MAPS & ADAS

Validating the ADAS Interface using Active Cruise Control

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Abstract

The MAPS&ADAS subproject within the EC PReVENT Integrated Project seeks to develop, test and validate appropriate methods in gathering, certifying and maintaining ADAS attributes to enable the provision of ADAS maps as well as a standardized interface from navigation systems or general positioning and map systems towards ADAS that make use of map data (e.g., for track preview purposes).

The development of Advanced Driver Assistance Systems (ADAS) and, more generally, of in-vehicle ITS applications which support the driver in driving safely, comfortably and economically, are of major importance to the automotive industry. Typical examples of ADAS-Applications are Adaptive Cruise Control (ACC) or Adaptive Light Control (ALC). ADAS currently perform their function on the basis of information generated by sensors observing the vehicle’s environment. There is a significant potential for the use of a digital map and the vehicle’s position to predict the road geometry and to track related attributes ahead of the vehicle. ADAS-Applications can benefit from this potential, and new functionality may likely be enabled. In particular, ADAS-Applications will use map data for recognizing road infrastructure conditions at the vehicle’s current position, and for a preview along the track ahead.

The concept ADAS in the PReVENT project will be a major focal point of the EU research project. ADAS are aimed at reducing high workloads on the driver and mitigating the consequences of specific driver deficiencies. One important activity comprises ACC, a series system for assistance in longitudinal control with the integrated navigation system.
However, because of the limitations of their sensors, driver assistance functions at best possess only part of the information needed to describe the whole situation, see Figure 1.

![Figure 1: Drivers View / ACC View](image)

Consequently, the driver will always experience a deficit in his or her expectations if the subjectively perceived information does not correspond to the full picture of the driving environment. First approaches of map-supported ADAS entering the market will probably use the vehicle’s navigation system as the map data source for this preview. The advantages of using the navigation system are that it already has a stored record of the map data, and it already performs the tasks of vehicle positioning and map matching. These functions can readily be used also for the ADAS preview.

However, each navigation system stores map data in a system-specific format, and uses its own version of vehicle positioning and map matching. Moreover, when tailored to single ADAS-Applications, the variety of different map interfaces may expand even more – not only due to different data sources, but also due to application-specific differences. By standardizing access to the map data, irrespective of the data provider and physical storage format, and by standardizing the way that position and track ahead information is presented to the applications, ADAS software can focus on performing its main task without having to deal with the complexities of map representation. To use this experience in the best way possible for the development of the ADAS standard protocol, the first prototype of this standard will
be implemented within a BMW 5 Series vehicle. Figure 2 shows this prototype will enable comparison with the existing BMW protocol, a check of consistency with BMW vehicle network and valuable input for the further refinement of the MAPS&ADAS standard.

Figure 2: BMW test vehicle with the ADAS interface and ADAS horizon

Map data access for most ADAS-Applications will normally use only a small map extract around the current vehicle position. This ADAS-specific map extract is called the ADAS Horizon (AH). It is expected that the navigation system supplier will add a module to the navigation system that extracts the ADAS Horizon data from the map and sends it across the ADAS-Interface as shown in the architecture Figure 3.

Figure 3: ADAS interface and ADAS horizon
This paper will show the results of the implementation and validation of the MAPS&ADAS interface for a precision navigation in ACC. Some improvements and additions to the protocol are described. The paper explains further how driver assistance systems, using ACC as an example, can take advantage of navigation data. The operational concept of the assistance function has to be designed according to the particular properties of this additional data source. Even with the quality of navigation data available today, BMW’s ACC system can be enhanced by dynamics, which adapt to the situation, providing even more benefit for the customer. Furthermore, considerations and a comparison of the BMW protocol with the MAPS&ADAS protocol are given.

Further development and improvement of the ADAS Interface and protocol developed, tested and validated within MAPS&ADAS will be carried out by the ADASIS Forum and its 26 Members from vehicle manufacturers, ADAS suppliers, navigation system suppliers and map providers.

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