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Causes, consequences and countermeasures of overtaking accidents on two-lane rural roads

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Abstract

Overtaking accidents have one of the most serious consequences of accidents on German rural roads. The aim of this project was to determine the infrastructural and traffic related variables which influence the occurrence and consequences of overtaking accidents as well as the overtaking behavior of drivers. Finally, diverse correlations between operational and infrastructural road characteristics and overtaking accidents and driver behavior were found out and a catalogue of measures had been developed. The given recommendations will have beneficial influences on overtaking behavior and their practice will lead to an increase in safety on two-lane rural roads.

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1. Introduction and methodology

In 2014, 73,916 accidents with personal injury on rural roads were registered by the police in Germany. Here, 2,019 persons died and other 25,971 persons were seriously injured as reported by DESTATIS (2015). About 6 percent of these accidents occurred due to overtaking maneuvers, but they cause approximately 9 percent of killed and seriously injured persons as analysed with data of DESTATIS (2009). This clarifies that overtaking accidents are one of the most serious accidents on German rural roads.

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Due to such statistic values further research activities and analysis on accidents and their influencing factors are an essential part in the section of road planning and road design. The subsequent advancement of guidelines for the construction and operation of rural roads is a significant contribution for improving road safety. In the literature there are mainly older reports on overtaking accidents and overtaking behavior. For the changing of German guidelines for the design of rural road in 2012 new research had to be conducted to assemble actual values on the topic of overtaking on two-lane rural roads. Which road configuration leads to which overtaking behavior and which is critical for accident occurrence is the result of the mentioned project and theme of this paper.

The main result of the research activities was the finding, that there is a lack of unity of road construction (existing sight) and road operation (configuration of the traffic regulation). Within the complex process of overtaking the driver needs support from the road design in the task of driving to avoid errors and accidents. Moreover, a microscopic accident analysis was carried out to identify the essential facts of accident occurrence. Thereby five typical situations were detected and are involved in the further recommendations. In general, a set of influencing parameters for overtaking accidents and overtaking behavior are identified. Finally, this parameters of real overtaking behavior are used to evaluate possible measures empirically.

This paper contains an overall summary of the results of the above mentioned research project. Here, the findings of the literature, the macroscopic accident analysis, the influence of the configuration of the traffic regulation, the visibility analysis and evaluation of road layout, the detailed analysis of overtaking behavior and recommended measures to avoid overtaking accidents on two-lane rural roads are indicated, which are valuable information's for improving road safety. A scheme of the overall project approach and the content of this paper is depicted in Fig. 1.

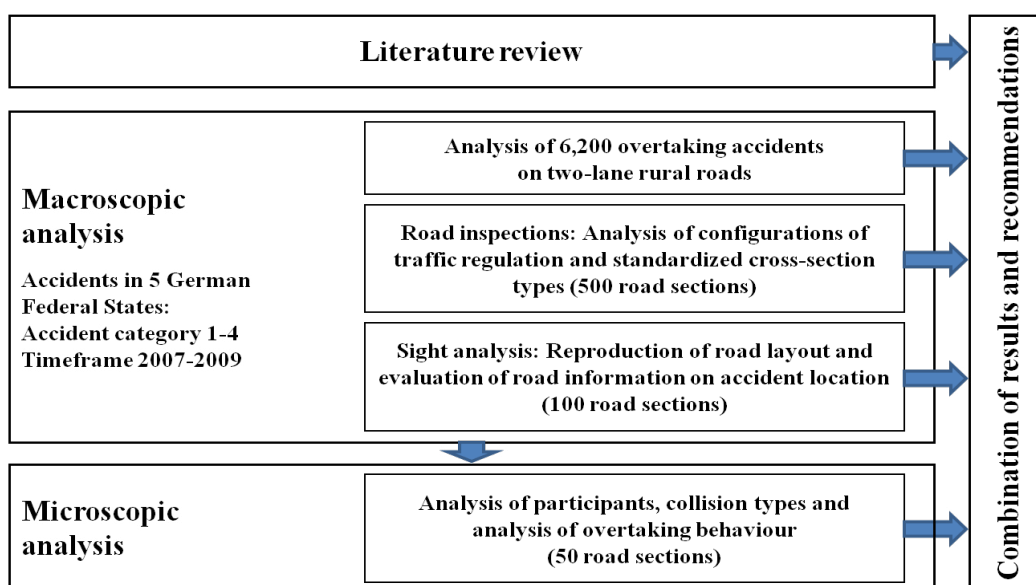


Fig. 1. Scheme of project approach and paper content.

2. Literature review

Overtaking is a very complex driving process with a variety of influencing factors. But the driver is physically and mentally not able to capture all the influencing factors rationally and make a decision based on a weighting. Even overtaking maneuvers under the same boundary conditions and with the same drivers will not be identically, see Netzer (1966). The traffic requirement for overtaking increases fundamentally with increasing speed dispersion in the traffic stream and generally with increasing traffic load. Missing overtaking possibilities can lead to accrued overtaking pressure which can cause risky overtaking maneuvers as reported by Steierwald et.al. (1983). Accumulation of overtaking maneuvers are correlating with existing overtaking sights and are influenced by the current traffic situation as mentioned in Kayser et.al. (1986).

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