SERMA Develops Edge AI-Avionics Solution Powered by AMD Versal™ Adaptive SoCs

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AMD × SERMA GROUP

INTRODUCTION

SERMA Group is a French company providing expertise in electronics technologies and materials characterization. The company offers consulting and testing services in electronic technologies, embedded systems, and information systems. They specialize in cyber security and safety operating across the product lifecycle, from research and development to maintenance. The company has a network of experts and laboratories, with a focus on technical excellence.

SERMA Ingenierie, based in Toulouse, France, develops flight recorders and surround view camera systems for small aircraft, as well as cockpit camera systems to detect pilot fatigue. The company recently introduced a groundbreaking on-board computer for avionics featuring AI computing capabilities, based on the AMD Versal™ Premium Series and the AMD Versal™ AI Edge adaptive SoC.

CHALLENGE

The idea of the product was to embed reduced-sized CNN models on AMD Versal devices and use federated learning capabilities on embedded systems inside the aircraft. Federated learning is a machine-learning technique where multiple participants collaboratively train a model without sharing their raw data. This allows for model training on decentralized datasets, ensuring data privacy and security while still leveraging the insights from diverse data sources.

The new solution developed by SERMA is called the ANAX system (Aircraft Navigation Assistance CompleX). The system can detect objects with thin or small dimensions at long distances from the aircraft.

"We needed low latency with results in a few hundred milliseconds," said Jerome Lastennet, an electronic engineer and FPGA specialist at the SERMA Group. "We knew the system had to be cost effective to target multiple types of aircraft and that it needed to be lightweight and compact." The ANAX system is targeted at small aircraft today but could eventually be used in other areas of transportation, including trains and automobiles.

INDUSTRY

Aeronautics and provides expertise, consulting, and testing services in electronic technologies, embedded systems, and information systems.

CHALLENGES

Embed reduced-sized CNN models on AMD Versal devices and use federated learning capabilities on embedded systems inside smaller aircraft to detect objects with thin or small dimensions at long distances from the aircraft.

SOLUTION

The solution developed by SERMA, enabled by an AMD Versal™ adaptive SoC, differentiates itself from the competition through its object detection capabilities, using a high-resolution camera able to detect very thin objects at 100 meters, with very low latency.

RESULTS

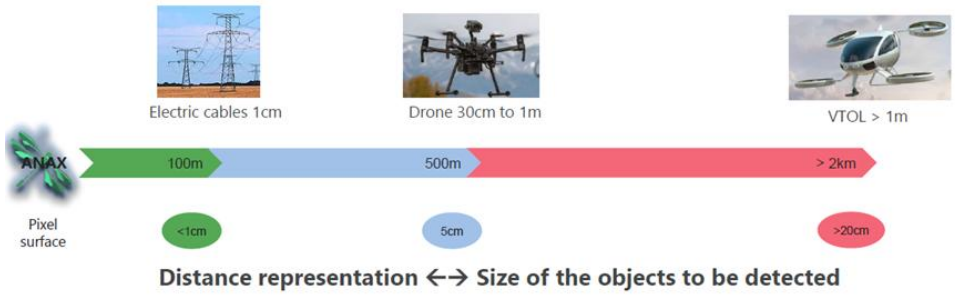
AMD Versal devices offer low latency and low power consumption and provide the compute resources needed for real-time image processing.

AMD TECHNOLOGY AT A GLANCE

AMD Versal™ AI Edge adaptive SoC
AMD Versal Premium Series adaptive SoC

TECHNOLOGY PARTNER

Avnet



"We were looking for a robust and reliable FPGA/AI Engines that would enable us to deploy AI for rapid image processing in harsh environments," Lastennet said. "We also needed an energy efficient solution that would enable us to distribute intelligent sensors for preprocessing, sorting, and decision-making."

SOLUTION

The ANAX solution enabled by an AMD Versal™ Premium adaptive SoC, distinguishes itself from the competition through its object detection capabilities. "We use a high-resolution camera that is able to detect very thin objects at a distance of 100 meters," Lastennet said. "We also have very low latency, with a response time of just a few hundred milliseconds."

"Others try to use LiDAR, but they can't achieve the same performance—not at 100 meters, or to the precision of detecting objects that are only 1 cm thick," he said. "Also, the latency can't be beat."

David Quenard, head of AI and data at SERMA, agreed. "No other solution on the market today can achieve our latency or resolution while being and fully industrial-solution compatible with our markets."

SERMA offers two different versions of its ANAX system. The first runs on an AMD Versal Premium VP1502 adaptive SoC and is used for image detection. It uses less AI power but is more easily certified. The second version runs on an AMD Versal AI Edge VE2802 and uses the on-board AI Engines to manage AI models on the device.

Quenard said ANAX is not an autonomous system for aircraft, but rather, it assists the pilot. The regulations are not ready for AI systems to control aircraft directly, he said. "We are using the FPGA and focusing on things that are repeatable and explainable to reach sufficient levels of certification."

RESULT

SERMA's solution has attracted important customers from the aerospace and aviation industries.

"We started in the space domain with AMD Virtex™ FPGAs, and on the AW2S side we used AMD Zynq™ RFSoC devices for our 5G telecom product," Lastennet said.

"For the ANAX project, we studied several options, but AMD had the most powerful metrics to date."

"AMD Versal devices offer low latency and low power consumption, and the company has a program to support its devices for the long term," Lastennet said. "They're built for real-time AI processing in long-lasting product and harsh-environment applications."

"What's important to me is the new architecture based on the programmable network on chip (NOC)," Lastennet said. "It is very efficient for the project to use high-speed memories like the LPDDR4 low-consumption device. In addition, we have very good support from the distributor, Avnet in France. They are very experienced."

"We also had access to early engineering devices to develop our product and we had direct contact with AMD, to help with any questions that came up," added David Arnaud, chief technology officer at AW2S, a Serma subsidiary.

Arnaud said the flexibility and adaptability of the AMD Versal product is pivotal to their design roadmap.

"With AMD, we can build one board and reuse it for different functions, and different AI models. This is not achievable without something like the Versal adaptive SoC. Our goal is to build a platform with adaptable functionality that we can use for different products down the road," he said.

ABOUT Serma Group

SERMA Group is an independent platform for expertise, consulting, and testing in electronic technologies, embedded systems, and information systems. It is particularly involved in the design, securing, and ensuring the reliability of products and data. Specialized in sectors with high environmental, reliability, and security constraints, SERMA is characterized by its culture of technical excellence and its network of experts. The Group operates throughout the product life cycle: from R&D and design phases to maintaining operational conditions, supporting designers and users of systems in mastering their strategic challenges. For more information visit: https://www.serma.com/

ABOUT AMD

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