Scanning the Issue and Beyond: The T-ITS Awards and Future Transportation

I have several happy announcements in this letter! First off, this issue marks the successful first year of our Transactions in the new format and schedule, and second, I am very glad to let everyone know we plan on expanding the Transactions further from a bi-monthly to a monthly publication in 2016, as suggested in the ExCom and BoG meetings of the IEEE Intelligent Transportation Systems Society (ITSS) during the October 2014 International IEEE Intelligent Transportation Systems Conference (ITSC) in Qingdao, China. As the Co-General Chair of the 17th IEEE ITSC, I am very proud to inform everyone that this is a record-breaking event in conference history, an exciting reflection of how fast ITS research is growing and developing. Last but not least, it is also my great pleasure to announce the winners of our annual Best Editor Service Awards and Best Paper Awards at the end of this editorial. Please check @IEEE-TITS (http://www.weibo.com/u/3967923931) in Weibo (an extended Chinese version of Twitter), IEEE ITS Facebook (https://www.facebook.com/IEEEITS), and our Twitter account @IEEEITS (https://twitter.com/IEEEITS) for upcoming news in IEEE ITSS, IEEE Transactions on Intelligent Transportation Systems, and IEEE Intelligent Transportation Systems Magazine. The three sites are still under development, and your participation and any suggestions for their operation are extremely welcome.

Scanning the Issue

Hand Gesture Recognition in Real-Time for Automotive Interfaces: A Multimodal Vision-based Approach and Evaluations

Eshed Ohn-Bar and Mohan Manubhai Trivedi

A real-time vision-based system that employs a combined RGB and depth descriptor in order to classify hand gestures is proposed. The system consists of two interconnected modules: one that detects a hand in the region of interaction and performs user classification, and the second that performs gesture recognition. The initial hand presence detection and user classification uses a modified histogram of oriented gradients descriptor as an input to a support vector machine. In the first step of the system, there are three possible classification classes: driver, passenger, or no one. Second, a state-of-the-art gesture recognition system is employed by efficiently extracting gesture characteristics from temporal dynamics of the feature set computed in the initial step. Its feasibility is demonstrated using an extensive hand gesture dataset.

Optimal Scheduling for Highway Emergency Repairs Under Large-Scale Supply–Demand Perturbations

S. Yan, J. C. Chu, and Y.-L. Shih

A model for emergency repair problems under large-scale supply–demand perturbations is developed. First, a novel time–space network flow technique is adopted to generate detailed schedules for repair teams and allow dynamic updates of the network due to perturbations. Second, the original schedules prior to the perturbations are considered by controlling its total difference with the adjusted schedule. Third, the model is formulated with different levels of detail. An ant colony system-based hybrid global search algorithm is developed to efficiently solve large-scale problems. To test how well the model and the heuristics may perform in actual operations, a case study is conducted using actual data from the 1999 Chi-Chi earthquake in Taiwan. The results show that the proposed model and solution algorithm perform very well.

Rapid Multiclass Traffic Sign Detection in High-Resolution Images

C. Liu, F. Chang, and Z. Chen

A traffic sign detection framework that is capable of rapidly detecting multiclass traffic signs while achieving a high detection rate is presented. There are three key contributions: 1) the introduction of two features called multiblock normalization local binary pattern (MN-LBP) and tilted MN-LBP (TMN-LBP); 2) the tree structure called split-flow cascade; and 3) the Common-Finder AdaBoost algorithm. Through experiments with an evaluation dataset of high-resolution images, the proposed framework is shown to be able to detect multiclass traffic signs with high detection accuracy in real time and outperforms the state-of-art approaches at detecting a large number of different types of traffic signs rapidly without using any color information.

