

# A Learning Vehicle for Forward-Looking Driving

## Ein lernendes Fahrzeug für vorausschauendes Fahren

M.Sc. **A. Carlsson**, IVK, Universität Stuttgart, Stuttgart;  
Prof. Dr.-Ing. **H.-C. Reuss**, Universität Stuttgart, IVK, Lehrstuhl  
Kraftfahrzeugmechatronik, Stuttgart;

### Abstract

It has been shown that a driver assistance system using foresight information can reduce the fuel consumption with up to 15% [1][2]. For this, information about e.g. road gradients, curves, intersections and speed limits is necessary [3]. The currently available digital maps do not contain the required information, and the preparation and updating of such maps are associated with high costs. Instead of a map, a self-updating system based on appropriate vehicle sensors and a simple data storage facility is currently developed at the Institute of Internal Combustion Engines and Automotive Engineering (IVK) at the University of Stuttgart. The sensors of the system gather information about the road characteristics and this information is analysed with some added software algorithms for situation detection. The identified events are stored in a vehicle internal database and can in subsequent drives be used to improve the function of some efficiency, comfort or safety systems. Based on the fact that many vehicles repeatedly travel the same route, the validity of the identified events can be improved and updated by each passing of the event, i.e. a learning process. Possible fields of application are beside fuel efficient power train control, also improved curve speed warning and adaptive headlights as well as improved controlling of the energy flow in hybrid powered vehicles.

### 1. System functionality

Figure 1 shows a flow diagram for the detection, identification and learning processes needed for the implementation of a driver assistance system using foresight information. The right hand side of the figure illustrates curve detection as an example. The development of the software algorithms for the situation detection and identification are based on several thousand kilometres of real test drives, arranged and conducted through the institute (IVK). By combining the sensor signals monitored during the test drives, information about the characteristics of the currently passed stretch of road can be continuously provided. From