iRVision
Fully integrated plug & play vision system
Machine vision in 2D, 2½D and 3D

Efficiency tool for higher productivity
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With three core product groups, FANUC is the only company in its sector to develop and manufacture all its major components in-house. Every detail, both hardware and software, undergoes stringent quality control checks as part of an optimised chain. Fewer parts and lean technology make FANUC solutions reliable, predictable and easy to repair. They are made to run and provide you with the highest uptime on the market.

All FANUC products – industrial robots, CNC systems and CNC machines – share a common servo and control platform, providing seamless connectivity and making full-automation scenarios really simple. Since all products share common parts, spare parts management with FANUC is fairly efficient. Plus, global standards make it very easy to go international with FANUC.
We empower robots to see

*iVision* is FANUC’s unique, fully robot integrated visual detection system enabling the robots to see in order to manage production settings in a faster, smarter and more reliable way. This increases the overall production flexibility and efficiency in the workplace. The *iVision* application solution can be implemented without complicated programming or expert knowledge. The need to place the work piece in an exact position for the robot to grip is no longer required, as *iVision* recognizes the work piece independently. This results in a high operational efficiency of the overall process. The solution is applicable to various industries (Automotive, Food, Metal, Plastic, Aeromotive, Pharma, etc.) and can be customized according to your various needs.

**100% FANUC**

Based on over 30 years of experience, we are specialists on the field of specifically tailored vision systems for robots. FANUC robots stand for high reliability, and our globally uniform service & support network guarantees competent troubleshooting and a timely delivery of spare parts.

**FANUC iVision supports:**

- Up to 7 cameras (B/W and colour) in different resolutions connectable.
- Supported vision technologies: 2D, 2½D, 3D by laser projection and 3D map by structured light.
- Can be combined with Bin Picking and *iRPickTool*.
- Complete robot range, from small to large.
- Detection of non-moving and moving parts independent of their size, shape or position.
- Usage of *iVision* for advanced service functions (*iRCalibration Suite*).
- Tools which automate calibration procedures and make manual teaching unnecessary.

**Easy plug and play technology**

*iVision* is fully robot integrated, not requiring an interface to external devices or any additional hardware (such as PCs, monitors or side cabinets) for the set up and operation. The vision process configuration can be done directly on the robot controller itself or via the internet explorer browser. The entire range of robots - from small to large ones, as well as all controller types are compatible with the *iVision* solution because the controller hardware is ready-for-vision.

**Efficient ease of use**

The solution is setup within a fast matter of time, as it guides you through each step along the way. A powerful vision toolbox, that is integrated in the standard *iVision* package, supports any tailor-made application. Thanks to a common HMI (GUI), all vision types share the same look and feel, independent of the used software/hardware platform. The vision executions are integrated in the basic robot TPP (Teach Pendant Programming) with direct and complete access to vision process data through *iPendant*.

**Easy simulation**

All vision types of *iVision* are supported in the simulation software ROBOGUIDE. This software enables a simulation of the process, allowing you to select and modify parts and dimensions as required and evaluate the feasibility and efficiency of the entire process before making a purchase decision.
Cover all types of vision with iRVision

Thanks to iRVision, each robot works as precisely as a human operator. All types of vision are applicable, ranging from 2D to 3D Vision Sensor. The entire range of robots can be equipped with this technology, from the smallest to the strongest robot, also including all our controller types. Based on this vast variety, the iRVision solution is suitable to various applications and industries.

Ultimate flexibility for your production processes.
The robot equipped with iRVision is able to:
• perform visual processing
• perform picking and placing of randomly positioned and oriented parts
• sort by colour, shape or many other features
• read 1D and 2D barcodes
• control completeness and dimensions
• perform quality controls

2D vision
• Detection of objects positioned in one layer (X,Y,R)
• Picking up non-moving parts

2½D vision
• Detection of objects positioned in two or more layers (X,Y,Z,R)
• Picking up non-moving parts with different heights

3D laser vision
• Detection of object position and orientation by laser projection (X,Y,Z,W,P,R)
• Picking up non-moving parts in all 6 degrees of freedom

3D Area Sensor and 3D Vision Sensor
• Detection of objects by 3D map (structured light projection) (X,Y,Z,W,P,R)
• Can be used for high-end vision based bin picking, depalletising, and other material handling applications and functions despite the parts conditions, e.g. being dirty, rusty or oily

iRPickTool
• Detection of objects on-the-fly in conveyor tracking (X,Y,R)
• For all processes involving the need to identify, pick and place objects on a moving conveyor

iRCalibration
• iRCalibration functions are service tools based on iRVision. They simplify the initial setup, speeding up the entire integration, which results in an improvement of the application accuracy.

