

Robot Vision Automating Automation.

Robot Guidance With Machine Vision
A Complete Range Of Products From One Source

**Robot Vision
at its Best**

ISRA
VISION

ISRA Robot Vision



Cutting-Edge Technology for Automation

Machine Vision gives robots intelligent eyes. Using these eyes, robots can recognize the position of objects in space and adjust their working steps accordingly.

Our constant goal as the market leader of Robot Vision is to design systems for automating automation - everything from simple pick & place applications to complex 3D tasks - and implement these cost-effectively. Our technological expertise, our experience and our innovative components support the cost-effective production of our customers worldwide.

Core Competencies from the Start

Since the company was founded in 1985, the technology of robot guidance has been one of ISRA's core competencies. Time and again, we are setting a new course for the global market with innovative developments. One of the primary reasons for this is our longtime combination of expertise in Robotics and Machine Vision.

Today, industrial robots have become a major economic factor in industrial automation. With Robot Vision, the number of application possibilities for these automation components increases exponentially.

Innovative Power for Customer's Benefit

Since the beginning, ISRA has aspired to regularly introduce new processes and applications to the market by means of systematic development of our know-how, thereby contributing to cost-effective production. Therefore, we regularly invest a large percentage of our turnover in Research & Development. The specialists in the ISRA R&D team make use of dedicated knowledge in the fields of optics, hardware and software development, lighting technology, engineering, numerics, algorithms, precision mechanics and sensor construction when developing highly complex Robot Vision Systems. In doing so, the team works closely with the applications and in close cooperation with our customers.

Robot Vision Basics, from the Technology to the System

Machine Vision for robot guidance provides the robot or handling system with information of where the component to be processed or moved is located spatially. This way, it is possible to automate handling, assembly and processing without having to precisely position and fix the components. This saves precious cycle time in production and reduces costs significantly.

Robot Vision is comprised of the following technologies :

- Contrasting of all relevant optical features of the component with illumination and image acquisition technology that is optimal for the application
- Fast and precise position determination of points, features or bodies in the plane or space using robust algorithms
- Coordinate transformations between the coordinate systems of the camera, the robot, the object and the cell, and the calibration of the entire system
- Time-efficient communication, resistant to transmission errors, between the image processor and the robot via various interfaces and protocols
- Integration of additional procedures for quality measurement and inspection including the documentation of all relevant results.
- Clear structuring of the software and concise user-interface in order to make complex technology available in a simple manner

The Entire Equipment from One Source

Robot Vision Systems are an integral part of production technology. Without a sound functioning system, the process comes to a halt. The demands on the availability of these systems are correspondingly high. The fact that all core components of the system come from one source is another reason why ISRA systems can guarantee a high degree of availability with low demands on maintenance and robust measuring and inspection results.

Robot Vision Core Components

- High-performance Frame Grabbers developed by ISRA, hardware-supported, fast processing with integrated FPGAs
- Sensors optimal for the application from the robot-suited miniature camera, to stereo sensors and 3D form matching sensors, to sensors for the combination of robot guidance and quality inspection
- Application know-how in the entire process, implemented in high-performance, robust and easy-to-use software with the components: calibration, measuring, inspecting, communication, data archiving and user support

The World of Robot Vision



The Optimal Solution for Every Demand

The demands on Robot Vision Systems start at the two-dimensional recognition of the translation and rotation of an object on a conveyor belt and extend beyond container unloading, to the recognition of all 6 degrees of freedom of the position of a moving object in space.

Applications for 2D Robot Vision:

- Loading and unloading presses
- Loading and unloading processing machines
- Sorting from the conveyor belt
- Loading and unloading latticed boxes
- Filling barrels
- Commissioning pallets and containers
- Controlling sanding and milling robots
- Guiding filleting machines
- Controlling labeling and marking systems
- Controlling packaging machines
- Positioning Pick & Place systems
- Controlling flame impingement robots
- Guiding slaughtering machines
- Controlling riveting robots
- Guiding harvesting machines

The Optimal Solution for Every Branch

Based on the complete portfolio of technologies, systems, products and components, as well as project experience from various branches, we are expanding our portfolio continuously in order to meet the branch-specific demands of our customers.

