

Manitoba Farmer Designed, Built Robotic Steering System

Manitoba farmer Matt Reimer uses an electronically steered tractor to pull his grain cart and in the process figures he'll save close to \$5,000 a year in harvesting costs. Reimer controls the tractor on-the-go from a laptop inside his combine. He assembled the operating system himself using funds he got as a Christmas present in 2014.

Reimer says he doesn't have any special education in computer programming or electronics, but the assistance provided by 3D Robotics, a company that normally builds autopilot systems for aircraft, proved invaluable. The program he uses has processor and sensor technology from ST Microelectronics and a NuttX real-time operating system. Those items can be harnessed to any autonomous vehicle for about \$260.

Since the programming and electronics are open source, Reimer says it was easy to set the system up for his tractor. The guidance system controls actuators that operate



Manitoba farmer Matt Reimer uses an electronically steered tractor to pull his grain cart, controlling the tractor on-the-go from a laptop computer inside his combine. He assembled the system himself.

controls on his Deere 7930 tractor. The tractor has a CVT gearbox that allows it to operate in the field and stop without changing gears or stalling. The engine operates continuously at 1,500 rpm's and uses an Outback hydraulic control valve for steering.

When he was putting the system together he learned that it was necessary to use a wheel angle sensor to soften the Pixhawk's guidance signals so the tractor turns would be more gradual. He took online training to develop programming skills so he could write about 600 lines of code to operate the system. Aside from a small oil leak and a few

stops for overheating, the system operated flawlessly during the 2015 harvest.

Reimer says the system has fail safe steps built in to keep the tractor within view whenever they call it to the combine or in the field. The 3D robotics digital radio that controls the tractor and the Pixhawk have a range of just over a mile. The tractor will stop if it's out of radio range.

Drivers filling their trucks from the grain cart use wireless key fobs to interrupt the signal from the controller so it doesn't move unexpectedly as they're unloading. Reimer says he has replaced the labor of one person

who'd normally operate the grain cart full time and put it to work in other parts of their farming operation. In the winter of 2015-2016 he hopes to experiment with another system that might let him operate a second driverless seeding unit in the same field where he's operating his planter. He thinks a self-steering tractor could also be used for harrowing and rolling crops that now require a person to drive the tractor.

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"John Deere Only" Christmas Tree

Fran Wranosky's interest in anything John Deere and his wife, Debbie's, love for Christmas, are obvious at the holidays. They have an artificial 7 1/2-ft. tree filled with 350 John Deere ornaments and topped with a tractor "star." That's not all; the branches of another small tree in the breezeway are loaded with mini JD ornaments surrounded by JD collectables decorated for the holidays.

"I love Christmas," Debbie Wranosky says. "Collecting John Deere ornaments was a way to share in Fran's interest, and it has been fun."

The ornaments are not that old (late 1980s to present), but they can be valuable, such as the Medallion series John Deere started in 1996. Those don't even get on the tree, Wranosky says. But she has plenty of other treasures to hang.

"My favorite is a bike, because it's just so cool," she says. "It's about 9 in. long and just something different." She also likes her collection of 25 lunch boxes complete with latches that open, and the large glass ball ornaments hand-painted by a California artist.

Wranosky got the idea to surprise her husband with a Deere tree in 2006 when he was having health issues. She had ornaments delivered where she worked and decorated a small 6-ft. pencil tree the first year.

After that the couple shopped for more ornaments at flea markets and auctions. When a larger 6 1/2-ft. tree filled up, they bought their third and current tree.

"He'll sit and look at the different ornaments and talk about where we picked them up," Wranosky says. Through trial and error, she's learned plain white lights on the tree are best to show off the green and yellow ornaments.

Each year she adds new ornaments sold by Hallmark and Enesco, buys the new medallion from John Deere, and watches for ornaments on eBay. Fran occasionally also



Fran Wranosky and wife Debbie will celebrate Christmas again this year by filling their 7 1/2-ft. artificial tree with Deere ornaments.

finds ornaments in Green Magazine.

The tree goes up right after Thanksgiving and stays up until the end of January. Wranosky packs each ornament in the box it came in and stores the collection in half a dozen totes.

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The 25 lunch boxes in Debbie's collection come with latches that open.



The couple shops for ornaments at flea markets and auctions.



Debbie's favorite Deere ornament is this 9-in. long bike.



Deere's Medallion series of ornaments is so valuable they don't even get on the tree.