing conversion method for illumination-robust lane detection. Our proposed gradient enhancing conversion method produces a new gray-level image from an RGB color image based on linear discriminant analysis. The converted images have large gradients at lane boundaries. In order to deal with illumination changes, the gray-level conversion vector is dynamically updated. In additions, we propose a novel lane detection algorithm, which uses the proposed conversion method, adaptive Canny edge detector, Hough Transform and curve model fitting method. We performed several experiments in various illumination environments and confirmed that the gradient is maximized at lane boundaries on the road. The detection rate of the proposed lane detection algorithm averages 96% and is greater than 93% in very poor environments.

VALIDATING THE IMPACT ON REDUCING FUEL CONSUMPTION BY USING AN ECO-DRIVING ASSISTANT BASED ON TRAFFIC SIGN DETECTION AND OPTIMAL DECELERATION PATTERNS

MUNOZ-ORGANERO, MARIO; CORCOBA-MAGANA, VICTOR

This paper implements and validates an expert system that, based on the detection or previous knowledge of certain types of traffic signals, proposes a method to reduce fuel consumption by calculating optimal deceleration patterns, minimizing the use of braking. The expert system uses the mobile device embedded camera to monitor the
environment and to recognize certain types of static traffic signals that force or can force the vehicle to stop. The system uses an adaptation of the algorithm proposed by Viola and Jones for the recognition of faces in real time adapted to the detection of traffic signals. Detected signals are also incorporated into a central database for future occasions. When the vehicle approaches an upcoming traffic signal the algorithm estimates the distance required to stop the vehicle without using the brakes, taking into account the rolling resistance coefficient and the road slope angle. Appropriate advice and feedback is provided to the driver in order to release the accelerator pedal. The expert system is implemented on Android mobile devices and has been validated using a data set of 180 tests using 5 different models of vehicles with 9 different drivers. The main contribution of this paper is the proposal of an assistant that uses information from the environment and from the vehicle to calculate optimal deceleration patterns when approaching traffic signals that force or may force the vehicle to stop. In addition, the proposed solution does not require road infrastructure and can be installed on any vehicle.

**SHORT-TERM TRAFFIC FLOW FORECASTING: AN EXPERIMENTAL COMPARISON OF TIME-SERIES ANALYSIS AND SUPERVISED LEARNING**

LIPI, MARCO; BERTINI, MATTEO; FRASCONI, PAOLO

The literature on short term traffic flow forecasting has recently run across a phase of great development. Many works have been published, describing a wide variety of different approaches, which very often share similar features and ideas. Publications presenting new prediction algorithms usually employ different settings, data sets, and performance measurements, making it difficult to infer a clear picture of the advantages and limitations of each model. The aim of this paper is twofold: first, we review the existing approaches to short-term traffic flow forecasting methods under the common view of probabilistic graphical models, presenting an extensive experimental comparison, which proposes a common baseline for their performance analysis, and provides the infrastructure to operate on a publicly available data set; second, we present two new support vector regression models, which are especially devised to benefit from the typical traffic flow seasonality, and which are shown to represent an interesting compromise between prediction accuracy and computational efficiency.

**A MATHEMATICAL MODEL FOR THE PREDICTION OF SPEEDING WITH ITS VALIDATION**

ZHANG, GUOZHEN; WU, CHANGXU; QIAO, CHUNMING

Speeding is one of the most prevalent contributing factors in traffic crashes. The prediction of speeding is important for reducing excessive speeds and preventing speeding-related traffic accidents and injuries. Speeding (either intentional or unintentional) is a consequence of inappropriate speed control. This work extends a previous mathematical model of driver speed control to provide quantitative predictions of intentional and unintentional speeding. These predictions consist of the time at which the driver exceeds the speed limit and the magnitude of speeding. Based on these modeling predictions, this work develops an intelligent speeding prediction system (ISPS) to prevent the occurrence of speeding. An experimental study using a driving simulator is conducted to evaluate ISPS. We find no significant difference between modeled predictions and experimental results in terms of the time and magnitude of intentional speeding. Also, ISPS can successfully predict the majority of unintentional speeding instances, with only a small portion of unnecessary speeding warnings. Applications of the ISPS to reducing driving speed, and preventing the real-time occurrence of speeding and speeding-related traffic accidents are discussed.
A GAZE-BASED DRIVER DISTRACTION WARNING SYSTEM AND ITS EFFECT ON VISUAL BEHAVIOUR

AHLSTROM, CHRISTER; KIRCHER, KATJA; KIRCHER, ALBERT

Driver distraction is a contributing factor to many crashes, therefore a real-time distraction warning system should have the potential to mitigate or circumvent many of these crashes. The objective of this paper is to investigate the usefulness of a real-time distraction detection algorithm called AttenD. The evaluation is based on data from an extended field study comprising seven drivers who drove on average 4351±2181 km in a naturalistic setting. Visual behavior was investigated both on a global scale and on a local scale in the surrounding of each warning. An increase in the percentage of glances to the rear view mirror and a decrease in the amount of glances to the center console were found. The results also show that visual time sharing decreased in duration from 9.94 s to 9.20 s due to the warnings, that the time from fully attentive to warning decreased from 3.20 s to 3.03 s, and that the time from warning to fully attentive decreased from 6.02 to 5.46 s. The limited number of participants does not allow any generalizable conclusions, but a trend towards improved visual behavior could be observed. This is a promising start for further improvements of the algorithm and the warning strategy.

