Title: Searching for the severity dimension of the traffic events

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One of the axioms behind the use of traffic conflicts as safety indicators is the existence of a continuous dimension that allows to order all the events in traffic according to their severity. The relation between the events severity and frequency is often referred to as the “safety pyramid”, and it is believed that knowing the shape of the pyramid it is possible to estimate the expected frequency of the very severe events (accidents) from less severe, but more frequently observed events. However, what exactly is meant by “severity” and how it can be measured is still very uncertain. Intuitively, we understand that in the row “injury/fatal accident” - “property damage only accident” - “near miss” - “normal passage” the severity is decreasing, but to find a good indicator that would reflect this change is not a trivial task. One of the problems is that for the events that do not result in a collision the severity indicator(s) should cover both the “nearness” to collision and the consequences if it occurs. There is a wide diversity of the suggested indicators and conflict definitions based on these indicators, but the current problem is they are seldom properly validated and cross-compared. As the result, there is no clear answer on what approach to conflict studies should be used as producing the most reliable results.

In this study we investigate several ways to describe the severity hierarchy of the traffic events. We have examined all the encounters between left-turning and straight on-coming vehicles at a signalised intersection during 5 working days. Using semi-automated video-analysis software T-Analyst we extracted the trajectories of the involved vehicles that allowed us to calculate various indicators (Time-to-Collision, Time Advantage, Relative Speed, DeltaV, etc.) with high accuracy and temporal resolution. This is a unique dataset that contains all the encounters (potential possibilities for an accident) during a relatively long time period and with very wide range of severities – starting from time margins of 5 sec. and ending with near-misses with Post-Encroachment Time less than 0.1 sec.

We test different indicators and indicator combinations and illustrate how their choice change the shape of the severity pyramid. We also investigate how the event rating based on the indicators agrees with the subjective perceptions of the traffic safety experts. Even though the validity of the subjective judgements is quite questionable, this approach is still useful in getting first indication on whether the rating is making any sense or not. Finally, we suggest an approach that combines the “nearness” to collision and its possible outcomes into one indicator.

With only one site and type of manoeuvre examined, this paper is more of a methodological than practical value. However, all the tools used for trajectory extraction and indicator calculations are implemented in a user-friendly software that is made public and free for research use. We encourage other researchers to make more studies using the same standardised procedures. This will create a bulk of results that are perfectly comparable and in a longer term will allow both the validation of individual indicators and cross-comparison of safety between different traffic conditions, sites designs, country differences, etc.