GUEST EDITORIAL

Cristina Olaverri-Monreal,
Javier Sanchez-Medina, and
Fernando García-Fernández



IEEE Intelligent Transportation Systems Magazine

Special Issue on "2017 IEEE International Conference on Vehicular Electronics and Safety (ICVES'17)"

During the last few years, significant attention has been paid to developing and implementing key technologies of future Intelligent Transportation Systems (ITS) by integrating vehicular electronics that enhance road safety and prevent traffic accidents. The fields of sensing, communication and control technologies increasingly play a crucial role for vehicle safety and security, while research in transport continues among industry engineers, practitioners, students and government agencies.

In past editions, the IEEE International Conference on Vehicular Electronics and Safety (IEEE ICVES) has been an excellent platform for scientific knowledge exchange, experience-sharing and professional networking. Topics of interest included novel approaches in the context of active safety development such as driver assistance system platform development, risk assessment algorithms, control algorithms for autonomous driving/driver assistance systems, driver behavior analysis, effectiveness estimation of active safety devices, as well as test methods for assessment of new approaches.

The IEEE ICVES 2017 took place in Vienna, an important cultural center in Europe. A main area of competence in Vienna is the development of innovative cross-cutting technologies in transport and logistics, with approximately one third of the Austrian revenue in the automotive sector being produced in the Vienna Region. The conference was hosted at the main campus of the University of Applied Sciences Technikum Wien, which is the biggest technical university of applied sciences in Austria.

The IEEE ICVES 2017 facilitated a proper environment to disseminate knowledge and motivate active discussion and interaction among the technical and scientific communities, and leveraged state-of-the art concepts and methodologies for this process. Drawing from those presented in the conference, the following seven outstanding articles describe novel approaches in vehicular electronics and safety, included for publication in this special issue.

"An Instance-Specific Parameter Tuning Approach using Fuzzy Logic for a Post-Processing Topological Map-Matching Algorithm", co-authored by several researchers from the universities of Andres Bello (Chile) and the University of Portsmouth (UK), elaborates on a novel framework for a systematic calibration of the parameters of a post-processing Map Matching Algorithm (MMA). The calibration approach consists of an Instance-specific Parameter Tuning Strategy (IPTS) that employs Fuzzy Logic principles. The proposed fuzzy IPTS tool determines algorithm-specific parameter values based on instance-specific information a priori to the execution of the MMA. The proposed IPTS tool can adjust to two decision maker preferences on algorithm performance, namely solution quality and computational time.

"Prospective and Monetary Effectiveness Assessment Method for Advanced Driver Assistance Systems—Usage of Naturalistic Driving Studies and Experimental System Tests", coauthored by researchers from the Technical University of Munich and AUDI AG in Germany, presents a comprehensive overview of a prospective and monetary effectiveness assessment method for advanced driver assistance systems. To this end, naturalistic driving studies and experimental system tests for parking and maneuvering are performed based on low-speed autonomous emergency braking systems installed in two different luxury vehicles. Research shows that these kinds of collisions are responsible for up to 40% of all insurance claims and for up to 30% of all claim costs worldwide. Furthermore, aspects of test evaluation, measuring instrumentation and test result evaluation are proposed and discussed. Finally, the

Digital Object Identifier 10.1109/MITS.2018.2867659
Date of publication: 22 October 2018

monetary effectiveness on motorist's personal damage collision insurance for both systems is presented.

A methodology for vision-based object tracking dealing with severe occlusions, where the tracker may fail due to the abrupt change of object appearance, has been proposed in the paper "Tracking Objects with Severe Occlusion by Adaptive Part Filter Modeling—In Traffic Scenes and Beyond" by researchers from the Karlsruhe Institute of Technology in Germany. The authors adopted part-based trackers, which are built in the form of correlation filter. The occluded object parts are identified by leveraging the knowledge derived from image features and filter responses. With the help of a masking process, visible object areas are acquired in a pixelwise precision and utilized to build part filters. As both the number and size of part filters are adapted to the current object appearance, the influence of occlusions can be significantly suppressed. Experimental results on traffic sequences demonstrated that the proposed tracker performs robustly against occlusion, especially in cases where long term and severe occlusions appear. A further experiment on the standard benchmark showed a good performance of the approach when tracking various object classes under varied circumstances.