E-CONSTRAINT AND FUZZY LOGIC-BASED OPTIMIZATION OF HAZARDOUS MATERIAL TRANSPORTATION VIA LANE RESERVATION

ZHOU, ZHEN; CHU, FENG; CHE, ADA; ZHOU, MENGCHU

With economic development and globalization of the market, a great diversity and amount of hazardous material is shipped in a transport network every day. Hazardous material transportation is well-known for its high potential risk. An accident can cause very serious economic damage and negative impacts on the public health and the environment over a long term. Transporting hazardous material on special lanes can reduce the risk of accidents. However, a lane reservation strategy may worsen the traffic situation for other users. This paper investigates a hazardous material transportation problem under a lane reservation strategy. Its solution consists in choosing lanes to be reserved in the network and selecting the path for each hazardous material shipment from the reserved lanes. The goal is to optimally obtain a compromise between the impact on normal traffic and the transportation risk. A multi-objective integer linear programming model is presented for the new problem. Then the algorithm is developed based on the e-constraint method and a fuzzy logic-based approach. Pareto optimal solutions are obtained by the former and a preferred solution is selected by the latter. Computational results show the efficiency of the proposed method via randomly generated instances.

THE USE OF AUTOMOTIVE RADARS IN VIDEO-BASED OVERTAKING ASSISTANCE APPLICATIONS

BELYAEV, EVGENY; MOLCHANOV, PAVLO; VINEL, ALEXEY; KOUCHERYAVY, YEVCEN

Overtaking on rural roads may cause severe accidents when oncoming traffic is detected by the driver too late, or its speed is underestimated. Recently proposed cooperative overtaking assistance systems are based on real-time video transmission, where a video stream captured by a camera installed at the windshield of a vehicle is compressed, broadcast through the wireless channel and displayed to the drivers of vehicles driving behind. In such a system it is of ultimate importance to deliver video information about the opposite lane with low end-to-end latency and good visual quality.
In this paper we propose reallocating the wireless channel resources in favor of the part of the captured video frame that contains the oncoming vehicle. To achieve this goal we apply the automotive radar for the oncoming vehicle detection and use the image of this vehicle as a region-of-interest for the video rate control. We present the theoretical framework, which describes the basics of such an approach and can serve as a useful guideline for the future practical implementation of the overtaking assistance systems. The benefits of our proposal are demonstrated in relation to the practical scenario of H.264/AVC video coding and IEEE 802.11p/WAVE inter-vehicle communication standards as well as currently used automotive radars.

**OPTIMAL FEEDBACK FLOW RATES FOR PEDESTRIAN EVACUATION IN A NETWORK OF CORRIDORS**

**SHENDE, APOORVA; SINGH, MAHENDRA; KACHROO, PUSHKIN**

This paper presents a methodology for the computation of optimal feedback flow rates (flow velocities and flow discharges) for pedestrian evacuation from a network of corridors using network wide pedestrian congestion data. The pedestrian flow is defined in a macroscopic sense wherein the differential equations for each corridor and node are obtained using the conservation of pedestrian mass. The effect of congestion on the flow velocities and discharges in the corridor and the corridor intersections is explicitly modeled. Collectively these corridor and node equations define the state space model of the pedestrian flow in the network. The state variables signify the congestion in a corridor or an intersection while the control variables directly affect the flow velocities and the flow discharges. For this model, an optimization based control algorithm is developed to ensure maximum total instantaneous input discharge subject to tracking the optimal congestion state and boundedness of the control variables. A comparison of the simulation results in the controlled and uncontrolled scenarios shows a superior performance in the controlled case due to convergence to the optimal congestion state and consistently high network input and exit discharges.

**AN EFFICIENT MULTIPLE LOOP SENSOR CONFIGURATION APPLICABLE FOR UNDISCIPLINED TRAFFIC**

**MOHAMMED ALI, SHEIK; GEORGE, BOBY; VANAJAKSHI, LELITHA**

This paper presents an effective multiple inductive loop pattern suitable for heterogeneous and less-lane disciplined traffic and its performance evaluation. Vehicle detection based on conventional inductive loops has been in use but works well only for lane based and homogeneous traffic. The scheme proposed in this paper employs a new multiple loop configuration, where all the loops are connected in series that considerably reduces the system complexity and improves reliability. Each loop has a unique resonance frequency and the excitation to the loops is programmed to have frequency components covering all the loop resonance frequencies. When a vehicle goes over a loop the corresponding inductance and resonance frequency will change. The shift in frequency or its effect in any/every loop can be monitored simultaneously and the vehicles can be detected and identified as Bicycle, Motor-cycle, Car, Bus, etc. based on the signature. Another advantage of this scheme is that the loops are in parallel resonance and hence the power drawn from the source will be at minimum. A prototype multiple loop system has been built and tested based on the proposed scheme. The developed system detected, classified and counted the vehicles accurately. The system also computes and provides the speed of the vehicle detected using single set of multiple loops. Accuracy of the speed measurement has been compared with actual values and found to be accurate and can be used applications under heterogeneous and less-lane disciplined (e.g., Indian) conditions.
REAL-TIME DETECTION SYSTEM OF DRIVER’S DISTRACTION USING MACHINE LEARNING

