Exploring the User Experience of Autonomous Driving Workshop at AutomotiveUI 2013

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ABSTRACT

Although cars are not flying yet, self-driving cars are definitively closer than some may think. Numerous research organizations and major companies have developed working prototype autonomous vehicles. Three U.S. states have passed laws permitting autonomous cars on public roads and the UK is currently working on making similar policy changes. Technical challenges are of great importance to fully transition to these vehicles, but legislation, infrastructure and human factors elements are of equal significance to tackle, and have received much less attention. With this workshop, we would like to start the conversation of Autonomous Vehicles with experts and researchers specifically in the area of Human Factors and User Experience. This workshop will explore the emerging themes of autonomous driving, social driving and novel user interface approaches. The aim being to define the future landscape for research within and across each these areas.

Categories and Subject Descriptors

H.1.2 [User/Machine Systems]: Human Factors, Human Information Processing.

General Terms

Human Factors, Experimentation, Design, Measurement, Human Computer Interaction, Verification.

Keywords

Autonomy, Autonomous Vehicles, Human-Autonomy-Interaction, User Experience Design and Research.

1. INTRODUCTION

Marc Hassenzahl stated that a common feeling exists today amongst vehicle and transportation researchers where "most technologies are driving-centered; the remaining are entertainment technologies (e.g., music, radio, games) or "traditional" communication technologies, such as the telephone. Likewise, interaction design in cars focuses mainly on the driving task and safety issues" [6] thus leaving lots of potential areas unexplored. Furthermore, the increasing success of researchers within the field of autonomous cars (also known as robotic cars, or informally as driverless or self-driving cars) means there is now the option to provide advanced services in cars while the vehicle is under fully automated or semi-automated control. Indeed it is widely predicted that automated driving will become more widespread in the near future [2]. This is perhaps best illustrated by the fact that numerous research organizations and major companies have developed working autonomous vehicle prototypes, including Mercedes Benz, Google, Bosch, Nissan, Toyota, Audi, among others. Indeed BMW expects to see "highly automated" driving functions available in its models by 2020 [8]. The subject is also being taken seriously at government level with three US states already having laws [9] and the UK planning to introduce them by the end of 2013 [1].

The most recent definition of California's DMV defines autonomous vehicles as "any vehicle equipped with autonomous technology that has been integrated into that vehicle" [3]. Another common definition of autonomous cars is a "vehicle capable of fulfilling the human transportation capabilities of a traditional car … capable of sensing its environment and navigating without human input [5]". While The National Highway Traffic Safety Administration[1] extends this by providing five levels (zero to four) of automation these are: (0) No automation, (1) Function Specific Automation (2) Combined Function Automation (3) Limited Self-Driving Automation and (4) Full Self-Driving Automation. Each provides for an ever increasing degree of

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[1] http://www.nhtsa.gov/

automation and with it a set of new challenges in terms of supporting automated driving. The increasing scale also opens up the potential to explore new services and user interface technologies.

Autonomous cars are not the only challenge being faced by industry and researchers. Indeed the plethora of new media, services and devices which can exist within car environments either for use by the drivers or passengers, including those which combine these elements into gamified environments such as VW SmartDrive and traffic congestion reduction approaches suggest a need to radically re-think the way we conceive the in-car experience. Indeed until comparatively recently the idea of drivers playing "games" in cars or engaging in micro-entertainment would have been largely outside the scope of what was considered acceptable from a safety perspective. These new experiences often require the exploration of novel interface techniques such as haptics, natural user interfaces, auditory or subliminal cues. Yet, to date the car itself remains comparatively bereft of these new approaches on account of the quite rightful set of safety considerations.

This workshop will aim to collect different, radical, innovative, versatile and engaging works that challenge or re-imagine human interactions in today's automobile space. It will seek to challenge existing thinking by exploring what is possible both now and by the time the autonomous vehicle is a standard feature of our roads. Participants will be encouraged to suggest alternative concepts whether low fidelity, high fidelity, or both. Especially encouraged will be works that are experiential and can be demonstrated hands on. The workshop will be an opportunity to re-shape the conversation of automobile technology by introducing the community to a new way of thinking. We will include questions on user acceptance and trust [4] as well as the role of insurance companies [7]. Topic areas of potential interest (not exhaustive) include:

- Autonomous vehicles, including specific issues such as handover, legal, ethics and trust

- Novel user interface approaches from haptics to subliminal information

- Usability testing and user acceptance, including metrics and analysis approaches.

- The social car, from a current human centred social networks perspective to one where cars have greater control.

- Entertainment for drivers and passengers, including gamification.

2. WORKSHOP STRUCTURE
The proposed format for the workshop consists on a full-day session. The workshop will be made up of presentations, discussions, and a hands-on activity.

