Looking into future computer vision opportunities for warehouse logistics

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Computer vision technology has rapidly replaced the human eye in logistical sorting processes. Cameras and artificial intelligence (AI) empowered software already reads labels, addresses, handwriting and barcodes on packages with incredible accuracy and speed. Now, the increasing accessibility of high-quality cameras and graphics processing units (GPUs) is helping operators to look beyond what's on the conveyor, unlocking a deeper understanding of warehouse processes. The rewards? Greater efficiency, less errors and easier jobs.

Lars Pruijn, Innovation Director, and Lorenzo D'Arsie, Computer Vision Product Manager at Prime Vision, examine computer vision technology and the new opportunities it provides in the postal and parcel sectors.

Vision capabilities move beyond OCR

Today, computer vision technologies in warehouse logistics are primarily optical character recognition (OCR) functionalities to improve sorting efficiency, accuracy and throughput. Taking static images from cameras mounted above conveyors, OCR can read and understand labels, addresses, barcodes and symbols, as well as handwritten and printed text. This information is used by people, sorting machines and robots to move items to the correct destination. Products such as

Prime Vision's Address Vision and Barcode Vision are augmented with AI to reconstruct and interpret damaged or obscured package information.

While impressive, nowadays computer vision is presenting even more opportunities. Cameras with higher resolutions, improved colour and 3D depth of field are allowing high-quality images and video to be collected. GPUs now offer the raw processing power required to handle this increased data, while deep learning techniques for text and object recognition mean that it can be more efficiently quantified. Excitingly for warehouse operators, these technologies are becoming more commercially accessible and less complex to implement.

Setting the scene for greater understanding

With these kinds of capabilities, warehouse operators can now look beyond the conveyor. Instead of having one opportunity to read a label on a letter or parcel, what if warehouse staff could see and connect every event for a package travelling through the facility?

This is known as 'scene understanding' and it allows errors to be reduced in even the most controlled sorting environments. By combining all information at a network level, problems can be spotted early and the whole process appraised, enabling proactive reasoning and a better approach to dealing with exceptions that otherwise may incur increased costs to the business.

How would this work in practice then? Well, computer vision software would have access to all installed cameras in the facility, with an innate understanding of the relative position of each unit. This intelligence means less calibration and easier setup. With this extended field of view, the system is free to identify and help solve problems.

The system could help resolve parcel no reads for example. There is also the possibility to spot packages that are on top of each other or have become stuck together. It could also highlight non-machinable items by assessing dimensions,

shape or the instability of an object, quickly separating items before they can cause issues for equipment or become damaged. For operations that handle a high variability of items like in the postal market, this streamlines how different packages are dealt with, saving time.

Beyond the parcel stream, computer vision can track roller cages to confirm they reach the right destination. The system can see whether doors are open or closed, pointing out where improvements to efficiency or safety could be made. Cameras on loading bays can monitor trucks moving in and out, allowing delivery trends to be analysed and further logistical insights gained.

Furthermore, computer vision can identify when ergonomic rules aren't being adhered to, an important safety factor in areas with machinery and heavy items. New efficiency opportunities and best practice can be identified and applied in day-to-day work, making certain tasks easier for the workforce. Across the warehouse, computer vision is a powerful tool for improvement.

Computer vision in real warehouse applications

As an expert in computer vision, Prime Vision is harnessing this technology in real-world applications, designing and implementing customised systems for specific tasks.

At one Prime Vision customer, operators were using a large parcel sorting machine inside a casing. Over time, debris collected within the casing, which would require the machine to be stopped so that maintenance personnel could conduct a visual inspection to find and remove it. This was a time-consuming process. To alleviate this, Prime Vision installed a computer vision system underneath the machine that could quickly detect and locate any debris or small parcels that had fallen into the casing. Consequently, removal could be completed faster by staff, helping to promote uptime.

An internal research project involved using computer vision to support a manual sorting system. A complex sorting process was simulated, involving non-conveyable items being moved manually to 40 different locations - an approach that often results in a high number of sorting errors. Prime Vision tested a system to check if specific items were placed in the right cage and provide alerts if an item ended up in the wrong place. Results showed the system's potential to dramatically reduce errors.

Computer vision systems can enhance the operation of a fully automated system too. Many warehouses are trialling the use of robot arms to load individual parcels onto conveyor belts in a logistical equivalent of pick and place. However, as a relatively new application in the sector, sometimes robots can pick up two items at once by accident, causing sorting issues. Computer vision can fix this by identifying when this occurs, providing alerts to operators or the robot, optimising the process.

Eyes on the future

Clearly, advancements in computer vision and the increasing ease of access will enable warehouse operators to better monitor, understand and optimise warehouse sorting processes. There are some considerations going forward though.

First is that warehouses are inherently conservative environments, where adoption of new technologies will be gradual. For example, many operations will continue to run off central processing units (CPUs) instead of GPUs because of the high upfront hardware costs of changeover. Big infrastructural changes won't happen overnight, but the capability is definitely here today.

The other factor is privacy. Video surveillance and access to personal images is a complex subject, so any computer vision system needs to be focused solely on tracking objects and processes, not people. There are various solutions to achieve this, such as blurring out images, using black box AI systems with no visibility or positioning cameras accordingly.