TANGO, FABIO; BOTTA, MARCO

There is an accumulating evidence that driver’s distraction is a leading cause of vehicle crashes and incidents. In particular, it has become an important and growing safety concern with the increasing use of the so-called In-Vehicle Information Systems (IVIS) and Partially Autonomous Driving Assistance Systems (PADAS). Thereby, the detection of the driver status is of paramount importance, in order to adapt IVIS and PADAS accordingly, so avoiding or mitigating their possible negative effects. The purpose of this paper is to illustrate a method for the non-intrusive and real-time detection of visual distraction, based on vehicle dynamics data and without using the eye-tracker data as inputs to classifiers. Specifically, we present and compare different models, based on well-known Machine Learning methods. Data for training the models were collected using a static driving simulator, with real human subjects performing a specific secondary task (SURT) while driving. Different training methods, model characteristics and feature selection criteria have been compared. Based on our results, SVM has outperformed all the other ML methods, providing the highest classification rate for most of the subjects. Potential applications of this research include the design of adaptive IVIS and of “smarter” PADAS.

A SUBWAY TRAIN TIMETABLE OPTIMIZATION APPROACH BASED ON ENERGY-EFFICIENT OPERATION STRATEGY

SU, SHUAI; LI, XIANG; TANG, TAO; GAO, ZIYOU

Given the rising energy prices and environmental concerns, train energy-efficient operation technique is paid more and more attention as one of the effective methods to reduce the operation cost and energy consumption. Generally speaking, the energy-efficient operation technique includes two levels, which respectively optimize the timetable and the speed profiles among successive stations. To achieve a better performance, this paper proposes to optimize the integrated timetable which includes both the timetable and the speed profiles. Firstly, we provide an analytical formulation to calculate the optimal speed profile with fixed trip time for each section. Secondly, we design a numerical algorithm to distribute the total trip time among different sections, and prove the optimality of the distribution algorithm. Furthermore, we extend the algorithm to generate the integrated timetable. Finally, we present some numerical examples based on the operation data from the Beijing YiZhuang subway line. The simulation results show that the energy reduction for the entire route is 14.5%. The computation time for finding the optimal solution is 0.15 seconds, which implies that the algorithm is fast enough to be used in the automatic train operation (ATO) system for real-time control.

HRV: HYBRID ROUTING IN VEHICULAR NETWORKS

WU, DI; ZHANG, YUAN; BAO, LICHUN; REGAN, AMELIA

We present a hybrid routing scheme for communication in Ad Hoc Vehicular Networks (VANETs) for inter-vehicle, vehicle-to-roadside and inter-roadside communication in hybrid urban networks. The combination of roadside unit resources and ad hoc networks involves an online probabilistic roadside unit retrieval algorithm which uses coarse- and fine-grained localization to estimate the number and location of available roadside units; a network coding based multicast routing for dense VANETs using maximum distance separation code and local topology information from the forwarding set to achieve robust communication and max-flow min-cut data dissemination; an application of opportunistic routing, using a carry and forward scheme to solve the forwarding disconnection problem in sparse
VANETs; and, a routing switch mechanism to guarantee quality of service under various network connectivity and deployment configurations. The performance of our hybrid routing scheme is evaluated using both simulation and live testbed experiments.

**INTEGRATED LANE AND VEHICLE DETECTION, LOCALIZATION, AND TRACKING: A SYNERGISTIC APPROACH**

**SIVARAMAN, SAYANAN; TRIVEDI, MOHAN**

In this paper, we introduce a synergistic approach to integrated lane and vehicle tracking for driver assistance. The approach presented in this work results in a final system that improves on the performance of both lane tracking and vehicle tracking modules. Further, the presented approach introduces a novel approach to localizing and tracking other vehicles on the road with respect to lane position, which provides information of higher contextual relevance that neither the lane tracker nor vehicle tracker can provide by itself. Improvements in lane tracking and vehicle tracking have been extensively quantified. Integrated system performance has been validated on real-world highway data. Without specific hardware and software optimizations, the fully implemented system runs at near-real-time speeds of 11 frames per second.

**UTN-MODEL-BASED TRAFFIC FLOW PREDICTION FOR PARALLEL TRANSPORTATION MANAGEMENT SYSTEMS**

**KONG, QING-JIE; XU, YANYAN; LIN, SHU; WEN, DING; ZHU, FENGHUA; LIU, YUNCAI**

Aiming to the requirement of Parallel transportation Management Systems (PtMS), this paper presents a short-term traffic flow prediction method for signal-controlled urban traffic networks based on the macroscopic urban traffic network (UTN) model. In contrast with other time-series-based or spatiotemporal correlation methods, the proposed method focuses more on using the substantial mechanism of traffic transmission in road networks and the topology model of the entire urban traffic network. Furthermore, this approach employs a speed-density model based on the fundamental diagram (FD) to obtain more accurate travel times in links. In the comparison experiment, the microscopic traffic simulation software, CORSIM, is adopted to simulate the real urban traffic. The experiment results fully verify the outstanding performances of the proposed prediction method.

