CAN Newsletter Online

ADVANCED DRIVER ASSISTANCE SYSTEMS

Rise of ADAS all over the world

Advanced driver assistance systems (ADAS) are a fast growing application field. Researchers say about 50,12 million vehicles will be equipped with ADAS in 2016.

The Renault Scénic shown at the Motorshow in Geneva monitors the vehicle environment, alerts the driver to collision risks, and triggers the brakes automatically if necessary; other ADAS features include lane keeping and fatigue detection systems (Photo: Renault)

In 2013, the ADAS market counted US$13,4 billion, according to the market research firm Markets-and-Markets. Taking an estimated 20-% annual growth into account, the market will increase to more than US$20 billion in 2016, estimated the researchers. Many of these systems provide CAN connectivity. Headlight control systems, adaptive cruise control (ACC), collision avoidance, blind spot warning (BSW), and park aid systems are among the systems that use CAN. Park assistance systems are one of the most popular applications. They are economic and easy to install compared to other ADAS functions, said market researcher Amey Amanaji from Markets-and-Markets. For the period from 2016 to 2022, Research-and-Markets predicts an annual average growth of 10,4 %. These researches are a bit more conservative: they predict an ADAS market of around US$5,8 billion for 2016.

The demand for ADAS has been rapidly gaining pace in the automotive industry owing to the expected future demand for autonomous/driverless vehicles. The rising awareness of the driver's safety and the influence of regulations and safety ratings on OEMs are the major factors responsible for enhancing the global growth of the ADAS market. The growing public awareness towards driver's safety is also the important factor responsible for the exponential growth of the market of ADAS-equipped vehicles. Moreover, vehicle manufacturers are instructed to include safety features in new car models due to the rising influence of regulators and national and international safety organizations.

In some countries, tire pressure monitoring systems (TMPS) are mandatory, for example in USA, some European countries, and South Korea. Japan and China are in the process of mandating this ADAS function in 2019, said Amey Amanaji. In the related study by Markets-and-Markets, it is stated that there are more ADAS regulations to come: the European Parliament will require electronic stability control (ESC), advanced emergency braking systems (AEBS), and lane departure warning systems (LDWS). Europe is also assessing the benefits of mandating blind spot detection (BSD).

China goes its own way

ABI Research forecasts China's ADAS market growth to gain speed between 2017 and 2020, increasing by roughly 40 % per year. "Once connected infotainment saturates China's automotive market, domestic OEMs will turn toward ADAS solutions as the next market driver," said James Hodgson, research analyst at ABI Research. "In many ways, the proliferation of ADAS in China will be a delayed reflection of the growth observed in other regions. Before the market can reach its full potential in China, however, regional automotive vendors need to educate consumers on system benefits, adjust the price level to make it more accessible, and build a feature set to specifically target the concerns Chinese consumers have in regards to their safety."

A number of carmakers are working hard on aligning ADAS functionalities with the Chinese consumer market. BMW, in partnership with Baidu and along with regional car manufacturers such as BAIC, is launching autonomous vehicle trials in China. These companies will then apply what they learned from those trials to mainstream ADAS packages, identifying critical circumstances that Chinese drivers face on the roads, and tweaking ADAS accordingly.

"Additionally, Nissan very recently started working with China's Automotive Technology and Research Center to figure out how to best adapt Nissan's lane keeping and collision avoidance technologies to suit the region's driving habits," continued Hodgson. "The company understands that it can't just copy what it did for Western and Japanese markets; it has to be intuitive and adapt this technology to specifically cater to Chinese consumers."

It is important to note that ADAS adoption in China continues to grow at a relatively slower pace than other regions due to the systems' unaffordability. As sensor costs continue to fall, ADAS will become far more accessible to China's burgeoning middle class. As liability is of utmost importance to these consumers, there is a flourishing market for digital video recorders or dash cams, where ADAS features such as forward collision warning (FCW), vulnerable user detection (VUD), or lane departure warning (LDW) can be included as a key product differentiator.

ASIC-based ECUs are on the rise

Many ADAS-supporting ECUs (electronic control unit) are based on FPGAs (free programmable gate array). These ASICs (application-specific integrated circuit) often also implement CAN modules (see also "Customized ICs reduce costs"). The next wave of ADAS functions will predict overtaking maneuvers. In order to resolve the conflict between the support and autocracy of ADAS, system control must incorporate the driver.

At the Human Factors Institute of the Bundeswehr University Munich, research is therefore being conducted on the prediction of driver intention, which can greatly increase the specificity of driver assistance. The researchers are developing an algorithm, which is based on currently available vehicle sensors and which is able to predict overtaking maneuvers with a high level of reliability.

