TRUST IN AUTONOMOUS DRIVING

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Abstract
As drivers need to trust their autonomous cars we have to rethink how to design the communication between the autopilot and the driver. I propose to differentiate between driver-car-interactions that create confidence in autonomous driving and interactions that create a real trust relationship. I believe that we have to design interactions that allow the driver to trust the car as he/she would trust a human driver.

Research interests
Compared to previous innovations in the driving related environment, autonomous driving introduces new challenges. As for the first time the driver willingly puts his/her fate into a machine. Fundamental to the driver-car relationship is trust that the driver places in the car. If the driver does not trust the car to perform well, the experience will be unpleasant and the autopilot won't be used.

Already existing highly automated features, such as parking or traffic jam assistants, try to gain the driver's trust through proving technical competence. In many cases this means visualizing sensor data relevant for the function of the assistant. Even recent studies on interaction and trust calibration in autonomous cars usually just highlight other recognized traffic objects,

such as cars and signs, or provide the driver with simple bar charts[1]–[3].

I believe that these competence centric visualizations support the creation confidence, however, fail to create real trust. Therefore I propose to differentiate between systems that help to build confidence and systems that use interactions and visualization to create real trust in the car, in a way as you would trust a human driver.

The autopilot can't demonstrate its competence to the driver in rare extreme situations (e.g. near accidents); hence the autopilot needs to be trusted in a more interpersonal way that is not solely based on factual experience and knowledge. Literature on trust in autonomous systems [4] often focuses on the experience of past performance and expects a deep understanding of the automated system by the user. Neither is the case in autonomous driving.

As autonomous driving becomes a standard option in modern cars, the autopilot functionality has to respond to the needs of many different user groups: aside from the technological interested early adopter, who is open to trust the autopilot and enjoys rather technical visualizations, less technological experienced people have to be convinced to trust the automation in a way they find it understandable and enjoyable. Especially on long trips the autopilots actions have to be understandable and predictable while being unobtrusive.

Motivation

Since it is very difficult to reproduce the autonomous driving experience in a simulator and very few people have experienced a ride in an autonomous car firsthand, I hope to gain valuable insights through exchanging, networking and brainstorming with other researchers who work in this area. I think that many security critical situations in autonomous driving, such as handover situations, are well understood, however, the experience of autonomous and highly automated driving is less explored.

Personal Information

I am a media informatics student at Ludwig-Maximilians-Universität Munich. The focus of my master program is on human computer interaction. Currently I am writing my master thesis on trust in autonomous cars in the context of windscreen displays.

As I have focused on human computer interaction from the beginning of my undergraduate studies, I have had several lectures and projects on topics like interaction design, tangible media and concept development. As part of my bachelor I also took lectures in fundamentals of psychology and human factors in engineering.

If possible I would like to participate in the pre-workshop program.

References

[1] T. Helldin, G. Falkman, M. Riveiro, and S. Davidsson, "Presenting system uncertainty in atomotive UIs for supporting trust calibration in autonomous driving," 2013, pp. 210–217.

[2] L. Lorenz, P. Kerschbaum, and J. Schumann, "Designing take over scenarios for automated driving: How does augmented reality support the driver to get back into the loop?," *Proc. Hum. Factors Ergon. Soc.*

Annu. Meet., vol. 58, no. 1, pp. 1681–1685, Sep. 2014.

[3] S. Stockert, N. T. Richardson, and M. Lienkamp, "Driving in an Increasingly Automated World – Approaches to Improve the Driver-automation Interaction," *Procedia Manuf.*, vol. 3, pp. 2889–2896, 2015.

[4] D. H. McKnight and N. L. Chervany, "Trust and distrust definitions: One bite at a time," in Trust in Cyber-societies, Springer, 2001, pp. 27–54.