RADMANTIS CHOOSES AMD KRIA SOM TO ACCELERATE LAND-BASED FISH FARMING WITH AI

CUSTOMER

radmantis

INDUSTRY

Industrial

CHALLENGES

Traditional fish farming has many challenges that impact production, from required manual fish handling to warming sea temperatures that create algae blooms and damage the fish.

SOLUTION

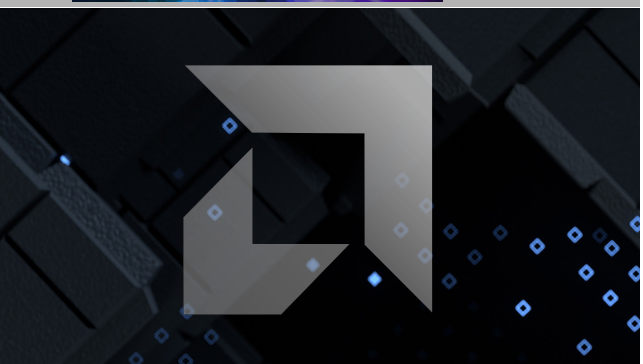
With the AMD Kria SOM, Radmantis is able to deploy automated fish inspection systems using AI inferencing.

RESULTS

The AMD KRIA SOM rapidly processes the high-resolution images and supports the AI inferencing and decision-making that is required to enable touchless fish farming.

AMD TECHNOLOGY AT A GLANCE

AMD KRIA™ SOM



USDA-Funded project aims to bring a sustainable food supply to regions across the U.S.

Recirculated Aquaculture Systems (RAS) technology is a method for growing seafood indoors, with minimal impact on the environment.

Radmantis, a specialist in the field, was awarded an innovation grant from the USDA and is exploring what next-generation imaging can do for fish farming using the AMD Kria™ SOM platform."

It takes two to three years to design and build an indoor fish farm, and another year and a half to grow the fish. Many fish, like Coho salmon, can complete their entire lifecycle in fresh water, which allows fish farms to be set up just about anywhere.

In a RAS-based fish farm, 15-20 percent of the farm water is replaced each day, and advanced filtration systems can use the sludge both as an organic fertilizer and to produce a biogas to generate electricity and reduce the carbon footprint.

"We've been incredibly excited to partner with AMD on this project," said Robert Huber, co-founder of Radmantis. "At the end of the day, we are extremely gratified to know that we are working together trying to solve a massive problem, which is to produce enough quality protein to serve a growing population with shrinking resources."

Traditional salmon farming has a number of challenges, including global warming. Increasing sea temperatures has reduced the areas where farmers can raise salmon in the ocean. Algae and jellyfish blooms, as well as sea lice, are other big problems. But neither of these issues is a challenge for land-based fish farming.

"Our goal is to commercialize our technology to reimagine fish farming," Huber said. "We are introducing cutting-edge, AI robotics automation technology into a process that is traditionally very reliant on manual handling."

"Fish farming typically depends on manually handling fish, but fish don't really want to be touched, and they can become very susceptible to disease or get injured," Huber said, "yet every fish farm is dependent on handing fish that way. Our vision is to create a process where the first time a fish gets touched by a human hand is when it is being put on a plate."

Huber said the goal is to teach its automated systems to cover the basic workflow needed in a fish farm. "It needs to be able to do a detailed analysis of the fish in their population, including sorting fish by size and harvesting them based on certain criteria," he said. "We also need to be able to identify sick fish to avoid catastrophic loss. With our advanced imaging systems, we have figured out ways to have fish pass through our devices, where we take high resolution images of

the fish, and use that information to do some automation with AI inferencing. If there is a sick fish, we want to extract it from the population, not just know that it's there."

The USDA project brings Radmantis' technology to the advanced imaging stage. "Imaging is tough in a fish farm," Huber said. "The fish are in hyper-oxygenated water, so you constantly have oxygen bubbles emerging from the water. When you do imaging, this is equivalent to a blinding snowstorm. The USDA project allows us to add two components to our imaging process. First, we'll be able to use high-resolution imaging to identify individual fish based on their dot patterns and skin patterns without having them marked. With this information, we'll be able to construct individual growth curves for each fish. If some fish are unable to grow, we can extract them from the population. The second component is the use of multi-spectrum imaging to identify fish that are not particularly healthy and try to extract them from population to prevent disease outbreaks from taking hold."

"AMD hardware with the Kria system-on-module is absolutely beautiful for this purpose," Huber said. "It delivers the resolution, the time frames, and the processing power that we need for both imaging and inferencing."

HOW IT WORKS

Radmantis' RAS system features a funnel-shaped entrance where fish are guided into the first chamber. This stage uses infrared lighting and a camera to examine the fish. Using AI inferencing, the team can identify the fish and its size, and based on that information, it can automate size-specific harvesting. The AMD Kria SOM is used to deliver real-time image and data processing during this stage.