2.1 Detailed Schedule
9:00 – 10:30 –Participants will introduce themselves as well as his or her interest, experience, and perspective on the topic and current research, if available.

During this time, each participant will be asked to rank the proposed areas of discussion (as listed in the introduction, that will also be provided to participants prior to the workshop). The

collectively top 4 ranked areas will be further addressed during the workshop.

10:30 - 11:00 -Coffee Break

11:00 - 12:00 –First Group Session. A discussion of two major topics identified.

12:00 – 1:30 – Lunch

1:30 - 2:00 –Second Group Session. A discussion on two further major topics.

2:00 - 3:30 - Hands on Activity (in small groups)

The goal of the activity will be to produce a concept, solution, or thoughtful point of view to be presented to the group. The activity will follow a rapid design approach. Required materials will be provided by the organizers.

3:30 - 4:00 -Coffee Break

4:00 - 5:00 –Each small team will share the concept with the group and a discussion will be encouraged.

6:30 –After Workshop Dinner (TBD)

3. WORKSHOP AUDIENCE
We would like to invite practitioners and academics from a range of disciplines, including design, marketing, anthropology and ethnography, sociology, engineering, and computer science. We would aim for a workshop of approximately 16 -20 individuals with a good representation of different disciplines. Registered participants will be contacted to prepare a short biography as well as their motivation to join the workshop before hand, but they will NOT be required to submit a position paper. Details will be communicated within the call for participation.

A website, listing pertinent dates and distributing information, will be set-up by the workshop organizers. This website will be used for publicizing the workshop amongst peers in the academia and industry as well as to share any pertinent research and information on the topic. The call for participation will be distributed via HCI, UX and Automotive UI related mailing list (e.g., chi-announcements). We will further use our own/personal distribution lists and social network.

4. EXPECTED OUTCOMES
We aim to help engaged participants to develop their provocative ideas and express them clearly. These ideas then provide new angles from which to understand the field. This increase in perspectives, coupled with a confidence that a good idea will eventually form itself into a practical mainstream solution, increases with richness of thinking within the community. Additionally, we aim to create a collection of such works and distribute it in appropriate channels such as publications in journals or interest. One venue could be Interactions (ACM), as an example. We also aim to build a network with and for the attendees (and those with similar thinking) to rely on each other and further collaborate on their novel ideas.

5. ORGANIZERS BACKGROUNDS
Manfred Tscheligi is Professor for the HCI & Usability at the University of Salzburg and was Conference Chair for the 3rd Conference AutomotiveUI 2011. David Wilfinger, Research Fellow, and Alexander Meschtscherjakov, Assistant Professor, together directs the car team at the HCI & Usability Unit at the University of Salzburg. Carlos Montesinos and Dalila Szostak are researchers at the Interaction and Experience Research

Laboratory, Intel Labs, currently focusing in the area of transportation. Rod McCall is the leader of the IGNITE (Interaction, Games and Novel Interface Technologies) research collective at SnT, University of Luxembourg. Rabindra Ratan is an Assistant Professor at Michigan State University's Department of Telecommunication, Information Studies, and Media. Alexander Muir is Senior Design Researcher in Microsoft Corporation's Connected Car division, leads the UI Research efforts to explore and assess the next generation of infotainment experiences.

6. REFERENCES

[1] Action for Roads A network for the 21st century. Presented to Parliament by the Secretary of State for Transport by Command of Her Majesty. Available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/212590/action-for-roads.pdfJuly 2013

[2] Arth, Michael E. (2010). Democracy and the Common Wealth: Breaking the Stranglehold of the Special Interests. Golden Apples Media. pp. 363–368

[3] "Autonomous Vehicles". State of California Department of Motor Vehicles.

[4] Beattie, D. Baillie, L., Halvey, M., and McCall R Maintaining a Sense of Control in Autonomous Vehicles via Auditory Feedback. 4th International Workshop on the Perceptual Quality of Systems. September 2-4th 2013, Vienna Austria (to appear).

[5] Bishop, Richard (2005). Intelligent Vehicle Technologies and Trends. Boston: Artech House. p. 300Thrun, Sebastian (2010). "Toward robotic cars". Communications of the ACM (Association for Computing Machinery) 53 (4): 99–106.

[6] Knobel, Martin, et al. "Clique trip: Feeling related in different cars." Proceedings of the Designing Interactive Systems Conference. ACM, 2012.

[7] Light, Donald (8 May 2012). A Scenario" The End of Auto Insurance.

[8] The car that parks itself, The Economist Newspaper Limited, Jun 29, 2013

[9] Yvkoff, Liane (27 April 2012). "Many car buyers show interest in autonomous car tech". CNET.