A.R.T.Forum
Automated Road Transport

Interreg
North Sea Region
ART-Forum
European Regional Development Fund

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Can autonomous vehicles improve the quality of life? – A simulation study

DLR Institute of Transportation Systems

Simulation of automated road transport

In a simulation study, the DLR Institute of Transportation Systems examined the effects of autonomous vehicles on indicators like travel time, land use and emission. The aim was to use simulations to demonstrate the potential of individual applications of ART. Several simulation scenarios with the tool SUMO (Simulation of Urban Mobility) were carried out. The focus was on two key use cases. One focussed on self-driving vehicles that drop off travellers at their destination and then park themselves in public garages. The second use case was an automated on-demand shuttle service that combined the travel requests of different passengers.

Potential of selected use cases

Several scenarios in two different urban residential areas were simulated. In both scenarios automated road transport offers new opportunities. Potential for reduction of emissions, traffic and land use could be demonstrated. Further exploration is needed with regards to effects of reduced travel time and other service parameters on modal split. In summary, the simulation showed that automated vehicles can improve the quality of life if they are combined with intelligent mobility concepts, such as on demand or sharing concepts.

SUMO
SIMULATION OF URBAN MOBILITY

» *Autonomous vehicles must be combined with innovative mobility concepts.*

Can autonomous parking of vehicles reduce travel time and land use?

In many residential areas, car drivers have to search for a long time to find a free parking slot. This not only costs time and nerves, but also emissions arise during the parking search traffic. Several simulation scenarios with up to five parking garages were carried out. The study was based on self-driving vehicles in a residential area. The idea is that people are dropped off at their destination, for example at their own front door, and the vehicle then drives itself independently to a public parking garage. Parking on the roadside no longer exists.

The results from the simulation show that a single garage in the study area has no significant impact on emissions, whereas if several garages are distributed in the study area, fewer emissions are emitted on the way through the examination area. In any cases travel times of passengers are reduced. A particular advantage of the garages is that vehicles no longer park at the roadside, so this space can be used for other purposes – as a living area, for children's play or as green areas.

Can on-demand shuttles with connected autonomous vehicles improve travel times of public transport?

The effects of autonomous cars could be even greater if collective means of transport are used instead of private cars. For example, it could be possible to bundle travel requests using the principle of ride pooling, so that passengers with similar destinations and at similar times can travel together. In combination with an on-demand shuttle service using connected automated vehicles this was the subject of a further simulation study.

One of the key outcomes is that on-demand under certain conditions can help to reduce travel times which could be proved during the peak hour by the simulation. Because of an increased vehicle occupancy due to a high pooling factor for the trip requests, the traffic could be improved. This resulted in decreased overall vehicle kilometres and therefore in reduced emissions and a reduced congestion.

> *Autonomous vehicles offer the opportunity to transform residential areas.*

Contact

To get in touch with ART-Forum, please visit our website

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ART-Forum is a project co-funded by the North Sea Region Programme

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