iRVision Weld Tip Inspection / iRTorchMate
• iRVision Weld Tip Inspection for spot welding
• iRTorchMate for arc welding
• Supports the optical wear and condition control of a Weld Tip or ArcTorch during automatic production.
**iRVision overview**

- Vision software is completely embedded in the robot’s hard- and software
- 2D, 2½D, 3D and Barcode reading
- iRPickTool supports 2D iRVision
- 2 different 3D technologies (3D-map and 3D-laser projection)
- Image processing and data storage on robot controller
- Max. 7 cameras connectable to one robot controller
- Different resolutions up to 1280x1024 pixels
- Colour camera support (max. 640 x 480 pixels)
- Many vision algorithms supported such as Geometric Pattern Matching and Blob detection
- Cable length up to 50m supported
- Huge vision tool box embedded in iRVision standard software package
  - Over 20 different vision process types supported
  - Additionally over 50 different vision command tools could be used/combined to create a special, tailor-made iRVision solution
- Robot integrated camera cable for harsh environment
- 100% FANUC Product, worldwide support
- FANUC simulation-software ROBOGUIDE supports all iRVision types

**Pre-sales support**

Prior to the purchase of our iRVision solution, we offer to test the vision process with you within your environment. Through the usage of our simulation software tool – ROBOGUIDE, we are capable of evaluating the time, effort and feasibility of the entire process to implement the vision system application requirements.

**Integration and Maintenance support**

Once you have selected the iRVision solution, we further support you in getting started with the set-up to tailor the solution to your individual application needs. We provide you with a direct access to your entire vision process, enabling you to identify further vision needs. Furthermore, our 24/7 real-application support hotline is available worldwide, where technicians provide their help in troubleshooting the entire setup.
**iRVision functions**

**iRVision 2D**

iRVision finds parts and their precise positioning and part orientation (X,Y,Z and R). As a result, the production flexibility increases due to the eliminated need for expensive positioning fixtures.

2D vision is suited for any material handling applications, palletising and depalletising applications, as well as vision inspections.

- **2D Calibration Free Vision process**, X,Y robot coordinates for non-moving parts
- **Single View Inspection process**, X,Y,Z,W,P,R robot coordinates for non-moving parts
- **2D Multi-View process**, X,Y,Z,W,P,R robot coordinates for non-moving parts
- **Barcode Reader Vision process** deliver the string of 1D or 2D Barcode. Five types of 1D barcode (EAN-13/JAN-13/UPC-A; Code 39, Interleave 2-of-5; Codabar/NW7) and two types of 2D barcode (datamatrix/ECC200; Model 2 and Micro QR-Code). No position information will be delivered
- **Image to Points Vision process** finds chains of connected edge points in an image captured by a 2D camera. The detected points on the outline of a work piece could be extracted into a TP program for applications such as deburring
- **Floating Frame Vision process**, X,Y,Z,W,P,R robot coordinates for non-moving parts. Allows measuring of objects from various robot postures when keeping same relationship between object plane and camera
- **Image to Points Vision process** finds chains of connected edge points in an image captured by a 2D camera. The detected points on the outline of a work piece could be extracted into a TP program for applications such as deburring
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- **Image to Points Vision process** finds chains of connected edge points in an image captured by a 2D camera. The detected points on the outline of a work piece could be extracted into a TP program for applications such as deburring
- **Floating Frame Vision process**, X,Y,Z,W,P,R robot coordinates for non-moving parts. Allows measuring of objects from various robot postures when keeping same relationship between object plane and camera

**iRVision 3D by 3DA and 3DV Sensor**

iRVision 3D Area Sensor and 3D Vision Sensor use a projector unit for 3D measurements. 3D data are measured in a wide area by projecting structured light very quickly for reliable detection. 3DA Sensor can be mainly used for depalletising and bin picking. 3DV Sensor can also be used for kitting, tote picking in logistics, presence/absence check, 3D visual line tracking and many more.

