Our newsletter aims to provide you with regular updates on news, current topics and dates of interest relating to the SAFIR research partnership. We look forward to your feedback as well as constructive suggestions and requests for changes!

News from SAFIR Cluster 1

The impulse project "Mixed reality test environment for safety functions in highly automated driving" (funding reference number: 13FH7I01IA) is run by Prof. Andreas Riener as part of the SAFIR cluster “Simulation-based test systems for the pre-crash phase”, which deals primarily with the validation of functions for automated driving, In the following we would like to share some results of the research work carried out as part of the subproject “Cognitive models and subjective evaluation measures”. In the second part of this newsletter, we will discuss the exploratory project “Development of a test vehicle for project-overarching function integration (AutoBit)”, which will start this year under the direction of Prof. Werner Huber, subject to approval and funding by the BMBF as part of the FH-Impuls programme.

Research focus “Human Factors”: takeovers in automated driving

Even once technical obstacles have been overcome, human beings will still have to take over control of vehicles in (critical) situations in the course of automated driving. As part of this impulse project, Prof. Riener's research group is investigating new interaction concepts and questions of trust and acceptance – with the primary goal of increasing vehicle safety. Among other things, the idea of automated driving is that the driver will be able to attend to other matters while travelling. At low automation levels, however, there may be regular requests from the vehicle to take over, to which the driver must respond by taking over control as quickly as possible. For example, solutions have been developed to integrate private mobile devices as effectively as possible into in-car user work processes.

One study[1] examined whether a planned takeover would have a positive impact on driving performance and cognitive stress. The idea: if takeover times are known at an early stage, the request could be planned (delayed) depending on the context so that the still ongoing activity could be safely terminated beforehand. Results confirm that vehicle takeover actually takes place more quickly and more precisely in such a scenario. When drivers were asked to take over a task, however, they often tried to complete the task beforehand (e.g. finish writing a message) – a potential safety risk that could be prevented by blocking the device when prompted to do so.

Left: Vehicle takeover at boundaries between tasks is faster and more precise than when an activity is interrupted. Right: Studies have shown that in critical situations, taking over control of a vehicle using a tablet rather than the conventional steering wheel significantly reduces response time and enhances user experience (sources: THI).

Even if a surprising takeover were to occur, however, device integration could be advantageous. In a second study[2] it was evaluated whether, in an emergency, it would be possible to take over control of the vehicle directly using a mobile device, similar to a video game. The assumption was that this would save valuable time that would otherwise be required to move the device and grab the steering wheel. Here, too, it is clear that takeover at the tablet is significantly faster.

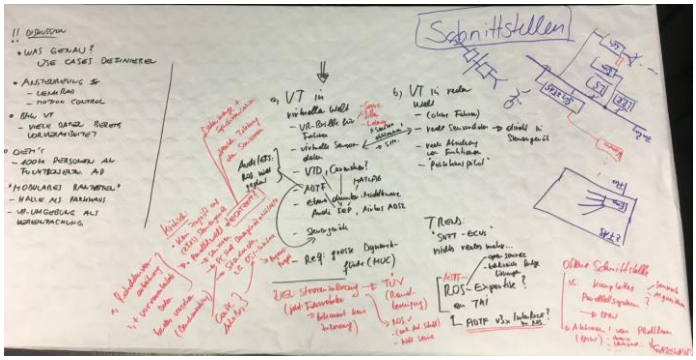
Both studies show that smart integration of mobile devices in the vehicle and embedding the entire system in the digital transport ecosystem offer considerable potential for increasing safety and user satisfaction.

“AutoBit”: development of a test vehicle for cross-project function integration

The foundation for this project was laid at an innovation workshop held in July 2018 on the subject of “Test vehicles – from the raw platform to operation”. The participants were THI professors and research assistants along with representatives of the industrial partners EFS GmbH, Ibeo Automotive Systems and Vires Simulationstechnologie GmbH. Those involved jointly defined the interfaces, the required infrastructure including sensors/actuators and the functions to be considered.

