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Mobile Interaction With and In Autonomous Vehicles

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Abstract
The rise of autonomous and fully autonomous vehicles requires a closer examination of how people will interact with them. In this workshop, we especially address two areas: (1) What can we learn from mobile HCI for the interaction design between human drivers and the autonomous vehicle? (2) What opportunities for mobile HCI arise due to new freedoms for drivers, when they also take on the role of passengers in autonomous vehicles? The workshop will seek to further develop the challenges involved and/or to suggest early solutions through the use of a highly participative format.

Author Keywords
Autonomous vehicles; mobile interaction; trust; experience.

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous

Workshop Goals
Google's driverless car [14] and the announcement of Uber using self-driving cars to transport people[1] along

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[1] https://www.wired.com/2016/09/heres-like-ride-ubers-self-driving-car/

with other approaches and vendors will have a **significant impact on people's mobility behavior, on how** people interact with autonomous vehicles, and what users will do while riding in such autonomous cars. This will lead to a number of challenges and questions, which need to be addressed and explored. From an HCI perspective these include shared situation awareness between driver and vehicle [6], the naturalness of interaction with a vehicle [10], acceptance of autonomous vehicles [13, 16], or ethical issues in decision making [4].

This workshop will specifically address: (1) What can we learn from mobile HCI for the interaction design between human drivers and the autonomous vehicle? (2) What opportunities for mobile HCI arise due to new freedoms for drivers, when they become passengers in autonomous vehicles? This workshop will focus on the goals outlined below:

- Discuss best practices and patterns for mobile design and how they can be applied to the design of autonomous vehicles;
- Envision new interaction opportunities for the driver to communicate with the automated vehicle (and vice versa);
- Explore new designs for hand-over, interferences, and (shared) control situations in mobile HCI and autonomous driving and discuss their practicability in the respective domains;
- Explore engineering issues related to safety, reliability, and security properties, as well as certification aspects;
- Exploration of UX factors such as fun, acceptance and (over)trust;

- Explore the evolution from car as a tool to car as a companion and what can be learnt from other domains such as Human-Robot-Interaction (HRI);
- Examination of situational awareness issues from the perspective of the car and the human;
- Discuss ethics-related questions for the design of interfaces in autonomous vehicles;
- Explore how to bridge academia, industry and policy makers in order to develop safer and more user friendly autonomous vehicles.

The workshop will follow an open format, meaning that participants can submit a position paper and present this paper at the workshop, but we will also open the workshop for mobile HCI participants without a position paper. Above that we will invite selected speakers form industry and policy makers to this workshop.

Workshop Structure
The call for participation (cfp) will be distributed via mobile HCI, AutomotiveUI, as well as general HCI related mailing lists (e.g., chi-announcements) via personal lists (including prior workshops/conference organized). Participants will receive copies of accepted papers in advance.

It will be a one-day workshop consisting of approx. 15 participants. Table 1 provides an overview of the proposed workshop schedule. Participants will be welcomed and introduced to the workshop goals, which will then be followed by a short introduction of every workshop participant. Then two sessions with presentations will be conducted. In the first session position papers will be presented. Each paper will be limited to 10-15 minutes including Q&A depending on the number of position papers. After a break

presentations of selected speakers from industry and policy makers will follow.

The second half of the workshop will be dedicated to one-on-one conversations and group work. There will **be a "speed dating" phase in which workshop** participants will have the time to talk to each other. This phase will last for 90 minutes. Each couple will have 15 minutes to discuss workshop related questions. After that, couples will be changed. **A "Deep Dive"** workshop phase will take place where the workshop group as a whole will propose at most two topics to be discussed. These will then be developed further in smaller groups with the objective of proposing solutions or identifying further challenges. Reports from groups will be presented in a plenary session.

Time	Phases
09:00 – 09:15	Welcome; introduction to workshop goals; short round of participant introductions.
09:15 - 10:30	Presentations of position papers.
10:30 – 10:45	Coffee break
10:45 – 12:00	Presentations of selected speakers from industry and policy makers.
12:00 – 13:00	Lunch
13:00 – 14:30	Speed Dating phase
14:30 – 14:45	Coffee break
14:45 – 16:45	Deep Dive Workshop Phase
16:45 – 17:00	Wrap-up, including future publications

Table 1 Workshop Timetable (tentative)

Particular emphasis will be placed on using group discussion formats which encourage collaboration and problem solving, e.g. such as those used by IDEO in their Deep Dive methodology [2].

