Tool-Carrying Robot Could Weed Out Tedious Farming Tasks

The remote-controlled Hortibot does not do away with human labor, but can navigate through farm fields to relieve workers of some wearisome duties.

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Danish scientists have created a robot prototype that can navigate through farm fields to relieve workers of the tedious task of weeding.

The robot itself is a tool-carrier with a commercial camera. It can recognize rows of crops, determine its own distance and angles in relation to the rows, and make its way through a field with precision weed-destroyers aboard. The robot, developed by Aarhus University Institute of Agricultural Engineering researchers and partners, can be equipped with a mechanical weed-pulling device, for organic farms, or a dispenser for farms that use herbicides.

"It's a stupid tool carrier, but it's good at it," scientist and project coordinator Rasmus Nyholm Jrgensen said in an interview Thursday.

Actually, it's not that stupid, but it is pretty simple. Jrgensen's colleague touted the prototype robot to farmers he meets while in the Midwest for a conference last week. Unlike other roving robots, the Hortibot does not have to rely on GPS. Although the automated machine can be equipped with GPS, it can also navigate fields without satellites and maps. That eliminates considerable trouble and expenses, Jrgensen said.

"If you look at outdoor horticulture, it is a well known structure," he explained. "If you can see the path and rows, why do all the planning, mapping, and using satellite navigation? This changes GPS from a "need to have" to a "nice to have."

The Spider slope mower, a lawn-mowing bot, served as the base platform for the Hortibot, which performs inter-row weeding.
A gyro helps the robot turn itself 180-degrees, but designers throughout Europe have struggled to perfect wheels on such robots, which often contain wires that can get tangled when wheels rotate 360-degrees. "If you rotate it more than 360-degrees, then the wire will break," Jrgensen said, adding that wireless technology could help solve that problem.

The remote-controlled Hortibot does not do away with human labor, but, with the help of one worker, it can accomplish what would otherwise take 10 people, according to Jrgensen.

"It's simple, so you don't need a PhD or a Nobel Prize to operate it," he said. "I see it as collaboration between a robot and a person. It's a partner. It's a colleague. The robots can do the boring work, going very slowly between the rows and cleaning."

The robot could reduce reliance on foreign workers, the need to train them, and the risk of produce contamination with E. coli, which is sometimes transferred from farm workers' hands. In Denmark, farmers rely on laborers from Eastern Europe, the way farmers here rely on Mexicans for hard labor. The Hortibot could carry mechanical weeding devices to do away with those risks. A feasibility study showed that an organic onion grower could save 40-50% on expenses associated with conventional cleaning.

Some scientists are also working on laser technology to replace manual weeding.

"It's almost like Star Wars," Jrgensen said, laughing. "You see a weed and just shoot it. That's not working yet, because it's very complicated."

Since most farms rely on herbicides instead of manual weeding, the robots could also be equipped with dispensers that place a single micro-droplet of herbicide on each weed, reducing waste from less-precise spraying, Jrgensen said. That could reduce the amount of chemicals required by up to 95%, while reducing environmental impacts, he said.

Another advantage is that the robot weighs about 450-650 pounds. Though that's no lightweight robot, it is lightweight for agricultural equipment. So the 3-foot-by-3-foot robot should reduce problems -- like decreased oxygen, trapped minerals, poor rainfall absorption, increased runoff, and erosion -- associated with soil compaction from heavier farming equipment.

Jrgensen and his colleagues already have some business partners, but they are seeking more partnerships. They hope to get the manufacturing price below $55,000 (U.S.). Eventually, the Danish designers hope to build a Hortibot that uses electricity.