

Industrial Robotic Automation

Reinventing Manufacturing Facilities, Warehouses, Distribution Centers, and Factories with Dexterous, AI-Powered Robots

Spotlight on RIOS

RIOS helps enterprises automate their entire factories, warehouses or supply chain operations by deploying end-to-end robotic workcells that integrate within existing workflows. Its AI-powered robots include the world's most advanced tactile sensors, smart food-grade grippers, and AI-powered vision systems that depend on RealSense technology. RIOS robots can be reconfigured to perform a wide variety of tasks, from pick-and-place to component assembly, with a focus on manufacturing, end-of-line packaging, and food services applications.

The RealSense Advantage

The RealSense family of cameras is the broadest product line of computer vision cameras on the market, with a range of stereo sensor cameras that perform in multiple environments in varying conditions. Their broad range of capabilities, small form factor, and robust SDK open up cost-effective applications across retail, warehouse/logistics, industrial manufacturing, healthcare, and other industries.



At a Glance

Challenge: Robotic automation has historically been out of reach for many businesses since it requires specialized knowledge, is fragmented, and is typically an expensive endeavor that requires large capital expenditures (CapEx). These technical and financial obstacles have prevented many small and midsize organizations from investing in robotics, as well as prevented larger organizations from retooling legacy robotic gear.

Solution: With its unique end-to-end robotic workcells combined with a commercially attractive Robots-as-a-Service (RaaS) business model, RIOS enables businesses to outsource a capital-intensive part of their business and offload risks.

Results: Powered by RealSense™ Depth Camera D435, RIOS develops dexterous, AI-powered robots to automate assembly lines, warehouses, distribution centers, pharmaceutical and chemical laboratories, and food services businesses.

Benefits: With help from RealSense cameras and guided by RIOS' intelligent software, RIOS robots can successfully augment the human labor force, working tirelessly to perform precision manipulation and handling at line speed and in a broad variety of industries, environments, and operating conditions.

Introduction: Robots-as-a-Service

As technology becomes integral to production lines, distribution centers, and e-commerce warehouses, more and more companies are implementing AI-powered robots to automate repetitive, risky, and labor-intensive tasks. However, due to the capital costs often associated with these industrial automation projects, most small and midsize firms have been unable to participate. These companies see the potential and have the need for automation, but may have a difficult time financing these projects and getting new robotic solutions into production.

RIOS has the answer with a unique robots-as-a-service (RaaS) business model that allows its customers to fund robotic installations with little or no upfront investments. Similar to the software as a service (SaaS) and subscription-based models that have become popular in the computer industry, RIOS customers pay a flat monthly fee that includes installation, programming, software updates, maintenance, and 24x7 remote monitoring of a broad array of robotic solutions. RealSense D435 cameras are at the heart of these initiatives.

"RealSense cameras are part of our AI-powered vision technology stack that allows robots to see, recognize, and interact with objects in their surroundings," says Dr. Clinton Smith, Chief Technology Officer at RIOS. "By embedding a powerful vision processor into a small form factor camera, RealSense D435 cameras and their associated SDKs are ideal for rapid development and product creation – at a great price."

Selecting RealSense

Developing a robot requires sophisticated hardware and software, including tools for computer vision and simulation. Instead of creating these assets from scratch, RIOS uses standard hardware in conjunction with Robot Operating System (ROS), a specialized software framework developed by the Stanford AI Laboratory and maintained by the Open Source Robotics Foundation.

The RIOS team likes the development flexibility of the RealSense technology stack, which revolves around ROS and leverages the ROS utilities, simplifying development and integration tasks.

According to Mandy Dwight, Vice President of Business Development at RIOS, the reasonable cost of the RealSense equipment was another deciding factor in their decision. While competing cameras with similar capabilities can cost ten times more, Dwight likes the affordable price point of the RealSense gear. “Our robotics solutions are price-sensitive, and the RealSense cameras gave us the best options for our needs,” she notes.

Putting RIOS Robots to Work

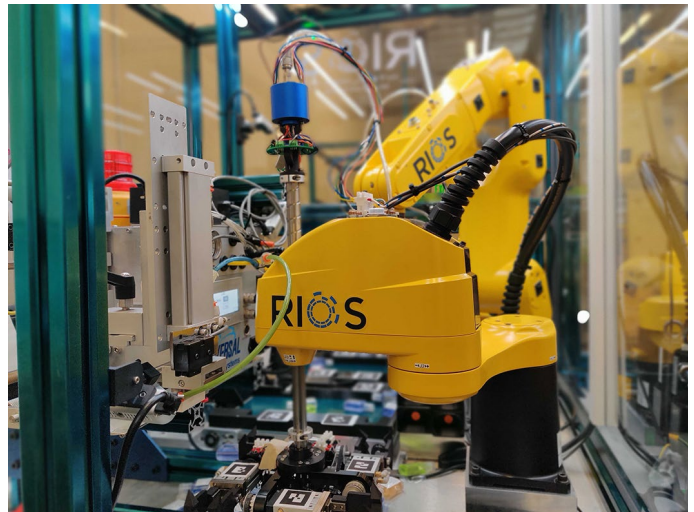
RIOS develops and deploys dexterous AI-powered robots in a number of industrial settings in manufacturing, e-commerce, food services, and other environments. The RIOS robotic work cell solutions are integrated throughout operations and provide automation that meet production goals for End-of-Line Pack, Box Tending, Quality Control, Machine Tending, Food Handling, Tray/Bin Handling, and other tasks.

