



SmartCow[®]
An AI Engineering Company

MARS

Elevating Agriculture

The Smart Sprayer Revolutionizing Precision Farming

The agriculture sector faces unrelenting pressures from climate change, labor shortages, and soaring food demand. Revolutionizing farming is imperative to tackle these challenges effectively. One of the pivotal transformations that the agriculture industry needs is the shift from conventional to smart farming. Smart farming leverages modern technologies to elevate agricultural output and quality, while minimizing manual labor.

Background

Integral to contemporary agriculture is the use of sprays — be it irrigation water, pest-controlling pesticides, or yield-boosting herbicides. To streamline this process, a cutting-edge smart spray system is being developed for seamless integration with commercial-grade tractor boom sprayers by SmartCow's customer based in the USA. These sprayers offer precise liquid delivery and efficient coverage, enabling swift treatment of vast agricultural areas, and reducing operator risks.

Across the globe, farmlands grapple with a shared issue: labor scarcity and an aging workforce. According to the U.S. census of agriculture, the average age of North American farmers is close to 60 years old, with only 9% under 35 years old — farmers are aging and not many young people are joining the agriculture industry. To address this, a smart sprayer system has emerged to bolster farm productivity and refine precision agriculture solutions.

Solution

To enhance the capabilities of the original sprayer system, and support the advancement of the agriculture industry, SmartCow co-work with the customer to integrate an IoT platform with expanded camera sensors. This integration enables accurate data collection, leading to advanced analytics for intelligent decision-making based on plant condition measurements.

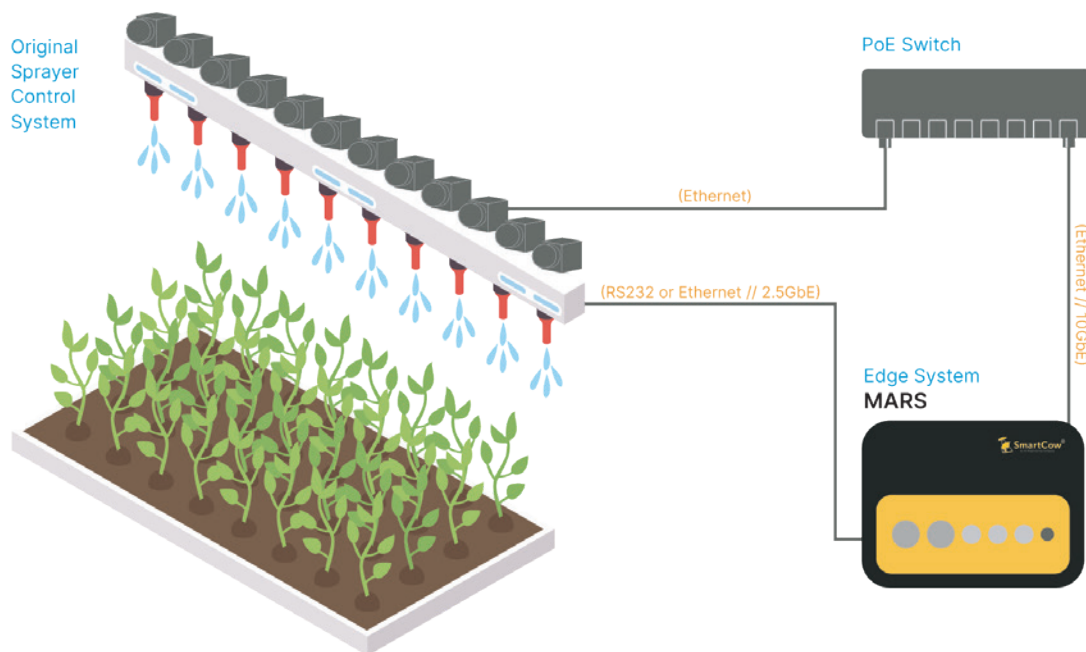
In this context, the application scenario employs MARS, an embedded system based on the NVIDIA Jetson AGX Orin™ platform. Thanks to its robust IP66 design, MARS offers protection against water splattering and dust blowing. Moreover, MARS is equipped with female M12 waterproof connectors. This ensures seamless integration with the sprayer's control panel to prevent water damage and leaks.

MARS Rugged AI Edge Embedded System



The remarkable performance of AGX Orin, offering up to 275 trillion operations per second (TOPS), facilitates the execution of complex AI models. It seamlessly connects and operates eight 5MP cameras at an impressive 200-frame rate, ensuring real-time, smooth coding and decoding operations.

MARS boasts versatile connectivity through interfaces like PoE, USB, MIPI CSI-2, and GigE. This broad compatibility offers diverse camera sensor options, providing farmers with easy upgrades for their existing solutions. This transition to a smarter solution not only enhances functionality but also yields cost savings on equipment.



Solution Flow (Source: SmartCow)

Benefits and results

MARS is equipped with Wi-Fi and 4G/5G communication connectivity, empowering the integrated smart sprayer to meet demanding requirements in large-scale farmlands. This ensures seamless communication from the edge to the farmer's control center, enriching the development of precision agriculture. Moreover, MARS supports out-of-band power cycling and OS recovery, eliminating the need for manual system maintenance during network connection loss or system crashes.

The Smart Sprayer effectively addresses labor shortages through advanced technologies. These include intelligent analytics with actionable insights, and automated fertilization for farmland care. Furthermore, it meticulously assesses optimal "spray" conditions, thereby enhancing crop production.

Using the latest Jetson AGX Orin platform, MARS has seen a computing performance improvement of up to 20% compared to the previous version. This advancement assists

integrators in achieving cost reductions of up to 40%. Furthermore, this enhanced performance enables the execution of more complex AI models, leading to a deeper understanding of farmland, and ultimately higher production.

Summary

Smart farming is a viable solution to the challenges of climate change and labor shortages in agriculture. In this article, we focused on one type of smart farming technology: a smart spray system. As computing power grows and farming technology becomes more precise, there is immense potential for smart farming to deliver even more productive and sustainable forms of agricultural production. ■

MARS Specifications

Supported Module	NVIDIA® Jetson AGX Orin™ 32GB / 64GB
Expansion	2x M.2 M Key(2280) 1x M.2 E Key (2230) 1x M.2 B Key (3052)
Power Input	24V DC input with M12 Power Connector
Operating Temp.	-20°C ~+60°C
Storage Temp.	-40°C ~+85°C
Storage Humidity	95% @ 40 °C (non-condensing)
Front I/O Panel	1x M12 Power Connector 1x 1 GbE port (OOB function only) 1x 2.5 GbE port 1x 10 GbE port 1x GPS 1x RS232
Communication	4G / 5G WiFi
Dimension	200(L) x 180(W) x 114(H) mm