Abstract 391

An approach for handling uncertainties related to the composition of vehicle fleets in traffic simulation experiments with automated vehicles

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Background

The introduction of automated vehicles (AVs) is expected to affect traffic performance, and both urban and national road authorities wonder how the introduction should be handled and what measures they should or shouldn't apply to avoid negative effects and boost positive effects of the introduction of AVs. Investigations on how road design and traffic control measures affect traffic performance are commonly based on results from traffic models.

Microscopic traffic flow models (TFM) are state-of-the-art tools in transport planning. By simulating the movements of every vehicle, the models provide indicators (travel time, queue length, vehicle throughput) describing the performance of road facilities. TFMs are typically applied for designing, testing and analysing road network sections with their traffic control facilities. Current microscopic TFMs are designed for modelling vehicles with no automation. Hence, modelling movements of AVs requires model extensions.

There are several possibilities for extending TFMs to incorporate modelling of the driving logic of AVs. However, there are limited information available on how AVs will behave. Information available so far is from tests with today's partly automated vehicles, mainly from test tracks. How future generations of AVs will behave will be unknown for some time. Thus, consistent assumptions are required to be able to conduct simulation investigations of traffic that includes AVs. It is reasonable to assume that the driving logic will evolve from cautious to more advanced logics.

Traffic simulation investigations of AVs commonly assume one type of automated vehicle and that all AVs behave the same. Furthermore, several traffic simulation investigations of AVs actually investigate vehicles with only one automation function. such as adaptive cruise control (ACC) or connected adaptive cruise control (CACC). The Transition period from no to 100% AVs will be long, and the transition period will include mixes of manually driven vehicles and AVs with different levels of automation and different generations of automation functions.

Methods

Based on an overview of literature on scenarios for AVs, and on a series of workshops with researchers and experts from Europe and USA, a systematic treatment of the uncertainties related to the future vehicle fleet composition was developed.

Results

The result is a systematic approach for handling the uncertainties related to how different generations of AVs will behave and which mixes of different generation of AVs that are likely to exist at different stages of the transition period. The presentation will introduce the developed approach and present examples on how it can be applied using the traffic simulation model Vissim.

Including automated vehicles in traffic simulation experiments is not straight forward due to large uncertainties on the behaviour of future automated vehicles. The proposed approach, to try to create scenarios with consistent assumptions and apply systematic sensitivity analysis, is a promising way to handle the large uncertainties.

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