

Traffic conflict technique in the Czech Republic

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Abstract:

Traffic conflict is defined as "an observable situation in which two or more road users approach each other in space and time to such an extent that a collision is imminent if their movements remain unchanged" (Amundsen & Hydén, 1977). Serious conflicts and accidents are based on the same processes which enables studying safety through analysis of development of conflicts (Hydén, 1987).

There have been various traffic conflict techniques (TCTs) developed: some of them use qualitative definitions (British TCT), some are more quantitative and based on measured time- and space-related parameters (such as Swedish or Dutch TCT). Calibration studies showed that there is a general agreement between various TCTs and their results have similar conclusions (Grayson, 1984).

Since the beginning of TCT two crucial issues were reliability and validity. Reliability relates to variability of observers' records and should be maximized by effective previous training. Validity is the amount of correlation between conflicts and accidents frequencies. Validation studies showed that conflicts are able to predict accidents (Hauer & Gårder, 1986).

There have been two main TCT schools in the Czech Republic: one at Czech Technical University in Prague and the second at Technical University of Ostrava. The former one is based on manual observations, the latter one relies on video recording and analysis in the office. Both are used mainly for research and teaching purposes. Neither of them was tested for reliability and validity in a sufficient way.

Since 2011 Transport Research Centre started a national project aiming to develop a unified TCT applicable in Czech conditions. It should compare both current methods and yield a common methodology. The final TCT will be approved by Ministry of Transport and put into practice. The paper describes current state of the project and its development so far.

1. Introduction

Traditional approach to road safety assessment is accident analysis. However it has number of drawbacks such as regression to mean or underreporting. In addition accidents are too much rare events to conduct sufficient statistical analyses in a short time. On the contrary traffic conflicts (near-accidents) are far more frequent than accidents and they are observable in real time on the site. What is more, they allow the safety assessment even before the occurrence of accidents.

These facts lie behind the world-wide use of traffic conflict techniques (TCTs) for a number of decades. There have been various TCTs developed: some of them use qualitative definitions, some are more quantitative and based on measured time- and space-related parameters. Calibration studies showed that there is a general agreement between various TCTs and their results have similar conclusions.

Since the beginning of TCT two crucial issues have been reliability and validity. Reliability relates to variability of observers' records and should be treated by effective previous training. Validity is the amount of correlation between conflicts and accidents frequencies. Reliability and validity also offer an answer to question: Which TCT is the most suitable? The most suitable should be the one with the highest reliability and validity.

2. TCTs in the Czech Republic

TCT concept is not much known in Czech practice. So far it has been conducted mainly at universities. There have been two TCT schools in the Czech Republic: one at Czech Technical University in Prague (Slabý, 1997; Kocourek, 2011) and the second at Technical University of Ostrava (Folprecht, 2000; Křivda, 2006). The former one is based on manual observations, the latter one relies on video recording and analysis in the office. Although they are seen as different concepts, they are both subjective in nature: the decision on the occurrence and severity of conflict, be it in the field or in the office, is always done by the observer. However none of Czech methods was tested for reliability and validity in a sufficient way.

Users of both TCTs are independent; there is no exchange of experience or sharing the results. This fact is calling for some kind of calibration which would allow a comparison of both TCTs.

3. Literature survey

As already mentioned, there is no science-based Czech TCT at the moment. Therefore Centrum dopravního výzkumu, v.v.i. (CDV) undertakes a national applied research project KONFLIKT (Czech Traffic Conflict Technique Methodology), funded by Technology Agency Czech Republic. It is partnered by Czech Technical University in Prague and lasting since 2011 to 2013. The aim is to develop a unified TCT applicable in Czech conditions. It will compare both current methods and yield a common methodology. The final TCT will be approved by Ministry of Transport and put into practice.

The project started with the thorough literature survey. There were three main questions identified:

- What is the current status of TCTs? Is it a substitute of accident analyses or their supplement?
- Are TCTs reliable and valid enough?
- Which TCT method is the best?

Literature survey provided following answers:

- TCT are meant to complement accident analyses, not to replace them. Both approaches have their pros and cons, it is thus ideal to combine them.
- Validity is a necessary condition of every scientific method. Due to its demands there are various opinions on necessity of validity. Nevertheless it can be also seen as a way to „market the procedure“ (Brown & Cooper, 1990).
- The future use of TCTs focuses on semiautomatic methods or automatic video detection.
- When developing new TCT, one may choose from existing TCTs which were already calibrated.

These points, mainly the last one, show further possible steps of Czech TCT development. If it is to be practically used, it has to

- a) follow existing valid TCT method or
- b) use Czech method which has to be validated

It is therefore necessary to study reliability and validity of both existing Czech TCT approaches. In order to compare (calibrate) them, several observations will be undertaken. Two of them, which have been conducted up to now, will be described.

4. Pilot TCT observations

The observations took place in Brno and Ostrava. They were true pilot projects: many challenges appeared on the way, giving valuable experience for further observations. These observations were meant mostly to compare the methods of manual observations and video analysis; the safety evaluation and diagnosis played a minor role there.

4.1 Observation in Brno

Busy intersection with traffic lights (*Fig. 1*) was selected due to its presence of all the traffic modes including public transport with tramway and high numbers of pedestrians and cyclists.



Fig. 1 Video picture of intersection in Brno

Observation lasted for one peak hour. Manual records were done by observers and video was recording as well. Both teams were recording independently in order to get two sets of results:

- 1) evaluation of manual records
- 2) evaluation of conflicts from video record

There were number of conflicts: mainly the slight ones such as U turns, lane changes or pedestrians red light crossing but also few severe conflicts in left turns. There were some differences in the records by both teams. The conclusion is that these reliability differences were caused by insufficient training before the observation. It would be better to train the observation in a short time to check the reliability and then observe the conflicts in the real situation.

Comparing the results of both teams, findings were as follows:

- Manual observers always observe specific part of intersection. The same is to be recommended for analysis of video record.
- Most of the conflicts were slight ones, which are not used for calculations but give overall picture of the safety situation.
- Minor differences in frequency and severity of conflicts were found.
- Severe conflicts were always recorded by both teams.
- The final assessments of safety and diagnosis were generally the same.

4.2 Observation in Ostrava

Selection of intersection was guided by proximity to the university (*Fig. 2*). There is busy traffic, including tramway and pedestrians, mainly students. There were number of observers at one time; in order not to obstruct the drivers, they were observing from inside of the university building.



Fig. 3 Intersection in Ostrava, viewed from inside of the university building

The results showed mostly slight but frequent conflicts. These included jaywalking or not giving way to vehicles and tramways on the main street.

As there were 16 students in total, there was a unique possibility of studying their reliability. In addition, observation took place three times, always lasting 2 hours. In-door training (lecture) explaining the observation rules was repeated between the observations. However results were discouraging:

- Both quality and quantity of results was practically incomparable.
- In the course of three observations, some students improved.
- With some students it was apparent right after the first observation that they lacked either the motivation or skills. They stayed on the same level in further observations as well.

5. Lessons learned

As already mentioned, the project is in its first phase: the literature survey and first pilot observations have been undertaken. Although there have been just two observations up to now, they give a clear message: it is crucial to provide training scheme which will ensure reliability of selected trained observers. It might contain in-door lectures, testing observations in the group with comparison and discussion of results and e-learning application for repeated testing with short video clips.

In the further course of the project, the aim is to test the training scheme and conduct further observations on various selected sites: not only urban intersections, but also pedestrian crossing facilities and railroad level crossing, both on urban and rural roads. It is necessary to accumulate enough experience to be able to produce common TCT guidelines which will be used in practice.

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