

Tailor-made development in China

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15/09/2022 The Chinese automotive market places special demands on vehicle technology. Therefore Porsche Engineering is continuously expanding its local presence: Roughly 130 employees develop, test and validate China-specific functions for the intelligent and connected vehicle.

A glance at the skyline is enough to tell the casual observer that driving in China is a different experience. The cities are crisscrossed by multi-level elevated roads of a type that simply doesn't exist in Europe. They make very specific demands of navigation devices because the technology must identify which of the up to three levels the vehicle is traveling on. Stop signs in China sometimes lack the word 'STOP', which is something that image recognition programs first must learn. Many drivers also use the digital services from technology giants such as Baidu, Alibaba and Tencent, which are hardly known in Europe, while on the move.

As these examples show, vehicles must be adapted to the special characteristics of the Chinese market or be developed specifically for them. That's what Porsche Engineering has been working on for its

Chinese customers for more than 30 years – as it continues to expand its local presence. This year alone, the number of employees at the Anting Development Center near Shanghai is expected to rise from around 130 to 160. The main task of the local experts is to develop, test and validate China-specific functions.

Given that the demands of sports car customers in China are exacting and very specific, Porsche AG made the decision to set up a development unit of its own there, known as the R&D satellite. It will work in close cooperation with Porsche Engineering as a local partner. The team at the R&D satellite largely originates from the electrics/electronics sector. “We aim for developing technology that is optimally adapted to the Chinese market,” says Karina Steinmetz, Head of the R&D satellite. Charging stations, for example, have different plugs and protocols than European ones. Differences like this will need to be considered. “We are also developing a local test strategy for all technical topics,” explains Steinmetz.

Observers and tech scouts

In addition to technical validation, the experts at the R&D satellite play a role as observers and tech scouts. “We’re keeping an eye on the market-specific technological regulations and standards,” says Steinmetz. They are also keeping track of important technical developments in China, she says, such as ones with relevance for autonomous driving and parking, or high-voltage technology. The work being done by the team at the R&D satellite will rely heavily on the local network. “Porsche Engineering is an important strategic partner for us,” emphasizes Steinmetz.

"The intelligent and connected vehicle is at the heart of Porsche Engineering's developments in China, as these services are in particularly high demand in the country", said Uwe Pichler-Necek, who took over the position of Managing Director of Porsche Engineering China on July. This is partly due to the clientele, which is younger and more interested in technology than it is in Europe. The average visitor to the Porsche Center in China is only 35 years old – and one out of two is a woman.

“Many customers belong to Generation Z, which grew up with digitalization and constant networking,” says Kurt Schwaiger who, after six years of successfully growing Porsche Engineering China as its managing director, is now retiring. “Customers expect seamless integration of the smartphone into the vehicle environment.” That’s why there are plans to make China-specific services usable on the road, such as the app WeChat, the Chinese equivalent of WhatsApp. To make them part of the vehicle, Porsche and Audi have developed a hardware module that is based on the Android cell phone operating system, and which will be integrated into the vehicle. Drivers could use the functions to have incoming messages read out to them in the future, for example.

More local entertainment will be available in the vehicle as well. “The next generation of vehicles will allow Chinese customers to use both a local music streaming service and a popular podcast platform, in addition to Apple Music,” says Qi Cao, who is responsible for developing the infotainment system. Unlike Europe, where most customers prefer to operate their vehicles using buttons or touchscreens, voice control is a popular option for communication in China. Customers also expect single sign-on.

"Anyone entering the vehicle wants to use all services immediately without having to enter passwords again," explains Yasumasa Ibuki, who is responsible for testing and validating the infotainment system.

Intensive local testing

At present, Porsche Engineering is intensively testing the infotainment package for the Chinese market locally. Test vehicles have already completed thousands of test hours. The experts also use hardware-in-the-loop (HiL) systems in which the infotainment package is connected to a replica of the real vehicle environment including, for example, the instrument cluster and the operating elements. "This allows testing to start before the real vehicle is available," explains Naikai Du, Senior Manager of Electrics/Electronics at Porsche Engineering China. Tests on test benches also save costs and make it possible to simulate situations that are difficult to carry out in a real-life scenario. One example would be the automatic emergency call sent after the airbag has been deployed.

