

Workshop on Adaptive Ambient In-Vehicle Displays and Interactions

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ABSTRACT

A major challenge in today's as well as future driving is to keep drivers informed about the vehicle's state and the environment. Today's assistant and infotainment systems compete for the drivers' attention and may even distract them from the primary driving task. Further, with an increase in automation, the vehicle needs to be able to communicate information with different urgency levels. While some information are not important and should never distract a driver from important tasks, there are also calls for action, which a driver should not be able to ignore. We believe in adaptive ambient displays and peripheral interaction as one possible way to unobtrusively present information while being able to switch the driver's attention if needed. In this workshop the focus lies in exchange of best known methods and discussion on challenges and potentials for this kind of interaction in today's scenarios as well as in future mixed or full autonomous traffic. The central objective of this workshop is to bring together researchers from different domains and discuss radical, innovative, and engaging ideas and a future landscape for research in this area.

ACM Classification Keywords

H.5.2 Information interfaces and presentation (e.g., HCI): User Interfaces

Author Keywords

Ambient displays; automotive user interfaces; human-centered design; multimodal displays; peripheral interaction; unobtrusive information presentation.

INTRODUCTION

Timely and user-appropriate presentation of information remains a pressing challenge, especially across non-, semi-, and fully autonomous traffic context. This is especially due to the fact that the effective allocation of the driver's attention can depend on a multitude of factors, which includes driving condition, perceived workload, and ever-changing task requirements. Depending on the cognitive workload some modalities might be more suitable than others as suggested by Wickens [6]. It is therefore important to have a wide range of possible modalities for interactions in the vehicle. Ambient displays have been introduced to display non-critical information in other domains [3]. For the automotive domain it is interesting that ambient displays can be designed to move from the periphery of the attention to the focus and back [4].

In this workshop, our goal is collecting innovative and engaging ideas to foster discussion on current as well as future interactions between drivers and assistant or infotainment systems. The focus lies in finding a common interdisciplinary understanding for in-vehicle technologies that are for example called "ambient displays", "calm technology", "peripheral interaction", "subtle interaction", or "unobtrusive notifications".

We are interested in arriving at comprehensive solutions for directing driver's attention and communicating the right amount of information at the right time via adaptive User Interfaces, in particular, but not restricted to ambient in-vehicle displays, so as to make driving a safer or more enjoyable

experience. For example, how should light displays be appropriately designed to indicate the timely need to perform a lane change maneuver without being unnecessarily disruptive [2]. How can navigational support be given using vibrotactile actuators [1]? How can displays adapt to the driver's state? To address this adequately, it is necessary to engage the combined expertise of UI designers, psychologists and professionals from the industry.

Participants will be encouraged to suggest alternative concepts and raise questions that are to be discussed during the workshop. We will especially appreciate submissions with outstanding questions to researchers from other disciplines.

With this workshop, we continue the discussion started in the workshop "Social, Natural, and Peripheral Interactions: Together and Separate" at AutomotiveUI '14 [5]. For this year, we split the topics into two workshops. While this workshop focuses on displays, interactions and how to adapt to the states of driver and vehicle, the other workshop looks at the input (sensory) side of the driver-vehicle interaction loop.

GOAL AND TOPICS OF THE WORKSHOP

We are aiming to provide a common ground for interested experts from different areas to introduce ideas, concerns and challenges they have identified, in the scope of the workshop topics, and exchange them through networking and discussion sessions during the workshop.

Topics of Interest

Potential topics to be discussed at the workshop include, but are not limited to

- Ambient interfaces in the vehicle
- Peripheral interaction in the vehicle
- Natural user interfaces for in-vehicle infotainment
- Adaptive & reactive user interfaces
- Modalities for feedback, e.g. acoustical, visual, etc.
- Shifting the attention of drivers
- Shifting the display of information to match user's state
- Support task resumption by unobtrusively triggering drivers' prospective memory
- Managing in-vehicle interruptions
- Types of information that can be communicated through ambient displays
- Challenges for designing and implementing ambient interfaces
 - nowadays,
 - in mixed traffic situations,
 - in a future with fully autonomous cars
- Applying ambient displays to support explicit and implicit communication and cooperation in mixed traffic conditions between drivers of non-autonomous and autonomous cars
- Optical Head Mounted Displays or Near-Eye Displays

Soliciting Submissions

In order to attract as many as possible submissions and participants, information to possibly interested researchers should be provided using various information channels. Our publicity plan consists of making use of several lines of "advertisement". The calls for papers and participation (CfP) for this workshop will be distributed via HCI, Perception or AutomotiveUI related mailing lists like, e.g., ACM SIGCHI, British HCI News, CVnet, and Local SIGs lists. Also social media such as Facebook, Twitter, and LinkedIn Groups etc. will be used to distribute the CfP. We will further use our own/personal distribution lists. A website of the workshop will be set up in order to provide information about the upcoming workshop, the submission modality (EasyChair) and links to related material, so candidates can get familiar with the scope of the subject and the goals of the workshop. Accepted position papers and other pre-workshop materials will be made available to participants. In the sense of the workshop we will set up a weblog on the workshop website to facilitate a pre-workshop discussion.

Estimation of Submitted Papers and Attendees

We hope to attract a reasonable number of submissions for the workshop and to compile an attractive program for potential attendees. As of now, we expect an audience of around 25 persons (including the organizers) for the workshop. We would allow other interested conference attendees to participate in the workshop (without submitting a paper). For that, we would encourage an early notification by the conference organizers (registration committee) about additional workshop participants (i.e., allow to register for the workshop already at the time of conference registration).