**A TOPOLOGY-BASED MODEL FOR RAILWAY TRAIN CONTROL SYSTEMS**

**WANG, HAIFENG; SCHMID, FELIX; CHEN, LEI; ROBERTS, CLIVE; XU, TIANHUA**

An innovative topology-based method for modeling railway train control systems is proposed in this paper. The method addresses the problems of having to rely too much on designers’ experience and of incurring excessive cost of validation and verification in the development of railway train control systems. Four topics are discussed in the paper, namely, (i) the definition of basic topological units for modeling railway networks, based on the essential characteristics of these units, (ii) the concept of a train movement authority topological space, (iii) the interpretation of the train control logic as a topological space construct and, (iv) topological space theorems for train control system verification. A case study is also presented where the approach was applied in the simulation model of a typical railway network and the results show good performance, which meets the system requirements.
A REVIEW ON THE APPLICATIONS OF PETRI NETS IN MODELING, ANALYSIS AND CONTROL OF URBAN TRAFFICS

NG, KOK MUN; REAZ, MAMUN BIN IBNE; ALI, MOHD ALAUDIN

Urban traffic systems that possess system states that are distributed, parallel, deterministic, stochastic, discrete and continuous are well suited for a Petri net (PN) approach. The literature survey conducted in this paper shows the vast applications of Petri nets in modeling and simulation; analyzing and evaluating performances; intelligent control and optimization as well as congestion management in urban traffic systems. This paper outlines the related works conducted using PN and discusses its viability such as its contributions and limitations. Extendibility and future research potential to further the successful applications of PN in traffic systems are discussed and proposed in this paper.

SHARED STEERING CONTROL BETWEEN A DRIVER AND AN AUTOMATION: STABILITY IN THE PRESENCE OF DRIVER BEHAVIOUR UNCERTAINTY

SALEH, LOUAY; CHEVREL, PHILIPPE; CLAVEAU, FABIEN; LAFAY, JEAN-FRANÇOIS; MARS, FRANCK

This paper presents an advanced driver assistance system (ADAS) for lane keeping, together with an analysis of its performance and stability with respect to variations in driver behavior. The automotive ADAS proposed is designed so as to share control of the steering wheel with the driver in the best possible way. Its development was derived from a H2-preview optimization control problem, which is based on the global driver-vehicle-road (DVR) system. The DVR model makes use of a cybernetic driver model so as to take into account any driver-vehicle interactions. Such a formulation allows to: i) consider driver-assistance cooperation criteria in the control synthesis, ii) improve the performance of the assistance as a cooperative copilot, and iii) analyze the stability of the whole system in the presence of driver model uncertainty. The results have been validated experimentally with one participant using a fixed-base driving simulator. The developed assistance system improved lane-keeping performance and reduced the risk of a lane departure accident. Good results were obtained using several criteria for human-machine cooperation. Poor stability situations were successfully avoided thanks to the robustness of the whole system in spite of a large range of driver model uncertainty.

COORDERATIVE COLLISION AVOIDANCE AT INTERSECTIONS: ALGORITHMS AND EXPERIMENTS

HAFNER, MICHAEL; CUNNINGHAM, DREW; CAMINITI, LORENZO; DEL VECCHIO, DOMITILLA

In this paper, we leverage vehicle-to-vehicle (V2V) communication technology to implement computationally efficient decentralized algorithms for two-vehicle cooperative collision avoidance at intersections. Our algorithms employ formal control theoretic methods to guarantee a collision free (safe) system, while overrides are applied only when necessary to prevent a crash. Model uncertainty and communication delays are explicitly accounted for by the model and by the state estimation algorithm. The main contribution of this work is to provide an experimental validation of our method on two instrumented vehicles engaged in an intersection collision avoidance scenario in a test-track.
COUNTING VEHICLES FROM SEMANTIC REGIONS

ZHAO, RUI; WANG, XIAOGANG

Automatically counting vehicles in complex traffic scenes from videos is challenging. Detection and tracking algorithms may fail due to occlusions, scene clutters and large variations of viewpoints and vehicle types. We propose a new approach of counting vehicles through exploiting contextual regularities from scene structures. It breaks the problem into simpler ones, which count vehicles on each path separately. The model of each path together with its source and sink add strong regularization on the motion and the sizes of vehicles and thus can significantly improve the accuracy of vehicle counting. Our approach is based on tracking and clustering feature points, and can be summarized in threefold. First, an algorithm is proposed to automatically learn the models of scene structures. A traffic scene is segmented into local semantic regions through exploiting the temporal co-occurrence of local motions. Local semantic regions are connected into global complete paths using the proposed fast marching algorithm. Sources and sinks are estimated from the models of semantic regions. Second, an algorithm is proposed to cluster trajectories of feature points into objects and to estimate average vehicle sizes at different locations from initial clustering results. Third, trajectories of features points are often fragmented due to occlusions. By integrating the spatio-temporal features of trajectory clusters with contextual models of paths, sources and sinks, trajectory clusters are assigned into different paths and connected into complete trajectories. Experimental results on a complex traffic scene show the effectiveness of our approach.

OPTIMIZING TRAIN-STOP POSITIONS ALONG A PLATFORM TO DISTRIBUTE THE PASSENGER LOAD MORE EVENLY ACROSS INDIVIDUAL CARS

SOHN, KEEMIN

Crowding on metro trains is a major factor in determining both the passenger service level and the operator supply level. An uneven distribution of passenger load across individual cars of a train exacerbates the overall capacity loading for a metro transit system. A loading diversity factor has been adopted to adjust the effect when computing the capacity for a metro train. The passenger preference for a specific car of a train was found to depend upon minimizing walking distance at destination stations. The present study was focused on the possibility that a passenger load could be more evenly dispersed by varying train-stop positions. The present study proposed a mathematical programming model to find the optimal train-stop position at each station of a hypothesized metro line. The objective function was set to minimize the discrepancies in passenger loading across individual cars. After applying a genetic algorithm for solving the proposed model, differentiating train-stop positions considerably improved the distribution of passenger loading.

