

# CHALLENGES AND OPPORTUNITIES IN DEVELOPING NEXT GENERATION IN-VEHICLE HMI SYSTEMS

Moderator:

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Panelists:

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Bruce Mehler, MIT AgeLab

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The next generation of automotive human machine interface (HMI) systems is expected to be heavily dependent upon artificial intelligence; from autonomous driving to speech assistance, from gesture & touch-enabled interfaces to web & mobile integration. Smooth, safe, and user-friendly interaction between the driver and the vehicle is a key to winning market share. This panel aims to discuss challenges and opportunities for the next generation of automotive HMI from the perspective of human factors and user behavior. Panelists from industry and academia will offer their unique perspectives on the concerns and opportunities in developing future in-vehicle HMIs.

## PANELISTS' PRESENTATIONS

### Topic 1: Conveying Situation Awareness through HMI

#### *Introduction of the panelist*

Yu Zhang, Ph.D., is a Principal Design Engineer, specializing in human factors at Denso International America. Her focus includes early-stage Human Machine Interfaces (HMI) evaluation, driver distraction/ inattention mitigation techniques, and autonomous vehicle HMI design. Dr. Zhang received her Ph.D. in Industrial & Systems Engineering from North Carolina State University. She also serves the Advanced Human Factors Evaluator for Automotive Distraction (AHEAD) consortium as the primary human factors specialist.

#### *Abstract of the presentation*

Advanced Driver Assistant Systems (ADAS) and automated driving (AD) features have become increasingly available to today's driver. To make effective use of the technologies, drivers may need to track information while driving to understand the states of those systems. Also, the prevalence of consumer electronics drives up the potential for driver distraction. All of these changes may come at the cost of losing Situation Awareness (SA). The desire for creating simplistic interfaces and sustaining sufficient SA leads to great opportunity and challenges for HMI designers. Hence, it is critical to understand the consequences for drivers' SA when introducing new technology and applying efficient HMI design to address the driver's SA needs. This part of the panel discussion is based on "The 2nd Workshop on Situation Awareness in Automotive Evaluation & Design" of Automotive UI 2018. It will include a discussion of how the demand of SA could change with the introduction of ADAS and AD systems and will explore how to address those SA needs with HMI design.

### Topic 2: Ensuring that Advanced HMIs Aid, Not Distract, the Driver

#### *Introduction of the panelist*

Bruce Mehler is a Research Scientist in the Massachusetts Institute of Technology AgeLab and the New England University Transportation Center, and the former Director of Applications & Development at NeuroDyne Medical Corporation. Bruce has an extensive background in the development and application of non-invasive physiological monitoring technologies and research interests in workload assessment, individual differences in response to cognitive demand and stress, and in how individuals adapt to new technologies and user interfaces. He is a senior member of the technical teams for the Advanced Human Factors Evaluator for Attentional Demand (AHEAD) and the Advanced Vehicle Technology (AVT) consortia at MIT.

#### *Abstract of the presentation*

Driver support and automated driving features are proliferating in modern vehicles, offering the promise of increased comfort and safety. However, the increased display of system state information and the number of controls provided to support multiple modes of operation can unintentionally place more demand and distraction on the driver – impacting the amount of eyes-off-road time and cognitive load. Consequently, the need for well-designed, user-centric HMIs is perhaps greater than ever. Select observations and analyses of real-world driver behavior coming out of the Advanced Vehicle Technologies (AVT) and Advanced Human Factors Evaluator for Automotive Demand (AHEAD) consortia at MIT will be used for illustration. In addition to identifying challenges, this presentation will emphasize opportunities for the HMI design space, arguing for the development of HMIs that not only provide basic information and warnings, but that actively support the driver and cue appropriate attention as needed. The potential role of driving monitoring as part of such systems will be considered.

### Topic 3: User-Centric HMI Design in the Era of 5G/AI

### *Introduction of the panelist*

Meredith Paige is a Senior Vice President of User Experience at Ipsos, North America. She is a core leader in one of the largest UX consulting groups in the world and has led a significant number of research projects that have influenced the human/computer interface interaction across industries. She is a key player in guiding today's business to new growth opportunities by identifying new products, new markets, and new consumers. Combining her expertise in technology and automotive industries, Meredith offers a unique insight in the evolution of the driver/passenger's digital experience.

### *Abstract of the presentation*

The emotional connection between a car and an owner is often the key factor leading to buying decisions. With the increasing connectivity of today's vehicles, the opportunities to build such emotional connections, not only based on driving functions, but also based on driver/passenger infotainment, has been booming. Meanwhile, the fast development of 5G and AI brings the automotive industry to an all-new era. 5G features like the massive Internet of Things, mission-critical control, and enhanced mobile broadband mean a vehicle can be connected at any time and anywhere, while AI features like AIAI features like AI features like voice recognition, autonomous driving, and virtual agent make a vehicle can be customized to fit anyone. User-centric HMI design becomes important than ever as long as car consumers' focus has been shifted from vehicle performance to digital experience. This part of panel presentation will discuss several concerns to achieve successful auto HMI designs in the era of 5G and AI: 1) the seamless integration of personal digital experience outside vehicle; 2) virtual agent mean a vehicle can be customized to fit anyone. User-centric HMI design becomes important than ever as long as car consumers' focus has been shifted from vehicle performance to digital experience. This part of the panel will discuss several concerns to achieve successful auto HMI designs in the era of 5G and AI: 1) seamlessly integrate personal digital experience outside vehicle into the vehicle; 2) design simple and elegant – feedback from users; 3) consider generation and use case – key to success or failure.