Chinese traffic, too, requires adjustments. "The driving style in China differs enormously from the one in Europe," explains Uwe Pichler-Necek. Frequent lane changes, taking advantage of every gap and rule-flouting overtaking maneuvers are not uncommon in China. This must be considered, for example, when calibrating the Adaptive Cruise Control (ACC). "Cut-ins have to be detected earlier," says Pichler-Necek. "Moreover, the time gap to the vehicle in front may not become too large. Otherwise, so many cars will cut in that the vehicle will hardly make any progress."

China-specific adaptions

To enable highly automated driving in the future, the systems must also be adapted to the elevated roads found in China – where each level has its very own speed limit. To find out which level the vehicle is on, for example, the system can detect the incline of a ramp. Automatic parking functions, which are also under development, also require a China-specific version due to features such as the colored barriers that delimit the parking spaces in many parking garages, among others. Algorithms that evaluate camera images must learn about these special features by using example images. The view blockers, for example, could cause an algorithm trained in Europe to brake too early.

Local development of assistance systems has recently become a challenge, however. In November 2021, a new law came into force in China that restricts the export of data recorded in the vehicle (Personal Information Protection Law). Commercially used photos or videos that show license plates, personal information, or people, for example, may not leave the country. The upshot for Western manufacturers: For each test drive, there must be an authorized Chinese service provider on board that will receive all data carriers after the test and 'desensitize' the information collected, for example by replacing all license plates with a generic plate. However, this image data then differs from the raw data available in the vehicle, which makes it difficult for AI to learn algorithms.

Geo-sensitive bus data from the vehicle and GPS information is likewise barred from leaving the

country. “The reasoning is that camera-based functions will increasingly be developed and validated in China in the future,” says Johannes Wiebelitz, Development Engineer for driver assistance systems at Porsche Engineering. This applies to autonomous driving functions for which camera data is essential.

Distinct development philosophy

The development of the intelligent and connected vehicle in China is being pursued with a country-specific development philosophy: “In Europe, one expects a vehicle to be able to perform its tasks even without a data connection. In Asia, it’s integrated into function development from the outset,” says development engineer Wiebelitz. Here’s an example: Some traffic lights in China broadcast their status wirelessly, so drivers can see at which speed they will have a green wave on their dashboard or in an app. Automated driving functions are expected to use this data from the outset (vehicle-to-infrastructure communication, V2I). China is also the leader in vehicle-to-vehicle (V2V) networking. Vehicles that were in accidents, for example, send out a signal that warns approaching cars.

China doesn’t want to wait for new technologies to connect the vehicles. They are relying on the existing mobile networks, while Europe intends to use the standard WLAN. “The next generation of vehicles in China will be connected to the Internet by 4G or 5G,” says Estha Li, Senior Manager of Data and Connected Services at Porsche Engineering China.

To do this, the local experts are continuing to work on development of the central node for telecommunication in the vehicle. In the future, it will be used to enable remote diagnostics and software updates as well. This always requires localization of European technology. “In China, mobile radio uses different frequencies and interfaces,” explains Thomas Pretsch, Senior Manager of the Connectivity discipline at Porsche Engineering. Interesting detail: To check the reaction of test vehicles to dead spots, local engineers must generate one artificially – because network coverage in China is so good.

Another China-specific function is Real Time Monitoring (RTM): New electric and hybrid vehicles will be required to transmit dynamic vehicle-related data, and in particular the battery charge level, to public authorities to gain more insights into e-mobility, such as gaps in the charging infrastructure. No installation obligation applies for foreign manufacturers, though many customers are asking about the feature due to regional and national incentive programs. Porsche Engineering is developing RTM on behalf of Porsche AG and remains in close contact with the authorities to ensure that the latest legal requirements can consistently be implemented in development.

Porsche Engineering in China is still focusing on localization. But that could be just the beginning. “It is conceivable that in the future, new technology will first be developed in China before being rolled out globally,” says Pretsch. This only makes it more important to be on the ground with a strong team.

Interview with Prof. Hong Chen

Prof. Hong Chen is dean at the College of Electronic and Information Engineering and holder of the Porsche Chair at Tongji University in Shanghai. In this interview, she talks about the special characteristics of road traffic in China.

How important are Highly Automated Driving (HAD) and Advanced Driver Assistance System (ADAS) functions in China?

