Florida Orchard

Florida Orchard Deploys Autonomous Tractor for Precision Agriculture Research

Orlando, FL – A large citrus grove in central Florida recently incorporated FreeWave Technologies' industrial wireless M2M communications solutions in a study of autonomous tractors utilized for mowing operations. These tractors are designed to function in a multi-vehicle care system that can be operated by a single human supervising several semi-autonomous vehicles, intervening only when a tractor encounters something it cannot handle autonomously. The development of this system is considered a step forward from the old, traditional system where one person drives a tractor for things like mowing and spraying. Currently, the tractor is being tested in a single-vehicle setting where it mows and sprays while being supervised by a remote operator.

FreeWave Usage and Applications

At the heart of automated orchard testing and eventual implementation in hundreds of citrus groves is FreeWave's wireless M2M communication infrastructure. Supervisory control of multiple autonomous vehicles requires a robust M2M communications system capable of reaching all parts of the orchard, reliably and securely transmitting data at high speeds. The system uses two types of messages for functionality: small, real-time data transmissions that are sent in pulses and empower the supervisor to always be in control of the vehicle when necessary; and large data transmissions, mainly for images that provide context to the operation data allowing the supervisor to quickly detect why the vehicle stopped working.

To accommodate the two different types of data transmissions, a dual communications system was implemented in the test orchard: one, a low-bandwidth but highly reliable M2M network operating at 900 MHz; the other a high-bandwidth M2M network that transmits images operating on a 2.4 GHz frequency. FreeWave's M2M communications solutions can be deployed in this setting with an installation of a tower at a base station that supports both the 900 MHz and 2.4 GHz frequencies. Operating on both frequencies is ideal for an autonomous agricultural system – especially an orchard that contains large trees and excess foliage with the potential to disrupt high-speed networks (2.4 GHz and above).

Outcomes

Currently, testing of the autonomous tractor deployment in citrus groves is still being tested. Preliminary results indicate that the FreeWave M2M communications infrastructure utilizing the single repeater tower of 120 feet is sufficient to cover nearly the entire 3,300-acre grove. Small dead zones have been detected where taller trees are present, so installations of small repeaters have been necessary.

Orchard managers utilized Real-Time Kinematics (RTK) for its GPS capabilities to navigate the orchard with up to a centimeter level of accuracy. Real-time data corrections can be used for both the precise calculation of a machine's positioning in the field, as well as for navigation systems that automatically guide the tractors. The correction data is sent via wireless M2M networking solutions that are used specifically for reliable wireless data transmission, thereby eliminating the need for wiring. The base station receiver can send the corrections to an unlimited number of receivers in the field. A wireless M2M network featuring a comprehensive installation of FreeWave's wireless M2M communications platforms has the potential to solve most of the connectivity issues in an autonomous agricultural setting.

Highlights of Success

Implementation of a reliable M2M communications network that enables the use of autonomous vehicles in orchard operations.

Successful testing site for future precision agriculture models across the country.

Improved operational efficiency of the orchard via advanced automation techniques.

Increased visibility through data transmission, so the operator can quickly diagnose why a tractor has stopped and remedy the situation to save time and money.

High-speed data transmission, mesh networking, and connection over multiple frequencies.