



Helping robots to see ▶

ADLINK NEON helped Recognition Robotics develop a whole new robotic vision guidance platform

Situation

Recognition Robotics (www.recognitionrobotics.com) is a technology leader for visual recognition and robotic guidance. They have 11 patents which cover the unique capability to locate a part and determine 6 degrees of freedom (X Y Z Rx Ry Rz) from a single 2D camera image. As a result, Recognition Robotics is able to use their visual recognition system to guide any robot to pick-up and place complex objects using a single robot mounted camera. Recognition Robotics is also one of the few vision-guided solutions on the market capable of visually driving a robot to perform random pile picking (AKA bin-picking).

In 2012, Recognition Robotics went to market with their initial product called the Robeye, a solution for robotic guidance. The core differentiator of Robeye is visual recognition and guidance software that mimics the way humans see. Robeye uses an industrial camera attached to the robot arm to take images of the robot workspace, and a separate industrial computer to process the images and communicate with the robot's controller.

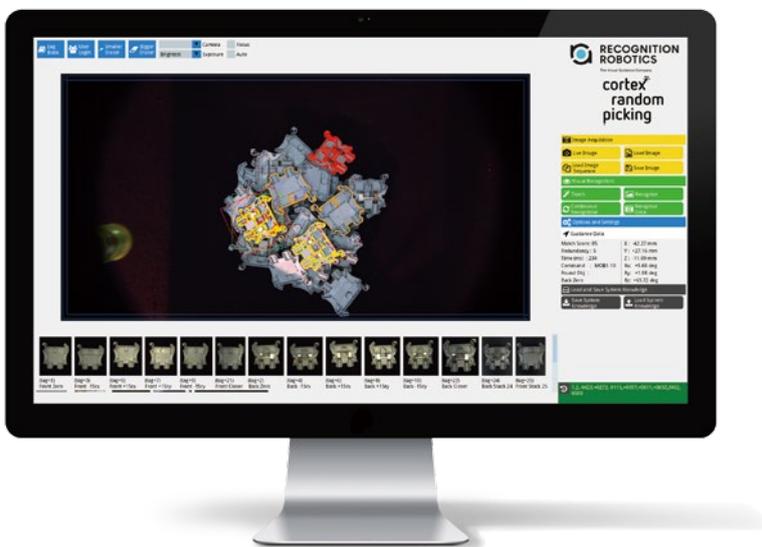


Figure 1 – Robeye's software user interface

Today, Recognition Robotics has found success with over 300 systems deployed in applications such as automotive body-in-white deracking applications, automotive powertrain and airframe fastening. The vision solution is simple to train and set up, and is able to use a single camera to acquire all of the information necessary for robot guidance.

Problem

A large automotive parts supplier wanted to use a robotic arm to derack automotive body panels and place them onto a vehicle in the body-in-white part of the vehicle assembly process. With multiple suppliers and different generations of part racks, de-racking was a difficult process to automate until Recognition Robotics applied their vision algorithms to the robotic vision guidance problem. Prior to the implementation of vision guidance, part locations could float around between different racks with enough variation that it made it impossible for a robot to acquire parts from the racks in a repeatable fashion.

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With industrial floor space at a premium, the automotive customer required a system with the following key characteristics:

- Smaller footprint
- Lower cost
- Simpler to setup and operate

Recognition Robotics' Robeye is unique in its ability to process images in the same way that the human visual cortex functions. From a single 2D image their system is able to recognize a part and return the X, Y, Z, Rx, Ry and Rz location information about the orientation of the part within the robot's user frame. With this data, the robot is then able to update a preprogrammed path with the corrected offset data of that parts current location in space.

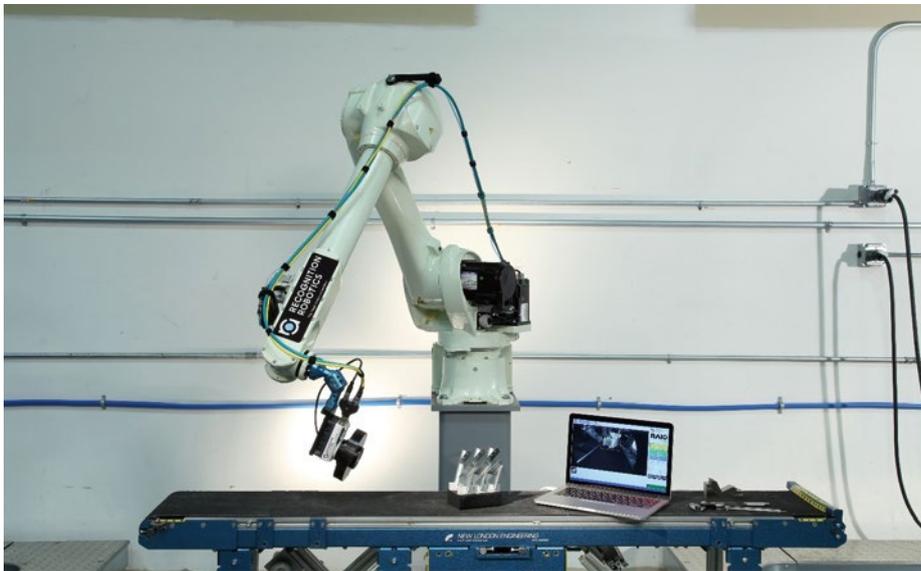


Figure 2 – Accurate part information from a 2D image with CortexRecognition.

“The algorithms are based on the human cognitive ability to recognize objects. When I developed these algorithms, I was mimicking the human visual cortex. We’ve used knowledge about human brain function, the point of view of the human eye, and put this into the software realm.” Dr Simon Melikian, CEO, Recognition Robotics

The industrial imaging market is also flooded with many low-cost vision competitors. Inspection software is even available as open source libraries (e.g. OpenCV), and has commoditized the low end of the vision market. However, none of these low-cost vision providers include the unique (or patented) visual recognition and robot guidance capabilities of Recognition Robotics. However, reducing the overall system cost was necessary to meet customer’s project requirements.