The ADAS market has a high impending growth in the automotive industry majorly attributed towards the high rate of proliferation of the sensors and emerging technologies in the automotive industry. Besides that, the cost of sensors has been decreasing drastically over the past five years, which contributes to the increasing volume of sensors in the automotive industry.

Providers of Systems-on-a-Chip (SoC) such as Renesas have teamed up with software experts such as Rightware: Rightware's Kanzi software runs on Renesas' R-Car H3 chip. The companies have demonstrated the cooperation of their products in a high-fidelity configurable digital cluster with infotainment and ADAS (Advanced Driver Assistance Systems) features.

"We are happy to announce the collaboration with Renesas. The R-Car product family is a great match for our Kanzi software, allowing our customers to design and develop HMIs with great performance and high-quality graphics. We look forward to several more series production wins together," said Jonas Geust, CEO at Rightware.

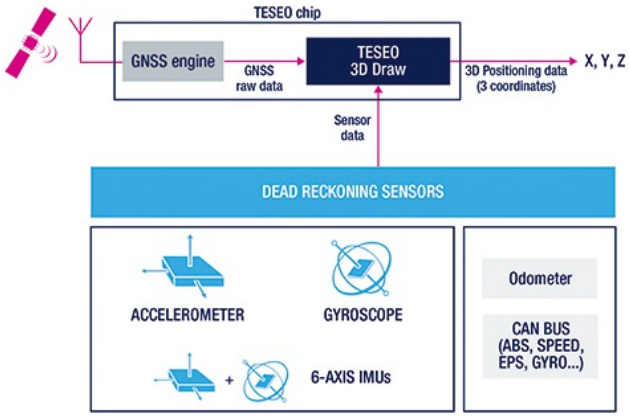
"We are pleased to cooperate with Rightware. Their Kanzi HMI demo running on our R-Car H3 SoC is a great showcase of the powerful graphical capabilities of the R-Car platform. We will continue to work with Rightware on future graphics technologies and look forward to more automotive design wins together." said Masahiro Suzuki, Vice President, head of Automotive Information System Business Division at Renesas Electronics Corporation.

ST-Microelectronics, another automotive chipmaker, and Arccore, an Autosar software provider, also joined forces to develop ADAS solutions. The software development tools include the Arctic Core embedded-software platform, which comprises a real-time operating system, memory services, and automotive communication services including for CAN and the Arctic Studio Integrated Development Environment.

"Our agreement with ST goes beyond a traditional service-driven model towards a cooperation based on a shared product-support roadmap. By getting early access to ST's automotive MCU know-how, we can provide SPC5 customers with the immediate advantage of a ready-made and market-proven methodology for easy and hurdle-free development of new Autosar-compliant applications," said Thomas Winkler from Arccore.

Additionally, ST-Microelectronics has introduced the Teseo Draw firmware for multi-constellation positioning chips. The firmware merges the satellite information with data from vehicle sensors such as the gyroscope, accelerometer, and wheel-speed sensors, to calculate location accurately in three dimensions including elevation. If the satellite signal is poor, the firmware compensates for the loss of accuracy, and if the signal becomes unavailable, navigation continues uninterrupted based on calculated location (dead reckoning). Road tests carried out in difficult under-cover and urban environments have demonstrated continuous tracking from entry to exit in complex multi-level car parks, and at street level between tall buildings, where conventional systems have been unable to track the vehicle.

"Our firmware strengthens GNSS performance and eliminates barriers to continuity, enabling exciting new services to emerge," said Fabio Marchiò working with ST-Microelectronics. "Users can also experience significant improvements in existing services such as fleet tracking, eCall, or Era-Glonass emergency response, usage-based insurance, road tolling, and anti-theft systems." The firmware has multiple modes and is capable of referring to sensors on the vehicle's CAN network or discrete sensors.



Block diagram of the Teseo Draw system connected to the CAN in-vehicle network in order to continue navigation when the satellite signal is poor or no signal is available (Photo: ST-Microelectronics)

Digital A9 Autobahn test bed

USA has its Google cars. In Nevada and some other states, other cars are also allowed to run driverless on roads. In Germany, the "digital A9 motorway test bed" project demonstrated real-time communication between vehicles via the LTE (long-term evaluation) cell network last November. The exercise showed how vehicles on the motorway can share hazard information using the LTE network of Deutsche Telekom.

As extremely short transmission times are vital for this purpose, a section of the Deutsche Telekom network was equipped with innovative Mobile Edge Computing technology from Nokia Networks and upgraded with position-locating technology developed by Fraunhofer ESK. This combination, for the first time, permitted signal transport times between two vehicles of less than 20 ms. Combining the technology with a vehicle electronics interface developed by Continental gave rise to a number of different applications aimed at making driving safer and more comfortable.

