

Evaluation of Automotive Vision Systems – Innovations in the development of video-based ADAS

Dr. Eric Wahl, Dipl. Ing. Florian Oszwald; BMW Group, Germany

Recent developments in automotive industry still show a trend towards *advanced driver assistance systems (ADAS)*. These are applications, which interpret the sensor inputs, while the calculated results assist the driver in form of provided information or active participation in current driving manoeuvres. Especially camera-based ADAS promise an enormous potential, due to the mass of provided information. Thus the combination of a camera and a capable processing unit build the base for numerous different functions. Both components, the camera as well as the processing unit and the corresponding algorithms massively determine the potential and the limitations of according applications. This paper discusses hardware and software issues and introduces new innovations in the evaluation process of camera based driver assistance systems.

For camera-based ADAS, the camera is a core component, which determines the performance of the whole system. In order to get the best results, different parameters of the camera have to be evaluated with respect to a single application or a conglomerate of multiple applications. Here, a system development is often characterized by several goals, which lead to complementary system demands. To find the best compromise, which will maximize proper working conditions, it is essential to evaluate the lens, the imager and the whole camera as one component. Moreover, the development of ADAS meets challenges with respect to complexity, modularity, and finally the quality assurance process. This work addresses two essential issues in the evaluation of ADAS functions.

First, it is the design and setup of an evaluation framework. The fundamental conditions one has to face here, is to realize an environment which can be used to demonstrate a target application in online and offline mode. The concept of the introduced runtime environment provides a solution for the valuation of complex ADAS, consisting of several functional parts. It allows focusing on the single system components as well as on the total system, too.

The second issue with respect to ADAS evaluation addresses testing methods. Since an ADAS function strongly depends on sensor inputs derived from complex real world situations, the testing methods require special attention. Here, the focus lies on the test design. It is discussed which functional aspects can be evaluated in relatively controlled environments, e.g. like test tracks and arranged scenarios, and which aspects demand driving on public roads. Furthermore, an outline will be given on how to use extensive automation for lab testing. It will be shown how testing benefits from the combination of a modular runtime environment, car to car communication and differential GPS.