If these conditions are met, computer vision offers the possibility to act as a helpful assistant to warehouse operators, making work easier and crucially, more efficient.

More from Prime Vision: https://primevision.com/looking-into-future-computer-vision-opportunities-for-warehouse-logistics/

Image captions:

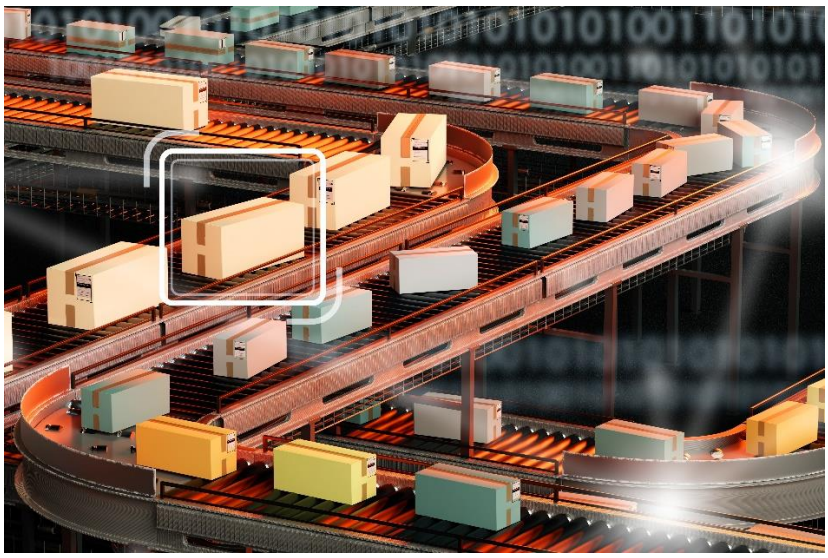

Image 1: Advancements in computer vision and the increasing ease of access will enable warehouse operators to better monitor, understand and optimise warehouse sorting processes. (Shutterstock 2444701159)

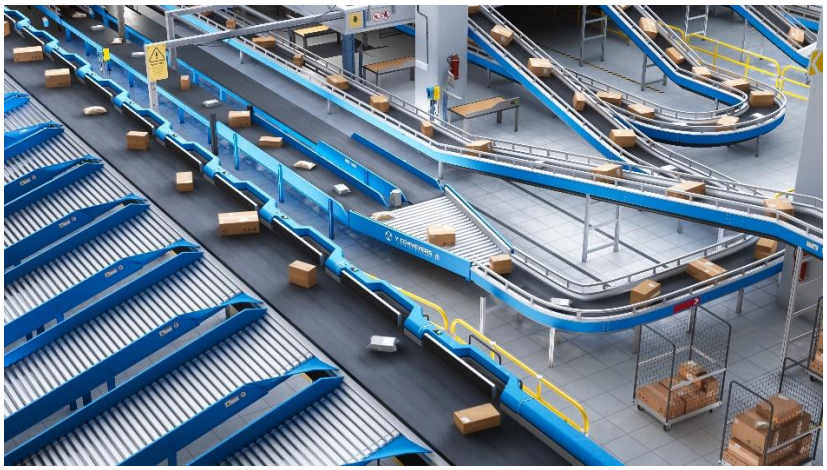

Image 2: Imagine warehouse staff having full visibility and connectivity for every step of a package's journey through the facility. (Shutterstock 2436656387)

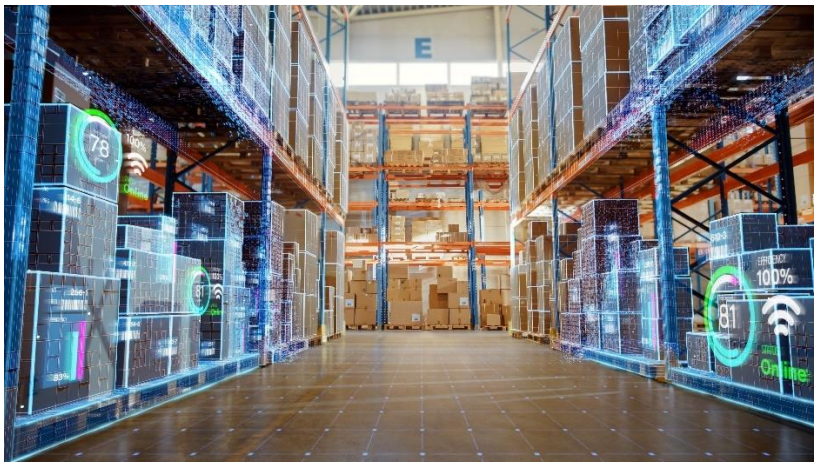

Image 3: Across the warehouse, computer vision is a powerful tool for improvement. (Shutterstock 2064581663)

About Prime Vision

Prime Vision is a global leader in computer vision integration and robotics for logistics and e-commerce. As an award-winning company, Prime Vision designs and integrates solutions using the latest recognition, identification, and robotics techniques to optimize the automation of sorting processes.

Headquartered in Delft, The Netherlands, more than 170 experts provide comprehensive market and domain knowledge to digital companies around the world.

For more information, visit https://primevision.com/

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