

# Machine building

## Customer case study



## Guiding the way in automotive plants

### Summary

- Traditionally, programming a vision guided robotics system has been a complicated process
- Recognition Robotics, Inc. (<https://recognitionrobotics.com/>) saw the need for a plant-floor-friendly visual recognition and guidance system that had the intelligence to tackle difficult tasks that others couldn't
- Recognition Robotics envisioned Robeye Jr, a hardware-software solution with CortexRecognition® integrated for 3D robotic guidance
- This presented a challenge, and RRI partnered with Phoenix Contact's Solutions Engineering team to develop a custom control solution that could withstand the rugged requirements found in automotive plants

*"Our focus was on ease of use, and our algorithms are what set us apart. People on the plant floor, such as maintenance staff, can use our systems without being vision engineers."*

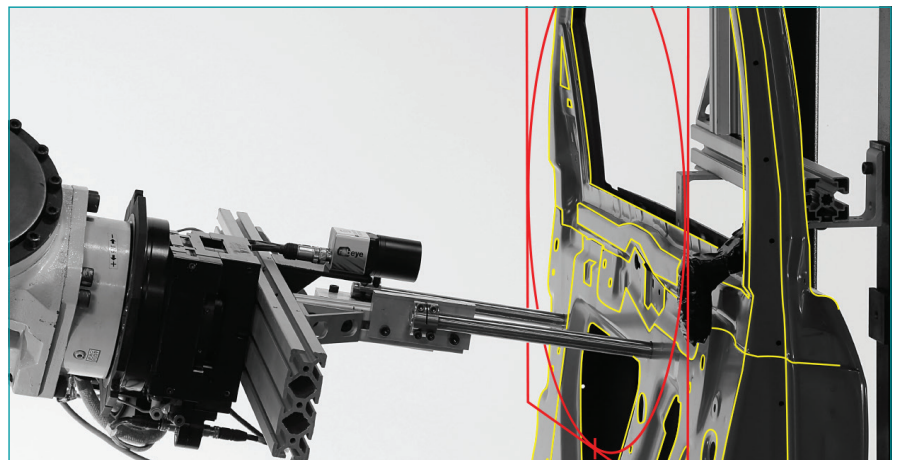
**Steve Gilbert, Visual Guidance Engineering Manager at Recognition Robotics**

Vision guided robotics, commonly used in today's automotive plants, are enabled to see the object they are working on, so they can perform the required activity accurately on/to an object that is not in a repeatable location.

Traditionally, programming a vision guided robotics system has been a complicated process. In many cases it required extensive calibration, structured lighting, multiple cameras, CAD drawings for each object, and vision engineers on site to keep the systems running. In addition, most of these vision guided robotics systems had a limited operating range linearly and especially in the rotational axes. Many of the first systems only properly guide in X, Y, and Rz degrees as well.

### Software algorithms change the game

Since its founding in 2008, Recognition Robotics, Inc. (RRI), located in Elyria, Ohio, has brought a paradigm shift to traditional vision technology. This shift happened when RRI broke the mold with its own algorithms that were not based on the industry standard machine vision platform. RRI founders saw the need for a plant-floor-friendly visual recognition and guidance system that had the intelligence to tackle difficult



Recognition Robotics CortexRecognition® software is capable of guiding a robot in 6 degrees of freedom utilizing one industrial 2D camera.

tasks that others couldn't. They realized that going their own route and building from the software up was the only way to transcend the limitations of traditional machine vision technology. The system needed to be simple for the operator to use, robust enough to withstand industrial environments and powerful enough to recognize and calculate both linear and rotational object displacement along and about all axes.

The company developed their CortexRecognition® software, which gives blind robots human-like sight with its introduction of visual recognition and guidance algorithms. This software allows for object recognition and 6 degrees of freedom robotic guidance (X, Y, Z, Rx, Ry, Rz), utilizing a single image from one industrial 2D camera. No structured lighting, multiple cameras, CAD data, or calibration grids are necessary.

CortexRecognition® enables robots to recognize up to 100 unique objects and can even perform random part picking and sorting under proper application setup. The system involves two questions:

1. What is the object? (Recognition)
2. Where is the object? (Localization)

If the robot has this data, it can take the required action for that particular object. That action might range from selecting a small part from a pile to picking a large SUV body panel from a rack or hanger.

Developed to mimic the human visual process, the software uses unique algorithms that give production robots the ability to recognize and locate taught objects. In most situations where a robotic arm needs to interface with an object, the CortexRecognition® software can be taught to see it, recognize it, and then perform a function on it accurately, regardless of position or orientation.

Steve Gilbert, Visual Guidance Engineering Manager, stated, "Our focus was on ease of use, and our algorithms are what set us apart. People on the plant floor, such as maintenance staff, can use our systems without being vision engineers."

## Completing the system with hardware

Several years ago, Recognition Robotics envisioned Robeye Jr, a hardware-software solution with CortexRecognition® integrated for 3D robotic guidance. Because Robeye Jr operates on the factory floor and needs to withstand harsh conditions, it required a reliable and robust control system. This presented a challenge, and RRI partnered with Phoenix Contact's Solutions Engineering team to develop a custom control solution that could withstand the rugged requirements found in automotive plants.

At the heart of the system is a Phoenix Contact Valueline industrial PC. The 15-inch IPC can withstand the harsh environmental conditions in an automotive plant, so it can be mounted in the door of a small enclosure housing. The smaller footprint of the overall system design reduces the required floor space for RRI's customers. The Valueline's processors are configured with enough horse power to run RRI's sophisticated software algorithms very quickly.

The system also incorporates an ILC 130 controller programmed with PC Worx, an IEC 61131-based software. The ILC is a compact and modular controller that can be adapted to many applications. For this application the, ILC is programmed to communicate with the CortexRecognition® software via custom Ethernet messages to control lights on the robot end-of-arm tooling (EoAT).

In addition, a Phoenix Contact power supply with UPS and pluggable surge protection ensure power reliability. When the Valueline is used with the correct power supply and surge protection products, Phoenix Contact honors a five-year warranty on the industrial PC.



The Valueline IPC's smaller footprint of the overall system design reduces the required floor space for RRI's customers.

## Results

Robeye Jr systems with CortexRecognition® have been implemented for robotic guidance in hundreds of applications worldwide.

With the hardware and software partnership between Phoenix Contact and Recognition Robotics, manufacturers and integrators have found reduced setup time and maturation of systems that rival their competitors. The time-consuming calibration process is gone, and Robeye Jr can work in nearly any lighting – so there is no need for multiple lighting solutions. When the customer looks at the cost of integrating a system, Robeye Jr usually results in a lower total cost of ownership.