Sampled-Data Cooperative Adaptive Cruise Control of Vehicles With Sensor Failures

G. Guo and W. Yue

The sampled-data cooperative adaptive cruise control (CACC) of vehicles with sensor failures is investigated. A novel switched sampled-data CACC system model is established, and a design method of state feedback controllers that can robustly stabilize the CACC system is presented. The obtained controller is complemented by additional conditions that have been established to guarantee string stability and zero steady-state velocity error. The effectiveness and advantage of the presented methodology are demonstrated by both numerical simulations and experiments with laboratory-scale Arduino cars.

Temporal Data Dissemination in Vehicular Cyber-Physical Systems

K. Liu, V. C. S. Lee, J. K.-Y. Ng, J. Chen, and S. H. Son

Digital Object Identifier 10.1109/TITS.2014.2368381

This paper focuses on the roadside-to-vehicle communication environment in which the roadside unit provides real-time data services to passing vehicles. Data items maintained in the database are periodically updated to keep the information up to date. According to analysis of the temporality of data items and the time constraint of request services, the temporal data dissemination problem is formulated and is proved to be NP-hard. A heuristic scheduling algorithm considering the request characteristics of productivity, status, and urgency in scheduling is proposed. An extensive performance evaluation demonstrates that the proposed algorithm is able to effectively exploit the broadcast effect, improve the bandwidth efficiency, and increase the service chance of requests, and hence, it significantly enhances the system performance.

A Bulk Queue Model for the Evaluation of Impact of Headway Variations and Passenger Waiting Behavior on Public Transit Performance

M. Kamrul Islam, U. Vandebona, V. V. Dixit, and A. Sharma

A model developed using the Markov chain technique is presented to ascertain the performance of public transit systems and examine the effects of stochastic variations in passenger arrival, waiting, boarding, and alighting behaviors on the regularity of headway along the route. The model addresses situations in which passengers abandon the system after consuming a certain amount of waiting time. This accounts for the existence of a finite allowance of waiting time from the viewpoint of the passengers. Numerical examples included offer insights into factors that affect the reliability of public transit systems and present analysis of the system performance measures such as mean counts of passengers served by transit systems, balked passengers, and unused space on vehicles. This investigation provides a better understanding of the determinants of reliability of public transit systems.

An Offline Framework for Handling Automatic Passenger Counting Raw Data

B. Barabino, M. Di Francesco, and S. Mozzoni

Knowledge of ridership data on bus routes is pivotal for quality and efficient operational planning of public transport companies. Automatic passenger counting (APC) can represent a powerful resource for supporting this activity. However, relevant challenges, such as the matching of data to the bus stop, data validation, tackling anomalies, and building intelligible performance reports, must be faced in order to make APC data a mainstream source of information. This paper proposes an offline framework to address these challenges. In order to illustrate a possible application of the framework, its use for setting bus frequencies is investigated. The results are represented by easy-to-read control dashboards composed of tables and graphs. The methodology is experimentally tested with data records provided by the bus operator CTM in Cagliari, Italy.

Accurate and Interpretable Bayesian MARS for Traffic Flow Prediction

Y. Xu, Q.-J. Kong, R. Klette, and Y. Liu

This paper presents an interpretable and adaptable spatiotemporal Bayesian multivariate adaptive regression splines (ST-BMARS) model to predict short-term freeway traffic flow. The parameters in the model are estimated with Bayesian inference, and the optimal models are obtained using a Markov chain Monte Carlo simulation. In order to investigate the spatial relationship of the freeway traffic flow, all of the road segments on the freeway are taken into account for the traffic prediction of the target road segment. Actual traffic data collected from a series of observation stations along freeway I-205 in Portland, WA, USA, are used to evaluate the performance of the model. Experimental results indicate that the proposed model is robust and can generate superior prediction accuracy in contrast with the temporal MARS model, the parametric autoregressive integrated moving average (ARIMA) model, the state-of-the-art seasonal ARIMA model, and the kernel method support vector regression.

