



Autocruis Makes Zynq-Based ADAS and IMS Systems Available in Tens of Thousands of Intelligent Vehicles

Xilinx adaptive computing enables reliable, cost-effective visual perception solutions for ADAS and IMS

AT A GLANCE:

Autocruis is a leading intelligent driving IP solutions provider and an electronic modules supplier. As a pioneer of FPGA-based computer vision technology, the company has deep FPGA talent in the fields of image processing and deep-learning technology. Autocruis is one of the members of China's national Driver Monitoring System (DMS) standard development, is Bosch's China DMS software partner, and is one of the certified automotive solution partners of Toyota Tsusho and Xilinx.

Industry: Automotive
Headquarters: Shenzhen, China
Established: 2016
Website: www.autocruis.com



Figure 1. Core technology of Autocruis

SUMMARY:

The development of artificial intelligence, 5G, and the IoT is redefining automotive safety and the human-computer experience in vehicles. Two of the most-important fields of intelligent driving, Advanced Driver Assistance Systems (ADAS) and In-cabin Monitoring Systems (IMS), are empowering the commercialization of intelligent driving from two directions: driving automation and in-cabin automation.

Autocruis is mass producing a series of visual perception intelligent driving solutions, including those for ADAS and IMS, based on the cost-effective Zynq®-7000 SoC adaptive computing platform. The Zynq platform provides Autocruis with higher performance, lower latency, and the flexibility to switch between multiple ADAS functions using a feature called Dynamic Function Exchange (DFX).

CHALLENGE:

AVM (Around View Monitoring), also known as 360-degree panoramic viewing, is one of the fastest-growing ADAS applications in recent years. By sensing data from four sensor cameras outside the vehicle, this system helps drivers understand what’s around the vehicle, and provides timely warning before danger occurs. Compared with a forward-view or rear-view system, AVM needs real-time processing of 360° data from the car body, while enabling the driver to make quick decisions through image mosaicing, video processing, and other technologies.

Traditional AVM systems are normally based on ARM processors or GPUs, however many of these chips face various limitations, such as low processing efficiency, high power consumption, slow start-up time, and high cost. These issues make them unable to meet automakers’ super-scale deployment requirements for intelligent driving applications.

Autocruis realized that various functions required by AVM and IMS systems could be met by adaptive computing technology because of its flexible deployment advantages, fast start-up speed, strong stability, rich logical resources, and reconfigurable characteristics. The company was able to combine its own world-leading AI technology with outstanding adaptive computing technology from Xilinx to build next-generation AVM and IMS systems for the industry.

SOLUTION:

Autocruis selected Xilinx’s (XA) Zynq-7000 SoC to build its next-generation AVM and IMS systems.

“As a heterogeneous multi-processor hardware platform based on FPGAs, Xilinx’s Zynq SoC is the combination of programmable logic and a processing system on chip. It not only has the functions of general processors such as ASICs, ASSPs, and DSPs, but also offers more functions that other processors do not have,” said Dr. Yanfeng Guan, CEO of Autocruis. “These capabilities, combined with our own leading deep-learning technologies and computer vision technologies, provide us valuable differentiation and a leadership advantage in building advanced AVM and IMS systems.”

According to customers’ requirements, Autocruis tailored a set of highly effective AVM systems based on the Zynq-7Z010 with the advantages of faster start-up speed, low stitching distortion, and high robustness. They also enabled such functions as dynamic viewing angle follow-up and dynamic loading of front and rear auxiliary lines. Autocruis also developed a highly efficient and cost-effective IMS system based on the Zynq-7Z010 and 7Z020 leveraging its leading AI algorithm technology. That system includes such features as: fatigue detection, attention detection, identity recognition, status recognition, behavior recognition, gesture recognition, emotion recognition, passenger status, rear row recognition, etc.

Compared with traditional solutions, the new AVM and IMS systems realized:

- **Higher performance.** A single Zynq SoC can achieve complete ADAS design from environmental feature extraction to recognition. It enables Autocruis’ solution to avoid the bandwidth bottlenecks and safety risks associated with inter-chip transmission of all other multi-chip solutions, resulting in higher performance and greater stability and reliability.
- **Reduced Latency.** Real-time response capabilities with low latency are essential to driving safety. The unique FPGA parallel processing advantage of Xilinx’s SoC allows it to flexibly access various sensors and process data from the entire front-end sensor in nanosecond or microsecond parallel processing, so the system latency will be lower than that of GPUs or CPUs.