Solution

Recognition Robotics partnered with ADLINK to leverage the ADLINK NEON-1020 smart camera as the core of a new generation of Robeye. As a result of this partnership, the Robeye All-In-One or RAIO product was born. The ADLINK NEON-1020 smart camera provided all of the functionality necessary to meet the hardware design goals of the RAIO product team.



Figure 3 - The RAIO Smart Camera from Recognition Robotics

The ADLINK NEON-1020 is a camera sensor, lens mount, PWM lighting control support and industrial computer combined in a small, self-contained package. It includes:

- Intel® Atom™ Quad-Core Processor E3845 1.91GHz
- FPGA co-processor
- Windows or Linux OS
- Weight less than 2 kg

This architecture dramatically reduced the footprint of the Robeye product. The inclusion of on-board processing is what makes the camera “smart”. The resulting camera package is ruggedized, IP67 sealed and proven to operate in the rigors necessary for end-of-arm tooling on an industrial robot. The Recognition Robotics software is windows compatible and runs on-board the ADLINK NEON-1020, thus eliminating the need for an external industrial computer to run the application. The entire solution is lightweight and able to be mounted directly onto the robotic arm for robot guidance. Because the RAIO unit is a completely self-contained visual recognition and guidance system, it’s easy to remotely interface the RAIO and the robot controller for object teaching, configuration and execution. This capability now allows for remote programming and monitoring of multiple RAIO work cells across the manufacturing floor network.

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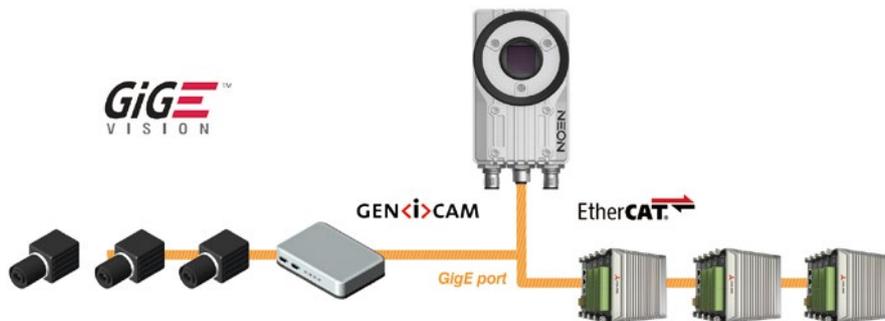


Figure 4 - Multi-system networking with the ADLINK NEON camera.

“ADLINK is very well known in the industry. They have been very flexible with us, they worked with us to get exactly what we needed out of an embedded sensor. There were specific features that we talked to ADLINK about, and they made sure we received exactly what we were looking for...” Bradley Vargo, Robotics Guidance Engineer, Recognition Robotics

Overall, the RAIO product development process illustrates how a software vendor and a hardware vendor can work together to create a best-in-class solution, leveraging the core competencies and unique expertise of each organization.

Results

ADLINK regularly works with partners such as Recognition Robotics to develop solutions that meet a unique market need. The NEON-1020 camera is one of several Smart Camera configurations available from ADLINK, which can be configured to meet your exact application requirements. The NEON product line is continually evolving as compute, storage and sensor technologies change and evolve, while providing a stable operating environment. As in this use case with Recognition Robotics, ADLINK is able to work with partners to meet the requirements of the system design as well as deliver new and unique capabilities.

“Their customer support is excellent”, Bradley Vargo, Robotics Guidance Engineer, Recognition Robotics

Finally, ADLINK provides excellent, worldwide support, training and spare parts for both end users and partners alike.

For more information on Recognition Robotics RAIO solution, please visit www.recognitionrobotics.com.

For more information on ADLINK’s NEON smart camera platform, please visit www.adlinktech.com.

■ About ADLINK

ADLINK Technology is leading edge computing with solutions that drive data-to-decision applications across industries. ADLINK offers a variety of building blocks and both generic and domain-specific Industrial Internet of Things (IIoT) platforms to serve the automation, communications, medical, transportation, and defense/government markets. Our products include motherboards, blades, chassis, modules, gateways, systems, and end-to-end solutions based on industry standard form factors, as well as an extensive line of test & measurement products and smart touch computers, displays, and handhelds that support the global transition to always connected systems. Many products are Extreme Rugged™, supporting extended temperature ranges, shock and vibration.

ADLINK is a Premier Member of the Intel® Internet of Things Solutions Alliance and is active in several standards organizations, including PCI Industrial Computer Manufacturers Group (PICMG), PXI Systems Alliance (PXISA), and Standardization Group for Embedded Technologies (SGeT).

ADLINK is a global company with headquarters in Taiwan and manufacturing in Taiwan and China; R&D and integration in Taiwan, China, the US, and Germany; and an extensive network of worldwide sales and support offices. ADLINK is ISO-9001, ISO-14001, ISO-13485 and TL9000 certified and is publicly traded on the TAIEX Taiwan Stock Exchange (stock code: 6166).

■ About the Intel® Internet of Things Solutions Alliance

From modular components to market-ready systems, Intel and the 400+ global member companies of the Intel® Internet of Things Solutions Alliance provide scalable, interoperable solutions that accelerate deployment of intelligent devices and end-to-end analytics. Close collaboration with Intel and each other enables Alliance members to innovate with the latest technologies, helping developers deliver first-in-market solutions. [Learn more at: intel.com/iotsolutionsalliance](http://intel.com/iotsolutionsalliance)



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