Multi-ROI Association and Tracking With Belief Functions: Application to Traffic Sign Recognition

M. Boumediene, J.-P. Lauffenburger, J. Daniel, C. Cudel, and A. Ouamri

This paper presents an object-tracking algorithm using belief functions applied to vision-based traffic sign recognition systems. This algorithm tracks detected sign candidates over time in order to reduce false positives due to data fusion formalization. In the first stage, regions of interest (ROIs) are detected and combined using the transferable belief model semantics. In the second stage, the local pignistic probability algorithm generates the associations maximizing the belief of each pairing between detected ROIs and ROIs tracked by multiple Kalman filters. Finally, the tracks are analyzed to detect false positives. Due to a feedback loop between the multi-ROI tracker and the ROI detector, the solution proposed reduces false positives by up to 45% whereas computation time remains very low.

A Novel Algorithm for Crash Detection Under General Road Scenes Using Crash Probabilities and an Interactive Multiple Model Particle Filter

T. Kim and H.-Y. Jeong

This paper proposed an algorithm for detecting an imminent collision in general road scenes. The proposed algorithm consists of crash probability data generated from Monte Carlo simulations that consider driver behavior and vehicle dynamics, a tracking algorithm that uses an interactive multiple-model particle filter, and a threat assessment algorithm that estimates crash probabilities. To reduce nuisance and false-positive alarms, the algorithm discriminated between normal and dangerous road scenes, and a point-of-no-return was detected using three driver models that addressed different levels of driver input. The performance of the proposed algorithm was evaluated under three scenarios, and it successfully discriminated between collision and near-miss cases and adjusted warning times depending on the road scenes. It is expected that the proposed algorithm would have good driver acceptability based on the results of the near-miss cases.

Cloud-Based Velocity Profile Optimization for Everyday Driving: A Dynamic-Programming-Based Solution

E. Ozatay, S. Onori, J. Wollaeger, U. Ozguner, G. Rizzoni, D. Filev, J. Michelini, and S. Di Cairano

This paper addresses the optimization of the speed trajectory to minimize fuel consumption and communicate it to the driver to adjust the speed profile for less fuel consumption. The driver sends the information of the intended travel destination to a

computing cloud where the server generates a route, collects the associated traffic and geographical information, and solves the optimization problem by a spatial domain dynamic programming algorithm. Then, the server sends the speed trajectory to the driver. The approach is tested on a prototype vehicle equipped with a visual interface mounted on the dash of a test vehicle. The test results show a 5%–15% improvement in fuel economy, depending on the driver and route without significant effect on the travel time.

Increasing the Regenerative Braking Energy for Railway Vehicles

S.Lu, P. Weston, S. Hillmansen, H. B. Gooi, and C. Roberts

This paper proposes a method to apply the Bellman–Ford (BF) algorithm to search for the train braking speed trajectory to increase the total regenerative braking energy (RBE) in a blended braking mode. A typical suburban train has been modeled and studied under scenarios involving changing gradients, journey time, and speed limits. It is found that the searched braking speed trajectory is able to achieve a significant increase in the RBE in comparison with the constant-braking-rate method. An RBE increment rate of 17.23% has been achieved. Verification of the proposed method using BF has been performed in a simplified scenario. Linear programming is applied to search for a train trajectory with the maximum RBE and achieves solutions that can be used to verify the proposed method using BF.

An Optimal Velocity Planning Scheme for Vehicle Energy Efficiency Through Probabilistic Prediction of Traffic-Signal Timing

G. Mahler and A. Vahidi

This paper proposes a predictive optimal velocity planning algorithm that uses probabilistic traffic signal phase and timing information to increase a vehicle's energy efficiency. A signal phase prediction model is introduced to use historically averaged timing data and real-time phase data to determine the probability of green for upcoming traffic lights. The best velocity trajectory that maximizes the chance of going through green lights is calculated. Case study results from a multisignal simulation indicate that energy efficiency can be increased with probabilistic timing data and real-time phase data. Monte Carlo simulations are used to confirm that the case study results are valid.

