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ANALYSIS OF SYSTEMS FOR AUTOMATIC DRIVING

Governed by the steady increasing travel volume the requirements to go up upon the individual driver during vehicle guidance. In order to support them, in the last years driver assistant systems have been developed. They can be divided by the degree of driver assistant in warnings and information, prescription, correcting interventions up to the takeover of driving tasks. According to the complexity of the driving task there is a big number of systems, which cover with their functions various areas of the driving (for example leading control, longitudinal vehicle guidance).

With increasing complexity of the system functions not only the equipped vehicles but even the surrounding vehicles become influenced by possible malfunctions. Therefore a safety analysis considering the aspects system-, interaction-, traffic-, and legal safety was necessary. Therefore ika/fka together with the Institut für Straßenwesen der RWTH Aachen University (traffic safety) and the RWTÜV (regulations) acquired an observation of the security of various systems.

On the basis of extensive literature investigation and expert-interviews the automatic friction coefficient detection as information system, the automatic traffic sign recognition as system with binding assignment and the collision avoidance system with correcting interventions and takeover of the driving tasks respectively for a detailed observation have been chosen.

In the course of the safety observations the possible failure of individual components and modules are considered. In addition the approaches and the applied valuation methods of the analysis of the system safety are pointed out. Here especially the failure mode and effects analysis (FMEA) and the fault tree analysis (FBA) are to be mentioned. Because of the high expenditure and the insufficient data situation only part systems have been analysed and described in this project.

The interaction safety deals with the effects of the system on the driver. During the observation the results of the field tests are used, which were carried out in the course of various projects. It turns out, that especially the transparency of the system reactions is important for the driver. The system reaction leads to a higher acceptance and to an increased system use on the one hand. On the other hand the intervention of the driver is avoided by what the safety increase through automatic intervention keeps preserved. Similar important is the clearness of system borders. By doing so it can be guaranteed that driver intervenes in time when crossing system borders (for example emergency braking during distance control like ACC as a comfort system).

Considering the traffic safety the effects of driver assistant systems using complete, partial and no equipment of the vehicle fleet are observed.

With the aid of several simulations with the program PELOPS and the evaluation of literature sources the increases of the efficiency of streets through systems for automatic driving have been investigated.

Considering the legal safety the current road traffic law, which has been adjusted to the human driving behaviour was observed. Important in this connection are the "legal borders" (for example the dictated minimum distances) which need to be considered during the development of driver assistant systems.

This safety analysis was extended by observations of the current developments of legal appointments and standardizes in the international comparison (for example with France and Japan). From these descriptions recommendations for future regulations and standards have been derived.

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