Guest Editorial Preface

Special Issue on Recent Advances in Automotive User Interfaces and Interactive Vehicular Applications Research:
Part 2 - Attentive User Interfaces

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In today's automobiles, digital interfaces and interactive services have become a decisive factor for safety, attractiveness and market penetration. Upcoming trends of shared mobility, personalization and autonomous driving are increasing the complexity of interface design even further. In order to sustainably shape the future of automotive user interfaces, substantial research efforts are needed that put the experience, performance and behavior of human drivers, passengers and other road users into the center of investigation.

This is the second part of a special issue on "Automotive User Interfaces and Interactive Vehicular Applications Research" in the International Journal on Mobile Human-Computer Interaction (IJMHCI). While we focused on novel direct interaction approaches between vehicle and driver, passengers and other traffic participants in the first part of this special issue, we now present a set of contributions that reflects today's trend towards implicit interaction, as enabled by intelligent and automated technology. This trend encompasses the management of pre-driving expectations as well as the provisioning of attentive system features that predict take-over requests, touch gestures or that recognize driver distraction.

The contributions of both the first and second part of this special issue are derived from the best rated papers of the 10th Automotive User Interfaces and Interactive Vehicular Applications (AutomotiveUI '18), which took place in Toronto, Canada. Each year, this conference serves as the premier forum for academics and practitioners to present and discuss novel vehicle technologies through models and concepts for enhancing the driver experience, performance, and behavior. The topics covered in this conference include, but are not limited to, automated vehicles, driver information processing, display and control design, in-vehicle information systems, and vehicle-pedestrian interactions.

From a total of 94 papers received for the main conference papers track, 35 submissions were accepted, which corresponds to an acceptance rate of 37%. The assessment of submissions was conducted by a committee of 44 experts who performed detailed reviews themselves and invited further external reviewers. The author teams with the highest-ranked AutomotiveUI '18 contributions, having received a committee rating score of 4 or higher (on a scale of 1 to 5), were invited to provide

extended versions with additional original contributions. The papers were then shepherded by the journal editor, with the help of further external reviewers.

Expectations formed in the pre-usage phase are highly decisive for actual acceptance and usage of an automotive system. To gather a better understanding of appropriate design for the pre-driving phase, Kraus, Forster, Hergeth and Baumann investigated the impact of certain a priori information on attitude formation and the calibration of trust towards conditionally automated driving. The authors found in their online study that prior information on both the reliability of an automated driving system as well as on the OEM brand influenced trust in the system prior to any actual interaction. They demonstrate that the form and content of information provided can have a strong impact on attitude formation towards a conditionally automated driving system. In order to achieve stable trust formation, Kraus et al. recommend to not merely provide emotionally connoted heuristic information (e.g., as a brand logo), but also information of high argument quality, such as realistic information on functionality, conditions, or limitations.

Apart from modelling expectations, predicting the user's intent in real time is promising to reduce required effort and workload for drivers. Ahmad, Hare, Singh, Shabani, and Lindsay, Langdon and Godsill present an experiment on predictive touch, a technique that may enable reliable interactions with in-vehicle displays through free-hand gestures, without the need to physically touch a surface to engage with an interface. This may make learning of symbolic gestures obsolete and could enable easier interaction with non-traditional interfaces such as head-up displays and 3D projections. Based on their experimental study, the authors recommend immediate mid-air selection as an effective and well applicable method to enable pre-selections for pointing gestures. Apart from further refinement of the involved machine learning techniques, the encouraged next steps in this promising area of research are to perform studies in naturalistic settings to account for road-driving conditions and to have more variance of driving scenarios.

How to optimally manage take-over between car and driver is one of the most pressing research questions with regards to automated vehicle interface design. In their paper, Wintersberger, Schartmüller and Riener demonstrate how attention awareness and device integration in the car can improve take-over situations in highly automated driving, when drivers have to switch between side activities during full automation and manual driving interventions. In two driving simulator experiments, Wintersberger et al. found that using mobile devices as an information source for scheduling take-over requests at task boundaries led to significantly less stress for drivers. Also, the use of mobile devices as a means to notify drivers reduced variance in response times for take-over (preventing drivers from continuation in the non-driving related task). The authors conclude that future consumers must be supported to experience both sides of the automation spectrum, while seamlessly switching between driving modes and non-driving related activities. Thereby, attentive user interfaces and consumer device-integration will be highly important for the sake of safety and convenience.

Recent advances in machine learning has taken attentive interfaces from being ideas to reality. Attentive interfaces need to understand the driver, the vehicle, and the environment in real-time in order to alter interface interactions to support safety, productivity, and user satisfaction. The final paper in this issue by Kanaan, Ayas, Donmez, Risteska and Chakraborty exploited the use of vehicle-based kinematic data, which is accessible in real-time in production vehicles, to predict driver distraction and environmental demand. The authors built hidden Markov Models on actual on-road data collected as part of the largest naturalistic driving study conducted to date, and predicted long off-path glances, secondary task engagement, and high motor control difficulty situations. Best classification accuracies were achieved for secondary task engagement and long-off path glances. The next steps are to enhance classification accuracies through the exploration of different modeling techniques and the inclusion of further data sources in addition to vehicle-based measures.

Again, we would like to thank the Automotive UI 2018 conference committee members and reviewers for attracting, selecting and shepherding the contributions that were the basis for this collection. Furthermore, we are grateful for the advice and support provided by the IGI Global

team and chief editor Joanna Lumsden. We hope that the presented papers on attentive automotive user interfaces can provide inspirations for further research and practice. Readers are encouraged to consider also the first part of this special issue, which presents and reflects on novel forms of direct user interaction, including depth perception cues in augmented reality head-up displays, haptics supported by thermal interfaces and opportunities for communication between co-located drivers.

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