Hong Chen: Traffic in China is much more specialized and complex than in Europe, not only due to China's population and density, but also due to the different culture. According to statistics, people in Beijing and Shanghai spend over two hours on their daily commute. During rush hours, drivers have to keep their eyes peeled to ensure their own safety and endure the stress of driving burden. Tired of driving in heavy traffic jams, Chinese drivers are eager for an alternative such as HAD and ADAS, to relieve them from this burden. To satisfy these expectations, OEMs in China are consistently investing in research and development of HAD and ADAS. As they are an effective solution to traffic jams and safety issues, the Chinese government is providing continuously support for HAD and ADAS in terms of policy, investment, and infrastructure construction.

What has to be considered in terms of local infrastructure, local topology, and legal requirements?

Hong Chen: In my opinion, the first and foremost issue to face is the legal requirement when it comes to HAD. When a car equipped with HAD is involved in an accident, legal responsibility remains a critical issue. Consent agreements could be concluded to delineate the shared operational responsibility between drivers and HAD systems, while insurance companies might also become involved. This might be the most critical concern for customers and car manufacturers. Regarding the local infrastructure and topology, from my perspective, if vehicle-road collaboration and vehicle-to-X communication become reality, it would undoubtedly accelerate the implementation of HAD. In this regard, China has obvious advantages and has already made rapid progress in recent years.

Where do Chinese OEMs stand on HAD?

Hong Chen: To our knowledge, most Chinese OEMs have expressed their optimism about HAD. They believe that intelligence and automation are the general trends in vehicle development in the new era; therefore, HAD is destined to become reality in the future, but it will happen gradually rather than suddenly. As described by the SAE "Levels of Driving Automation" standard, it would most likely be a long and gradual process.

Which tech players are involved in the development of HAD and ADAS?

Hong Chen: At present, many enterprises are involved in the development of HAD and ADAS in China. First of all, OEMs like FAW, Dongfeng, SAIC and Geely are focusing both on developing ADAS in

production and HAD for ports and mines. The latter is very attractive for some high-tech companies like Baidu, Didi, and HUAWEI as well, which have launched their own HAD projects. Moreover, several startups such as HorizonRobotics, BlackSesame, RoboSense, Hesai and Xingshen, are actively involved in the development of HAD. Finally, some well-known international automotive suppliers, for example Bosch, Continental and ZF, have also invested considerable effort in the research of HAD in China.

What are you personally and the Tongji University working on in the area of HAD?

Hong Chen: Tongji is one of the top universities in the area of HAD. In regard to the facilities, Tongji has the first fully functional proving-ground for HAD in China. The associated research covers almost all of the requirements for HAD, from vehicle-road collaboration and Vehicle-2-X-communication to the actual autonomous vehicle. More specifically, Tongji has wide-ranging expertise in market and policy analysis, algorithm design, testing, and evaluation. As a Porsche Chair professor, my research focus on the development of the key technologies by using advanced control and learning-based methods for HAD. More specifically, we are working on the cooperative chassis control for autonomous vehicles, the predictive cruise control, Level 4 'Robotaxi' development, and the intelligence analysis of HAD. Meanwhile, to verify and validate the algorithms that we develop, we are also designing testing environments on different level, such as software-in-the-loop, hardware-in-the-loop, and vehicle-in the-loop environments.

When will true level 4/5 be reality in China?

Hong Chen: It's hard to say. Although both academia and industry are pouring considerable resources into this area, it is still challenging to turn level 4/5 into reality in the a short term. However, level 3, as described in the SAE "Levels of Driving Automation" standard, may be achieved soon in specific scenarios like highway driving. Similarly, level 4/5 could be implementedd in limited areas, such as the port and mining area, first and then in traffic scenarios that are more open. The good news is that road tests for level 4 (Robotaxi) have been limited in China in several demonstration areas on open roads, which undoubtedly provides a better environment for the research and development of level 5 technologies. Nonetheless, level 5 HAD that is functional in all conditions will still need some time to realize.

Summary

Due to the legal and infrastructural circumstances as well as specific customer expectations, developments for China must largely be carried out locally. Porsche Engineering has therefore been active in China for more than 30 years and is continuing to expand its presence. Both vehicle systems and development methods are adapted to the special characteristics of the country.

Info

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