

## ROBOTICS AND AUTOMATION VISION SYSTEMS

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# Seeing is believing

Computer vision systems are helping to improve processes throughout the warehouse—especially when it comes to inventory.

BY VICTORIA KICKHAM, SENIOR EDITOR

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TECHNOLOGY CONTINUES TO TRANSFORM THE SUPPLY CHAIN, especially on the

warehouse floor, where innovations in material handling equipment are making it easier for workers to accomplish the daily tasks of moving inventory into, out of, and around facilities. Computer-enabled vision systems—which allow equipment and devices to essentially see, observe, and even understand their surroundings—are a key part of the trend. They are a central component in the robotic equipment that is quickly becoming a staple in warehouses across the country, and they can be applied in other ways to improve warehouse processes as well.

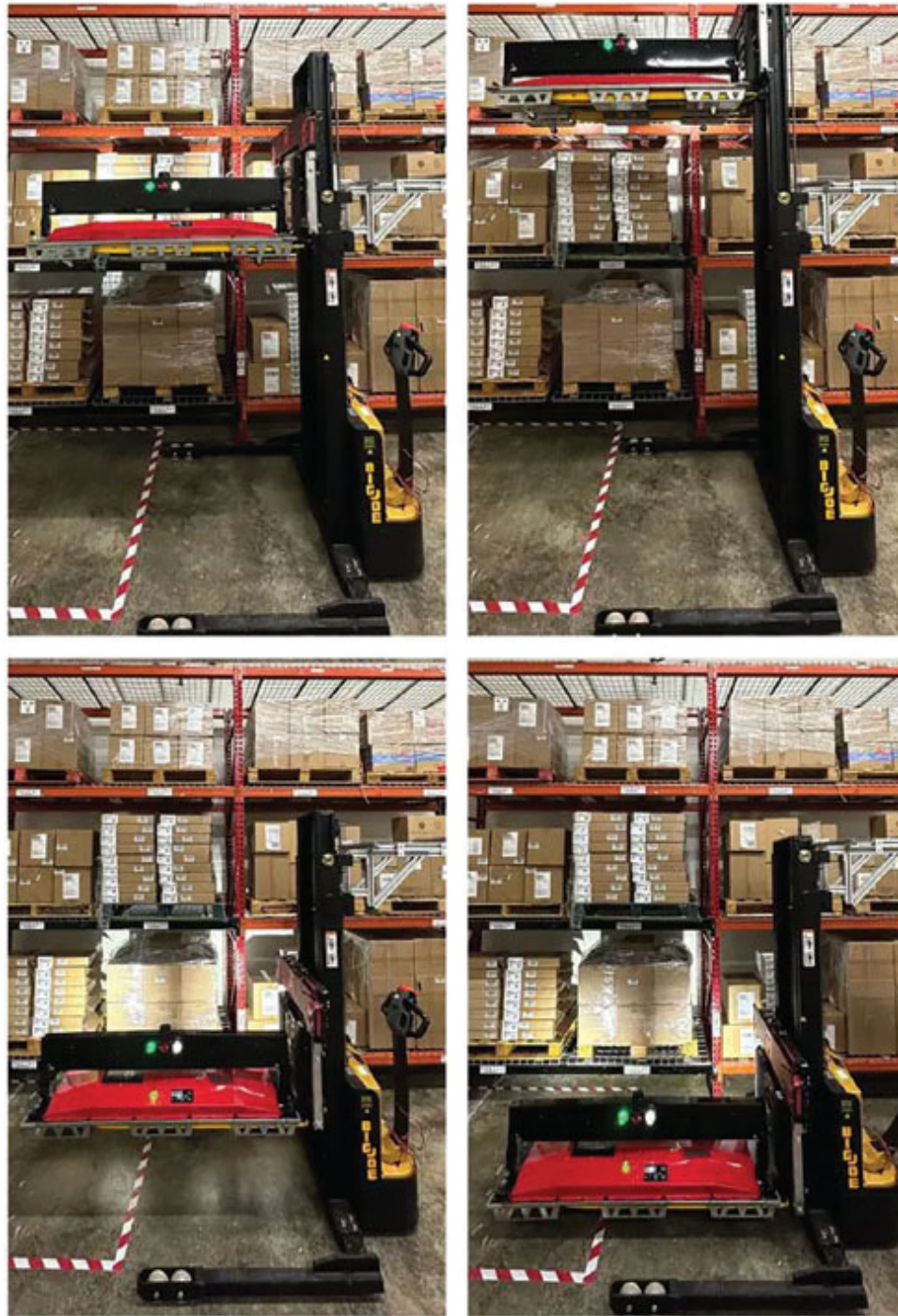
Computer-enabled vision systems are also becoming one of the industry's hottest growth sectors. The market for computer vision systems is expected to increase nearly 20% between 2023 and 2030, according to recent data from market research firm Grand View Research, for example. And the development of vision systems powered by artificial intelligence (AI) is among the top eight strategic supply chain technology trends for 2024, according to Gartner research released earlier this year. These are advanced systems that combine 3D cameras, computer vision software, and AI pattern recognition technologies to autonomously capture, interpret, and make inferences based on the unstructured images the vision systems see in real time.