Efficient Closed-Loop Multiple-View Registration

X. Shao, Y. Shi, H. Zhao, X. Li, and R. Shibasaki

This paper presents a novel algorithm for multiple-view registration by investigating the mechanism of adjusting the poses of views to provide a highly efficient and accurate solution. It proves that translation vectors can be decoupled if the same point set is used in each view to associate the previous and next views, leading to the solution for such cases. Otherwise, an exact solution of translation vectors is provided when rotation parameters are given, resulting in the iterative solution for general cases. Most importantly, each iteration has linear computational complexity with respect to the number of views, which is much superior to that of other methods. A series of experiments were conducted, and results show that the proposed method is not only stable and highly efficient but also with competitive accuracy.

Dynamic Classification of Traffic Flow Patterns Simulated by a Switching Multimode Discrete Cell Transmission Model

H. B. Celikoglu

A dynamic approach to specify flow pattern variations simulated by a multimode macroscopic flow model is followed, incorporating the neural network theory to reconstruct real-time traffic dynamics. Filtered data are dynamically and simultaneously input to neural density estimation and traffic flow modeling processes. Traffic flow is simulated by modifying the cell transmission model to explicitly account for flow condition transitions. Cell-specific flow dynamics are used to determine the mode of prevailing traffic conditions, which are in turn sought to be reconstructed by neural methods. The classification of flow patterns over the fundamental diagram is obtained by considering traffic density as a pattern indicator. The modified classification returned promising results in capturing sudden changes on test stretch flow patterns that are simulated by the switching multimode discrete macroscopic model.

Automated Test Approach Based on All Paths Covered Optimal Algorithm and Sequence Priority Selected Algorithm

W. Zheng, C. Liang, R. Wang, and W. Kong

A timely and complete test is important to assure the functionality and safety of the railway signal system before it is put into service. With the development of rail transportation in China, traditional semiautomatic test methods cannot satisfy the timely and complete test requirements. This paper proposes an automated model-based test method that uses colored Petri nets to describe the system specification and all paths covered optimal algorithm and the sequence priority selected algorithm to generate the test cases and sequences automatically. Taking the typical radio blocking center (RBC) handover scenario as an example, the generated test cases and sequences are applied into the RBC functionality test platform. The testing result validated the feasibility and efficiency of the proposed method. Compared with the random-walk-based test sequence generation, the repeatability rate of the generated sequences is reduced by 46%.

Intelligent Train Operation Algorithms for Subway by Expert System and Reinforcement Learning

J. Yin, D. Chen, L. Li

This paper presents two intelligent train operation (ITO) algorithms without using the precise train model information and the offline optimized speed profile. The first algorithm, ITOE, is based on an expert system with a heuristic inference. Then, to minimize energy consumption of train operation online, the ITOR algorithm, based on reinforcement learning (RL), is developed via RL policy, reward, and value functions. From the actual operation data in the Yizhuang Line of the Beijing Subway, manual driving data with the best performance are chosen as ITOM. Numerical examples are used to test the ITO algorithms on the ITO simulation platform established with actual data. The results indicate that, compared with ITOM, both ITOE and ITOR can improve punctuality and reduce energy consumption while ensuring comfort. Moreover, ITOR can offer about 10% less energy consumption than ITOE.

When to Control the Ramps on Freeway Corridors? A Novel Stability-and-MFD-Based Approach

H. Tu, H. Li, Y. Wang, and L. Sun

Coordinated ramp metering (CRM) is an efficient measure to mitigate traffic congestion on freeway corridors. One of the key issues of implementing CRM is to decide when to start the control on the ramps. Generally, the control timing for CRM is determined on the basis of the traffic state on a freeway corridor to prevent traffic jams on corridors. This paper proposes to determine the control timing by considering not only high throughputs but also stable flows on freeway corridors. A novel approach is developed by introducing an indicator of production stability (PS) to determine when to start the control of CRM. PS is established on a basis of a macroscopic fundamental diagram and the instability of traffic flows. Empirical data from urban freeway networks in Shanghai, China, are utilized to verify the feasibility of using the PS indicator.

