Could robot tractors revolutionize agriculture?

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Courtesy of Catholic University of Leuven
and World Science staff

A ritual older than civilization itself—the farmer rising at dawn to till the fields all day—could become a thing of the past, if a group of Dutch researchers and engineers has its way.

The team has engineered a self-steering robotic tractor. It adapts to different terrains and adjusts its speed and the tightness of its turns automatically, according to the developers, with the Mechatronics Technology Center in Flanders and the Catholic University of Leuven, the Netherlands.

A prototype robotic tractor developed by researchers with the Mechatronics Technology Center in Flanders and the Catholic University of Leuven, both in the Netherlands. (Courtesy K.U. Leuven)

They plan to unveil a prototype at the annual International Agriculture and Horticulture Days of Mechanisation on Sept. 24 and 25 in Oudenaarde, Belgium.

"We started by installing a linear propulsion system to press the gas pedal down and steer. Then we equipped the tractor with a computer and various additional positional sensors, including a GPS system," said Erik Hostens, project engineer for the Mechatronics Technology Center.

Next came the most important challenge, he added: engineering a steering system. "Only experienced tractor operators have the skills needed to work a field with precision," he noted. "The job of an operator is really quite complex: he observes the tractor's current position, makes a judgement based on terrain conditions and the route to be followed, and, based on all this, decides the speed and orientation of the tractor. All these actions had to be integrated into the automated steering system. The system registers positional changes in real-time with a GPS and

adjusts itself accordingly."

The constantly changing ground conditions present a special challenge, the developers said. "The tractor must be capable of driving in both hard and wet terrain," said Gregory Pinte of the Center. "Traditional navigation systems are unable to handle multi-terrain conditions. Instead, a different setting must be calibrated for each terrain type. That's why we developed a steering system that intuits terrain conditions and estimates the expected wheel slippage. Based on a model of the tractor, the optimal speed and turning radius is calculated, in real-time, for the current terrain type. This 'smart steering' allows for precision down to the centimeter."

"The importance of precision steering for agricultural machines has increased significantly, particularly with the arrival of organic farming," said Wouter Saeys, a collaborator in the project with Catholic University of Leuven. "Accurate positioning of the machine is essential."