Guest Editorial Special Section on Advanced Vehicle Power Propulsion Systems

ELECTRIFICATION of vehicles is one of the major trends in current research and development. In coming years, answers regarding more electric-based propulsion systems for a smooth and decided transition into more efficient and environmentally sensitive propulsion systems are required. Researches and developments should respond to these challenges by investigating more advanced energy storage, power propulsion and energy conversion systems in order to ensure better energy performance, reduced operating cost, and higher lifetime of the next generation of electric vehicles.

The IEEE Vehicle Power and Propulsion Conference (VPPC) is an annual conference of the IEEE Vehicular Technology Society (VTS). The 14th VPPC was held in Belfort, France, in December 2017 and the 15th VPPC was held in Chicago, IL, US, in August 2018. In 2017 edition, there were 237 papers submitted and 218 papers accepted for presentation at the conference. For 2018 edition, there were 128 papers submitted and 106 papers accepted. In order to further promote excellence of research in Vehicle Power and Propulsion, in collaboration with the 2017 and 2018 IEEE VPPC teams, a special section of the IEEE TRANSACTIONS ON VEHICULAR TECHNOLOGY (TVT) has been organized to focus on state-of-the-art research and development, as well as future trends in modeling, design, and control of advanced power and propulsion systems for more electric vehicles. The papers submitted to this special section had to offer substantial novel contributions beyond the previous work presented in the conference papers (substantial change of more than 50%). The authors were invited to submit extended papers, and 40 articles have been proposed (17 originally from 2017 edition and 19 from 2018 edition). The distribution of submitted manuscripts by country is presented in Fig. 1. The Guest Editors are Prof. João Pedro F. Trovão (University of Sherbrooke, Qc, Canada) and Prof. Theo Hofman (Eindhoven University of Technology (TU/e), The Netherlands). Each paper has been associated with a minimum of three independent reviewers from other countries than the authors ones. In order to ensure highest quality for TVT published papers, only 12 submissions were accepted for inclusion in this special section.

This special section devoted to Advanced Vehicle Power Propulsion Systems will emphasize recent developments on five topics:

- *Driving cycles and driving conditions prediction:* with specific incidence on buses considering the design choice is discussed in "Reducing the Energy Consumption of Electric Buses with Design Choices and Predictive Driving," by K. Kivekäs, A. Lajunen, F. Baldi, J. Vepsäläinen and K. Tammi. The impact of the maximal velocity and acceleration rates of the driving cycle on the energy consumption of an urban electric vehicle (Renault Zoe) is studied in "Impact of the Velocity Profile on Energy Consumption of Electric Vehicles," by A. Desreveaux, A. Bouscayrol, R. Trigui and E. Castex, and online energy management strategy for fuel cell/battery vehicle considering driving pattern and drift impacts is proposed by M. Kandidayeni, A. O. Macias Fernandez, A. Khalatbarisoltani, L. Boulon, S. Kelouwani and H. Chaoui in "An Online Energy Management Strategy for a Fuel Cell/Battery Vehicle Considering the Driving Pattern and Performance Drift Impacts."
- *Optimization design of the inductors for multi-phase, high-power and bidirectional DC-DC interleaved converters for electric vehicles* is presented in "Power-Dense Bidirectional DC-DC Converters with High Performance Inductors" by G. Calderon-Lopez, J. Scoltock, Y. Wang, I. Laird, X. Yuan and A. J. Forsyth."
- *Smart and hybrid balancing system devoted to increase the performance of battery packs with high number of cells in series using convex optimization and supercapacitors* is proposed in "Smart and Hybrid Balancing System: Design, Modeling and Experimental Demonstration" by R. P. de Castro, C. Pinto, J. Varela Barreras, R. E. Araujo and D. Howey.
- *Fuel cell hybrid vehicles energy management optimization:* with systematic management based on 3D power map, is introduced by M. Kandidayeni, A. Macias, L. Boulon and S. Kelouwani in "Efficiency Enhancement of an Open Cathode Fuel Cell Through a Systemic Management," and with situation-based power management strategy based on offline definitions in "Optimal Situation-Based Power Management and Application to State Predictive Models for Multi-Source Electric Vehicles" by A. M. Ali, R. Shivapurkar and D. Söffker. A health-conscious energy management based on the prognostics-enables and decision-making is the contribution proposed in "Health-Conscious Energy Management for Fuel Cell Hybrid Electric Vehicles based on Prognostics-Enabled Decision-Making" by M. Yue, S. Jemei and N. Zerhouni.

