"Automated driving is rather an evolution"

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AUTOMOBILE ELECTRONICS: *Electronics steer, the driver checks emails or takes a nap—is this how safe driving looks? The automobile industry doesn't discuss any more whether the answer to this is yes but rather when this will occur and under what conditions. The component manufacturer Continental ranks as one of the advocates of automatic driving. Corporate officer Ralf Cramer is convinced: "By 2025 we see fully automated driving as feasible."*

VDI Nachricten: Dr. Cramer, Continental and other firms in the auto branch are working on automated driving as a means of lowering the number of accidents. How can that be?

Cramer: Accident reconstruction research shows that in 95% of all auto accidents, human error plays a roll—false reaction, late reaction, or a false appraisal of the situation. One has to support the human with a driver-assistance system. Naturally we cannot go to fully automated driving tomorrow.

What is true is that assisted driving is the first step toward this ultimate goal. For example with systems that are already on the market, such as adaptive cruise control (ACC).

The automation of driving functions helps to solve the long-term, central challenges of individual mobility: fewer fatalities and injuries than today by lowering the accident rate and making traffic safer. Besides this, less economic loss from traffic jams in urban areas and from property damage in an accident.

Continental thinks that the first driver assistance systems will be able to drive the car in a traffic jam, starting in 2016. Then later systems will be able to drive in difficult situations, like around a construction zone. (Photo: Continental)

Driving also encompasses cultural factors. Automobiles are sold using slogans like "the joy of driving". Can automated driving push through such cultural factors?

Yes, of course. If you can choose when you want to drive and when you would rather have the car take over driving, then that can happen. If you can give the car over to automatic driving in horrible, stop-and-go traffic but then drive yourself through a curvy alpine pass, then this will promote acceptance and certainly also the fun of driving.

Is the transition to automated driving a leap of disruptive technology or does it rather result from the further development of current systems?

Automatic driving is not a technological leap but rather an evolution. You can bring in over the years ever more assistance functions. Traffic sign recognition with cameras, emergency braking systems with radar—we already have all of that, and you can expand it with electronic steering. In a traffic jam you can begin with the longitudinal dynamics—giving gas and braking. The next step is then the coupling with the transverse dynamics, for example to automate the steering in a curve. That will develop step by step.

The "connected car" is making a lot of headlines also. Is there a connection between the connected car and autonomous driving?

Yes, of course. The connected car means indeed data networking in the vehicle. And the more sensors that you have in the car—that is, for example, sensors that look forward in order to see whether there is another vehicle there engaged in an emergency braking maneuver or whether a pedestrian is walking on the roadway, or sensors that look backward—the more sensors you have that sense the vehicle's environment, the more demand there is that these sensors be networked. Thus you come immediately to the concept "connectivity", in order to bring all the signals together in the vehicle.

And when automated driving comes into play, you have of course to observe the outside world—over car-to-car or car-to-infrastructure communication. Additionally you use data, that is sent into the vehicle from outside. Example: via GPS the car knows where it is. Then through car-to-car communication the driver receives the information: Careful! In 500 meters around a curve there is a traffic jam.   The driver doesn't see it. So is the connection of the car with the outside world a component of automated driving.

What technical prerequisites must still be fulfilled in the car before we can think about fully automated driving?

The biggest leap—as much on a technical as a psychological level—is to take the driver out of the "loop", the driving control loop. If he today uses a cruise control that maintains distance from the car in front, the driver is already today out of the loop with his foot. The vehicle drives by itself behind the car in front, brakes and accelerates without the driver touching the gas pedal. However the driver has to monitor the system continuously and be ready to jump in at any moment.

The most important next step would be—and so far the requirements haven't yet been fulfilled—to take the driver out of the loop, to really turn him off, so that he doesn't have to concentrate on driving.

So the transferal of control has to be staged so that he can again be pulled into action, if for example a critical situation arises or if the stretch of road where automated driving is possible comes to an end. This transferal of control, from the driver to the car and the return of control to the driver, has not yet been solved technically.

Continental's Cramer: "Automated driving is rather an evolution" (Photo: Continental)

You then imagine automated driving to be restricted to certain areas, not generally in use?

Automated driving in the city is not imaginable within the next five years and more—that is in high-traffic settings and places with complex traffic patterns, with pedestrian traffic, intersections, and so forth. It's easiest to accomplish automated driving on the autobahn, since it is very structured and already even ready for it—for example with commuter lanes and lanes with special markings.

Must then first requirements for the infrastructure—streets, traffic signs, traffic lights—be put into place, so that automated driving can be introduced?

As a supplier of automobile components we want to avoid that, and I see us in agreement with our customers on this point. If the infrastructure comes into play, then often it is very difficult, costly, and complex to reach agreement. For then it isn't just about agreement with the customers regarding functionality and price. But then you must reckon with agencies and public organizations—thus something that takes time and costs a good deal.

The costs—that is a point that certainly interests the consumer. How much more then must an automobile cost that can drive itself?

There is no such thing as generalized automatic driving. It depends on where you are driving, what traffic zones you are driving, at what speed, with which functions. Is the car to drive just straight ahead or also in curves? On the autobahn or also on two-lane highways? In city traffic? Around construction zones?

Thus you could build a very large range of costs and capabilities, let's say between 1000 € and 3000 € or more. It's certainly not a mere 500 €. This estimation you'll find elsewhere too.

And finally the price politics is of course a matter for the OEMs (original equipment manufacturers, i.e. auto makers and the companies that build components). It can certainly be said that automated driving will cause added costs; you can't count on zero costs. But there is for the user also stress-free driving and time saved. You can check emails in a traffic jams, make telephone calls, do all the things that a networked person can do nowadays at home.

Let's look at the point of who is responsible if a vehicle in fully automated driving mode has an accident. It's certainly not the driver.

Today it is so—and it will remain so for some time—that the driver carries the responsibility for how the car drives. In any case the question is what one means by "in-the-loop" and "out-of-the-loop". There is still a need for further clarity on how the transition between high- or full-automated driving and manual driving should appear, and tied to that the responsibility of the car versus the responsibility of the driver.

And what happens if the technology fails despite all security measures?

We—that is, automakers and auto-component makers—must naturally make certain, that, first, the technology does not fail—and then if it does, then we need redundant hardware and software systems, a fail-safe level, to guarantee safety. Many engineers are working on development involving reliability. At least as many as the number working on the functioning of the systems themselves.

The European Union wants to have the number of traffic fatalities within the next ten years. Automated driving is supposed to play an important role. Do you have a time horizon for its introduction?

It isn't possible to describe the entire system precisely in detail. However, I'd like to give you the best picture I can. We can imagine partially automated driving systems by 2016. These will be systems that work in traffic jams on the autobahn at speeds up to 30 km/hr (19 mph). By 2020 we should see highly automated stop-and-go systems on the autobahn, where the driver does not have to monitor the driving constantly, but rather can be summoned within a still-to-be-defined time period to take over the driving. From 2025 onward we see then the fully automated driving as possible.