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## Robotic cars are coming – are we ready?

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Robotic cars and automation in traffic were the great innovation of 2016 – or were they really? Could they perhaps just represent a long-term revolutionary path that has merely attracted special attention in recent media headlines? In any case, automotive engineering is undergoing transition from metal bending towards software development which is extremely fascinating.

Cars travelling 24/7 in a snowfall on icy roads are a future dream and more reliable technology is needed to equal surpass human driving skills. For example, a self-driving car representing the current state of the art cannot enter a multi-lane roundabout in congested Paris traffic – or at least leaving roundabout would be enormous challenge.

Automation in traffic is now top of the famous Gartner hype curve which is a measure of technology interests in industry. Unfortunately, the next few years a steady downward slope is expected before a slow rise again. Meanwhile, the automated functions will take over control of the vehicle step by step and becomes a master of driving instead of being assistants.

**Development of robotic cars began more than 35 years ago**

Although the media was awakened to the significant investments made in robotic cars by Google five years ago, the seeds of automation had been sown considerably earlier. Mercedes Benz introduced the first self-driving car in 1980, using the technology of the time. However, the loudest starting shot was fired at the DARPA Grand Challenge competitions, arranged by Pentagon in the U.S. between 2004 and 2007. The core of Google's development teams was also made up of the university teams which had successfully participated in these completions.

Starting from the early 1990s, the European car industry has brought to the market a series of active, electronics-based safety systems. Through EU projects, we have had ringside seats to follow the development. Automated safety features now being released onto the market can be considered as the next generation of active safety features. Thus, the development of automation did not begin five years ago – it was initiated already 35 years ago.

**Difficult road weather conditions pose a problem**

Despite the product development efforts worth several billions undertaken by the automotive industry, traffic authorities and public funders, the world is not yet ready. As a matter of fact, at the current stage, fully automated vehicles are fairly primitive. Such vehicles are capable of travelling on roads at up to 50 kilometres per hour in areas covered by an accurate mapping data and during sunny weather. Cars travelling 24/7 in a snowfall on icy Finnish roads are still a distant dream, perhaps ten years away.

The current sources of sensory data are not sufficiently reliable in harsh weather conditions, and the processing capacity of vehicles to understand varying traffic incidences is far from the human brain. Not until now has the technology reached a point where sensors for talking and hearing can be installed, thanks to the capability of vehicles systems which enables them to exchange data. An obvious demand for automation in traffic exists, but the technology still needs further development. Anyway, having an opportunity to develop cars of which the public only has a faint conception is a researcher's dream job.

**Mixed traffic poses problems**

The widespread adoption of automated cars is often said to improve traffic safety – after all, automation removes one of the factors underlying accidents, the human error. Traffic is also expected to run more smoothly as automated vehicles can travel closer to each other than cars with human drivers. Automated cars also facilitate the travel of such people who cannot or do not want to drive a car for some reason.

As we have had the opportunity to read during the past few weeks, gains in safety can be made, but not even automation is able to deal with every possible situation. One unfortunate collision involving a fatality has already occurred, as the sensory system of a car controlled by an autopilot failed to recognise an obstacle ahead of it. One additional challenge to safety is the fact that robotic vehicles do not travel in traffic composed of their likes, but in mixed traffic involving ordinary cars, pedestrians and cyclists.

Making traffic run smoothly requires not only automated systems but also a capability of vehicles to 'talk to' each other. An automated vehicle just following the car in front of it and reacting on its movements is not enough. After all, a good and experienced driver follows the traffic farther ahead, and in this way is capable of anticipating new situations. At present, human drivers are more flexible than automated cars.

**What next?**

The technical development of automated cars will continue and the price of its components will come down. More and varied experiments will be conducted, providing excellent data for impact assessment. At the present stage, impacts can only be assumed, with scenarios representing the opposite ends of the spectrum being equally likely. Therefore, it is important to be involved in development and research.

Components for smart cars have been developed for 30 years, and will be developed for the next 30 years. The decades to come will present challenges. The price of the components representing the previous generation will decrease, with new features being introduced in the high-end cars. Alternatively, we might be mistaken, and the traditional car industry loses the game and the new car brands will bear names such as Baidu, Google, Apple, and Tesla. The future manufacturers might even deliver a set of components to the customer who could then assemble a car by following instructions, in the same way as the furniture industry delivers its products today. Of course the automotive software is being sold separately for a monthly fee. Let's wait and see.

The only certain thing is that traffic philosophy will change. We already have mixed traffic involving traditional cars, automated vehicles, more or less automated lightweight vehicles (such as Segway PT electric vehicles), and public transport. This will make the traffic environment highly complex. In order to help researchers to understand the changes in guiding product development in the right direction, various

field tests involving motorways, urban environment, networked environment, closed areas, crossroads, winter conditions, articulated platoon of lorries and passenger cars need to be conducted.

Building and maintaining traffic infrastructure and the R&D of vehicles is expensive and requires a great deal of work. Field tests will substantially reduce the risk of wrong or unnecessary investments. Tests not only offer an opportunity to assess impacts and to provide support to companies conducting R&D, they also provide an excellent channel to communicate to the public the true meaning of automated traffic and to prevent people from getting the wrong ideas and attitudes. Automated vehicles are not developed for engineers or authorities, but for ordinary people in order to enable them to travel in a more convenient way in future.

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