

# **LARGE-SCALE FOT FOR ANALYZING THE IMPACTS OF ADVANCED DRIVER ASSISTANCE SYSTEMS**

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## **ABSTRACT**

The euroFOT project is the first large-scale Field Operational Test (FOT) of multiple advanced driver assistance systems (ADAS) in Europe. It will evaluate, using instrumented vehicles, the impacts of ADAS on safety, traffic efficiency, environment and user-acceptance in real life situations with normal drivers. The results of the evaluation of this field test will offer valuable information for the short and long-term impact of ADAS. Altogether, about 1000 vehicles from different manufacturers and with different ADAS will take part in the FOT and are coordinated by five vehicle management centers (VMC). The project duration is 40 months and it will end in August 2011. At the German1-VMC the data acquisition and data processing from 240 FOT vehicles is managed by the Institut für Kraftfahrzeuge of the RWTH Aachen University (ika). The tested functions cover Adaptive Cruise Control (ACC), Lane Departure Warning (LDW), Forward Collision Warning (FCW) and Curve Speed Warning (CSW). Thereby only data from the vehicles' CAN busses is used at the German1-VMC (e.g. vehicle speed, acceleration, etc.).

**Topic:** Intelligent Vehicle Safety (8)

**Subtopic:** Advanced Driver Assistance Systems (8.1)

## **INTRODUCTION**

In this paper the data retrieval process, the methodology as well as the analysis of the enormous amount of data are discussed. At ika the data retrieval and storage processes for the German1 fleet will be defined and finally developed. All vehicles of the fleet are equipped with data acquisition systems (DAS), which enable recording and temporary storage of all relevant measured values as well as transfer of previously recorded data to a central storage server. The

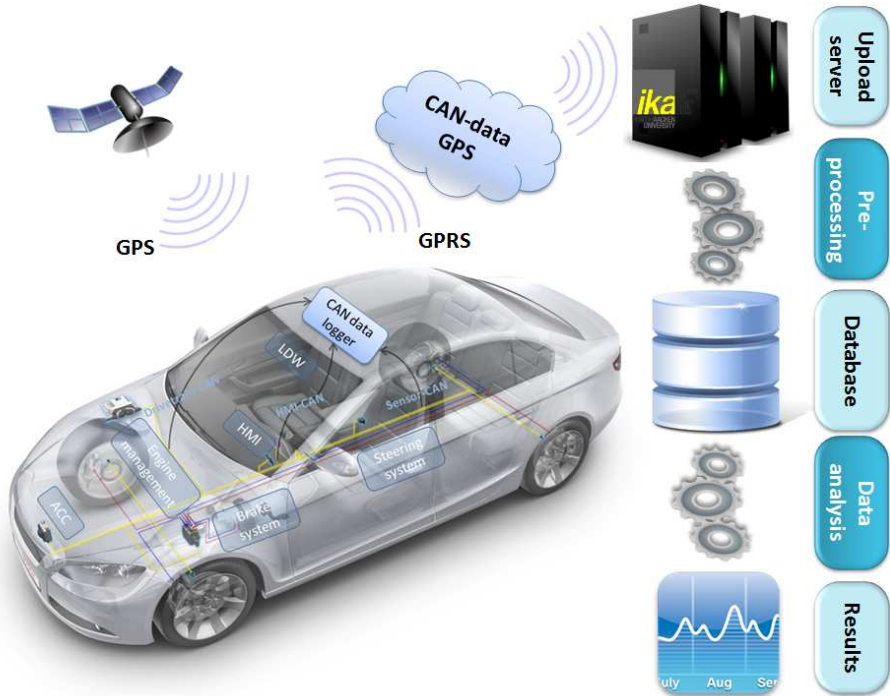
estimated amount of data at the German1-VMC adds up to approximately 12 TB, considering a duration time of one year for the field test (1).

## THE FOT

Based on the identified research questions and the pre-defined hypotheses to be tested, the required signals and data sources are identified. The availability of the data has been checked, in order to avoid that relevant data is missing for the analysis at the end. For the data acquisition a DAS for collecting CAN-data as well as GPS is used.

## DATA ACQUISITION

The DAS at the German1-VMC offers the possibility to communicate with the device during the operational time of the field test using an integrated GPRS module. The figure below presents an overview of the process stages of the German1-VMC approach. These stages are data acquisition, pre-processing of data, storage and monitoring of operation as well as analysis of the final results.



**Figure 1 Data processing and data flow at the German1-VMC**

This offers the opportunity to realize two functionalities – monitoring and data upload – which are of importance for the execution of the FOT and thus one key feature for an automation of the data processing and fleet management. Autonomous operation means that no user interaction – neither on the driver side nor on the operator side – is required as long as no critical situation is detected. At the same time the drivers are totally kept out of the data retrieval

loop. No training of the drivers participating in the field test is needed and the probability of loss of data, due to maloperation is excluded. The drivers can fully concentrate on the driving task and by this means the maximum achievable natural driving behaviour can be achieved.

The acquired data consists of data from the FOT vehicles (CAN signals and GPS) as well as data from external sources (attributes from digital map e.g., road type, speed limits etc.). This data is merged within the pre-processing phase. At this step of the FOT all recorded data is analysed with respect to usability and data quality.

## **METHODOLOGY**

Afterwards the data is classified into specific events (e.g., incident, lane change etc.) and situational variables (e.g., weather condition, road type etc.), in order to optimize the analysis of the data by considering only relevant data sets. Using the clustered data, performance indicators (PI), such as average speed or time headway, are calculated. Each PI is used in the testing of hypotheses that have been specified by the consortium partners. There are hypotheses relating to the various types of impacts and user related aspects, e.g. "ACC increases average time headway". For testing of the hypotheses an experimental design is defined, which provides a reference standard against the effects of the respective system or systems can be compared. This is the main purpose of the three month baseline period at the beginning of the FOT. Within the baseline period the drivers are driving with inactive systems. After the baseline a nine month treatment period follows, where the drivers are encouraged to use the systems.

## **IMPACT ASSESSMENT**

Within the impact assessment effects on the EU level for the functions tested on traffic efficiency, safety and the environment at various penetration rates (low / medium / high) are analysed, which will be used as input for the cost benefit analysis (CBA). The impact assessment translates effects found for the equipped fleets and trips made in the FOT to the EU level. This means scaling up of the effects found in the FOT data, in certain situations, or for certain groups of drivers (2). This leads to an understanding of the effects of functions if they would be used in the entire European Union (by a small or larger part of the drivers).

The final paper will offer more insights into the data retrieval, analysis as well as the methodology behind the FOT.

## **REFERENCES**

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