AN ENERGY MINIMIZATION APPROACH TO AUTOMATIC TRAFFIC CAMERA CALIBRATION

DAWSON, DOUGLAS; BIRCHFIELD, STANLEY

We present a method for automatic calibration of traffic cameras. The problem is formulated as one of energy minimization in a reduced road-parameter space, from which the internal and external camera parameters are determined. Our approach combines bottom-up processing of the video to find the vanishing point, lines in the background, and a directed activity map, along with top-down processing to fit a road model to these detected features using Markov chain Monte Carlo (MCMC). Enhanced autocorrelation along the dashed lines is used in conjunction with best fit road model to find the road-to-image parameters. To maximize both robustness to noise and
flexibility (e.g., to handle cases in which the camera is looking straight down the road), a single vanishing point length-based approach (VWL, according to the taxonomy of \cite{kanhere2010its}) is used. On a large number of datasets exhibiting a wide variety of conditions (including distractions such as bridges and on-/off-ramps), our approach performs well, achieving less than 10% error in measuring test lengths in all cases.

**EFFECTS OF WIND ON OPERATING COST BASED CRUISE SPEED REDUCTION FOR DELAY ABSORPTION**

**DELGADO, LUIS; PRATS, XAVIER**

En route speed reduction can be used for Air Traffic Flow Management purposes. For example, delaying aircraft while airborne or realizing metering at an arrival fix. In previous publications the authors have identified the flight conditions that maximize the airborne delay without incurring extra fuel consumption with respect to the nominal (not delayed) flight. In this paper, the effect of wind on this strategy is studied, and the sensitivity to wind forecast errors is also assessed. A case study of Chicago O’Hare airport is presented showing that wind has a significant effect on the airborne delay that can be realized and that, in some cases, even tail winds might lead to an increase in the maximum amount of airborne delay. The values of airborne delay are representative enough to suggest that this speed reduction technique might be useful in a real operational scenario. Moreover, the speed reduction strategy is more robust than nominal operations against fuel consumption in the presence of wind forecast uncertainties.

**DESIGN AND EVALUATION OF A ROBUST OPTICAL BEAM INTERRUPTION-BASED VEHICLE CLASSIFIER SYSTEM**

**RAO, ARAVIND; GOBBALIPUR RANGANATH, JAYANTH; M. D., MADHUSUDAN**

This paper presents the design and development of a novel optical vehicle classifier system, based on interruption of laser beams, that is suitable for use in places with poor transportation infrastructure. The system can estimate the speed, axle count, wheelbase, tire diameter and the lane of motion of a vehicle. The design of the system eliminates the need for careful optical alignment, while the proposed estimation strategies render the estimates insensitive to angular mounting errors and to unevenness of the road. The strategies to estimate the vehicular parameters are described along with the optimization of the geometry of the system to minimize estimation errors due to quantization. The system is subsequently fabricated and the proposed features of the system are experimentally demonstrated. The relative errors in estimation of velocity and tire diameter are shown to be within 0.5% and to change by less than 17% for angular mounting errors up to 30°. In the field, the classifier demonstrates accuracy better than 97.5% and 94% respectively in estimation of the wheelbase and lane of motion, and can classify vehicles with average accuracy of over 89.5%.

**A HYBRID APPROACH FOR AUTOMATIC INCIDENT DETECTION**

**JIAWEI, WANG; LI, XIN; LIAO, SHAOYI; ZHONGSHENG, HUA**

This paper presents a hybrid approach for automatic incident detection (AID) in transportation. It combines time series analysis and machine learning techniques in light of the fault diagnosis theory. In this approach the time series component is to forecast the normal traffic for the current time point based on prior (normal) traffic. The machine
learning component aims to detect incidents using features of real-time traffic and predicted normal traffic, and differences between the two. We validate our approach using a real-world data set collected in the previous research. The results show that the hybrid approach is able to detect incidents more accurately (higher detection rate) and faster (shorter mean time to detect) under the requirement of a similar false alarm rate as compared with state-of-the-art algorithms. This study lends support to further studies on combining time series analysis with machine learning to address problems related to Intelligent Transportation System (ITS).

**VEHICLE DETECTION BASED ON THE AND-OR GRAPH FOR CONGESTED TRAFFIC CONDITIONS**

LI, YE; LI, BO; TIAN, BIN; YAO, QINGMING

In the urban traffic video monitoring system, traffic congestion is a common scene which causes vehicle occlusion and is challenging to current vehicle detection methods. To solve the occlusion problem, we have proposed an effective vehicle detection approach based on the And-Or Graph (AOG) in this paper. Our method includes three steps: constructing an AOG for representing vehicle objects, training parameters in AOG, and finally detecting vehicles by using a bottom-up inference. In the AOG construction, sophisticated vehicle feature selection avoids using the easily-occluded vehicle components but takes highly visible components into account. The vehicles are well represented by these selected vehicle features in the presence of a congested condition with serious occlusion. Furthermore, a hierarchical decomposition of the vehicle representation is proposed during the AOG construction to further reduce the impact of vehicle occlusion. After AOG construction, all parameters in the AOG are learned from the training images or set manually, and further applied to the bottom-up vehicle inference. There are two innovations of our method which are the usage of AOG in vehicle detection under congested traffic condition and the special vehicle feature selection for vehicle representation. In order to fully test our method, we have done a quantitative experiment under a variety of conditions, a contrast experiment, and several experiments on congested conditions. The experimental results illustrate that our method can effectively deal with various vehicle poses, vehicle shapes, weather, and time-of-day conditions. In particular, our approach performs well in congested traffic conditions with serious vehicle occlusion.

