New computer system could one day help citrus growers count fruit before harvest

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Farmers are told not to count chickens before they hatch, but for citrus growers it's a little different – knowing how much fruit is on their trees can help them make better decisions about managing and harvesting the crop.

So University of Florida experts are developing an electronic system to "see" and count fruit, a concept called machine vision. It could be commercially available by the end of the decade.

"Basically, you use a camera and a computer to mimic what a human being can do," said Daniel Lee, an associate professor with UF's Institute of Food and Agricultural Sciences who leads the project.

This week Lee presented two papers on the system at the American Society of Agricultural and Biological Engineers' annual meeting. In one, the system was used to count green oranges in the field and had an 85 percent success rate.

By knowing their expected yield, growers can tell how much time, labor and equipment will be needed for harvest, said Lee, a faculty member in the agricultural and biological engineering department.

Because the system includes a Global Positioning System receiver and notes the position of each tree, it can help growers manage specific areas for better productivity.

Traditionally, orange groves have been managed in blocks – land units ranging from 5 to 500 acres. Each is managed as though it had no variations in soil fertility, irrigation and other characteristics. But that's not the reality.

"Yield is not constant in the whole grove," Lee said. "Some places you see more fruit, some places you have less fruit. So (with this system) you can do things differently at different locations."

Similar methods are used for crops such as cotton, potatoes and tomatoes, he said. It's part of a trend called precision agriculture, the use of technology to better manage crops.

But it will be another two or three years before the system can be sold because researchers are addressing challenges inherent in machine vision, he said. One is uneven lighting, which makes it hard for the camera to detect fruit in the dark recesses of the tree canopy. The other is detecting fruit partially obstructed by leaves or other objects.

The system includes a digital camera with special optical filters, a portable computer, GPS receiver and software designed by Lee and his graduate students. The camera and computer are mounted on a truck and driven through groves.

In smaller groves it's possible to photograph every tree, Lee said. But for those covering thousands of acres, operators would photograph trees in representative parts of the grove and use the results to make projections.

The project is funded by the Florida Citrus Production Research Advisory Council, an industry organization supported by growers, and also by a state initiative that supports research and education programs for citrus mechanical harvesting.

Currently, Florida's citrus yield is estimated each month during harvest season by the U.S. Department of Agriculture, using a system that relies on hand counts of specific trees, as well as tree size, Lee said.

Machine vision could be a big help to some growers, especially for predicting yield when the fruits are still green, said Esa Ontermaa, precision agriculture coordinator for Lykes Brothers Inc., one of the state's largest citrus growers.

"I can't really answer for everybody in the industry, I think, but it would definitely be highly beneficial for us," said Ontermaa, based in Lake Placid. "We utilize crop estimation as one of our primary tools to project toward the future. And that (machine vision) would allow a whole lot better picture of what the coming crop would be."

Ontermaa said his company already uses precision agriculture to manage its groves. One of Lee's recent studies used machine vision to count ripe fruit just prior to harvest in a Lykes grove.

"That's why Dr. Lee's work is very interesting to us, because it would integrate very well with what we already do."

Source: University of Florida