Researchers from the Technical University of Darmstadt and the Honda Research Institute (HRI) Europe addressed risk evaluation in traffic scenarios with limited observability due to restricted sensorial coverage in "Intersection Warning System for Occlusion Risks using Relational Local Dynamic Maps". The research focused on intersection scenarios that are difficult to access visually. To identify the area of sight, the authors employ ray casting on a local dynamic map providing geometrical information and road infrastructure. Based on the area with reduced visibility, they first model scene entities that pose a potential risk without being visually perceivable yet. Then, a worst-case trajectory in the survival analysis for collision risk estimation is predicted. Resulting risk indicators were utilized to evaluate the driver's current behavior, to warn the driver in critical situations, to give suggestions on how to act safely or to plan safe trajectories. The approach was evaluated and validated by an intersection warning system in real world scenarios.

The research on a vision-based method built upon a deep convolutional neural network from the Intelligent Systems Laboratory (LSI) Research Group at the Department of Systems Engineering and Automation, University Carlos III Madrid in Spain presented in "Fast Joint Object Detection and Viewpoint Estimation for Traffic Scene Understanding" a system that can reason simultaneously about the location of objects in the image and their orientations on the ground plane. The same set of convolutional layers is used for the different tasks involved, avoiding the repetition of computations over the same image. Experiments on the KITTI dataset show that the presented efficiency-oriented method achieved state-of-the-art accuracies for object detection and viewpoint estimation and that it is particularly suitable for the recognition of traffic situations from on-board vision systems.

Researchers from the Coordination and Interaction Systems (React) group at L´ Ecole Polytechnique Fédérale de Lausanne in Switzerland presented a distributed maneuver planner for connected automated vehicles (CAVs) in the paper "Virtual Vehicle-Based Cooperative Maneuver Planning for Connected Automated Vehicles at Single-Lane Roundabouts". It built upon the idea of CAVs being able to explicitly share their intentions by creating virtual vehicles (VVs) on the targeted traffic stream. Specifically, their work focused on the decision-making process concerning the merging maneuver at single-lane roundabouts, for which a traffic model is exploited to assess the suitability of potential merging gaps. An optimization-based trajectory planner was then used to generate collision-free, smooth trajectories to successfully perform the planned maneuver. The algorithm was tested and compared with a gap-acceptance-based driving policy. The results showed the potential positive impact on traffic management of the proposed VV-based interaction mechanism along with the traffic-model-based cooperative maneuver planner.

Finally, the paper "Examining the impact on road safety of different penetration rates of vehicle-to-vehicle communication and adaptive cruise control", coauthored by researchers from the UAS Technikum Wien, Johannes Kepler University Linz and Continental Automotive Austria GmbH, Carlos III Madrid and IAV GmbH in Germany, addresses the effects on road safety of a variety of penetration rates of vehicles equipped with Advanced Driver Assistance Systems (ADAS) and Vehicle-to-Vehicle (V2V), either separately or combined, using the simulation platforms Scene Suite and Simulation of Urban Mobility (SUMO). A total of six simulation scenarios were developed, three for intersections and three for urban cases. The obtained results show that the ADAS Adaptive Cruise Control (ACC) requires combination with V2V communication in order to increase safety, especially in certain scenarios with side and rear-end collisions. However, V2V alone at the lowest penetration rate already provided a level of safety like the one reached by combining it with ADAS-ACC.

We conclude with a word of appreciation to all of the authors that have submitted their contributions to this special issue and for sharing their novel visions, outstanding research and significant results. The papers included in this issue have benefitted greatly from the laborious and time-consuming work of many anonymous reviewers that have contributed their expertise, suggestions and recommendations, and we therefore wish to thank them as well. We hope that the readers will enjoy the content of this

special issue as much as the participants of the conference did, and that the scientific community and practitioners alike will find this work stimulating and useful in promoting and developing the field.

About the Authors

Dr. Cristina Olaverri-Monreal graduated with a master's degree in Computational Linguistics, Computer Science and Phonetics from the Ludwig-Maximilians University (LMU) in Munich 2002 and received her PhD 2006 in cooperation with BMW.