**A NEW “SMART PARKING” SYSTEM BASED ON RESOURCE ALLOCATION AND RESERVATIONS**

GENG, YANFENG; CASSANDRAS, CHRISTOS

We propose a novel “smart parking” system for an urban environment. The system assigns and reserves an optimal parking space based on the driver’s cost function that combines proximity to destination and parking cost. Our approach solves a Mixed Integer Linear Program (MILP) problem at each decision point defined in a time-driven sequence. The solution of each MILP is an optimal allocation based on current state information, and is updated at the next decision point with a guarantee that there is no resource reservation conflict and that no driver is ever assigned a resource with a higher than this driver’s current cost function value. Based on simulation results, compared to uncontrolled parking processes or state-of-the-art guidance-based systems, our system reduces the average time to find a parking space and the parking cost, while the overall parking capacity is more efficiently utilized. We also describe a full implementation in a garage to test this system, where a new light system scheme is proposed to guarantee user reservations.
AN OPTIMIZATION FRAMEWORK FOR DRIVER FEEDBACK SYSTEMS

MALIKOPOULOS, ANDREAS; AGUILAR, JUAN

Modern vehicles have sophisticated electronic control units that can control engine operation with discretion to balance fuel economy, emissions, and power. These control units are designed for specific driving conditions (e.g., different speed profiles for highway and city driving). However, individual driving styles are different and rarely match the specific driving conditions for which the units were designed. In the research reported here, we investigate the driving style factors that have a major impact on fuel economy and construct an optimization framework to optimize individual driving styles with respect to these driving factors. In this context, we construct a set of polynomial metamodels to reflect the responses produced in fuel economy by changing the driving factors. Then we compare the optimized driving styles to the original ones and evaluate the effectiveness of the optimization framework. Finally, we use this proposed framework to develop a real-time feedback system, including visual instructions, to enable drivers to alter their driving styles in response to actual driving conditions to improve fuel efficiency.

MULTI-AGENT REINFORCEMENT LEARNING FOR INTEGRATED NETWORK OF ADAPTIVE
TRAFFIC SIGNAL CONTROLLERS (MARLIN-ATSC): METHODOLOGY AND LARGE-SCALE
APPLICATION ON DOWNTOWN TORONTO

EL-TANTAWY, SAMAH; ABDULHAI, BAHER; ABDELGAWAD, HOSSAM

Population is steadily increasing worldwide resulting in intractable traffic congestion in urban dense areas. Adaptive Traffic Signal Control (ATSC) has shown strong potential to effectively alleviate urban traffic congestion by adjusting the signal timing plans in real-time in response to traffic fluctuations to achieve desirable objectives (e.g., minimize delay). Efficient and robust ATSC can be designed using a multi-agent reinforcement learning (MARL) approach in which each controller (agent) is responsible for the control of traffic lights around a single traffic junction. Applying MARL approaches to ATSC problem is associated with a few challenges as agents typically react to changes in the environment at the individual level but the overall behaviour of all agents may not be optimal. This paper presents the development and evaluation of a novel system of Multi-Agent Reinforcement Learning for Integrated Network of Adaptive Traffic Signal Controllers (MARLIN-ATSC). MARLIN-ATSC offers two possible modes: (1) independent mode, i.e. each intersection controller is independently working of other agents; and (2) integrated mode, where each controller coordinates the signal control actions with the neighbouring intersections. MARLIN-ATSC is tested on a large-scale simulated network of 59 intersections in the lower downtown core of the City of Toronto for the morning rush hour. The results show unprecedented reduction in the average intersection delay ranging from 27% in mode 1 to 39% in mode 2 at the network level; and travel time savings of 15% in mode 1 and 26% in mode 2, along the busiest routes in downtown Toronto.

A MULTI-CLASS USER EQUILIBRIUM MODEL CONSIDERING OVERTAKING ACROSS CLASSES

CASTILLO, ENRIQUE; CALVIÑO, AIDA; SÁNCHEZ-CAMBRONERO, SANTOS; LO, HONG

In this paper we deal with the traffic assignment problem solving a multiclass equilibrium problem. In particular we focus our analysis when the overtaking of vehicles is permitted. A new family of link travel time functions is presented that allows us reproducing the same asymptotic congestion behavior of several overtaking classes to mimic the fact that high congestions impede overtaking and then all classes must have identical link travel times. This family is generated based on local linear convex combinations of BPR travel time functions. A nonlinear complementary
problem (NCP), that does not require path enumeration, is used to solve the user-optimal traffic assignment. An example is used to illustrate the proposed methods and techniques. In particular, a case in which cars and motorcycles share the network is analyzed under congested and uncongested conditions.

