Een kwestie van kiezen:

een nieuw hiaat-acceptatiemodel voor links afslaan op een T-kruising met behulp van simulatie om verkeersveiligheid beter in te schatten.

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23 May 2008

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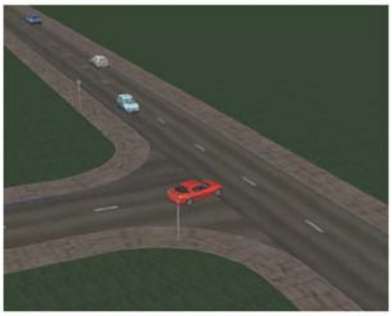

Advanced Driver Assistance (ADA) systems, such as advanced cruise control, are becoming increasingly available in mid-sized cars. New assistance systems for intersections are in the first stages of development. Impact assessment on traffic safety and flow of these systems is necessary before they are implemented.

Microscopic traffic simulation models can assess traffic flow impacts and look promising to assess traffic safety impacts. They simulate each vehicle in a traffic network. Driving behaviour of a vehicle consists of behaviour of a driver and vehicle together and is modelled by sub behaviour models. The decision to cross an intersection is modelled in a gap acceptance model.

This research intends to contribute to a realistic model of driving behaviour on a T-intersection in a microscopic simulation model. The aim of this research is to develop a realistic gap acceptance model for drivers turning left on a T-intersection in a simulation model, to assess traffic safety impacts more accurately. A realistic gap acceptance model comprehends the modelling of the drive decision based on the observable reality. This is achieved by including more influencing factors in the decision model of drivers turning left.

The gap acceptance model is developed for drivers turning left from a minor road in to a main road on a STOP-controlled T-intersection. The minimum gap length in the major traffic stream that a driver is willing to accept is called the critical gap. This differs between drivers. A distribution of the critical gap includes these variations between drivers. The new gap acceptance model compares multiple gaps in the traffic stream against the critical gap, rather than only the first gap, as done in the current model. Four gaps are included in the decision of the driver and based on the position of the gaps in the traffic stream weighting factors are used.

Traffic safety effects can be assessed by using conflicts in microscopic simulation models. A conflict is defined as a near accident. The severity of a conflict is measured by surrogate safety measures like time-to-collision (TTC) and post-encroachment-time (PET). In this thesis a conflict is defined when the minimal TTC or a PET is 1,5 seconds or less. Detailed positions and velocities of vehicles are needed to compute these conflicts accurately.

The new gap acceptance model is implemented in the simulation environment called Multi-Agent Realtime Simulator (MARS) which is developed by TNO. It was required to implement sub behaviour models like decision time and acceleration of the drivers turning apart from the gap acceptance model. Traffic on the main road is implemented by a car following model and a headway distribution between cars.

Simulations are carried out to investigate the differences between the new gap acceptance model (with multiple gaps in the decision) and the current model (with one gap in the decision). Conflicts by means of the surrogate safety measures are used to measure traffic safety. Waiting time of the driver turning left is used to measure traffic throughput of the T-intersection.

Results indicate that the number of conflicts decreases as more gaps are included in the decision of the driver turning left. The mean waiting time differs slightly between the new and the current model. Two effects are recorded with multiple gaps in the decision. First, some gaps are rejected because a more favourable one is in the traffic stream behind it. This effect was intended. Second, a few gaps are accepted in the new model, that were rejected with the current model. This effect was not foreseen.

The new gap acceptance model includes a part of the traffic stream in the decision of the driver. This concept is more realistic than the current model with only one gap in the decision. The new model assesses traffic safety higher and traffic throughput differs slightly.

The new gap acceptance model and the other driver behaviour models implemented in this research should be validated with real, detailed driving behaviour data. Only then it will be possible to claim whether the new gap acceptance model and driver behaviour in the simulation environment is realistic and if the traffic safety effects are computed more accurately.

Further research to improve driving behaviour in microscopic simulation models should incorporate the following recommendations.

- A next step is the calibration and validation of the implemented models with real detailed traffic data and conflict data.
- The car following model of the main road drivers should be extended with an improved reaction on crossing traffic.
- The new gap acceptance model should be extended for other types of intersections and other manoeuvres like a right turn and 4–way intersection.
- A next step in realistic driving behaviour is incorporation of misjudgements and mistakes made by drivers.
- The development of the simulation environment MARS must be continued to use the simulation environment in future traffic safety impact assessment studies on intersections.
- To asses traffic safety effects of ADA-systems, the systems should be modelled correctly and the adapted driving behaviour as well. Short term and long term effects of ADA-systems on driving behaviour should be taken into account.