Fuzzy Architecture of Safety-Relevant Vehicle Systems

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Abstract

The research discusses the problems of designing the automotive safety systems as comprehensive objects at the interface between the vehicle dynamics control, intelligent transportation systems and human machine interface. Taking into account the extreme uncertainty of the driving environment, the development of reliable safety control systems is possible only on the basis of intelligent analytical methods. In the work under discussion these matters are considered as applied to fuzzy sets.

Despite the existing traditions of fuzzy applications to vehicle design (Kiencke and Nielsen, 2000; von Altrock, 1997), the fuzzy logic has a sufficient potential for the development of advanced automotive systems, especially to ensure the driving safety.

From these positions the research surveys the following issues:

- Automotive active safety and design of relevant control systems;
- Integrated monitoring, identification and forecasting the road conditions on the basis of environmental parameters and vehicle dynamics;
- Design of the combined fuzzy on-board and off-board safety systems;
- Fundamentals of fuzzy identification of the driver for human vehicle interface;
- Progress in fuzzy control for automotive applications using the alterable fuzzy sets.

The main investigated topics are being illustrated with the vehicle test results as well as with the model- and hardware-in-the-loop-simulation.

The presented work generalises and advances essentially the research results obtained by the authors and presented in a number of publications (Ivanov, 2005; Shyrokau and Ivanov, 2008).

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