After the imaging stage, the fish enters a sorting chamber with two exits. There is an AI-controlled switch that decides which of two gates is open. Most fish will go back into the fish farm through one exit.

But if a fish meets certain criteria for being sick, it will be guided out to the other exit where a vet can examine the fish. The total time to process each fish is about ten seconds.

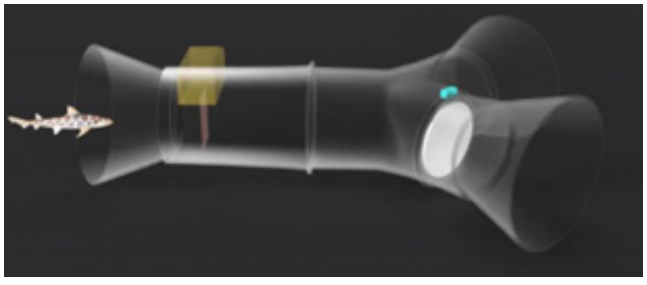
"The AMD Kria SOM rapidly processes the high-resolution images and supports the AI inferencing and decision-making that is required to quickly control the switch," Huber said.

Huber, a fellow at Harvard University's Ratcliffe Institute, has been an academic for 35 years. "The ability to grow protein on our planet is a major challenge, but there is a significant need for it," Huber said. "I decided to partner with a couple companies who shared our interest in reinventing fish farming and started Radmantis. It's been a really interesting ride. I got my first patents filed and many more are in process. I'm incredibly excited. It's been a wonderful opportunity to bring AI and automation tools to an enterprise-scale fish farm."

"A lot of the world's fisheries are past their peak," Huber said. "Many of the traditional places are plagued with environmental damage or are overfished. The ultimate solution for seafood production is land-based systems used to raise large amounts of fish at great densities on very small resources. Land-based systems are a great solution because they can generate large quantities of healthy food, and they are sustainable, reliable, and resilient to climate change."

The USDA grants are intended to help the industry commercialize this technology. Once Radmantis can show it is feasible in phase one, the second phase will be to build a functional prototype, and phase 3 is to make the technology broadly available.

"Kria is a lovely piece of hardware that is flexible and provides all of the optimized components that we need. I'm excited to be working with AMD to solve one of the biggest problems on the planet." - Robert Huber, Co-Founder, Radmantis



Fish funnel. ***Image courtesy of Radmantis***

Fish farm. ***Image courtesy of Radmantis***

USDA FUNDING

"The USDA is funding the RAS project with Radmantis. To refine and validate Radmantis' technology, the team has partnered with The Conservation Fund's Freshwater Institute, a private, nonprofit organization working on advancing recirculating aquaculture technology through research and technological innovation.

Rakesh Ranjan, a research scientist, is leading the precision aquaculture effort at Freshwater Institute.

"We learned about Radmantis' project to develop a method for identification of individual fish in real-world scenarios and we were intrigued because most of the work in the past has been done on very few fish in a lab setup," Ranjan said. "In the real world, things change drastically."

Ranjan said the Radmantis system will be tested in two parts. The preliminary testing will happen at the Freshwater Institute in West Virginia, where data will be collected and the model refined. Once the system is optimized for commercial use, it will be tested in a production facility.

Ranjan said the first part of the project is to develop an algorithm to individually identify each fish. "The markings on each fish are different, like fingerprints on a human. If we can identify patterns on the skin or dot patterns on the head, we can track the health of individual fish, without having to take the fish out of the tank. These technologies are essential for ensuring the improved health and welfare of RAS-grown fish. We need powerful hardware to run these algorithms, and AMD is helping us by delivering powerful and fast computing."

ABOUT RADMANTIS

Radmantis develops uncrewed systems that use robust machine learning interence to categorize and sort individual fish entering the device. Radmantis develops real-time solutions that allow facilities managers to monitor and remotely manage a facility's fish population. For more information, visit: https://www.radmantis.com.

ABOUT AMD KRIA SOMs

Kria SOMs were designed with SW engineers in mind, providing familiar design enviornments without requiring FPGA programming experience, and enabled by the Kria Starter Kits that are low-cost out-of-the-box ready development platforms. Getting started with AMD has never been easier.

ABOUT AMD

For more than 50 years, AMD has driven innovation in high-performance computing, graphics, and visualization technologies. Billions of people, leading Fortune 500 businesses, and cutting-edge scientific research institutions around the world rely on AMD technology daily to improve how they live, work, and play. AMD employees are focused on building leadership, high-performance, and adaptive products that push the boundaries of what is possible. For more information about how AMD is enabling today and inspiring tomorrow, visit the AMD (NASDAQ: AMD) website, blog, LinkedIn, and Twitter pages

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