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How RightHand Robotics Is Using Intel® RealSense™ Computer Vision Technology to Revolutionize Automated Warehouse Order Fulfillment

RightHand Robotics' RightPick2 Platform, guided by Intel RealSense cameras, delivers robotic piece-picking solutions for e-commerce order fulfillment in grocery, pharmacy, electronics and retail that save costs and boost worker productivity

"The Intel® RealSense™ computer vision system is absolutely essential for item handling in automated e-commerce fulfillment. We simply can't do it without the imaging. With Intel RealSense, we don't have to worry about the camera in terms of its consistency, its availability, its flexibility, or its predictable performance."

— Vince Martinelli
RightHand Robotics
Head of Product and Marketing

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At a Glance

Challenge

As e-commerce grows globally at double-digit rates, warehouses that fulfill digital orders increasingly have to pick and sort thousands of individual SKUs with limited lead time. This type of single-item picking, when fulfilled manually, greatly increases overhead costs. Warehouse managers are looking for a comprehensive, predictable, adaptable, piece-picking solution that will allow them to automate e-commerce order fulfillment, but traditional factory robots — programmed for just one task — aren't up to the challenge.

Solution

RightHand Robotics created RightPick2, a software-driven, hardware-enabled platform for e-commerce order fulfillment. Guided by Intel® RealSense™ cameras, RightPick2 uses computer vision technology to deliver an end-to-end solution that can automatically handle any item, picking and placing thousands of SKUs at high speeds with high reliability.

Results

RightPick2 is an automated piece-picking solution that revolutionizes e-commerce order fulfillment for grocery, pharmacy, electronics, retail, and more, helping warehouses save costs and boost worker productivity. With RightPick2, a single warehouse worker can supervise and manage a fleet of half a dozen robots or more, picking and placing thousands of SKUs instead of having to search warehouse aisles. RightPick2 robots fulfill orders at high speeds for a reduction in order lead times and a strong ROI, reducing the potential for human error so that warehouses can accurately fulfill orders and get customers what they ordered, fast.

Challenge

Before the e-commerce revolution, most retail orders fulfilled by warehouses were fairly straightforward — warehouses shipped products in bulk to stores, and the hand-picking of individual items was left to customers in the aisles of the store.

Now, as e-commerce is growing by 15 to 20 percent per year around the world, warehouses that fulfill digital orders have had to adjust to a growing challenge — the rise in demand for single-item picking. Customers choose their items online, and with the retail environment out of the picture, the cost burden for picking individual items for orders shifts upstream to the warehouse. In an e-commerce environment, it becomes the responsibility of warehouses to provide labor for the hand-picking of each item in an order.

Single-item picking, when fulfilled manually by workers in a warehouse that may contain millions of individual items, is a real logistical challenge. Instead of one touch point in warehouse order fulfillment — one worker loading one pallet that represents one order — there are now multiple touch points requiring increased labor hours. This lessens overall worker productivity and increases overhead costs.

With the overall trend towards single-item orders on the rise, warehouses have been seeking to implement solutions. Some warehouses have attempted to meet the challenge by batch picking and by creating sort walls or put walls. These semi-automated tote and shelving solutions create some efficiencies. However, in a business environment in which warehouses are looking to constantly improve labor efficiency and order accuracy, reduce implementation risk, balance labor demand during peak times, increase scalability, and reduce lead times, warehouses need a more robust, predictable, automated solution.

Traditional factory robots do not represent a viable automated solution for retail warehouses either because such robots operate blind. They are programmed for one task and for interacting with one type of object, which means that they lack the features necessary to do complex bin picking.

> "We have applications where we need multiple sensors at times, and Intel RealSense cameras are at a cost point and performance level that just makes a whole lot of sense for us. We've been very happy with the choice to use Intel RealSense in our RightPick solutions."
>
> **— Vince Martinelli**
> **RightHand Robotics**
> **Head of Product and Marketing**

Solution

"The key to making the shift to automated piece-picking," says RightHand Robotics Head of Product and Marketing Vince Martinelli, "is computer vision."

"An e-commerce fulfillment center may have 100,000 to 1,000,000 different products, and it's really hard to use traditional robotics there. Automated industrial robots typically have a very structured environment and a very limited number of products that they're going to try to handle. In an e-commerce environment, items come jumbled in a bin with a mix of products — they're changing all the time. This requires a new capability. This is where computer vision comes in, and this is why we needed Intel RealSense."

RightHand Robotics created RightPick2, a product platform that provides piece-picking solutions that are viable for e-commerce fulfillment in grocery, pharmacy, traditional retail, and more. RightHand calls RightPick2 the future of e-commerce order fulfillment, combining the performance of traditional automation with the flexibility of traditional workflows.

