A new microsimulator to evaluate road safety at skewed intersections

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Abstract

Microscopic traffic simulation models or traffic microsimulators are currently one of the most advanced tools for traffic study. These allow us to reproduce in detail the individual drivers' behavior and the vehicles' evolution, and to model them during long periods. Nowadays, traffic microsimulators are mainly used for traffic planning, and for capacity studies of highway facilities, as well as, for evaluating intelligent transport systems (ITS). Nevertheless, with small improvements, these microsimulators can be used for studying other aspects, such as, visibility problems at intersections or merging.

A new microsimulator was developed, called ValSim, which allows us to relate the skewed angle at intersections (merging or crossing) to the driver's angle of visibility for both direct vision and indirect vision through rear-view mirrors. Thus, it is possible to evaluate road safety. ValSim aims to allow designers to evaluate, by dynamical analysis in the geometric design process, the configuration and geometry of an intersection, and to verify possible conflicts at merging as well as at skewed crossings due to lack of visibility. The software simulates the driver's behavior while carrying out the entry or crossing maneuver. For each moment, it calculates the blind spot zones and a possible visibility conflict is highlighted.

Keywords – Microsimulator, visibility, skewed intersection, geometric design, safety

1. Introduction

The microsimulation models reproduce the vehicle evolution along the road, representing their position and velocity over the course of time, generating a visual output. Its main characteristic is that it can individually simulate each and every vehicle.

The micro models are based on a simulation of the driver's behavior and the interaction between vehicles and other traffic elements. With the information corresponding to the trajectories of all vehicles moving in a road section, statistics which relate traffic characteristics with elements of the road can be obtained. For this kind of simulation it is mandatory that the program represents the drivers' maneuvers and the vehicles' trajectories with great precision.

Generally, traffic microsimulators are used for traffic planning and capacity studies of highway facilities, as well as for evaluating intelligent transport systems (ITS). In the evaluation of road safety the visibility through rear view mirrors has, of course, not yet been accounted for.

This problem is especially serious in case of skewed intersections, because a vehicle may be located on a blind spot. Right turn lanes at intersections, and the intersections themselves, are one of the main elements that have to be taken into account for the design process because they register the highest accident rates. At intersections many conflictive situations occur.

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