- **Reduced Total Cost-of-Ownership (TCO)** : Leveraging Zynq’s BRAM, lookup tables, registers, DSP and other rich hardware resources, Autocruis is able to deploy the complex deep-learning network on cost-effective Zynq SoCs, and successfully develop high performance, multi-function, and highly competitive IMS and ADAS systems.
- **Greater Flexibility.** With the unique reconfigurable function of the FPGA and Autocruis’ deep-learning modularized design and configurable technology, Autocruis’ new solution can support users that wish to customize new functions according to their needs, or easily expand the sensor. At the same time, it has laid a solid foundation for Autocruis to rapid optimize and deploy new deep neural networks or upgrade more advanced ADAS system functions in the future.
- **Better Intelligence and Safety:** Zynq SoC’s Dynamic Function Exchange (DFX) function enables Autocruis to realize multiple ADAS functions with real-time loading and dynamic conversion using unified computing resources. This feature allows the company to implement other driving assistance functions, such as the Lane Departure Warning System (LDW) and Blind Spot Vehicle Discern System (BSD) on the new AVM system. This makes intelligent driving smarter and safer.

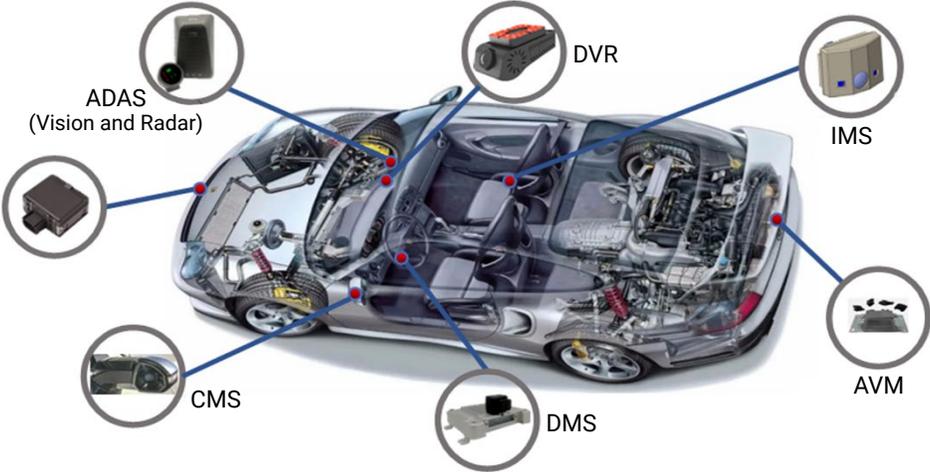


Figure 2. - Autocruis intelligent automotive product roadmap

RESULT:

Compared to a traditional I.MX6D solution, Autocruis’ new AVM system reduces the cost by more than 50% on the main chip alone and achieves the level of the current mainstream intelligent vehicle solutions in terms of functionality and performance. It can meet the needs of both domestic and foreign intelligent vehicle products on the market.

Autocruis’ various adaptive computing-based intelligent driving products and solutions have successfully achieved stable mass production in commercial and passenger vehicles (including a large bus OEM, and an automotive OEM with annual sales exceeding 2 million units.)

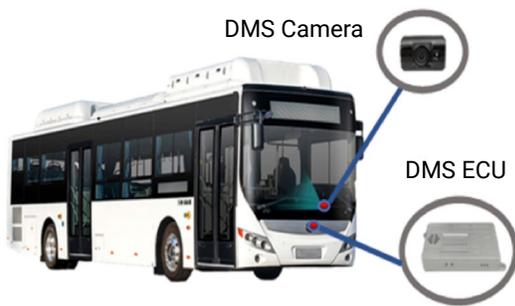


Figure 3. - Schematic diagram of DMS for bus

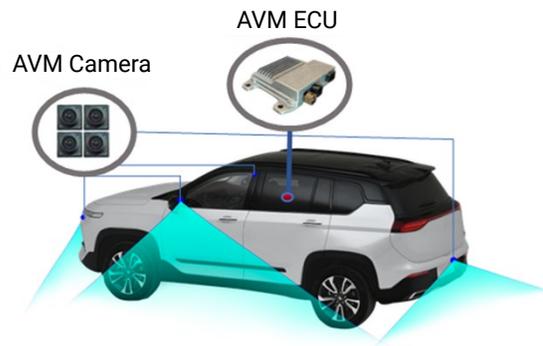


Figure 4. - Schematic diagram of AVM for SUV

ADDITIONAL RESOURCES:

[Learn More About Autocruis Technology](#)

[Learn More About Xilinx Zynq SoCs](#)

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