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!

Camila Heller: New program coordinator for SAFIR

Fig. 1: Camila Heller

After a few months of vacancy, the SAFIR coordinator position was filled by Ms. Heller. After several years of professional activity in Brazil, for example at the DAAD office in Rio de Janeiro, she will accompany the SAFIR intensification phase in the future. At the DAAD, Ms. Heller was responsible for various funding programs as well as for the Brazilian-German network for the internationalization of higher education (Rebralint).

News from SAFIR Cluster 1

Within the SAFIR Cluster 1 "Safe Automated Mobility" under the leadership of Prof. Dr. Andreas Riener, the basic functionality of the so-called "Mixed Reality Test Environment" was implemented and tested in individual situations in Impuls Project IP1 during the set-up phase. In the intensification phase, impulse project IIP1 is concerned with the mixed reality-supported safeguarding of safety-critical automated driving functions ("MIRASOFT").

Problem definition

The quality of driver assistance systems is determined by defined test cases (e.g. according to NCAP) and results in a star rating. However, it is almost impossible to recognize the actual quality of the system - especially in critical situations. In tests according to the test protocol, for example, the speed of both the first-person vehicle and the object of interference (dummy, e.g. pedestrian, cyclist) is gradually increased and it is measured in each case whether the system (still) reacts to the object and, e.g. in the case of AEB, brakes in time and thus protects the unprotected road user. However, the points given in stars do not indicate which test cases were actually passed and which were not. Typically, tests at low speeds are passed, tests at higher speeds tend to be less good; the limit value of a particular function is not provided by the star rating. Another problem with these tests is that they take place under idealized conditions. Testing is usually done only in clear weather and not in rain, fog, snowfall, or darkness. Future tests in automated driving are infinitely more complicated. Systems consist of fused data feeds from multiple sensors. The number of possible test cases that may occur when the vehicle is on the road in an automated manner are incomparably higher. Only simulation-based methods can be used meaningfully for qualified system evaluation, as can also be read in the Euro NCAP 2025 Roadmap. However, preliminary work on this is still thin on the ground internationally.

"MIRASOFT": mixed reality-based safeguarding of safety-critical automated driving functions.

Building on the results of the set-up phase, IIP1 will advance the further development of the MR environment on the basis of open, standardized interfaces in three subprojects (TPs).

TP1 deals with the modeling of the behavior of unprotected road users (UVTs, e.g. cyclists, pedestrians, eScooter/eBike riders, etc.) in traffic circles and intersection situations and under special consideration of weather conditions. Through user studies in different degrees of reality, movement patterns of test persons are recorded in order to validate to what extent the behavior in virtually conducted experiments corresponds to reality. Subsequently, these data are used to model UVT behavior by statistical methods. The goal is to generate realistic UVT models for simulation.

Fig. 2: SAFIR IIP1 MIRASOFT: Virtualization of Euro NCAP tests. Source: THI

In TP2, critical situations are investigated from the driver's perspective, focusing not only on safety but also on improved interaction between driver and vehicle. Augmentation and physiological sensors will

be used to improve situation awareness through driver state recognition and lead to safer operation. Furthermore, the understanding of algorithmically made system decisions shall be increased by system transparency.

TP3 prepares the integration of TP1/TP2 into a common overall architecture for virtual-real driving tests. For consistency reasons, the Open Simulation Interface (OSI) will be used and test methods based on the project results obtained in the set-up phase will be integrated.

The results of MIRASOFT, synchronized with the exploratory project EP1 Autobit as well as the architecture project IIP2 starting in 2023, will lead to an extended NCAP-based test scenario. In addition to the individual research contributions in the key topics, IIP1 MIRASOFT shows how auto-mated vehicles could be safeguarded in the future based on simulation.

Start of Impulse Project 4 "AVENUE"

The SAFIR impulse project 4 "AVENUE" (Automated and networked electric vehicles before, during and after an accident) started on 15.04.2021. The project is located at the CARISSMA Institute C-ECOS under the direction of Prof. Dr. Hans-Georg Schweiger. Cooperation partners are DEKRA Automobil GmbH and FSD Fahrzeugsystemdaten GmbH - as a central body according to the StVG (Road Traffic Act). The project is divided into two main research areas: traffic accident reconstruction and periodical technical inspection (PTI), which is known in Germany as the main inspection according to § 29 StVZO (Road Traffic Licensing Regulations).

Traffic accident reconstruction

The focus of this research is the extraction of digital traces from (electric) vehicles involved in accidents as well as the reconstruction of the influences of driver assistance systems (FAS) and automated driving functions (AF) on a traffic accident sequence. Due to the close cooperation with the accident analysts of DEKRA Automobil GmbH, it is possible to obtain valuable information from real traffic accidents. Furthermore, a test vehicle is being procured at CARISSMA, which is to be built up into a test platform with measurement technology. This vehicle will be used to simulate real accident scenarios, especially with pedestrians, cyclists and e-scooter drivers, under different environmental conditions. The focus here is on Proving Ground and Vehicle-in-the-Loop tests. In addition, research is being conducted on the visualization and "experienceability" of traffic accident events, especially in the area of driver interaction with FAS and AF. This is done in order to be able to present difficult technical circumstances in a comprehensible way for judges, affected parties and their lawyers, etc. in the context of court proceedings. In addition, work is being done on the development of a Forensic Event Data Recorder, which is to be installed in the test vehicle and will record accident-relevant data.

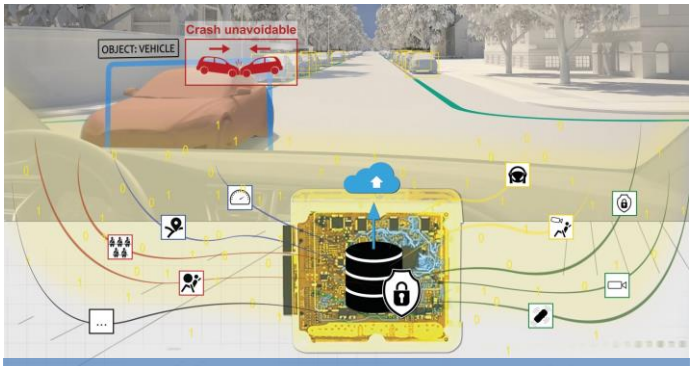

Fig. 3: Holistic EDR concept with C2X integration
Source: FSD GmbH/K. Böhm

Periodical Technical Inspection (PTI)

Up to now, the functionality of driver assistance systems can only be checked to a very limited extent as part of the main inspection. For this reason, AVENUE will develop methods for checking both FAS, AF and C2X communication in the future as part of a more advanced PTI. The aim is to prevent traffic accidents and thus increase vehicle safety. FSD Fahrzeugsystemdaten GmbH has been acquired as a competent research partner in this field. As a central body under the Road Traffic Act (StVG) of the Federal Republic of Germany, it is responsible for the development of innovative technologies for testing current and future vehicle systems.
The topics of traffic accident reconstruction as well as PTI topics are strongly interdisciplinary and therefore offer the ideal opportunity for a cooperation on the level of the impulse projects as well as cross-institute cooperation. We are very much looking forward to this in the next four years.

GEFÖRDERT VOM
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