After working several years in different European countries and in the US, both within the industry and academia she is holding since October 2018 the BMVIT endowed professorship and chair for sustainable transport logistics 4.0 at the Johannes Kepler University, Linz, Austria. Her research aims at studying solutions for an efficient and effective transportation focusing on minimizing the barrier between users and road systems, applying wireless communication and sensing technologies. Current research interests include automated driving, multi-functional systems for in-vehicle information; overall efficiency of user and system utilization; driver behavior; simulation tools and research concerning Intelligent Transportation Systems (ITS).

Dr. Olaverri was the general chair of the IEEE ICVES 2017 conference, is chair of the Technical Activities Committee on Human Factors in the ITS Society and Vice-president of Educational Activities. In addition, she serves as an associate editor and editorial board member of several journals in the field, including the IEEE ITS Transactions and the IEEE ITS Magazine. She has been recently recognized for her dedicated contribution to continuing education in the field of ITS with the 2017 IEEE Educational Activities Board Meritorious Achievement Award in Continuing Education.

Dr. Javier Sanchez-Medina earned his Engineering Master's Degree at the Telecommunications Faculty in 2002, and his PhD at the Computer Science Department on 2008. His PhD dissertation versed on the use of Genetic Algorithms, Parallel Computing and Cellular Automata based Traffic Microsimulation to optimize the Traffic Lights Programming within an Urban Traffic Network.

His research interests include mainly the application of Evolutionary Computation, Data mining and Parallel Computing to Intelligent Transportation Systems. He has a wide experience on the development of traffic models and simulation platforms. In the last years he has devoted himself to the application of his knowledge on Machine Learning to Data Mining with some publications on that. Dr. Sanchez-Medina has been volunteering for several years at many international conferences related to Intelligent Transportation, Computer Science, Evolutionary Computation, etc. He is reviewer for some Transportation related journals.

He is also very active as a volunteer at IEEE (senior member) and at the IEEE ITS Society. Since 2010, he has served for the IEEE ITS Society in a big number of activities. Some of them: Publications Chair at the IEEE FISTS2011, Registration Chair at the IEEE ITSC2012, Workshops and Tutorials Chair for IEEE ITSC 2013, Panels Chair at IEEE VTC2013-Fall, Program Co-Chair at IEEE ITSC2014, IEEE ITSC2016 and IEEE ITSC2018; publicity chair at IEEE IV2016, program chair at IEEE ICVES 2017 and General Chair at IEEE ITSC2015. He served as EiC of the ITS Podcast (2013–2016) and EiC of the ITS Newsletter (2014–2016). In 2016 he organized the IEEE Summer School on Smart Mobility. Since 2017 he is President of the IEEE ITSS's Spanish Chapter and VP for Technical Activities at the IEEE ITSS. He has widely published his research with more than 30 international conference articles and more than 15 international journal articles.

https://www.researchgate.net/profile/Javier_Sanchez-Medina

http://orcid.org/0000-0003-2530-3182

Dr. Fernando García-Fernández is Visiting Professor of Universidad Carlos III de Madrid where he focuses his researches in Intelligent Vehicles and Intelligent Transportation Systems involving the use of Computer Vision, Sensor Fusion, and Human Factors, as well as Vehicle Communication. He has been recipient of the Master in Robotics and Automatics Scholarship at Universidad Carlos III de Madrid in 2008, the Barreiros Foundation Award in the domain of Automotive and Vehicle Applications in Spain in 2014 and finalist to the best PhD Thesis Dissertation Award in the period 2013–2015 given by ITSS Spanish Chapter, and the award to the innovation in the automotive sector, diagnosis "Galeria de innovación Motortec 2015". He has organization experience in the ITSS conferences and is member of the BoG and Vicepresident of the Spanish Chapter of the IEEE-ITSS since January 2017. He has been involved in more than 40 research projects, 16 of which are funded by public entities. He is author of 3 patents and published more than 70 papers in international conferences and journals. He spent 10 months as visiting researcher in Vislab, at Universidad de Parma, spread in different periods (2008, 2011 and 2014). He also stayed as visiting researcher during 4 months at SUNY University at Buffalo in 2010. As lecturer, he has given lectures in different international Universities such as University of Buffalo, Università degli Studi di Parma, Universidad Pontificia Bolivariana de Medellin, Universidad de las Fuerzas Armadas de Quito (ESPE), Universidad de La Salle at Bogotá, and Universidad Politécnica de Madrid. Moreover, he gives lectures in Programming, Computer Vision, Data Fusion, Intelligent Transportation Systems and Control Engineering.

ITS