By harnessing the computer vision capabilities of Intel RealSense cameras, RightPick2 robots are able to automate more stages of the order fulfillment process. Data from the cameras allows the robot to discern objects in a bin, recognize the location of each object, and then avoid collisions as it pulls the object out.

"The vision and the software allow the RightPick2 robot to look into a pile of products and distinguish one item from the other," explains Martinelli, "and then plan how the robotic hand should go about reaching in and securing the item and getting it back out of the tote and over to the destination without damaging it. We call this the hand/eye coordination side of our system."

This hand/eye coordination allows RightPick2 robots to perform across a range of different customer workflows, including sorting batch-picked items, picking items from automatic storage and retrieval systems (ASRS), inducting items to a belt sorter, and facilitating order quality assurance.
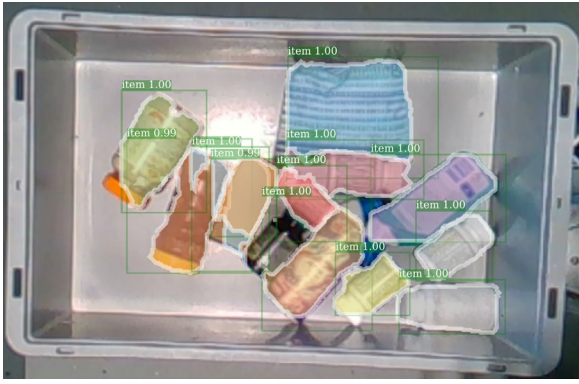
The RightPick2 solution is guided by Intel RealSense D415 depth cameras. The D415 is part of the Intel RealSense D400 series of cameras, a lineup that provides highly accurate depth data in easy-to-integrate products. Featuring an integrated RGB sensor, the D415 is perfect for volumetric capture. The D415 has a tightly focused field of view, which offers higher quality depth per degree. This field of view results in higher depth resolution for smaller objects or situations in which precise measurements are required, as is the case in bin-picking scenarios in warehouses.

"We use the Intel RealSense D415 depth camera as our primary vision system," says Martinelli. "It's vital for segmentation and all aspects of motion planning."

The Intel RealSense D415 also helps RightHand Robotics modify its platform over time. Data from the D415 gathered over millions of individual picks helps RightHand learn about the best way for the robot to approach different shapes and classes of items and the optimal way to orient different types of packaging for more efficient sorting and lifting.

RightHand Robotics finds that the flexibility and range of the Intel RealSense Software Development Kit (SDK) is essential for a platform that will continue to adapt and change. D400 series cameras offer simple, out-of-the-box integration, and the SDK is future-proof, working across the entire Intel RealSense family of cameras.

The small form factor of the D415 and its price-performance ratio mean that RightHand Robotics can integrate multiple cameras into solutions that require robots to pick from varied sources and sort for multiple destinations. Multiple D415s can also be used to generate robust data about specific items.

RightHand has said that as it adapts and grows its piece-picking platform, they have confidence in the reliability and long-term dependability that Intel brings as a Fortune 100 company and a leader in computer vision technology.

Results

RightPick2 is an automated piece-picking solution that revolutionizes e-commerce order fulfillment for grocery, pharmacy, electronics, retail, and more, helping warehouses save costs and boost worker productivity. Based on a model-free design that leverages the vision system and generalized machine learning 'experience,' RightPick2 reliably handles items it has never seen before. This enables the system to easily adapt to common changes in workflow such as product assortment modifications, seasonal packaging changes, and even complete product re-branding.

With RightPick2, a single warehouse worker can supervise and manage a fleet of half a dozen or more robots, picking and placing thousands of SKUs instead of having to search warehouse aisles. RightPick2 robots fulfill orders at high speeds for a reduction in order lead times and a strong ROI, reducing the potential for human error so that warehouses can accurately fulfill orders and get customers what they ordered, fast.

This allows warehouses to operate quickly and efficiently and meet supply chain demands with fewer errors and lower overhead costs. Warehouses improve labor efficiency and order accuracy, reduce implementation risk, balance labor demand during peak hours, increase scalability, and reduce order lead times.

Unlike traditional factory robots that can be complex to set up and are singly purposed, RightHand Robotics solutions are simple to integrate and adaptable to improve the utilization of many different customer workflows. RightPick2 robots can sort batch-picked items, pick items from ASRS, induct items to a belt sorter, and facilitate order quality assurance.

RightHand Robotics' use of computer vision technology from Intel RealSense allows RightPick2 to gather data and make critical decisions related to segmentation and motion planning. This makes RightPick2 an optimal piece-picking solution for kitting — in which separate items are culled and packaged together as one unit — as well as for automated packaging, sorter induction, and goods-to-picker tending.

Together, RightHand Robotics and Intel RealSense computer vision technology deliver a complete solution for a broad range of e-commerce order fulfillment needs.