Submissions and Selection of Participants

The organizers will issue calls for papers for this workshop through mailing lists and through the workshop website <http://waadi.offis.de>. Participants are expected to submit a position paper of 1 to 6 pages via email by July 20th 2015. All submissions must follow the ACM SIGCHI Extended Abstracts Format. Participants will be selected on the basis of the quality of their position paper in a peer-review process by the organizing committee as well as invited experts from the field. Successful submissions will have the potential to raise discussion, provide insights for other attendees, and illustrate open challenges and potential solutions. Authors of accepted submissions will be notified by July 27th 2015. At least one author of each accepted paper needs to register for the conference and the workshop itself. Accepted papers will be distributed amongst the participants prior to the workshop.

At the Workshop

We strongly believe in fostering communication between participants by providing various forms of interactivity during the workshop. Due to time constraints, we will omit long presentations of submitted papers during the workshop. Instead, we are going to have a "1-Minute-Madness", where each participant can present him- or herself or their work. We will use the open questions from submitted papers to derive topics for a World Café and split the participants into groups. During

| Time | |
|---------------|-----------------------------|
| 14:00 - 14:10 | Opening and Introduction |
| 14:10 - 14:30 | 1-Minute-Madness |
| 14:30 - 14:40 | Break |
| 14:40 - 15:40 | World Café |
| 15:40 - 16:05 | Presentation and Discussion |
| 16:05 - 16:25 | Break |
| 16:25 - 17:10 | Group Work |
| 17:10 - 17:35 | Presentation and Discussion |
| 17:35 - 17:45 | Break |
| 17:45 - 18:00 | Wrap up Discussions |

Table 1. Workshop schedule

this session, participants will have the opportunity to get feedback for their work and discuss new ideas. After a presentation and discussion of the results of each group, we will have another session with different groups to work on the topics (A) “Definition of Interaction with Ambient Displays”, (B) “Possible Applications Today”, (C) “Possible Applications in the Future”, (D) “Grand Challenges”. Presentation and discussion of group work results will further foster the exchange between participants. In the closing panel, we will explore the chance of future collaborations and publications within this group of researchers interested in ambient in-vehicle displays. A timetable is given in Table 1.

The actual workshop looks at the output (feedback) side of the driver-vehicle interaction loop, and we have aligned the aims of the workshop with another workshop (entitled “Workshop on Practical Experiences in Measuring and Modeling Drivers and Driver-Vehicle Interactions”) that is focusing on the input (sensory) side. In order to allow conference participants to participate in both workshops (which should make sense), we recommend to schedule our workshop in the afternoon, and the other one in the morning (in case both will be accepted). In the preparation phase of this proposal, we have been working closely with the team proposing the other workshop in order to make sure that both perfectly complements each other.

OUTCOME OF THE WORKSHOP

The aim of this workshop is to bring together people who are active in HCI research on adaptive or ambient in-vehicle displays. The expected outcome is an overview of the recent challenges of mobile deployments or interaction and potential ways to overcome them. We aim to generate insights in new questions that present themselves when it comes to doing research in this dynamic landscape of ambient in-vehicle displays as well as unobtrusive and peripheral interaction with the display and the presented information. Participants are expected to discuss, share, and take away beneficial insights, strategies, tips and tricks in dealing with issues such as attention and memory management, novel sensing and modeling methods to analyze ambient displays.

A workshop website will be set up at <http://waadi.offis.de> and will feature all accepted papers and a brief overview of the discussion. Based on the quality of the papers we will consider publishing extended versions of selected papers in a

special issue in an appropriate journal. Further, depending on the number of submissions and the success of the workshop, it is planned to compile a survey paper about the “Grand Challenges”, issues, approaches, etc. discussed at the workshop to communicate the state-of-the-art in in-vehicle ambient displays to the community (ACM Computing Surveys).

ORGANIZERS SHORT BIOGRAPHIES

Andreas Löcken is a researcher in the Media Informatics and Multimedia Systems Group at University of Oldenburg in Germany. His research interests include new display modalities and peripheral interaction in the car.

Shadan Sadeghian Borojeni is a researcher at the Interactive Systems group at OFFIS – Institute for Information Technology in Oldenburg, Germany. Her research interests are in-vehicle interruption management and supporting task resumption using ambient displays.

Heiko Müller is a researcher at the Interactive Systems Group at OFFIS – Institute for Information Technology. His research interest is in conveying spatio-temporal information with ambient light displays.

Lewis Chuang leads research on “Cognition and Control for Man-Machine Systems” at the Max Planck Institute for Biological Cybernetics (Tuebingen). His research investigates information-seeking and -processing behavior, especially in the context of man-machine systems, by relying on gaze-tracking and EEG/ERP methods.

Ronald Schroeter is a PostDoctoral Research Fellow at the Centre for Accident Research and Road Safety – Queensland (CARRS-Q), QUT. He embraces multidisciplinary research, but his current main research interest is the design of innovative driving experiences that make driving more fun and safe.

Ignacio Alvarez is Research Scientist at Intel Labs, USA. He obtained his PhD in Computer Science at University of the Basque Country, Spain. His background is in Human Computer Interaction. His research is on future intelligent transportation systems. He is interested in the practical application of cognitive sciences to affective computing and ADAS.

Valerian Meijering is an HMI research engineer in the HMI Research department at Jaguar Land Rover in the United Kingdom. His research interests include include human perception, driver behavior and driving simulators.

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