Rollover-Preventive Force Synthesis at Active Suspensions in a Vehicle Performing a Severe Maneuver With Wheels Lifted Off

N. C. Parida, S. Raha, and A. Ramani

Among safety technologies for vehicles, active suspensions have received a lot of attention. The existing models for synthesizing and allocating forces in such suspensions are conservatively based on the constraints that are valid until no wheels lift off the ground. However, the fault tolerance of the rollover-preventive systems can be enhanced if the smart/active suspensions can intervene in the more severe situation. The difficulty in computing control in the last situation is that the vehicle dynamics then passes into the regime that yields a model involving disjunctive constraints. The simulation of dynamics with disjunctive constraints in this context becomes necessary. This paper provides an algorithm for this problem by solving it as a disjunctive dynamic optimization problem. The vehicle model used is similar to those used in the automobile industry, and the synthesis is validated against arbitrary severe steering inputs that are consistent with the industrial practice.

Measuring Networkwide Traffic Delay in Schedule Optimization for Work Zone Planning in Urban Networks

H. Zheng, E. Nava, Y.-C. Chiu

This paper develops a mathematical decision model and a solution algorithm to prioritize and schedule work zones in the planning process. The model is designed to measure the mutually interacting traffic impact and delay as a result of work zone disruptions in the network. Several construction strategies that interested stakeholders are discussed, including daytime and nighttime construction modes, sequencing precedence, and seasonal variation effect of demand. The method evaluates networkwide traffic delay through a k-shortest path algorithm to analyze drivers' behavior of alternative route selection. A numerical example is analyzed on a real-world network to demonstrate the solution quality.

Transit Timetables Resulting in Even Maximum Load on Individual Vehicles

A. (Avi) Ceder and L. Philibert

With advances in passenger information systems, the importance of even and clock headways in transit timetables is reduced. This allows the creation of timetables with even average maximum passenger loads on individual vehicles. The maximum load attained is a load standard desired at the maximum-load stop. This paper provides a procedure for the creation of transit timetables to improve the correspondence of vehicle departure times with passenger demand. The algorithm developed yields departure times for vehicles to achieve an even maximum load on each vehicle and a smoothing consideration in the transition between time periods. A case study was carried out using data of one bus route in Auckland, New Zealand, with modeling and simulation analyses. The results of an even maximum load on individual vehicles exhibit significant improvement over timetables with even headways or with headways based on hourly even maximum loads.

An Integrated Vehicle Navigation System Utilizing Lane-Detection and Lateral Position Estimation Systems in Difficult Environments for GPS

C. Rose, J. Britt, J. Allen, and D. Bevly

A navigation filter combines measurements from sensors currently available on vehicles—Global Positioning System (GPS), an inertial measurement unit (IMU), camera, and light detection and ranging (lidar)—to achieving lane-level positioning in environments in which stand-alone GPS can suffer or fail. Measurements from the camera and lidar are used in two lane-detection systems, and the calculated lateral distance estimates of both lane-detection systems are compared with the centimeter-level truth to show decimeter-level accuracy. Experimental results show that the inclusion of lateral distance measurements and a height constraint from the map create a fully observable system even with only two satellite observations and, as such, greatly enhances the robustness of the integrated system over GPS/INS alone.

Reliable Vehicle Pose Estimation Using Vision and a Single-Track Model

J. Nilsson, J. Fredriksson, and A. C. E. Ödblom

This paper examines the problem of estimating vehicle position and pose from a single vehicle-mounted camera by combining standard in-vehicle sensor data and vehicle motion models with the accuracy of local visual bundle adjustment. This means that pose estimates are optimized not only with regard to observed image features but also with respect to a single-track vehicle model and standard in-vehicle sensors. The proposed method has been tested experimentally and exhibited good accuracy in estimating planar vehicle motion. Results show that this property is preserved when combining these information sources with vision. Furthermore, the accuracy obtained from only vision in direction estimation is improved, primarily in situations in which the matched visual features are few.