Digital Object Identifier 10.1109/TVT.2019.2954256

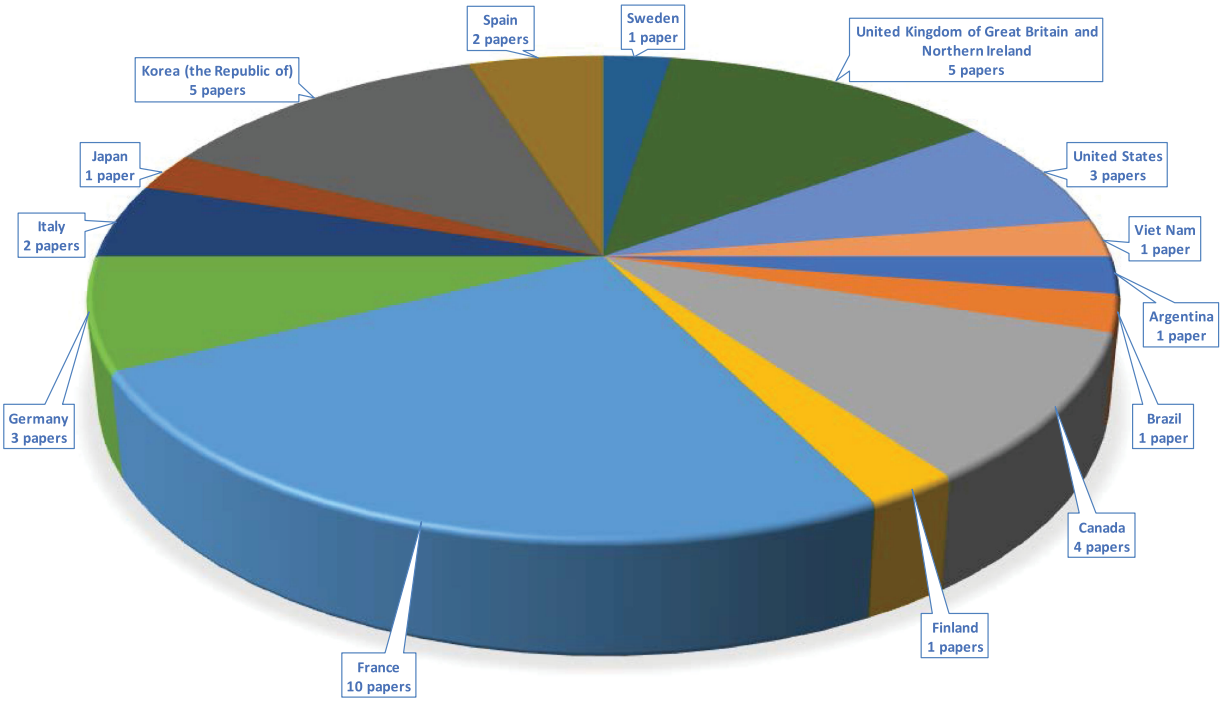

Fig. 1. Number of manuscripts by country submitted to the Special Section on Advanced Vehicle Power Propulsion Systems.

- *The efficiency enhancement of hybrid electric vehicles:* by decoupled energy management and speed control (see B. Chen, S. Evangelou and R. Lot, "Hybrid Electric Vehicle Two-step Fuel Efficiency Optimization with Decoupled Energy Management and Speed Control"), using adaptive concept of PMP-based control (see W. Lee, H. Jeoung, D. Park and N. Kim, "An Adaptive Concept of PMP-based Control for Saving Operating Costs of Extended-Range Electric Vehicles") and adaptive hierarchical energy management design (see T. Liu, X. Tang, H. Wang, H. Yu and X. Hu, "Adaptive Hierarchical Energy Management Design for a Plug-in Hybrid Electric Vehicle") are addressed in this special section. Finally, a regard on efficiency improvement by topology modification using a global sensitivity analysis and comparison is presented by B. Kabalan, E. Vinot, C. Yuan, R. Trigui, C. Dumand and T. El Hajji in "Efficiency Improvement of a Series-Parallel Hybrid Electric Powertrain by Topology Modification."

Overall, we are extremely pleased and honored to have handled this Special Section on Advanced Vehicle Power Propulsion Systems in the IEEE TRANSACTIONS ON VEHICULAR TECHNOLOGY. We are particularly convinced that the large variety of appropriate topics covered in this special section will lead for forthcoming ideas, new developments and innovations in the field of vehicular technology applied to electric powertrains for the new generation of vehicles.

