Decker's Nursery grows new plants with superior genetics p. 12

Mike Miller
and Brian Decker
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Multi-rotor systems prove beneficial to inventory data collection

The recent downturn in the economy has caused the entire nursery industry to look carefully for opportunities to improve efficiencies and reduce costs. A process that costs considerable money, and is always a thorn in any business’ side, is collecting inventory data. Any business owner knows that linking the collection of accurate real-time inventory information with sales is critical to their success. In many cases, because nurseries know that collection of real-time inventory data is expensive, time consuming, and often imprecise, they simply use estimates for their current availability. Enter remote sensing techniques — such as RFID, ground and aerial sensors — as a future solution to inventory processes in the nursery industry.

For the past two years a collaborative team from academia and industry has been pursuing a range of cost-effective sensors to obtain inventory data for both field and container nurseries. In June 2010, the team identified an exciting, low-altitude multi-rotor system (MRS) that

Made for field growing, the Root Control Bag makes digging easy and greatly expands your harvest season. No more tree spades - almost anyone can dig!

The Pot Pruner is a fabric liner that turns any standard plastic container into a root-pruning container. It insulates against heat and stops root circling. And it is reusable.

Wind blow over is no longer a problem with Tree Collars. Mounts on a stake and cable line. Extra padding to protect the plant. Easy on and off.

The MRS can be operated manually or be preprogrammed in specific fields or beds based on GPS waypoints.

can be used as a low-cost platform to collect images. In early September, the team demonstrated some of the exciting potential of this low-altitude MRS to members of the nursery industry in Oregon. The initial demonstration flights over both container and field-grown ornamentals validated to growers and researchers alike that this aerial system shows great promise for the nursery industry. Although not yet fully tested under nursery conditions, this aerial system may provide a low-cost method to check inventory, monitor for weed or pest pressure, or monitor plant stress on an as-needed basis.

A view from above

The heart of the system is a low-cost ($4,000 to $6,000) and light-weight (2 pounds) MRS. The MRS is modified to carry a variety of off-the-shelf digital still and video cameras, or a variety of sensors that can monitor for plant health. The vehicle can be operated either manually using a standard radio-controlled transmitter or it can be preprogrammed in specific fields or beds based on GPS waypoints, and the vehicle will fly this preprogrammed path automatically. Once the images are collected, they can be easily downloaded for processing.
The low-altitude, multi-rotor system will likely be a future solution for inventory issues in the nursery industry.

While the team is currently using free software that stitches multiple images together to form a larger composite, it is possible that in the near future the camera will stitch the images together as it takes the individual images.

Data analysis
The final piece in this technology puzzle is the fact that these images can be quickly analyzed to provide valuable information to the nursery. For example, imagine you have just pulled product for shipment and you want to know the grade and quantity of product remaining in the field or container bed. By analyzing the image using advanced software, you can count the plants and determine grading issues such as plant height and width on the remaining plants. At this point, although the counting and grading software has not been tested on nursery-grown plants, it has been tested...
in citrus groves. This type of software uses advanced algorithms to discern differences that we can observe with our own eyes in these images.

The team envisions a nursery will have a complete user-friendly package that will provide a seamless transition from an image with thousands of plants to actual counts of certain grades of a specific variety. Within minutes, this information could be linked to a sales forecast. Since images are tagged to GPS, you have the potential to know the exact location of every plant and characteristics about each plant. The collaborative team anticipates that because this innovative tool is fairly inexpensive, large nurseries will want to purchase their own MRS for inventory and crop production applications. Smaller nurseries will likely pay a service company to collect this valuable information on an as-needed basis. The collaborative team is gearing up to initiate research to clarify the limits and capabilities of this innovative tool.

Lessons learned
This project illustrates two valuable lessons. One, that open collaboration between industry and academia can result in major positive breakthroughs. The other lesson learned, is just how rapidly technology is changing and potential opportunities that exist for the nursery industry. It is likely that MRSs will become a critical tool in several aspects of nursery production in the near future.

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