Guest Editorial
Special Issue on ITSC 2006

THIS Special Issue contains revised versions of selected papers originally presented at the 9th IEEE International Conference on Intelligent Transportation Systems (ITSC 2006) held in Toronto, Canada, on September 17–20, 2006. ITSC 2006 aimed to continue the tradition of the ITSC conference series of promoting interaction among researchers from all over the world and to contribute to the progress of scientific knowledge in the area of intelligent transportation systems (ITS). Presentations of the most recent advances and state of the art in research related to ITS took place, covering a broad range of topics, such as travel information systems, traffic management, ITS modeling and analysis, navigation and guidance, advanced vehicle safety systems, and intelligent vehicle technologies. ITSC 2006 had high technical quality, with a large submission of 426 papers from 30 countries. Each conference paper was peer reviewed, on average, by three reviewers, and additionally, for each paper, an International Program Committee (IPC) member produced a summary review report. Based on reviewer and IPC member evaluation reports and scores, 273 papers were finally selected by the conference Program Committee.

In organizing this Special Issue, we started by checking the review reports of all ITSC 2006 papers. Finally, 25 candidate papers were selected, with consideration for both paper quality and content coverage of the various ITS fields. The authors of these 25 papers were invited to submit a revised and extended version of their conference papers that would be adequate for journal publication. Finally, 24 papers were received and underwent the regular review process of the IEEE TRANSACTIONS ON INTELLIGENT TRANSPORTATION SYSTEMS. After a rigorous and timely review process, 11 papers were accepted for publication in this Special Issue. The guest editors thank the authors for submitting their excellent work to this Special Issue and the reviewers for their critically helpful review efforts.

The Special Issue includes the following papers, some of which were published in the December 2007 issue of the journal:

1) Variable Speed Limits: Safety and Operational Impacts of a Candidate Control Strategy for Freeway Applications by P. Allaby, B. Hellinga, and M. Bullock: This paper attempts to quantify the impact of variable-speed limit sign (VLSL) systems on the overall transportation system performance. These VLSLs dynamically change the posted speed limit, in response to prevailing traffic and/or weather conditions. This paper presents the results of an evaluation of a candidate VLSL system for an urban freeway in Toronto. The evaluation was conducted using a microscopic simulation model combined with a categorical crash potential model for estimating safety impacts.

2) Characterizing Driver Behavior on Signalized Intersection Approaches at the Onset of a Yellow-Phase Trigger by H. Rakha, I. El-Shawarby, and J. R. Setti: This study characterizes driver behavior (perception–reaction time and stopping/running decisions) at the onset of a yellow phase. The study demonstrates that the 1.0-s eighty-fifth-percentile perception–reaction time that is recommended in traffic signal design procedures is valid and consistent with field observations. Furthermore, the study demonstrates that brake perception–reaction times are impacted by the vehicle’s time-to-intersection (TTI) at the onset of a yellow indication introduction. The study also demonstrates that either a lognormal or beta distribution is sufficient for modeling the stochastic nature of brake perception–reaction time. In terms of stopping decisions, the study demonstrates that the probability of stopping varies from 100% at a TTI of 5.5 s to 9% at a TTI of 1.6 s. The study also demonstrates a decrease in the probability of stopping for male drivers when compared to female drivers. Furthermore, the study demonstrates that drivers 65 years of age and older are significantly less likely to clear the intersection at short yellow-indication trigger distances when compared to other age groups.

3) PATH at 20—History and Major Milestones by S. E. Shladover: The California Partners for Advanced Transit and Highways (PATH) Program was founded in 1986 as the first research program in North America that is focused on the subject now known as ITS. This paper reviews the history of the founding of PATH and of the national ITS program in the U.S., providing perspective on the changes that have occurred during the past 20 years.

4) Online Learning Solutions for Freeway Travel Time Prediction by H. van Lint: Travel time prediction is not a one-step-ahead prediction problem and cannot be solved by standard incremental learning algorithms or time series approaches. This paper presents two new online learning algorithms that adequately deal with the inherently delayed travel time prediction problem. One of these, i.e., the so-called online-censored extended Kalman filter (EKF) algorithm, performs slightly better than the second, i.e., an online-delayed EKF algorithm, on a large set of actual data from a heavily congested freeway route in the Netherlands. Both methods outperform a naive online method (instantaneous travel time) and outperform a historical average by far.

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5) **Nonlinear Kalman Filtering Algorithms for On-Line Calibration of Dynamic Traffic Assignment Models** by C. Antoniou, M. Ben-Akiva, and H. N. Koutsopoulos: This paper presents an online calibration approach that jointly estimates the demand and supply parameters of dynamic traffic assignment systems. The problem is formulated as a nonlinear state-space model. Three extensions to the Kalman filtering (KF) algorithm, which are appropriate for nonlinear problems, are examined, including the extended, the limiting, and the unscented Kalman filters. The results from a case study indicate that the limiting KF shows accuracy that is comparable to that of the best algorithm but with superior computational performance.