ChainCluster: Engineering a Cooperative Content Distribution Framework for Highway Vehicular Communications

H. Zhou, B. Liu, T. H. Luan, F. Hou, L. Gui, Y. Li, Q. Yu, X. (Sherman) Shen

Recent advances in wireless communication techniques have made it possible for fast-moving vehicles to download data from the roadside communications infrastructure, namely, drive-thru Internet (DTI). However, the data download volume

of individual vehicle per drive-thru is quite limited, as observed in real-world tests. On addressing this issue, this paper proposes a cooperative DTI scheme, ChainCluster, to select appropriate vehicles to form a linear cluster on the highway. With cluster members consecutively driving through the roadside infrastructure, the download of a single vehicle is virtually extended to that of a tandem of vehicles. Using simulations, the authors verify the performance of ChainCluster and show that ChainCluster can outperform that of the typical studied clustering schemes and provide general guidance for cooperative content distribution in highways' vehicular communications.

Efficient Bilevel Approach for Urban Rail Transit Operation With Stop-Skipping

Y. Wang, B. De Schutter, T. J. J. van den Boom, B. Ning, and T. Tang

The train scheduling problem for urban rail transit systems is considered with the aim of minimizing the total travel time of passengers and the energy consumption. We adopt a model-based approach in which the model includes the operation of trains at the terminus and at the stations. In order to adapt the train schedule to the origin–destination-dependent passenger demand in the urban rail transit system, a stop-skipping strategy is adopted and solved by an efficient bilevel optimization approach. Its performance is compared with the existing bilevel approach. In addition, we also compare it with the all-stop strategy. The simulation results show that the proposed and the existing bilevel approaches have a similar performance, but the computation time of the new approach is around one magnitude smaller than that of the old approach.

Limits of Predictability for Large-Scale Urban Vehicular Mobility

Y. Li, D. Jin, P. Hui, Z. Wang, and S. Chen

This paper considers the fundamental problem of the predictability limits of vehicular mobility. By using two large-scale urban city vehicular traces, described is an intuitive but effective model of areas transition to describe the vehicular mobility among the areas divided by the city intersections. Based on this model, the predictability limits of large-scale urban vehicular networks are examined and the maximal predictability based on the methodology of entropy theory is derived. Our study finds that about 78%–99% of the location and 70% of the staying time, respectively, are predicable. Our findings thus reveal that there is a strong regularity in the daily vehicular mobility, which can be exploited in practical prediction algorithm design.

A Memory-Efficient Architecture of Full HD Around View Monitor Systems

B. Jeon, G. Park, J. Lee, S. Yoo, and H. Jeong

The design of around view monitor (AVM) systems with full high-definition (HD)-level resolution presents significant technical challenges. In particular, a high memory performance is required to process the full-HD images obtained from multiple cameras. Specifically, a full-HD AVM requires a high memory bandwidth and is characterized by a significant amount of single writes. To address these problems, two methods are proposed. The first method reduces the required memory bandwidth by storing in the memory only the input pixel data that will be used in the final processing step, and the second improves the single-write performance of a DRAM subsystem by DRAM-aware data mapping. The effectiveness of the proposed methods is proved by designing an AVM system incorporating field-programmable gate arrays and DDR2-200 SDRAMs, reducing the memory bandwidth requirement by 53%, allowing a full HD AVM system to run at over 24 frames/s.

Semiautonomous Vehicular Control Using Driver Modeling

V. A. Shia, Y. Gao, R. Vasudevan, K. D. Campbell, T. Lin, F. Borrelli, and R. Bajcsy

Threat assessment during semiautonomous driving is used to determine when correcting a driver's input is required. Since current semiautonomous systems perform threat assessment by predicting a vehicle's future state while treating the driver's input as a disturbance, autonomous controller intervention is limited to a restricted regime. Improving vehicle safety demands threat assessment that occurs over longer prediction horizons wherein a driver cannot be treated as a malicious agent. A real-time semiautonomous system is proposed to utilize empirical observations of a driver's pose to inform an autonomous controller. We measure the performance of our system using several metrics that evaluate the informativeness of the prediction and the utility of the intervention procedure. A multisubject driving experiment illustrates the usefulness of incorporating the driver's pose while designing a semiautonomous system.

