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Editorial: Trust, safety and passenger experience in Intelligent Mobility

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Editorial on the Research Topic
Trust, safety and passenger experience in Intelligent Mobility

Intelligent Mobility (IM) has been transforming the way people and goods travel, providing benefits and opportunities for optimized logistics and travel time (e.g., through seamless mobility). Indeed, IM infrastructure trends have opened up new avenues for considering (and designing) how to best connect different transport modalities to accommodate more inclusivity, accessibility and efficiency in travel. More importantly IM appears to change the way passengers experience technologies as the nature of IM infrastructure [e.g., Automated Vehicles (AVs), Smart Roads, etc.] challenge notions of trust and safety while at the same time create new modes of interactions within cars and with the transport environment. Intelligent Mobility has direct implications on vehicle interior's design but also introduces novel opportunities and challenging "traditional" problems (e.g., Trolley Problem) for managing "external" interactions i.e., interactions with the natural environment whether this includes people (e.g., pedestrians) or not. In this Editorial we have the pleasure to host a very interesting Research Topic of unique papers that span across different areas in IM including research findings regarding designing Human-Machine Interfaces (HMIs) for car interiors, IM in city contexts e.g., how drivers' behavior and trust influence intelligent infrastructure acceptability or how human behavior gets affected when using automated and self-driving shuttles. We also have papers that address the key aspect of accessibility and inclusivity and how representative user groups view IM emphasizing the importance to approach mobility as a service while emphasizing the role of Virtual Reality (VR) technologies play in designing and testing automated driving.

Hartwich et al. provide a comparison of conventional HMI designs (e.g., with permanent information availability) vs. Context and User-Adaptive HMIs. They found that participants with lower perceptions of trust preferred more conventional HMIs compared to those with higher perceptions of trust and overall User Experience (UX). Such findings help to reflect on how the "familiarity" factor interplays in notions of trustworthiness in AVs' interior design but also how UX could be potentially impaired by "familiar" interfaces and contexts. The introduction of AVs and IM more broadly have challenged the traditional ecosystem boundaries as communications and sensor-based data can go beyond the mere physical boundaries of a vehicle.

This change in ecosystem boundaries have introduced new layers of uncertainties as the familiarity in interactions between vehicles and people has also changed, showing a need to investigate the role of uncertainty, trust and control in a broader IM context (e.g., in exploring how pedestrians and bystanders in IM contexts perceive trust). An example of this is Lanzer et al.'s work, which moves beyond the in-vehicles' interior and investigates the role of context and system factors on drivers' perception of control and trust in AVs. Researchers found that prior experience (e.g., in perceiving missing information within a given context) affected trust levels toward AV simulations and also affected willingness to control. The same pattern was observed when visualizations showed "accident-prone" contexts (e.g., pedestrian distracted by smart phones) suggesting also that uncertainty (in making a decision) could potentially be generated from lower levels of trust and increased willingness for control to take over. The uncertainty factor can be ameliorated through appropriate (and prompt) information provision.

Information provision, indeed, appears to be a critical aspect in defining trust, not only within the context of perceiving "danger" and accident-prone situations in IM but also in assisting travel planning whether in rural or urban settings. Speaking of urban settings and AVs usage, Mirnig et al. provide an insightful paper on travel planning implications (e.g., in-vehicle seat allocation) when using autonomous shuttles. Through their research they highlight the importance to plan ahead travel components such as seat allocation as the dynamicity and autonomous nature of shuttles in urban contexts poses challenges in seamless planning and mobility. For example, AVs provide a smaller timeframe (and speedier interactions!) between people and vehicles and this affects people's expectations on how efficient and effective they can be with their travel bookings.

How context-aware can AVs become without causing negative PAX such as confusion and distress? This is a key question, especially for stakeholder populations that have certain accessibility (and other) characteristics and needs. The paper by Nanchen et al. addresses what People With Disabilities (PWD; including People with Reduced Mobility—PRM) need to retain and enhance their autonomy through the use of AVs and IM more broadly. They utilized a qualitative approach to understand how feeling included in society has a direct impact on people's wellbeing and how enhanced mobility—*via* IM technologies—provide this opportunity. In this paper there is a particular emphasis on the notion of Mobility as a Service (MaaS), highlighting the importance to not assume inclusivity just because MaaS and IM are offered and facilitated; instead, extra care must be given in ensuring inclusive design in all aspects of IM-based technologies, from AV shells' and interior design to supporting inclusive interactions and travel planning that do not compromise safety for e.g., PWD and PRMs—this aspect links heavily with aspects discussed within the aforementioned work that Mirnig et al. presented on autonomous shuttles. As the authors say, mobility goes beyond the means of transport and entails contextual characteristics such as physical environment conditions (e.g., traffic lights, noise, and congestion). The travel experience -even more so for PWD- needs to be approached from a holistic point of view and at the same time acknowledge that individuals can have multiple needs as a result of hidden and non-hidden disabilities. Awareness, preparation and learning are necessary to accept AVs in the long run as they carry a great potential to enhance mobility and accessibility opportunities for PWD. Inclusive Design, Participatory Design where PWDs take active role in proposing IM designs, as well as Service Design and the use of Mixed Reality technologies such as Virtual Reality (VR) and Augmented Reality (AR) can greatly support early understandings of what kind of IM designs PWDs need without compromising safety perceptions and perceived trust levels.

Last but not least, Riegler et al.'s paper provides a very interesting review of the use of (and research in) Virtual Reality (VR) for automated driving capturing insights from papers published between 2009 and 2020. The use of VR can offer excellent testbed frameworks for assessing different levels of automation, with safety aspects and vulnerable stakeholders being two of the major drivers for adopting VR. Aspects of UX such as trust and motion sickness appear to be popular themes for investigation in the past decade to inform not only interior Human Machine Interfaces (HMIs) in AVs but also external HMIs (eHMIs). The review paper offers insights on a wide range of VR-related Research Topics in AVs but perhaps one of the most intriguing triggered questions is how the reality—virtuality continuum can contribute to the design of better UX in AV and IM contexts. We hope that this Research Topic will inform you and provoke useful reflections on what IM currently offers, its challenges but also its potential.

Author contributions

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