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EDITORIAL PREFACE

Special Issue on HMI and Autonomous Driving

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Human-machine interaction (HMI) is about the interaction design inside the cockpit of vehicle. It takes the human-centered design approach related to systems that help driver or passengers' communication with vehicles. Ensuring safer driving and more effective communication between the human and the vehicle is the central focus. Its design challenges have changed a lot due to the increasing level of autonomous driving. What kind of interaction will be the mainstream? How would a driver's personality influence the driver's attitude toward active safety and trust of the autonomous driving? How should HMI be designed for the handover scenarios from Level 3 to Level 5 autonomous driving? What HMI solutions make the driving safer and improve user experience?

This special issue includes eight papers. The first five papers seek to address the above questions by assessing the current approaches and technologies, as well as to outline the major challenges and future perspectives related to HMI technology applied in intelligent vehicles. The other three papers are related to autonomous driving.

We hope this special issue could motivate research in the vehicle HMI design and promote the building of quality criteria for automotive user interfaces and autonomous driving systems in the automotive industry.

We would first like to gratefully acknowledge and sincerely thank all the reviewers for their timely and insightful valuable comments and criticism of the manuscripts that greatly improved the quality of the final versions. Of course, thanks are due to the authors, who provided excellent papers and timely extended revisions. Finally, we are grateful to the editors of *Automotive Innovation* for their trust in us, their efforts, patience, and painstaking editorial work during the production of this special issue.

1 Highlights of Papers on HMI

The first paper entitled "Personality Openness Predicts Driver Trust in Automated Driving" discusses the influence of drivers' personality on their trust in Level 2 autonomous driving system, and it demonstrates that drivers with higher openness trait tend to have a lower level of trust in the autonomous driving system.

The second paper "Automated Vehicle Handover Interface Design: Focus Groups with Learner, Intermediate and Advanced Drivers" discusses handover issue and non-emergency takeover in Level 3 autonomous driving by focus groups study with new approach in the methods.

The third one "Constraining Design: Applying the Insights of Cognitive Work Analysis to the Design of Novel In-Car Interfaces to Support Eco-Driving" adopts a mix of cognitive work analysis and design with intent to create a novel in-car interface, which gains insights from prominent design theorists and complex socio-technical systems.

In the fourth paper "Usability Assessment of Steering Wheel Control Interfaces in Motorsport," the authors employ a unique approach to synthesize a set of key performance indicators (KPIs) that require specific analysis of the context of use in motorsport. Such an approach can broaden application possibilities when evaluating new interfaces in autonomous vehicles.

In the fifth paper "Toward Shared Control Between Automated Vehicles and Users," with analyzing different use cases, the authors point out that full out-of-the-loop automated driving may not be acceptable to users. It is believed even when the technology is achievable, people still need to have the choice to take over the control of vehicles.

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2 Highlights of Papers on Autonomous Driving

In the sixth paper “Active Collision Avoidance System Design Based on Model Predictive Control with Varying Sampling Time,” based on the hierarchical control framework, an improved MPC controller is proposed, featuring varying sampling time, and it is proved to have better adaptive capability on a curved road in terms of the varying road adhesion coefficients and vehicle speed.

In the seventh paper “Dynamic Trajectory Planning of Autonomous Lane Change at Medium and Low Speeds Based on Elastic Soft Constraint of the Safety Domain,” with driver characteristics considered and compared with traditional static trajectory planning, it is concluded that unnecessary instances of trajectory re-planning can still be effectively filtered out by the designed dynamic trajectory planning system with the elastic soft constraint.

Finally, in the paper “Robust Cooperative Control of Multiple Autonomous Vehicles for Platoon Formation Considering Parameter Uncertainties,” a robust cooperative vehicle control framework to achieve safe and stable platoon formation is proposed, and the trajectory of each vehicle is planned by using flocking algorithm considering the vehicle stability boundaries.

Prof. Fang Chen
Guest Editor

Prof. Fang Chen received her PhD at Linköping University in 1998. She is currently an associate professor in Interaction Design Division, Department of Computer Science and Engineering of Chalmers University of Technology, Sweden. Her research interests are in the areas of auditory ergonomics, human factors and speech technology, human factors in multi-model interface design and working in the cold. From 2004, her most interest and focus are the human–system interaction and culture aspects in future vehicle design for traffic safety.

In 1993, Saab JAS39 battleplane was crashed in a performance of Water Festival, Stockholm. The reason for this accident was investigated that the aircraft interaction system led the pilot’s misjudgment and thus carried out the incorrect operation. Subsequently, she took the project leader for two research projects concerning human–computer interaction: human factors in 3D audio presentation and human factors in speech technology application. The research directly upgraded the auditory interaction system in the next generation of JAS39. Research results also have led to new projects to integrate multimodal applications in complex control systems. From 2006, she has been trying to introduce vehicle interaction design to China. Since 2013, she has been working together with Chinese partners including Tsinghua University to organize conference on HMI every year in order to promote the development of vehicle HMI design, especially in Chinese vehicle market.