ACKNOWLEDGMENT

The Guest Editors would like to thank Prof. N. Kato, Editor-in-Chief of the IEEE TRANSACTIONS ON VEHICULAR TECHNOLOGY, for his support and also a specific acknowledge for the tireless support of System Administration Staff. We also gratefully the authors who supported this Special Section on Advanced Vehicle Power Propulsion Systems by submitting papers with their important research results, and the world-class panel of reviewers for their constant efforts, who provided valuable and meticulous comments and suggestions for each paper. Finally, special recognition is due to the Technical Program Committees of the IEEE Vehicle Power and Propulsion Conference 2017 and 2018 editions (Prof. M.-C. Pera, Prof. J. P. F. Trovão, Mr. D. Karbowski, Prof. S. Jemei, and Prof. S. Kelouwani) for their hard work in organizing a high-level scientific conferences and ensure the preselection of the presented papers.

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João Pedro F. Trovão (S'08–M'13–SM'17) was born in Coimbra, Portugal, in 1975. He received the M.Sc. and Ph.D. degrees in electrical engineering from the University of Coimbra, Coimbra, Portugal, in 2004 and 2013, respectively.

From 2000 to 2014, he was a Teaching Assistant and an Assistant Professor with the Polytechnic Institute of Coimbra, Coimbra Institute of Engineering, Coimbra, Portugal. Since 2014, he has been a Professor with the Department of Electrical Engineering and Computer Engineering, University of Sherbrooke, Sherbrooke, QC, Canada, where he holds the Canadian Research Chair position in efficient electric vehicles with hybridized energy storage systems. His research interests cover the areas of electric vehicles, hybridized energy storage systems, energy management, and rotating electrical machines.

Dr. Trovão was the General Chair of the 2018 IEEE Vehicle Power and Propulsion Conference, and the Technical Program Committee Co-Chair for 2014 and 2017 IEEE Vehicle Power and Propulsion Conferences. He was a Guest Editor for the Special Issue of the *IET Electrical Systems in Transportation* on Energy Storage and Electric Power Sub-Systems for Advanced Vehicles, *Journal of Energy Storage* (Elsevier) on Second Life of Electric Vehicle Batteries in Stationary Applications, IEEE TRANSACTIONS ON VEHICULAR TECHNOLOGY on Electric Powertrains for Future Vehicles, and IEEE TRANSACTIONS ON VEHICULAR TECHNOLOGY on Advanced Vehicles Power Propulsion Systems. He is a Senior Editor for the IEEE VEHICULAR TECHNOLOGY MAGAZINE for Automotive Electronics.

Theo Hofman received the M.Sc. (Hons.) and Ph.D. degrees in mechanical engineering from the Eindhoven University of Technology (TU/e), Eindhoven, The Netherlands, in 1999 and 2007, respectively.

From 1999 to 2003, he was a Researcher and Project Manager with the R&D Department of Thales–Cryogenics B.V. (Space, Defense), Eindhoven, The Netherlands. From 2003 to 2007, he was a Researcher and the Project Manager with Drivetrain Innovations B.V. (Punch Powertrain N.V., 2013+), Eindhoven, The Netherlands. From 2007 to 2009, he was a Postdoctoral Fellow and from 2010 to 2018, an Assistant Professor with the Control Systems Technology Group. Since 2018, he has been an Associate Professor with the Department of Mechanical Engineering, TU/e, where he is Group Leader in engineering systems design with applications to high-tech powertrain systems. In addition, he is a Senior Contact (2009+) with the Modélisation Énergétique et Gestion d'Énergie des Véhicules Hybrides et électriques Group, a French network on hybrid electric vehicles.

Dr. Hofman was an Invited Professor with the University of Valenciennes and Hainaut-Cambresis in 2011, 2014, and 2018, Int. Program in 2004–2006 and 2014); has been a Standing Committee member of the IEEE Vehicle, Propulsion and Power Conference since 2014; was a Technical Program Committee member and Special session Co-Chair of the IEEE VPPC'11/VPPC'14; was a Co-Chair of the IEEE Best Paper Award VPPC'14/VPPC'15; was a Guest Editor for the IEEE TRANSACTIONS ON VEHICULAR TECHNOLOGY in 2015; has been an Associate Editor for the *International Journal of Hybrid and Electric Vehicles* since 2006, *SAE International Journal of Alternative Powertrains* since 2015, and *International Journal of Vehicle Performance* since 2015; has been an Editor for the *Vehicles* (MDPI) since 2018; was a Guest Editor for World Electric Vehicle Association in 2018; and has been an Editor for the IEEE TRANSACTIONS ON VEHICULAR TECHNOLOGY since 2018.