Applications for 3D Robot Vision:

- Controlling painting robots
- Mounting glass, roofs, front modules, cockpits, etc.
- Controlling the application of seams, sealant and adhesive
- Controlling loading cranes
- Loading and unloading racks
- Loading and unloading boxes
- Filling the tanks of stationary and moving vehicles
- Mounting wheels on stationary and moving vehicles
- Seam tracking in welding, gluing and sealing processes
- Controlling laser cutting robots
- Spatial collision monitoring
- Controlling the stamping process
- Loading and unloading baggage
- Guiding milking and shearing robots
- Controlling harvesting machines

Robot Vision Sensor Innovations

Robot Guidance and Gauging Combined

The family of **Robot Guidance Sensors (RGS)** can be implemented as either stationary or mobile (attached to the robot) 2D/3D position and coordinate measurement system. For very complex tasks, several sensors can be combined in a multi-sensor system. All sensors are calibrated internally and temperature compensated. The sensors are used for 3D robot guidance and seam tracking, for assembly tasks, for best-fit installation, and integrated quality measurements, including inline measurements.



RGS Features:

- Multi-line 3D form matching
- LED projection technology
- Integrated LED area illumination, controllable power and adjustable intensity
- Stationary and mobile use
- Complete sensor family for various working distances

Compact – Robust – Economical

Cameras and **lighting** units integrated on the robot or in the gripper are subject to intense stresses. The components must be compact, quick to assemble and reproducible for replacing and must be able to withstand high accelerations and strong vibrations. As to cameras, ISRA relies on tested standard components that are integrated in ISRA's own robot-suited housings. LED lighting modules have been developed and produced in-house in order to obtain the optimal contrast in every application.



Robot Camera Features:

- Compact construction
- Fast assembly and exchange
- Miniaturized, robust case
- Own power LED lighting units

Two Eyes for the Three-Dimensional World

Spatial vision with stereo sensors works according to the same principle as the human eye. ISRA's **LOCMES** (Location Measurement Sensor) determines the 3D coordinates of a point in space using two camera images. LOCMES registers objects that can be described using distinctive points, corners, lines or polynomial-like web contours. For definite measurements on areas, additional stripe light projectors are used. For large objects or increased accuracy, several LOCMES sensors are integrated in one network.



Stereo Sensor Features:

- Stereo sensor with integrated stripe light projection
- Freely configurable sensor arrangement
- Stationary and mobile use
- One sensor for various working distances

3D Multi-Function Sensor: Guidance and Inspection

Want 3D determination of the position and orientation of objects while simultaneously carrying out a fully automatic inspection of adhesive and sealant applications during the application process itself? With **EASI3D**, the functionalities for both tasks are integrated into one sensor head. This makes it possible to control and monitor the entire process of fully automatic adhesive and sealant application using only one sensor.



EASI3D Features:

- 3D position determination using stereometry
- Integrated stripe light projector
- 360° inspection within the application area around the nozzle
- Adhesive and sealant inspection while in motion during the application, without reorienting the sensor in curves.

ISRA Robot Vision

2D Position Recognition and Identification on the Plane

The 2D Robot Vision System is the standard system for identification and position recognition. It provides information about the position, rotation, and component type that are arranged on a defined plane. The system distinguishes itself from others through its extreme speed. Contour extraction – accurate down to the subpixel – provides the highest precision, even in the case of fluctuating features. Applications for the system include de-palletizing from the running conveyor belt, sorting and removing objects from the belt, loading and unloading machines, and much more.



2D Robot Vision

Features of the 2D and 2 1/2D Robot Vision System:

- Subpixel accuracy
- Contour-based recognition
- Independent of scaling
- Integrated impact control
- Robust against contrast fluctuations, size fluctuations, rotation and distortion

2 1/2D Position and Orientation Recognition

The 2 1/2D Robot Vision System provides information about the height of the object in addition to the position and rotation. Here the configurable scaling comes into play. Tasks such as de-palletizing or automatically unloading latticed boxes can be solved economically by the lean system construction. A sorting scheme and impact control inspection can be specified.