[1] Wintersberger, P., Riener, A., Schartmüller, C., Frison, A.-K., & Weigl, K. (2018). Let Me Finish Before I Take Over: Towards Attention Aware Device Integration in Highly Automated Vehicles. In Proc. AutomotiveUI 2018, Toronto, ON, Canada, September 23-25, 2018 (pp. 53–65). https://doi.org/10.1145/3239060.3239085

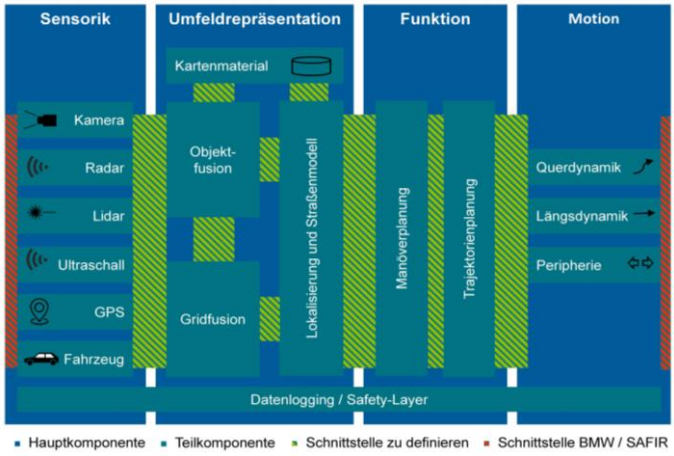
[2] Schartmüller, C., Riener, A., & Wintersberger, P. (2018). Steer-By-WiFi: Lateral Vehicle Control for Take-Overs with Nomadic Devices. In Adjunct Proc. of AutomotiveUI 2018, Toronto, ON, Canada, September 23-25, 2018 (pp. 121–126). s://doi.org/10.1145/3239092.3265954



At the innovation workshop, work was done on the areas relevant to the design of the planned test vehicle (Source: THI).

The project is focused on a vehicle platform that is to be set up as an integrative test vehicle in software and hardware for testing highly automated driving functions. This is to be made available to the independent development teams in the SAFIR clusters as well as the teams at the CARISSMA research centre, in particular in order to promote networking between them.

For this purpose, the vehicle is to be equipped with sensors, one or more control units for the processing logic and read/write access to the vehicle bus systems via gateways. The entire infrastructure is to be installed in the vehicle and made available to the outside world via appropriate function interfaces using open source software. We attach great importance to the openness of the individual components, versatile application possibilities and clearly understandable documentation in order to enable flexible development and integration of vehicle functions. The key aim of “AutoBit” is to offer vehicle deployment options for various issues arising from the SAFIR subprojects. The plan is also to use the vehicle as a central element beyond the end of the project for the planned intensification phase of SAFIR. Due to the limited time and financial resources available, the project does not include development and integration of a driving function.



Planned vehicle infrastructure of the test vehicle (source: THI).

In contrast to the CARISSMA vehicles controlled by driving robots, this test vehicle enables a realistic and future-proof solution for functional testing in the test hall, in the outdoor testing grounds and on the road. In addition, the project enables researchers to gain expertise in test vehicle construction and operation, which will subsequently be of enormous value in terms of future research in the field of highly automated driving at THI. Expertise can be acquired in practical use and data processing in the vehicle as well as on the scientific side. In addition, it will be possible to share this practical knowledge with students in the form of semester projects. Unlike vehicles that companies/OEMs optimise to integrate their own functions, this test vehicle can be used flexibly. Potential projects would include SME projects that might have a leverage effect, since SMEs often have innovative ideas but lack the resources for the construction and operation of their own test vehicles.

You are also welcome to visit our website:
https://www.thi.de/forschung/safir

GEFÖRDERT VOM
Bundesministerium für Bildung und Forschung
FORSCHUNG AN FACHHOCHSCHULEN

Note

If you no longer wish to receive the newsletter, please let us know by e-mail.