**MODELLING AND ANALYSIS OF DSA-BASED VEHICLE-TO-INFRASTRUCTURE COMMUNICATION SYSTEMS**

KHABBAZ, MAURICE; ASSI, CHADI; GHRAYEB, ALI

This paper presents an in-depth investigation on the feasibility of Dynamic Spectrum Access (DSA) in vehicular environments. We present a comprehensive description of the DSA-based Vehicle-to-Infrastructure (V2I) communication as it takes place in the context of a scenario where spectral resources are limited. Founded on top of this description is a queueing model whose primary objectives are to capture and characterize the dynamics of this type of communication systems as well as to assess its performance in terms of several classical metrics. Simplicity, and tractability distinguish the proposed model herein from existing models in the literature. Extensive simulations and numerical analysis are conducted for the purpose of validating the proposed model as well as to evaluate the performance of DSA-based communication and highlight its limitations.

**DERIVING THE VEHICLE SPEEDS FROM MOBILE TELECOMMUNICATIONS NETWORK**

LIOU, REN-HUANG; LIN, YI-BING; CHANG, YU-LONG; HUNG, HUI-NIEN; PENG, NAN-FU; CHANG, MING-FENG

Vehicle speeds of roads are often measured by the Intelligent Transportation Systems (ITS) through some sensors or software solutions. Our previous work proposed the Lin-Chang-Huangfu (LCH) scheme to compute the cell residence times by the standard counter values in the mobile telecommunications switches. In this paper, we use mathematical and statistical developments to investigate the accuracy of the LCH scheme by deriving the bias of the cell residence times computed in this scheme. Then we extend the LCH scheme with some filtering and compensation techniques for vehicle speed estimation, and validate our approach with vehicle detector measurements at National Highway 3, Longtan Township, Taoyuan County, Taiwan. Our study indicates that the LCH scheme is an effective approach for the vehicle speed estimation.

**CONGESTION AVOIDANCE AND ROUTE ALLOCATION USING VIRTUAL AGENT NEGOTIATION**

DESAI, PRAJAKTA; LOKE, SENG; DESAI, ANIRUDDHA; SINGH, JACK

Traffic congestion becomes a cascading phenomenon when volume of vehicles from a congested road segment, chaotically spill on to successive road segments. Such uncontrolled dispersion of vehicles can be avoided by evenly distributing vehicles along the alternate routes. This paper proposes a practical multiagent based approach which is designed to achieve an acceptable route allocation within a short time frame and with low communication overheads. In the proposed approach, called Congestion Avoidance and Route Allocation using Virtual Agent Negotiation (CARAVAN), the vehicles agents in local vicinity communicate with each other at appropriate decision points (junctions) along their route and perform cooperative route allocation. Vehicle Agents (VA) use inter-vehicular communication to propagate key traffic information and undertake its distributed processing. Every VA exchanges its autonomously calculated route preference information to arrive at an initial allocation of routes. The allocation is
further improved using a number of successive virtual negotiation 'deals'. Virtual nature of these deals requires no physical communication and thereby reduces communication requirements. In addition to the theory and concept, this paper presents the design and implementation methodology of CARAVAN including experimental results for synthetic and real world road networks. Results show that when compared against the Shortest Path Algorithm for travel time improvements, CARAVAN offers 21-43% gain (when traffic demand is below the network capacity) and 13-17% gain (when traffic demand exceeds network capacity), demonstrating its ability to regulate overall system traffic using local coordination strategies.

A USER-CUSTOMIZABLE URBAN TRAFFIC INFORMATION COLLECTION METHOD BASED ON WIRELESS SENSOR NETWORKS

ZHOU, JIN; CHEN, C. L. PHILIP; CHEN, LONG; ZHAO, WEI

Traffic-monitoring can efficiently promote urban planning and encourage the better use of public transport. Efficient traffic information collection is an important part of the traffic-monitoring systems. Based on the wireless sensor networks technique, this paper provides a flexible framework for regional traffic information collection in accordance with user requests. This framework serves as a basis for future research in designing and implementing traffic-monitoring applications. The two-layer network architecture is established for traffic information acquisition in the context of wireless sensor networks environment. And the user-customizable data-centric routing scheme is proposed for traffic information delivery, in which multiple routing related information are considered for decision making to meet different user requirements. Simulations have shown the good performance of the proposed routing scheme compared with other traditional ones on a real-world urban traffic network.

REFORMULATION AND SOLUTION ALGORITHMS FOR ABSOLUTE AND PERCENTILE ROBUST SHORTEST PATH PROBLEMS

XING, TAO; ZHOU, XUESONG

To model driver route choice behavior under inherent traffic system stochasticity, and further provide better route guidance with travel time reliability guarantees, this paper examines two models to evaluate the travel time robustness: absolute and α-percentile robust shortest path problems. A Lagrangian relaxation approach and a scenario-based representation scheme are integrated to reformulate the minimax and percentile criteria under day-dependent random travel times. The complex problem structure is decomposed into several subproblems that can be solved efficiently as the standard shortest path problems or univariate linear programming problems. Large-scale numerical experiments with real-world data are provided to demonstrate the efficiency of the proposed algorithms.