2 1/2D Robot Vision

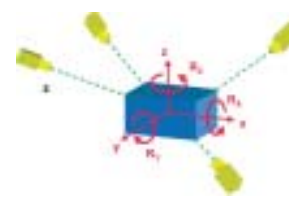
3D Photogrammetry

The patented system links the information from several cameras photogrammetrically to produce precise recognition of the object's spatial orientation. Deviations from a given target orientation are precisely calculated in all six degrees of freedom and robots, in particular, those that process large format components, such as the robots in an automobile painting line, are controlled.



Features of Photogrammetry:

- High accuracy, even with large components
- All camera arrangements possible
- Low amount of configuration work
- Color-independent
- Short measurement times



3D Robot Vision Photogrammetry

3 Dimensional Vision with One Camera

MONO3D is the economical alternative to procedures and equipment for 3D measurements with two or more cameras. With one camera and one image only, all six degrees of freedom (position and orientation) can be determined precisely for a three-dimensional object using only three features. This can be used, for instance, for de-racking of complex components from transport and storage racks.



Features of MONO3D:

- Reduced hardware use
- High flexibility
- High cost-effectiveness
- Quick integration
- Position determination, even while moving

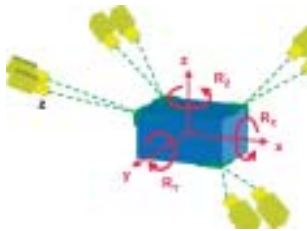


Monocular 3D Robot Vision

The Art of Robot Vision

Features Stereo Measurement Technology:

- Scalable measurement volumes and measurement distances while using the same sensors
- Feature and surface detection
- High measurement distances



3D Stereosystem



3D Stereo Measurement Technology

3D Stereo Measurement Technology is used where the quality and efficiency of highly automated robots and handling systems can be increased through quick and precise position determination, for example, in processes for mounting glass, roofs, cockpits, etc. The systems can be stationary or mobile and can, depending on the demands, control any number of stereo sensors in a network.

Features Multi-Line 3D Form Matching

- High measurement accuracy
- Simultaneous registration of position and coordinates
- Very short measurement cycles
- Multi-sensor system and multi-tasking system



3D Form Matching

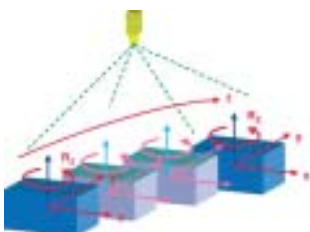


3D Form Matching – Robot Guidance & In-Line Measurement Technology

The use of multi-line projection sensors with integrated area illumination allows for the combination of 2D/3D robot guidance and 2D/3D in-line measurement technology. The high level of redundancy of the measurement lines ensures robust and precise measurement results. The systems can be stationary or mobile. Assembly processes with simultaneous coordinate measurement technology for quality inspections are automated with these systems.

Features Visual Servo:

- 3D in-line tracking
- Optical conveyor synchronization
- Adaptive track corrections during the running process



Visual Servo



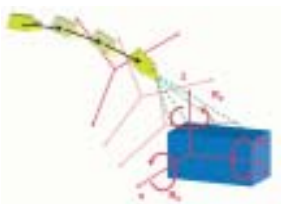
Visual Servo and Seam Tracking

Visual Servoing describes the conveyor synchronization of the robot using the 3D vision system. This enables processing and assembly processes to take place during component feed, for example, wheel assembly or the filling of the gas tank on a moving vehicle.

In seam tracking, the robot is moved exactly along the component geometry; for instance for the precise sealing of seams that do not run in a straight line.

Features AURA:

- Learning system
- Simple and quick set up
- Adjustable to various image features and shapes
- No calibration targets



AURA



Learning Robot Guidance

AURA (Adapted Uncalibrated Robot Automation) is a new method for 3D robot guidance. The procedure is distinguished by its automatic learning ability at various robot positions. Calibration of the cameras is not necessary.

Robot Vision Brainware

Robot Vision Software – Coded Application Know-How

Our experience from hundreds of Robot Vision projects worldwide and in various fields of application manifests itself in the software for our systems. That is what we at ISRA call Brainware.

Calibration

The systems provide all the classic calibration methods, and some innovative ones, too. Depending on the application and surrounding conditions, you can choose between fully automated calibration with a fixed or moving calibration plate, calibration without the calibration plate, or uncalibrated self-learning operation.

