



Het effect van Adaptive Cruise Control (ACC) op de doorstroming rond een invoeging

een verkennende simulatiestudie met het microscopisch verkeersmodel MIXIC



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Purpose:

This study explores the traffic flow effects of Adaptive Cruise Control (ACC) on the main roadway of a Dutch motorway around a disturbance caused by traffic coming from a merging on-ramp.

Methods:

To study the effects of ACC the microscopic traffic simulation model MIXIC was used. For simulation of traffic on a merging ramp a newly developed on-ramp lane change model was implemented. The extended MIXIC model has been applied in a study of traffic on a two-lane main roadway in combination with a one-lane merging ramp. Ten different variants were simulated: a reference variant with no ACC traffic and nine variants with ACC traffic. The variants with ACC differ in the penetration level of ACC (5%, 20% and 50%) and in the ACC headway (0.7, 1.0 and 1.4 s). For each variant ten independent simulation runs were carried out. De results were analysed with ANOVA (analysis of variance).

Results:

The simulated traffic coming from the on-ramp indeed causes a disturbance of the traffic flow on the main roadway. ACC does not result in an improvement of the traffic flow on the main roadway of a motorway round a merging on-ramp. An ACC headway of 1.4 s with a penetration of 20% ACC even shows a deterioration of the traffic flow. This manifests itself in a reduction of the average speed. The reduction varies from 1% in case of 20% ACC to 4% in in case of 50% ACC. An ACC headway of 0.7 s in combination with a penetration of 50% ACC results in a strong deterioration of the traffic flow measured by the number of vehicles in a shockwave. This number of vehicles in a shockwave increases with 55% in the merging section and 50% right after the merging section. Indirectly this can also be of great influence on the traffic flow since it is to be expected that the risk of occurrence of traffic accidents will increase. This in turn could lead to more congestion.

Conclusion:

In the mid term (20% ACC) and the long term (50% ACC) it is not advisable to equip vehicles with ACC systems which give drivers the choice to set an ACC headway of 1.4 s. In the long term the same holds for the choice of an ACC headway of 0.7 s. It is recommended to carry out further research into the effects of more advanced types of ACC. These more advanced types of ACC should be able to recognize specific situations (for example merging vehicles) and could therefore anticipate or react in a more appropriate way.