Improving Handover and Drop-off Performance on High-Speed Trains With Multi-RAT

Y.-B. Lin, S.-N. Yang, and C.-T. Wu

Provisioning commercial mobile telecommunications service on high-speed trains (HSTs) faces several challenges. This paper proposes the multiple radio access technology (multi-RAT) to resolve the HST handover issue, which allows the HST to simultaneously connect to two or more heterogeneous mobile networks. With this approach, the handover process can be improved by keeping multiple heterogeneous network links of the HST at the same time and maintaining the connection through one link during the handover process of the other link. We show that multi-RAT can effectively enhance HST communications by reducing the impact of handover failure. This approach can work together with other solutions such as the dual-link scheme to further enhance the performance of the HST communications.

New Efficient Regression Method for Local AADT Estimation via SCAD Variable Selection

B. Yang, S.-G. Wang, and Y. Bao

This paper focuses on the estimation and variable selection for the local annual average daily traffic (AADT). A variable selection procedure by smoothly clipped absolute deviation (SCAD) penalty is proposed. It can select significant variables and estimate unknown regression coefficients simultaneously at one step. The estimation algorithm and the tuning parameters selection are presented. The data from Mecklenburg County, NC, USA, in 2007 are used to demonstrate our proposed variable selection procedures. The results show that this penalized regression technology improves the local AADT estimation along with satellite information, and it outperforms some other benchmark models.

Theme Classification and Analysis of Core Articles Published in the IEEE TRANSACTIONS ON INTELLIGENT TRANSPORTATION SYSTEMS from 2010 to 2013

S. Tang, Z. Li, D. Chen, Z. Chen, W. Liu, X. Liu, L. Li, and X. Shi

In this paper, the authors attempt to find the developmental tendencies and study hotspots of ITS technologies by theme classification and analysis of core articles from all papers published in the IEEE TRANSACTIONS ON INTELLIGENT TRANSPORTATION SYSTEMS during the period from 2010 to 2013. First, the authors classify theme categories by co-word analysis with different research domains and obtain 12 themes that include vehicle control technology, modeling and simulation, image processing, etc. Second, they find research focuses and directions of these themes by analyzing the trends of the article numbers published in each year of the top 5 themes. Finally, we identify top 5 core articles of these 12 themes and obtain their specific study hotspots by sorting the citations without self-citations of the articles in the Web of Science.

Collaboration Patterns and Productivity Analysis at the IEEE T-ITS from 2010 to 2013

T. Wang, X. Wang, S. Tang, Y. Lin, W. Liu, Z. Liu, B. Xiu, D. Shen, X. Zhao, and Y. Gao

This paper investigates the productivity and collaboration patterns in the publications of the IEEE TRANSACTIONS ON INTELLIGENT TRANSPORTATION SYSTEMS over the past recent five years. We found that one of the most noticeable trends is that company played more and more important role in cooperation, which can be more competitive to meet the needs of social development by the transfer of scientific and technical achievements. In addition, there is one other pattern worth noting, which is that of growing international collaboration. More and more collaborations usually happened within the different research institutions and countries, especially between the United States, China, and Europe.

The T-ITS Awards and Future Transportation

First, presenting the Best Editor Service Awards (formally called Best Associate Editor Award).