Position Determination

Contrast-oriented, feature-oriented, contour-oriented or projection-oriented algorithms are used to recognize the features for determining the position of the component. Photogrammetrical, stereo-based and 3D form matching-based calculations of all 6 degrees of freedom of the object's position are available.

Reliability

The large number of processes employed guarantee the feature recognition at a high degree of reliability. All processes work redundantly, offer automatic alternative strategies and allow manual correction in emergencies. Every measurement is subject to a quality inspection and a plausibility inspection before it is used to control the robot. All results are documented and archived.

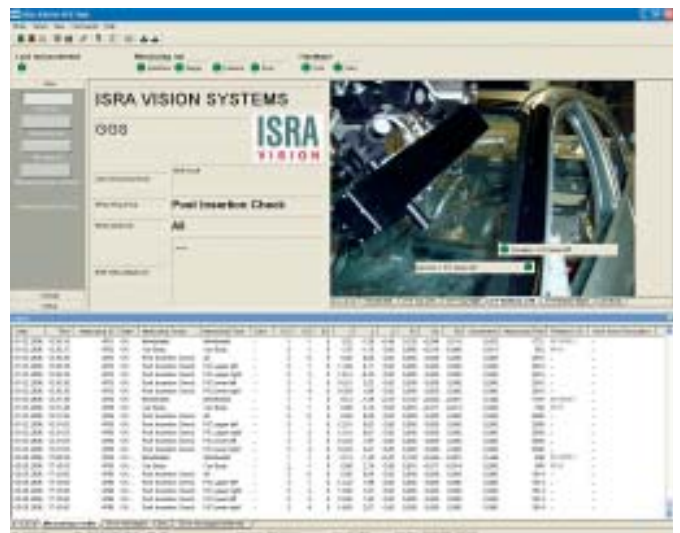
High Levels of Clarity:

- Structured, ergonomic layout
- User-interface can be customized flexibly
- Context-sensitive, clear user-operation
- Image-oriented overview display with the presentation
- All production-relevant data for the current component
- Understandable, user-oriented nomenclature



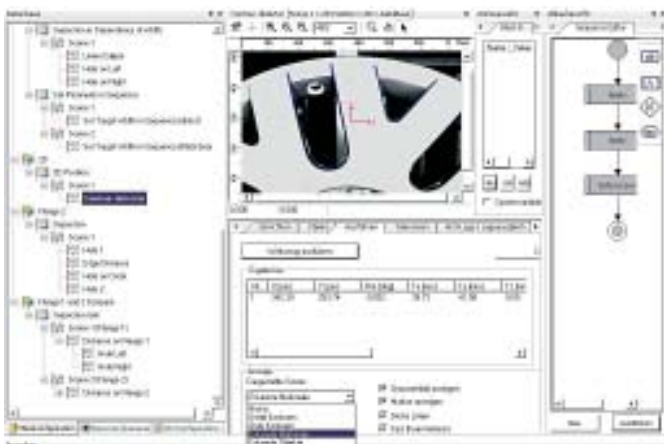
Direct Diagnosis:

- Display of the system status using colored status light signals
- Extensive logging area
- Overview image with graphical visualization of all measurement features and their status



High Flexibility:

- Quick teach-in
- Point, edge and surface detection
- Automated self-control
- Automatic and manual compensation strategies



Innovations for Robot Automation



World class automation

ISRA VISION has been a leading supplier of high-performance quality inspection, robot guidance and production logistics systems for more than 20 years.

These systems are used all over the world in such industries as automotive, tier 1 automotive suppliers, packaging, aerospace, food, logistics, mechanical & plant engineering, and robotics. Our goal is to offer a complete portfolio of standard solutions which meet the full spectrum of requirements along the entire process chain.

Thousands of successful installations worldwide demonstrate ISRA's experience and technological expertise in machine vision.

A summary of the advantages

Customers choose ISRA over the competition for the following reasons:

- Our development activities are fully focused on the needs of our customers.
- We consistently invest in our own know-how in all of the core areas of machine vision.
- At our company, the customer relationship does not end when a new system leaves our shipping dock. The Customer Support Center operates a range of services including a telephone hot line, teleservice, on-site service and maintenance to support our customers during operation of their systems and equipment and to help them increase their productivity.
- More than 300 team members at our locations in Europe, North America and Asia are committed to helping you achieve success.

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The More You See...

