



The vehicle of the future: Frank Köster's car, designed at the German Aerospace Center, features a host of technical innovations, but the computer scientist still has to drive it – for now. A few years from now the car will drive itself.

Hands off the Steering Wheel

Frank Köster has a vision: a car that he doesn't need to drive so he can read on the motorway or simply watch nature go by. Together with his colleagues, the computer scientist is working to ensure that that vision goes into serial production within a few years' time

When he's not working Frank Köster prefers to leave the car in the garage. He particularly enjoys going for long walks with his daughter. Walking through the woods and letting nature work on all his senses is his idea of relaxing.

His job, however, involves lots of travelling. He commutes between his two workplaces in Oldenburg and Braunschweig, but also travels a lot around Germany and Europe. He uses a car every now and then but prefers taking the train because then he can work at the same time. Around half his working hours are spent on the go.

For Köster, driving a car is a waste of time. So it seems logical that his field of research is automated and networked driving.

This is a complex subject that still requires plenty of basic research, but which is already seeing extensive testing. Köster feels privileged to be able to participate in both research and testing. His professorship at Oldenburg University, „The Design of Intelligent Transport Systems“, is oriented towards basic research, Köster explains. „Together with colleagues from other fields I'm examining questions like

what embedded systems for automated driving should look like.“ These systems take over monitoring and steering functions in vehicles. „They perform their tasks largely unnoticed by the user“, Köster notes. Air bags and cruise control are examples of embedded systems that were introduced in vehicles more than 30 years ago. Köster and his colleagues are developing integral systems in which a number of otherwise autonomous embedded systems come together and, for instance, make it possible for vehicles to communicate with each other.

Köster applies scientifically grounded basic knowledge in Braunschweig, where he heads a team of more than 60 engineers, psychologists and computer scientists working in the automotive department of the German Aerospace Center (DLR). „There, too, we are working on assistance and automated systems for intelligent vehicle technology, but with a stronger focus on practical applications,“ he says explaining the differences between his two workplaces. The team tests such things as emergency systems that combine braking and swerving manoeuvres, key components of automated driving. Köster sees his work in Oldenburg and Braunschweig as „a perfect combination“ – and he is the bridge between the two locations.

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The computer scientist is clearly passionate about his field of research. „I find the developments in computer science incredibly exciting,“ he says. „They are taking on a new form and being integrated into the automation of vehicles in technical systems that haven't changed in a long time.“ He points out that although there is a lot of technology in vehicles nowadays, „the principle of using the steering wheel and pedals to drive them has remained the same.“ But Köster is convinced that this will change in the next five years. „At least on motorways, automated driving will also be possible in serial products,“ he predicts. Partially automated vehicle functions are already available on the market today.

However, they have one crucial disadvantage: the driver still has to concentrate on the traffic and be ready to take over in an emergency. Köster and his colleagues have more ambitious goals: they want the driver to be able to give the car complete control. If a vehicle is controlled by cameras, sensors, radars and laser scanners, the

systems in the background need to function efficiently. „The vehicle must be able to identify and interpret its surroundings. It must register objects and know where they're coming from and in which direction they're moving. The systems must decide how to react to these objects: move out of their way, drive behind them, or overtake them? On top of that the vehicle must not make any dangerous manoeuvres, and it must behave logically so that other vehicles can react accordingly.

But this is not just about making things more comfortable for people. When Köster decides not to drive, it's mainly for safety reasons. „Most accidents are the result of drivers' mistakes. Assistance and automation systems can therefore boost safety and efficiency in the long term,“ Köster stresses. But first the systems themselves need to be tested. „And for this we also need to develop new methods. To obtain reliable road results we would have to drive well over 200 million test kilometres,“ Köster explains. But because this kind of testing is unfeasible, simulators are being developed. This is another thing the scientists at Oldenburg and Braunschweig are working on together.

Once automated driving on motorways becomes possible it won't be more than a few years before cars can do even more on their own, Köster says. You could be sitting at the hairdresser's while your car goes to the supermarket

to pick up groceries ordered online in advance. Connected to servers, the car's embedded systems calculate the route, park the car and pay parking tickets online. Trips to the charging point when the vehicle needs refuelling are also included.

Different areas of life become interconnected

This interconnection of various increasingly automated areas of life is also an aspect of so-called „smart cities“ - development concepts for making cities more efficient, more high tech, more environmentally friendly and more socially inclusive. Köster is involved in this area of research too. At Fliegerhorst, a former military airbase just outside Oldenburg, a „living lab“ for testing digital innovations is already in planning. Its various housing complexes will be used for testing innovations like an automated parking service and networked telemedicine.

Köster lives with his family in Braunschweig. Here, too, he is involved in the construction of a „smart city“. One day he may be able to use the innovations he is helping to develop today. And if his car can make the trip to the charging point on its own, that will be one small task less for Köster to take care of - leaving him more time for taking walks with his daughter. (dr)



Cars will soon be able to do even more on their own, like looking for a free parking space.