Organizers and Participants
The workshop will be organized by leading experts in the field of Mobile HCI, AutomotiveUI, and HRI; all have prior experience of organizing conferences and workshops. Past events include a series of workshops on UX in autonomous driving at the International Conference on Automotive User Interfaces and Interactive Vehicular Applications [7, 11], at CHI [8, 9] **and organized a SIG on "**Multiple Views on Safety-Critical Automation: Aircrafts, Autonomous Vehicles, Air Traffic Management and Satellite Ground Segments **Perspectives" [**2]. Organizers are as follows:

Alexander Meschtscherjakov
Alexander will be the main contact person. He is an Assistant Professor at the Center for HCI at the Computer Sciences Department of the University of Salzburg. In his research, he deals with automotive user interface design as well as user experience with autonomous vehicles [13]. He was co-organizing **conferences such as AutomotiveUI'11, Persuasive'15)** and organizer of **different workshops (AutomotiveUI'13-16, CHI'15**-16).

Manfred Tscheligi
Manfred is professor for HCI & Usability at the University of Salzburg and is heading the Center for Technology Experience at AIT (Vienna). He is involved in driving experience activities and has been active already in the discussion on autonomous driving and HRI [15]. He has been involved in several conferences

(e.g., co-chairing CHI'04 and AutomotiveUI'11) and co-organizing workshops and SIGs (e.g., CHI'16, AutomotiveUI'15, and Interact'15). He is also conference co-chair of HRI 2017 and MobileHCI 2017.

Peter Fröhlich
Peter Fröhlich, Senior Scientist at AIT, has 10 years experience in the research and development of user interfaces for connected and autonomous cars. In co-operation with companies like OMV, TomTom, SIEMENS and ERICSSON, he conducted studies on the road and in the driving simulator to investigate the requirements and success criteria for driving safety systems, multimodal traffic information and context-sensitive advertising. He is a regular author, co-organizer, editor and reviewer for renowned conferences and journals, such as Mobile HCI, Automotive UI, and CHI.

Rod McCall
Rod is a Lead Researcher at the Luxembourg Institute of Science and Technology. His research focuses on human-factors within the fields of (semi)-autonomous vehicles and mixed realities. He is an associate editor of Interacting with Computers (Oxford University Press), is the vice-chair of the IFIP Working Group on Social and Ethical Issues in Entertainment Computing. He has co- organized workshops at CHI, MobileHCI and AutoUI.

Andreas Riener
Andreas is a professor for HMI and VR at THI with co-appointment at CARISSMA (Center of Automotive Research on Integrated Safety Systems and Measurement Area). His research interests include driving ergonomics, driver state estimation from physiological measures, human factors in driver-vehicle interfaces (e.g., [12]), as well as topics related to (over)trust, acceptance [16], and ethical issues [4, 11] in automated driving.

Philippe Palanque
Philippe is Professor in Computer Science at the University Toulouse 3. He is working on formal methods for engineering interactive systems and the application of such techniques to Higher Automation Levels in the field of Air Traffic Management, Interactive Cockpits of Large Civil Aircrafts [1] and Satellite Ground Segments [5]. He was chair of (Application and Theories of Automation in Command and Control Systems) ATACCS 2015 conference.

Participation
The workshop is intended for mobile HCI, AutomotiveUI, and HRI researchers and practitioners, designers and developers. Workshop candidates have to submit a position paper (up to 4 pages in the CHI extended abstract format submitted via a submission system linked via the workshop website).

Planned Outcomes
Workshop results will be communicated to a general audience. We plan to produce a report for publication in ACM Interactions magazine and prepare a special issue in a selected journal (e.g., Springer Journal on Quality and User Experience[2]) following the conference. This will depend of the quality of the contributions and of the output of the workshop. In any case, workshop results will be made available through the workshop website and an email list to network with others will be created.

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