6) **Fuzzy Control Model Optimization for Behavior-Consistent Traffic Routing Under Information Provision** by A. Paz and S. Peeta: This paper presents an $H_\infty$ filtering approach to optimize a fuzzy control model used to determine behavior-consistent information-based control strategies to improve the performance of congested dynamic traffic networks. This approach is able to enhance the computational performance of the fuzzy control model with significantly less computational time than when the default controller is used. The experimental results indicate that the proposed $H_\infty$ approach contributes to the development of an efficient and robust information-based control approach.

7) **Off-Road Path and Obstacle Detection Using Decision Networks and Stereo Vision** by C. Caraffi, S. Cattani, and P. Grisleri: This paper presents a complex artificial vision system that is able to provide the two basic sensorial capabilities needed by autonomous vehicle navigation in unstructured off-road environments: 1) obstacle detection and 2) path detection. This artificial vision system was developed as part of the TerraMax vehicle, which was one of the five vehicles to complete the 2005 DARPA Grand Challenge course.

8) **On Color-, Infrared-, and Multimodal-Stereo Approaches to Pedestrian Detection** by S. J. Krotosky and M. M. Trivedi: A multimodal trifocal framework consisting of a stereo pair of color cameras coupled with a single infrared camera is proposed in this paper. Such a setup allows for accurate and robust registration of the color and infrared imageries using the trifocal tensor. The authors use this registration framework to design a pedestrian detector that integrates color, disparity, and infrared features and yields higher detection rates than when using separate features.

9) **Online Extrinsic Parameters Calibration for Stereovision Systems Used in Far-Range Detection Vehicle Applications** by S. Nedevschi, C. Vancea, T. Marita, and T. Graf: This paper proposes a high-accuracy online calibration method for the absolute extrinsic parameters of a stereovision system that is suited for far-distance vision-based vehicle applications. The process does not require any calibration objects with a known structure, nor calibration patterns, but only a suitable environment consisting of a flat and straight road with clearly painted lane markings. Such an environment may be found on highways or marked roads; therefore, it does not require the construction of special calibration fields.

10) **Robust Lane Detection and Tracking in Challenging Scenarios** by Z. W. Kim: This paper presents a real-time lane detection and tracking system that is able to deal with challenging situations, such as lane curvature, worn lane marking, lane changes, and merging, ending, and merging or splitting lanes. The overall system uses a cascade classification composed of lane-marking detection, which integrates gradient and intensity-bump detectors, and an artificial neural network classifier, as well as a probabilistic framework for lane boundary extraction and tracking. Left and right lane boundaries are separately detected to effectively handle merging and splitting lanes.

11) **Information-Theoretic Data Registration for UAV-Based Sensing** by S. Jwa, U. Ozguner, and Z. Tang: Robust data alignment for sensor data fusion, without the necessity of knowing the explicit pairwise correspondence between two feature sets, is addressed in this paper. To achieve this goal, the authors propose an approach that comprises the construction of a cost criterion based on the information theory and the solution of an optimization problem with a mixed search strategy that combines the Nelder-Mead simplex and random search methods.

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Dr. Nunes is an Associate Editor for the IEEE TRANSACTIONS ON INTELLIGENT TRANSPORTATION SYSTEMS and a Cochair of the Technical Committee (TC) on Autonomous Ground Vehicles and Intelligent Transportation Systems (ITS) of the IEEE Robotics and Automation Society (RAS). He was with several conferences and workshops: International Conference on Advanced Robotics, General Cochair (2003); IEEE ITS Conference, Program Chair (2006); Workshop on Planning, Perception, and Navigation for Intelligent Vehicles, Coorganizer (2007); Workshop on Safe Navigation in Open and Dynamic Environments, Coorganizer (2007); and IEEE International Conference on Vehicular Electronics and Safety, Program Chair (2007). He was the recipient of the IEEE ITS Society Outstanding Service Award in 2006 and the IEEE RAS Most Active TC Award in 2006 as Cochair of RAS TC on ITS. He was also the winner of the NiSIS Competition 2007 with the solution “Scheme of Primate’s Visual Cortex Cells for Pedestrian Recognition,” of which he was a coauthor.

Hesham Rakha (M’04) received the B.Sc. degree (with honors) in civil engineering from Cairo University, Giza, Egypt, in 1987 and the M.Sc. and Ph.D. degrees in civil and environmental engineering from Queen’s University, Kingston, ON, Canada, in 1990 and 1993, respectively. He is currently a Professor with the Charles E. Via, Jr. Department of Civil and Environmental Engineering, Virginia Polytechnic Institute and State University (Virginia Tech), Blacksburg, where he is also the Director of the Center for Sustainable Mobility, Virginia Tech Transportation Institute. He has authored/coauthored more than 120 refereed publications, 57 of which are fully refereed journal publications. His research interests include traffic flow theory, traffic modeling and simulation, dynamic traffic assignment, traffic control, energy and environmental modeling, and safety modeling.

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