How European GNSS enables support to all levels of vehicle guidance - Examples of ADAS from the project FAMOS

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Vehicle Safety/Driver Assistance

ABSTRACT

Driving can be divided in different levels according to the cognitive demand and the frequency of action. The basic model was developed in 1970 by Bernotat. Further investigations about the vehicle guidance are done by Rassmussen (1986) and Donges (1993). Figure 1 below shows the three-dimension-model of vehicle guidance.

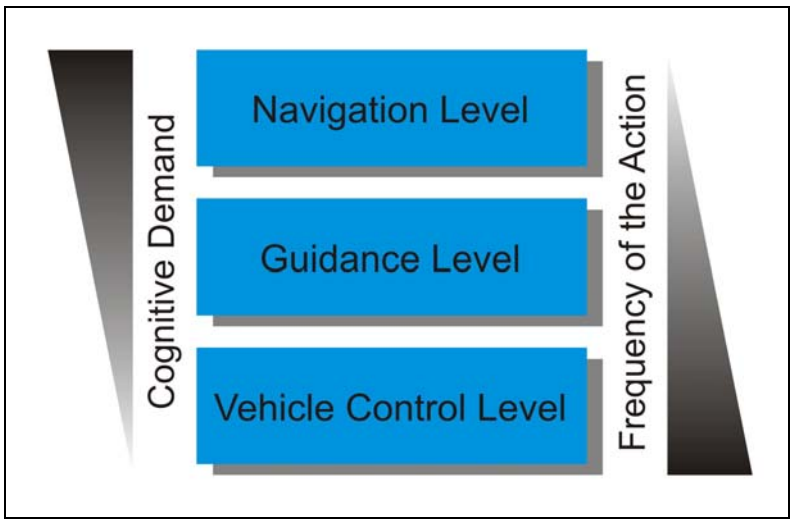

Figure 1: 3-level-modell of vehicle guidance

On the navigation level, high-level decisions based on the aim of the trip have to be made. This concerns for example primary route choice, time coordination of the travel as well as the

adjustment of the route due to possible situational requirements. According to the frequency of action, i.e. the long term character of the task the necessary location based information can also be provided with a lower accuracy as well as the positioning using e.g. GPS like in today's navigation systems. Wrong location data or bad positioning results in a decreasing acceptance according to such systems. The European GNNS will provide an integrity signal which can be used to adjust the positioning algorithms or to inform the user about restrictions according to positioning.

The guidance level contains tasks for the selection of the appropriate manoeuvres. In this case different kinds of location information have to be taken into account. At first static features of a road section like road charging, and second dynamic features, like variable speed limits. For this features the accuracy requirements according to assistance systems are below 10 Meters in longitudinal direction. In lateral direction map matching methods usually can be used to provide the necessary accuracy. In this case again the integrity signal is a strong advantage because unknown system failures causes legal and financial consequences for the user which lead to a considerable reduction of user acceptance. Furthermore, the combination of both systems supports such applications by a higher availability and accuracy. The second group of features considering manoeuvres are the static and dynamic location features, like no thoroughfare or icy road. These features need accuracy below 1 meter in location and positioning in lateral and longitudinal direction for the use in assistance systems. Hence, differential methods as well as first sensor fusions are necessary as a basis for assistance systems.

The lowest level of vehicle control includes all strongly automated actions like steering, acceleration and braking. In this case high requirement according to the accuracy, availability as well as dependability are unavoidable.

The project FAMOS is funded by the Federal Ministry of Economics and Technology in Germany. It is parted into a basic definition phase and a phase of realization of applications. The first phase is nearly finalized, and the second phase is proposed. The main objective depends on the abilities which occur using the European GNSS Galileo and other new technologies to build up new driver assistance and services.

During the definition phase some assistance systems were chosen for a realization in phase 2. One example will be an advanced ACC, which uses high accurate positioning data in combination with a precise map. This assistance will support the driver in adapting the best velocity of the car to the adjacent environment. This will be according to static and dynamic information.

The assistance will only give information about the possible driven velocity and adapt the speed control. At every time, the driver can choose a higher or lower velocity just at he likes it.

There are also other systems in focus like an assistance which will hinder to drive a vehicle in the wrong direction of the street and an assistance which helps to merge into freeways.

A new navigational aid uses local dynamic traffic data in urban environment to create a routing which is accurate to the driven lane.

Own references according to the topic

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