Those advances are translating into real-world results. In one recent example, industry technology provider Vimaan has developed an automated cycle-counting solution that combines computer vision and machine learning (ML) algorithms to speed and streamline inventory management in the warehouse. The system is helping warehouse managers get a better handle on the important but difficult task of regular cycle counting, with the end goal of driving higher inventory accuracy overall. Here's how.

## CYCLE COUNTING MADE EASIER

Vimaan is using its expertise in computer vision and AI to help third-party logistics service providers (3PLs), retailers, and others get a more accurate view of what's in their warehouse. Once focused on using drone technology for cycle counting—which is the process of regularly auditing inventory to ensure record-keeping accuracy—the company has morphed its drone solution into a new offering that company leaders say provides a better way to manage and track inventory.

"Our approach and experience with cycle counting has allowed us to gain significant insight into the shortcomings of using drones in the warehouse," explains KG Ganapathi, Vimaan's founder and CEO. He cites limited battery life and the inherent risk in having objects flying around warehouse workers as some of the main drawbacks.



The company's StorTrack solution replaces the drone with a standalone hardware module (it looks like a pallet) that attaches to a piece of material handling equipment already in use at the warehouse—like a forklift, an

automated guided vehicle (AGV), or even the cranes used in automated storage and retrieval systems (AS/RS)—and then captures images of the goods within the racks of a particular aisle or storage location, even densely packed ones. The images are then automatically uploaded to the facility's warehouse management system (WMS), where they can be accessed for real-time analysis or stored in photo archives for future use.

The technology inside the StorTrack module was developed for Vimaan's dronebased solution and works in much the same way, albeit with some improvements, according to company leaders. It combines computer vision and ML algorithms to capture and analyze data from the labels on pallets, cases, and boxes of goods. The system can read barcode data as well as label text, inspect for damage, and even identify open bays, allowing companies to maximize available storage space. The system stitches together multiple images for a complete view of the racks, pallets, and packages in the facility—creating a kind of "Google street view" of the entire warehouse, according to Ganapathi. This allows warehouse workers to easily zoom, pan, and scroll through images to spot and resolve inventory and storage utilization issues, which can improve inventory accuracy and give managers more control over stored goods.

"Warehouse managers have expressed that they would benefit from more contextual imagery that displays other goods found on a shared or nearby rack, or even on shared pallets," Ganapathi says. "So [we] developed a solution to make that possible."

Ganapathi says the system is easy to use as well. Warehouse associates simply pick up the hardware module with a forklift or similar piece of handling equipment, set out on their predefined path (as determined by the system's user interface), and then follow instructions to complete the cycle count. As the module is carried down an aisle, lights illuminate the stored inventory, and the computer vision-powered camera suite captures the barcode data, reads label text, inspects for damage or problems, and even identifies inventory that might be in the wrong location.

## FROM ONE WEEK TO ONE HOUR

As for potential applications, Craig Dowley, Vimaan's vice president of marketing,

says the system is ideal for any customer that requires thorough and fast cycle counting and that it is especially well suited for warehouses that store dry grocery items, high-volume industrial parts, home furnishings, medical devices, electronics, and other consumer goods.

Georgia-based luxury rug manufacturer Jaipur Living is one such customer: The company significantly improved cycle-counting efficiency after implementing the StorTrack system, company leaders said in a case study on the project.

"We experienced a 40x improvement in time to scan our inventory," said Ryan Schmid, Jaipur Living's distribution center operation manager. "What used to take us a week to scan, now takes an hour. This has [led to] a dramatic improvement in the way we now operate in the warehouse. Before ... we would have to break the aisle into sections and shut the area down for several hours. Now we get done with an entire aisle and open it up after one hour, allowing our team to have greater access to our inventory."

Accuracy has improved as well.

"I can say without a doubt that StorTrack has almost doubled our inventory accuracy," said Schmid, who reported that bin accuracy improved to 95% from an average of 50% within six weeks of implementing the system. "And it continues to improve each week. Additionally, our overall accuracy has improved from the low- to mid-70s to consistently reporting in the mid-to high-90s. Anybody responsible for inventory management understands the impact this will have on day-to-day operations."

Such applications are likely to become more commonplace in the warehouse, and elsewhere, as the technology continues to advance. The Grand View research, for one, points to a widening scope for vision systems across a broad range of industries.

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