Scalable, Real-Time AI, Enabled by AMD, Accelerates SICK Intelligent Sensor Solutions

SICK Combines AMD FPGA Devices and Machine-Learning Frameworks to Deliver Fast and Accurate Inspections

PARTNER

SICK
Sensor Intelligence.

INDUSTRY

Industrial / Machine Vision Applications

CHALLENGES

Deliver high-performance machine vision in real-time while simplifying customer development.

SOLUTION

SICK uses AMD FPGAs and the FINN machine-learning framework in its intelligent machine vision platform to simplify and accelerate processing.

RESULTS

The integration and performance of AMD FPGAs optimizes performance and accuracy in even complex machine vision applications.

AMD TECHNOLOGY AT A GLANCE

Kintex™ UltraScale+™ FPGAs
FINN Machine-Learning Framework
Deep Learning Processing Unit

Rapid innovation of artificial intelligence (AI) technology continues to bring exciting new capabilities to the automation industry. In particular, machine vision applications enable higher accuracy, greater throughput, and increased ease of use. SICK AG, a world leader in intelligent inspection technology, is at the forefront of AI development, providing both preconfigured and customizable machine vision solutions.

One challenge for SICK is that high-speed machine vision applications must execute complex inspection tasks in real-time using high-resolution images. The combination of large image size, pixel-accurate processing, and high-speed processing requires highly integrated silicon that delivers high performance, greater flexibility in hardware acceleration, scalability, and ease of use. The availability of integrated FPGAs and adaptive SOCs from AMD enables SICK to introduce real-time AI to a greater range of automation applications.

CHALLENGE

SICK machine vision solutions are fully integrated systems that bring AI out to the edge. Their clients need technology that can deliver high performance without breaking power or space constraints. But these solutions must also be simple to use, so their customers don't need to become AI experts in all technical details, rather be able to train systems quickly without much effort, even on the device.

SOLUTION

SICK uses AMD FPGAs, coupled with the AMD FINN open-source framework, to generate a highly optimized FPGA accelerator in its intelligent machine vision platform. AMD adaptive technologies use programmable and configurable hardware resources to accelerate processing. Thus, systems using this technology achieve the optimal performance of hardware-based solutions with the flexibility of software programmability.

Because SICK has a flexible, high-performance platform to build upon, they have been able to focus their development efforts to simplifying their technology for their customers.

The SICK Lector camera family, for example, is preconfigured for code reading applications. With its large image size and pixel-accurate processing capabilities, the Lector family uses an on-device neural net to identify barcodes on parcels or envelopes within a large inspection space.

Where Lector is a solution configured for a specific type of application, the Inspector camera family provides flexible and programmable access to the many capabilities of the SICK intelligent machine vision platform. Developers can use the internal Deep Learning Processing Unit to optimize high-speed, high-resolution machine vision AI processing in real-time for complex inspection tasks.

SICK provides the Nova 2D SensorApp, a deep-learning-powered intelligent inspection toolset for a seamless user experience within its development ecosystem.

"The simple framework of Nova allows our customers to use their own images to train the AI neural network," said Christoph Maier, senior engineer at SICK. "Both expert and nonexpert users can rapidly train and configure sensors using an intuitive interface with results available in just minutes. For more complex tasks, SICK provides cloud training capabilities for its customers to easily create custom AI neural nets without having to invest in own training infrastructure."

SICK Lector, Inspector and Nova families use a variety of AMD FPGAs and adaptive SOCs in its intelligent machine vision platform. An AMD Kintex™ UltraScale+™ device provides the integrated architecture inside the SICK Lector / Inspector83x and 85x families of machine vision solutions for executing complex inspection tasks. Inside the camera, the Kintex UltraScale+ FPGA enables the high-speed capture, compression, pre-segmentation, and AI neural net processing of 5- to 12-Mpixel images in real-time.

RESULT

"The hardware/software programmable flexibility of AMD FPGAs and adaptive SoCs carries over to our customers," says Maier. "Our machine-vision solutions deliver hardware-accelerated performance optimized for their data and applications."

"The results speak for themselves," says Stefan Blattmann, an embedded systems egineer at SICK who is part of the team that evaluates new technology for the company. For example, a key metric in the logistics industry is how many barcodes a system can read under unpredictable circumstances. A barcode reader has to find as many codes as possible so parcels don't need to be put back through the scanner. Blattmann said, "The integration and performance of AMD FPGAs enables our solutions to optimize accuracy and execution speed while achieving exceptional accuracy in even complex barcode-reading applications."

SICK is able to program the Kintex UltraScale+ and other AMD FPGAs to provide the optimal hardware configuration for a particular application task. The advantage of AMD FPGA technology enables SICK to scale AI technology in multiple dimensions. From low latecy AI in stream processing to high perfomance general purpose AI vison tasks.

"We can use our home-grown technology and tailor the silicon to the size and capabilities we need," Maier said. "In this way, we can guarantee that our solutions can run even a complex AI inference within a fixed frame rate."

AMD technology has helped SICK to deliver more than just high performance by simplifying their technology for their customers. Maier said, "Our customers don't want to struggle with integrating hardware or worrying about the implementation of AI for a specific application. That's the value we bring. We abstract the complexity of hardware and AI to make them easier to use. This frees our customers to focuson solving their problems."

In terms of simplifying their own development, Blattmann called out the level of integration in AMD devices. "AMD provides a complete package. Their FPGAs and adaptive SoCs integrate the AI processing power we need all in a single device without compromising performance. And with the hardware programmable resources available, we can instantly integrate anything else we might need."

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About AMD Kintex UltraScale+ FPGAs

About FINN

About SICK

About SICK

From factory automation to logistics automation and process automation, SICK's sensor solutions are keeping industry moving. As a technology and market leader, SICK provides sensor intelligence and application solutions that create the perfect basis for controlling processes securely and efficiently, protecting individuals from accidents, and preventing damage to the environment. Visit the SICK website at https://www.SICK.com/us/en/

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