GROWERTALKS

Features

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The Race to Autonomy

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Seeing is deleafing

A two-time award winner in its debut year, Aisprid, of Brittany, France, earned a Gold Medal in the Machines and Automation category at Sival 2024 in January in France and the Robot Challenge at GreenTech in Amsterdam in June, beating out six other competitors for the prize. Their robot's specialty? Not harvesting, like so many others, but deleafing of tomato plants, a monotonous but necessary task that requires long hours for many workers—from 175 to 330 man-hours per hectare (2.4 acres) per deleafing session.

The Aisprid D01, aka "Leafy," automates this task using multiple cameras, a robot arm and artificial intelligence to continually "learn on the job" as well as from other robots doing the same task. The goal is for one Leafy to cover a hectare of greenhouse space, operating continuously, taking time out only for battery charges. Currently, 30 Leafy robots are working away in French greenhouses.

There are at least four benefits to robots operating in the greenhouse, says Nicolas Salmon, CEO and co-founder of the four-year-old company. Labor is the most obvious. "Without this, we risk seeing growers closing shop within the next five to 10 years, which is a threat for our food sovereignty," he says. Predictability is another. "Even if a robot is slower than a human, two robots will pretty much work at the same speed … So, it's easiest to predict when a job will be done with robots. Also, a robot shows up every day at work and can work pretty much 7 days a week and 24 hours a day." Lastly, less risk of disease, as the robot utilizes UV-C to sterilize its cutting head on a continuous basis.

Next up for the company is deleafing other crops, such as cucumber, as well as harvesting of crops.

Oh, as for the company and robot name? "Isprid means "Spirit" in Breton, and they added the "A" to form the acronym "artificial intelligence."

Freed from the rails

Hydroponic greenhouse mechanization has depended on heat pipe rails to guide their powered mechanization, whether simple scissor lifts or new autonomous UV-C robots, like Octiva's Lumion (which we wrote about in this space in the Summer issue). But not every operation has heat rails, and perhaps they don't need or want them.

That’s why Octiva has developed a guidance system for Lumion that lets it travel through the growing area on pneumatic tires, freeing it from the constraints of rails. Says CEO Tom Coen, “This is a logical step after the success of Lumion with our customers. We often receive questions from growers without a pipe rail system and we can now answer them.”

The new Lumion requires no changes to your greenhouse infrastructure, as the robot is guided by cameras and software using “intelligent trajectory generation.” It was successfully pilot-tested at a strawberry nursery in Achtmaal, the Netherlands, where there is high demand for chemical-free powdery mildew protection. UV-C can be deployed at night, when no workers are present, and it leaves no spray residue. A no-rails version of the robot opens up the technology to many more growers.

Can a computer grow a crop?

Scientists have been trying—and failing— for years (see MIT’s personal food computer) to answer that question. But with the right sensors, the right data and the right algorithm to make sense of it all (like a good human grower can), perhaps it is possible.

At Wageningen University & Research (WUR) in the Netherlands, they are trying to make it so by working with the smartest scientific teams from around the world in the Autonomous Greenhouse Challenge (AGC), an attempt to combine data and technology to control a greenhouse full of tomato plants, with the goal of producing the most fruit profitably—again, just like a good human grower.

Organizers give three key reasons for pursuing this objective. Shortage of labor—especially experienced growers—is one. The drive to produce more food, efficiently, is another. But third is a need to reduce resource consumption when producing CEA food. That’s something big data can potentially do more precisely than a human.

AGC #4 attracted 23 teams from around the world, which have been narrowed down to five finalists who met the initial objectives. Starting September 2, 2024, these five teams deployed their machine learning and computer vision algorithms in five greenhouse chambers at WUR. They will have three months to control the growing environment completely autonomously, growing a crop of dwarf tomatoes as economically and profitably as possible—meaning highest yield with the lowest possible input costs (water, energy, etc.). They will be compared to a control greenhouse operated by a team of growers. The winner will be announced January 16, 2025.

AGC has produced real-world benefits. Several members of the first winning team, The Croperators, have joined to form Blue Radix (blue-radix.com), a Dutch startup that offers an algorithm-based autonomous greenhouse solution called Crop Controller. Crop Controller guides existing environment and irrigation control computers, delivering a claimed 5% profit increase, 7% yield improvement, 10% less water and fertilizer usage, and 15% energy savings.

Their website lists nine operations using Crop Controller, including Village Farms in the U.S. Says Arie van der Giessen, vice president and regional facility manager for Village Farms, “Crop Controller is aware of our goals and strategy. It continuously optimizes the settings of the climate computer controls autonomously, and within the specified bandwidth we have determined beforehand. I no longer have to analyze all the data and set the climate computers manually.”

Crop Controller earned the GreenTech Innovation & Concept Award 2024, with the jury noting, “We have seen many innovations using AI and data science to optimize a single process in the greenhouse. Since there are many

processes which influence each other, the real challenge is to optimize the total operation. Blue Radix combines autonomous climate and water control, which is an important step towards autonomous greenhouses.”