Title: Parameters and statistical modeling for comparison of simulated and observed traffic conflicts. A case study on 2+1 road sections.

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Background

The literature points out that additional passing lanes and 2+1 roads improve significant road safety. Studies indicate sections with additional passing lanes (relief or alternately), which may cause reduction in the number of accidents by 50%. However, how geometric design affects the safety performance of such sections is not in depth investigated. Previous studies are carried out with two approaches, i.e. the most often, based on analysis of observed crashes and more rarely by using microsimulation study. In the case of microsimulation research, traffic conflict theory can be applied as a Surrogate Measure of Safety (SMoFs). By using simulated traffic conflicts, the use of the Surrogate Assessment Module (SSAM) estimates a set of parameters which have to be considered in observed data if a fair comparison has to be carried out. Furthermore, the measure of risk when traffic conflicts are considered as measure of exposure to risk instead of SMoFs does not necessary resemble the crash statistical distribution. This was validated in several studies considering traffic conflicts within a certain threshold of Time To Collision (TTC) and considering the largest extreme value theory or the Lomax distribution.

Aim

One of the main problem in simulated conflicts study is the validation of simulation results against real world conditions. In the field of passing lanes and 2+1 roads microsimulation is in an early phase of application. The aim of the paper is to assess the reliability of traffic conflict measures obtained by microsimulation against real world observations. Besides, given the easiest identification of PET in observed conflicts (instead of TTC), one of the aim of the present research work is, by fixing a threshold value of PET, to study if some distributions can better describe the relationship between observed and simulated traffic conflicts.

Method or methodological issues

Conflicts were detected and classified from video recording and analysis of vehicle trajectories in the merging area on 2+1 roads in Poland. Starting from that data, trajectories were extrapolated and conflicts detected and analyzed. Conducted studies focus only on lane changing conflicts, locations and PETs values of observed conflicts between vehicles were primarily identified. Particularly their values need to be further corrected. Observed conflicts are than used as dependent variable to estimate the expected number of conflicts using as covariate the microsimulated one, to assess if there is a correlation in the two. Simulation is carried out in VISSIM®, calibrating models with experimental data related to traffic operation parameters, and trajectories are analyzed using SSAM. To estimate the probability of observing a traffic conflict conditioned on the occurrence of a simulated one with a certain value of PET, different statistical distributions will be tested. Simulated and observed traffic conflicts will be selected setting different PET thresholds.

Expected results
The validation of the microsimulated traffic conflicts as SMoS is one of the main objectives of the present research work. The ground truth provided by observed traffic conflicts will be used either for the validation of the microsimulation analysis or for the study of other possible distribution in the relationship between observed and simulated traffic conflicts when a PET threshold is selected.

Conclusions

The paper presents an in-progress research work to define a new approach to the validation of microsimulation models with observed conflicts. As first step in the analysis it represents a good starting point for future analysis by taking into account that a perfect validation of a microsimulation model will allow to apply a proactive approach to evaluating road safety at the end of passing lane for 2+1 roads using microsimulation approach. Furthermore, the use of observed traffic conflicts to estimate safety, requires an established connection between observed and simulated conflicts, with the right statistical inference and approach to estimate the risk of observing a traffic conflict given the occurrence of a microsimulated one with a certain PET value.