The test vehicles contained an on-board unit, which was connected to the vehicle systems and communicates with the LTE network via a wireless module. Continental supplied the interface to the cars' on-board systems via CAN and the tablet application software. Fraunhofer ESK developed the Geo Service software, which ensured that the vehicles' position data were recorded and processed directly at the LTE base station. The geo service at the mobile base stations allows for incident warnings to be sent practically in real-time to all vehicles in the relevant area.

Alexander Dobrindt, the German Federal Minister of Transport and Digital Infrastructure, commented: "With the 'digital A9 motorway test bed', we have created a technology-neutral offering for industry and research. Innovative companies can trial automated and networked driving in real-life conditions on the motorway. We are, in a very real sense, bringing the laboratory to the road. This is the first demonstration of car-to-car communication via a high-speed cellular connection with near-5G performance. The project highlights the fact that Germany is paving the way for Mobility 4.0 in the digitalized world. Our ambition is to make the rating 'tested on German Autobahn' internationally recognized as a standard."

Requests from carmakers to provide ADAS

At the Motorshow 2016 in Geneva, Delphi and other Tier1 suppliers reported that they get more and more requests from carmakers to provide ADAS solutions not just for the premium class cars. This includes audio and visual driver warnings and adaptive cruise

control, lane keeping assist, and emergency breaking.

Renault demonstrated an active emergency braking system with pedestrian detection, lane keeping assist, and fatigue detection warning. Other ADAS functions implemented by the French carmaker include adaptive cruise control, lane departure warning, safe distance and blind spot warning, traffic sign recognition, over-speed prevention, and parking assistance. Other OEMs also demonstrated ADAS functionality: Toyota showed a pre-collision warning system, road sign assistance, and pedestrian detection systems.

The Drive Wise sub-brand of Kia demonstrated in Geneva is already equipped with some ADAS systems (Photo: Kia)

In Geneva, Kia showed its Drive Wise sub-brand to encompass its forthcoming ADAS. The Taiwanese carmaker will invest US$2 billion by 2018 to develop autonomous driving vehicle technologies. A partially autonomous driving car is planned for 2020, and a fully automated vehicle is targeted for 2030.

Kia is planning to introduce a range of partially autonomous ADAS technologies in the coming years, with an array of new functions anticipated for introduction to market by 2020. Among the technologies currently under development is the Highway Driving Assist (HDA), which combines a Lane Guidance System (LGS) and Advanced Smart Cruise Control (ASCC). HDA is designed to automatically maintain a safe distance from cars in front while keeping the car in its lane on the motorway and adhering to local speed limits using information from the navigation system. The system will also assist in safely overtaking other cars on the motorway.

Traffic Jam Assist (TJA), currently under development, will help make light work of heavy congestion by tracking the vehicle in front during moderate-to-highly congested traffic conditions. The system employs a range of sensors to maintain a safe distance from the car in front and keep the vehicle within its lane. Using TJA, drivers will find it easier – and more relaxing – to navigate traffic jams on often-congested roads.

To make Kia vehicles among the easiest cars to park, the company is developing further technologies to enable cars to complete low-speed maneuvers more easily. Enhancing Kia's existing Smart Parking Assist System (SPAS), which enables the car to park itself in parallel or perpendicular spaces with minimal driver input, Kia will also introduce Remote Advanced Parking Assist System (RAPAS), allowing Kia vehicles to park themselves when the driver presses the smart key button while within a certain range of the car.

At all times, the new range of ADAS technologies can be circumvented by direct driver control, enabling closer control of the car as desired. These technologies will join the suite of technologies already offered by Kia on its latest production vehicles in many of its global markets, including the Sorento and the soon-to-be-launched all-new Optima and Sportage. They are primarily designed to make driving safer and easier for the customers by identifying hazards at the earliest possible opportunity and allowing the driver – or the car – to take the appropriate reaction. Existing Kia technologies include Lane Departure Warning System (LDWS), Lane Keeping Assist System (LKAS), Blind Spot Detection (BSD), Auto Emergency Braking (AEB), and Advanced Smart Cruise Control (ASCC).

ADAS: Not just for road vehicles

Highly automated cars, more or less autonomous driving, are the driving force for new ADAS solutions. But ADAS are not just suitable for road vehicles. Manufacturers of off-highway agriculture vehicles and construction machine builders are already considering and developing similar functions for their mobile machinery. Fendt, a brand of Agco (USA), has introduced a driverless tractor able to follow another tractor conducted by a farmer. Of course, this is allowed only on farmland and not on roads. It is unnecessary to mention that these agriculture vehicles use embedded CAN networks.

hz