TRAVEL TIME ESTIMATION BASED ON TEMPORAL-SPATIAL QUEUEING MODEL

LI, LI; CHEN, XIQUN; LI, ZHIHENG

Travel time serves as a fundamental measurement for transportation systems and becomes increasingly important to both traffic participants and traffic operators. Existing speed interpolation algorithms simply use the average speed time series collected from upstream and downstream detectors to estimate the travel time of a road link. Such approaches often result in inaccurate estimations or even systematic bias, especially when the real travel times vary quickly. To get rid of this problem, Coifman proposed a special interpolation algorithm based on kinetic wave models.
However, this algorithm gives significant over-estimation when jams emerge from somewhere between the upstream and downstream detectors. To make a remedy, we design a new temporal-spatial queueing model to describe the fast travel time variations using only speed and headway time series measured at upstream and downstream detectors. Theoretical and numerical studies show that this new interpolation algorithm could better utilize traffic flow dynamic information embedded in speed/headway time series and thus significantly outperforms conventional approaches.

Abstracts of forthcoming papers on IEEE ITS Magazine

**VEHICLE CLASSIFICATION WITH CONFIDENCE BY CLASSIFIED VECTOR QUANTIZATION**

ZHANG, BAILING; ZHOU, YIFAN; PAN, HAO

Automated vehicle classification based on static images is highly practical and directly applicable for various operations such as traffic related investigations. An integrated vehicle detection and classification system is proposed in this paper. A multi-resolution vehicle detection scheme is introduced as an improvement over the cascade boosted classifiers proposed recently by Negri et al. 2008 in the literature. Building on solutions from previous works from Negri et al, the implementation of a new decision strategy renders current detection method to be robust to environmental changes. The vehicle classification is based on the Classified Vector Quantization (CVQ) proposed earlier by Zhang et al. 2009. The justification of choosing CVQ is its advantages in providing classification confidence by incorporating rejection option. The significance of rejection in enhancing the system’s reliability is emphasized and evaluated. A database composed of more than 2800 images of four types of vehicles (cars, vans, light trucks and buses) was created using police surveillance cameras. The proposed scheme offers a performance accuracy of over 95% with a rejection rate of ~8%, and reliability over 98% with a rejection rate of 20%. This exhibits promising potentials for implementations into real-world applications.

**ROAD SIDE UNIT DEPLOYMENT: A DENSITY-BASED APPROACH**

BARRACHINA, JAVIER; GARRIDO, PIEDAD; FOGUE, MANUEL; MARTINEZ, FRANCISCO J.; CANO, JUAN-CARLOS; CALAFATE, CARLOS T.; MANZONI, PIETRO

Currently, the number of vehicles increases every year, raising the probability of having accidents. When an accident occurs, wireless technologies enable vehicles to share warning messages with other vehicles by using vehicle to vehicle (V2V) communications, and with the emergency services by using vehicle to infrastructure (V2I) communications. Regarding vehicle to infrastructure communications, Road Side Units (RSUs) act similarly to wireless LAN access points, and can provide communications with the infrastructure. Since RSUs are usually very expensive to install, authorities limit their number, especially in suburbs and areas of sparse population, making RSUs a precious resource in vehicular environments. In this paper, we propose a Density-based Road Side Unit deployment policy (D-RSU), specially designed to obtain an efficient system with the lowest possible cost to alert emergency services in case
of an accident. Our approach is based on deploying RSUs using an inverse proportion to the expected density of vehicles. The obtained results show how D-RSU is able to reduce the required number of RSUs, as well as the accident notification time.

### RELIABLE POSITIONING DOMAIN COMPUTATION FOR URBAN NAVIGATION

**DREVELLE, VINCENT; BONNIFAIT, PHILIPPE**

Reliable positioning is a key issue for intelligent vehicle navigation. Interval-based positioning methods have shown to be capable of computing relevant confidence domains used for integrity monitoring in environments which are challenging for Global Positioning System (GPS). The approach presented in this paper consists in tightly coupling a GPS receiver with a 3D-map of the drivable area. Interval analysis is employed to solve the constraint positioning problem using contractions and bisections. Integrity is provided through the use of a robust set-inversion scheme applied to a redundant measurement set. If the prior distribution of the measurement noise is known, it is possible to compute confidence domains that correspond to a given integrity risk, which is often set very low out of safety considerations. In this paper we examine a way of validating the proposed approach, using a real experimental dataset and a ground truth equipment. Different tunings of the method, corresponding to different risks, are assessed in terms of availability and integrity in order to compute statistical metrics. Results indicate that this methodology is relevant since the specified risk corresponds to experimental observations.

### A NOVEL EVALUATION METHODOLOGY FOR COMBINED PERFORMANCE OF WARNING AND BRAKING IN CRASH IMMINENT BRAKING SYSTEMS

**CHIEN, STANLEY; LI, LINGXI; CHEN, YAOBIN**

Crash imminent braking (CIB) systems have been equipped in high-end passenger vehicles by many auto manufactures. Due to the complex nature of the CIB technology, the features and performance of various CIB systems differ significantly. As to date, there are no standards to evaluate and compare the comprehensive performance of different CIB systems. This paper describes a systematic methodology for the evaluation of CIB systems which include both warning and braking features. The percentage kinetic energy reduction is a measure used in the performance evaluation. Some examples are provided to illustrate our approach. The information collected from some ongoing vehicle active safety testing projects will be used to validate the proposed methodology.
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