When equipped with RealSense cameras and driven by RIOS’ intelligent software, these robots can successfully augment the human labor force, working around the clock to perform precision activities at tremendous speed.

With its low power, high quality, easy-to-use depth cameras, RealSense is fulfilling RIOS’ needs with a broad range of imaging modalities specifically targeted for robotics developers.

Powered by RealSense D435 cameras, the RIOS robots are finding their way into a wide array of industrial, retail, manufacturing, and clean room environments. The RIOS AI-powered computer vision system directs these robotic arms to pick up items accurately, quickly, and with just enough pressure to hold them securely.

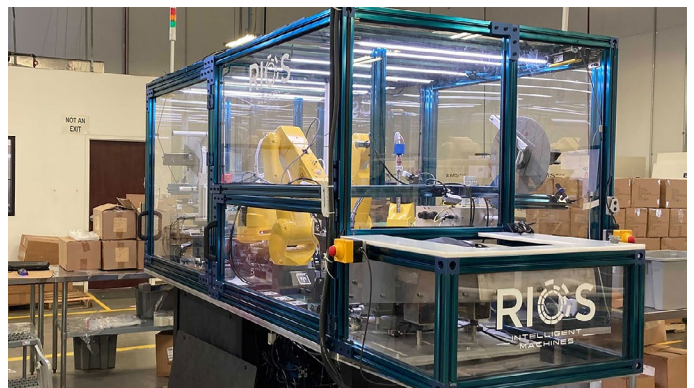
RIOS machine learning (ML) models utilize the data from RealSense sensors to recognize the pose (orientation in space)



and grasp points of objects in many different settings, enabling the robots to perform complex handling and manipulation such as picking and placing items into bins and moving them on and off of conveyor belts—two notoriously difficult examples of dynamic, ever shifting conditions.

According to Dr. Smith, RealSense cameras include an imaging sub-system with stereo sensors, giving RIOS robots the versatility they need to enable many types of robotic applications. The cameras can be mounted on a static base, on the arm of the robot, or in the surrounding cages of a work cell. The cameras can withstand a wide range of hot and cold temperatures. “Especially in the food industry, factory warehouses are very important to our business,” he says. “Therefore temperature ranges need to be factored when purchasing our equipment.”

Developing and Integrating Unique Solutions



From assembly line automation to “lights out” factories, RIOS delivers integrated technology solutions that are dedicated to execute specific tasks. RIOS partners with systems integrators, automation vendors, and hardware manufacturers to bring together the key components for its robotic work cells. RIOS combines robot arms from FANUC America with tactile sensors, intelligent grippers, and vision systems that include the RealSense cameras.

AI-powered vision, in conjunction with tactile perceptions, enable RIOS robots to recognize parts, and perform precise manipulation at line speeds. “Having a wide field of view and global shutter sensor make the D435 our preferred solution for object recognition,” Dr. Smith says.



Technical Components of Solution

- RealSense technology is a suite of depth and tracking solutions designed to give machines and devices the ability to “see” and understand their surroundings.
- RIOS robots are full-stack, multi-purpose dexterous robots that can be reconfigured to perform a wide variety of tasks in unstructured environments and across different industries including manufacturing, e-commerce, food services, lab automation, and more.

Learn More

- **RIOS Corporation:**

<https://www.rios.ai>

- **RealSense Technology:**

<https://www.realsenseai.com>



RealSense has the core capabilities RIOS needs for a broad range of robotic applications. Popular use cases for the RIOS robotic work cells include the following:

- In **manufacturing** environments, the RIOS robot relies on the precise viewing capabilities of RealSense D435 cameras to recognize parts in any orientation. The exceptional visual acuity of the camera enables precise alignment down to 1 mm tolerances.
- In the **food services** industry, the RIOS robots can manage racks and trays in work cells that have been specially designed to streamline industrial baking, steaming, cooling, freezing, material transport, and food preparation.
- In **e-commerce and warehousing**, RIOS robots efficiently pick up objects and place them in bins, boxes, and totes. Being able to grasp a broad class of objects makes RIOS ideally suited for these e-commerce applications.
- In **life sciences**, the RIOS robots leverage RealSense cameras to recognize and properly handle test tubes, vials, and beakers, as well as perform essential tasks such as capping and uncapping bottles, inserting test tubes in analytics equipment, pouring liquid, and more.

Learning from Experience

To mimic a human's natural haptic intelligence, the RIOS robots combine visual perception of items with sensations of hardness, vibration, and other physical properties. At the heart of these initiatives is a unique haptic intelligence platform that enables the robots to perform tasks that typically require human-level dexterity and intelligence, such as warehouse automation systems that can manipulate thousands of SKUs. Just as a child learns about its world by reaching out to touch, feel, and grasp new objects, RIOS robots construct models of their surroundings, and ultimately extend these models to new objects and experiences, guided by feedback through both vision and tactile sensory data. RealSense cameras reveal the location, type, and shape of each object.

“We are happy with our decision to use the RealSense cameras,” concludes Dwight. “We must carefully consider our total solution when working with new customers. RealSense has the best cameras on the market based on performance and price.”