As usual, three editors have been selected, but the final decision was an extremely tough one. Since 2009, when I became the Editor-in-Chief, the number of manuscripts submitted annually to our Transactions has increased from 322 to 675, our page count has increased from 720 to 2772 pages, and the number of papers published per year increased from 68 to 234. However, our average evaluation timelines has greatly decreased! From submission to the first decision and the final decision, our times have been reduced from 156 days to 71 days and from 273 days to 103 days, respectively. The average number of manuscripts processed annually by each editor is now 14, a record high that must be significantly reduced as soon as possible. This is a tremendous demand on time and effort from our editors! I really appreciate their service and dedication, and this is why it has been such a difficult decision to make for this year's Best Editor Service Awards. Congratulations to the following three distinguished editors:

Qingjie Kong, Chinese Academy of Sciences and Qingdao Academy of Intelligent Industries (QAII);

Rosaldo Rossetti, University of Porto;

Mauro Da Lio, University of Trento.

Again, many thanks for their outstanding efforts and great contributions to our Transactions.

Here, I would like to call for more volunteers for associate editors and reviewers. Anyone with two papers published in our Transactions is qualified to be an associate editor. Please send your CV along with your two T-ITS published papers to me at feiyue.trans@gmail.com.

Second, the Best Paper Awards of the IEEE TRANSACTIONS ON INTELLIGENT TRANSPORTATION SYSTEMS. The Award Selection Committee has selected the following two papers for the Best Regular Paper Award and the Best Survey Paper Award among those published by our Transactions during 2012 and 2013.

Best Regular Paper Award

A. Hofleitner, R. Herring, P. Abbeel, and A. Bayen "Learning the Dynamics of Arterial Traffic From Probe Data Using a Dynamic Bayesian Network," *IEEE Trans. Intell. Transport. Syst.*, vol. 13, no. 4, pp. 1679–1693, 2012.

Best Survey Paper Award

Li Li, Ding Wen, Nan-Ning Zheng, Lin-Cheng Shen "Cognitive Cars: A New Frontier for ADAS Research," *IEEE Trans. Intell. Transport. Syst.*, vol. 13, no. 1, pp. 395–407, 2012.

Congratulations to the Authors of both papers!

Finally, I would like to say a few words on the future of the Transportation. The ultimate goal of our T-ITS publication is to promote and advance the development and deployment of effective and efficient transportation technology. This year marks the 100th birthday of the traffic light application. According to History.com (http://www.history.com), on August 5, 1914, the first electric traffic light was installed on a city street in Cleveland, Oh, USA, marking a major milestone in the history of traffic management. Ten years later, in 1924, Siemens installed the famous five-sided traffic light tower in Berlin's Potsdamer Platz, the busiest intersection in Europe at that time. For better or worse, the red–yellow–green signals are now an integral part of urban landscapes worldwide. What will be the future of traffic management in another 100 years? With or without traffic lights? I hope not!

I do like the idea of Siemen's historical "Traffic Light Tower," not as a singular traffic regulator for one intersection, but re-imagined for the future as a fully connected transportation computing and decision-making building or buildings supported with the future generation of the Internet of Everything and cloud computing for real-time, closed-loop, and adaptive urban traffic management. Each city would have its own "*Transportation Tower*." In this future, we may no longer need traffic lights, with a fleet of smart vehicles, linked and autonomous, able to share pervasive, multimode transportation information available from physical, cyber, and social domains via roadside devices, mobile equipment, and human sensors. My vision of the *Transportation Tower* will be a typical CPSS, that is, a cyber-physical-social system, a full implementation of our vision of Transportation 5.0, as discussed in my previous editorial, published in October 2014. For this, I am so glad that our call for a Transportation 5.0 Initiative has

received an overwhelming response in a very short time. At the 2014 ITSC in Qingdao, we launched a joint international research center for intelligent transportation (hosted and supported by Qingdao Academy of Intelligent Industries) to facilitate the development of our vision and recommendations for a CPSS-based *Transportation 5.0 Strategic Initiative*. I will present more information on this exciting effort in my editorial next year.

I am looking forward to driving into the future of intelligent transportation. To all of our readers, a very Happy New Year!

FEI-YUE WANG, *Editor-in-Chief*
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