- **3D Plane Measurement tool**, X,Y,Z,W,P,R robot coordinates for non-moving parts. This tool is combined with 2D pattern matching and finds the position and orientation of a part
- **3D Obstruction Measurement tool** could be added to GPM or CSM locator tool, to detect higher 3D point and avoid potential collisions before pick operation
- **Bin Picking Support [optional]**
  Bin picking system enables the vision system to recognize the position and orientation of all parts, which are randomly placed inside a container.
  This option contains all mandatory functions required for a successful bin picking application. Bin picking supports all types of iRVision Sensor, and provides two important functions:
  - **Part list manager** organizes all detected parts in accordance to their position and orientation, reachability and other part-relevant information
  - **Interference avoidance** takes all mechanical interference contours in account and plans all mandatory positions for the robot approach, the pick and retract movements. Complete robot movement is planned by the system itself
- **3D Peak Locator tool**, X,Y,Z,W,P,R robot coordinates for non-moving parts. Locally, it finds the highest position in the 3D map
- **3D GF Locator tool** finds the grip position of a work piece using real grippers. In case a part needs to be picked up with a gripper (no vacuum or magnet), additional space around the part is mandatory. GF locator tool uses a gripper model to find the best pick position
- **3D Box Locator tool** finds boxes which are palletized orderly. It uses the size of boxes to find their upper surface by referring to a 3D map and a camera image
- **3D Cylinder Locator tool** finds some cylinder parts from a 3D map
- **3D One-Sight-Model Locator tool** finds a 3D model which has been taught in advance for one face of a workpiece from 3D data and outputs the 3D position and posture
- **3D Cog Measurement tool**, X,Y,Z robot coordinates for non-moving parts. It finds positions of the gravity center relatively to parent GPM or CSM

**DIFFERENT 2D PROCESS TYPES AVAILABLE**

- **2D Multi-View process**, X,Y,Z,W,P,R robot coordinates for non-moving parts
- **Barcode Reader Vision process** deliver the string of 1D or 2D Barcode. Five types of 1D barcode (EAN-13/JAN-13/UPC-A; Code 39, Interleave 2-of-5; Codabar/NW7) and two types of 2D barcode (datamatrix/ECC200; Model 2 and Micro QR-Code). No position information will be delivered
- **Image to Points Vision process** finds chains of connected edge points in an image captured by a 2D camera. The detected points on the outline of a work piece could be extracted into a TP program for applications such as deburring
- **Floating Frame Vision process**, X,Y,Z,W,P,R robot coordinates for non-moving parts. Allows measuring of objects from various robot postures when keeping same relationship between object plane and camera

**DIFFERENT 3D TOOLS AND FUNCTIONS AVAILABLE**

- **3D Peak Locator tool**, X,Y,Z,W,P,R robot coordinates for non-moving parts. Locally, it finds the highest position in the 3D map
- **3D GF Locator tool** finds the grip position of a work piece using real grippers. In case a part needs to be picked up with a gripper (no vacuum or magnet), additional space around the part is mandatory. GF locator tool uses a gripper model to find the best pick position
- **3D Box Locator tool** finds boxes which are palletized orderly. It uses the size of boxes to find their upper surface by referring to a 3D map and a camera image
- **3D Cylinder Locator tool** finds some cylinder parts from a 3D map
- **3D One-Sight-Model Locator tool** finds a 3D model which has been taught in advance for one face of a workpiece from 3D data and outputs the 3D position and posture
- **3D Cog Measurement tool**, X,Y,Z robot coordinates for non-moving parts. It finds positions of the gravity center relatively to parent GPM or CSM

**3D Vision Sensor and 3D Area Sensor**

- **3DV/400 for smaller field of view (420 x 300 x 300 mm)**
- **3DA/1300 for euro pallet format (1340 x 1000 x 1000 mm)**
**iRVision functions**

**iRVision 3D by 3DL sensor head**

iRVision 3DL uses a hybrid sensor head (FANUC development) for the 3D vision function. The 3DL head uses structured laser light projections for reliable detections. The projection of structured light makes the system robust against various surface conditions (e.g. flat metal, rust, wet, discolorations, etc.). Through this hybrid technology, FANUC’s 3DL Sensor can detect 3 dimensional position and posture of a part.

**DIFFERENT 3DL PROCESS TYPES AVAILABLE**

- **3DL Cross Section Vision process**, X,Y,Z robot coordinates (linked to UTool or UFrame) for non-moving parts. Laser slit beam projection generates a black and white image of the contour of the part.

**Bin Picking Support** (optional)

Bin picking system enables the vision system to recognize the position and posture of all parts, which are randomly placed inside a container. This option contains all mandatory functions required for a successful bin picking application. Bin picking supports all types of iRVision Sensors, and provides two important functions:

- **Part list manager** organizes all detected parts in accordance to their position and posture, reachability and other part-relevant information
- **Interference avoidance** takes all mechanical interference contours in account and plans all mandatory positions for the robot approach, the pick and retract movements. Complete robot movement is planned by the system itself.

**iRCalibration**

iRCalibration functions are based on iRVision, but it is a stand-alone service tool to simplify the initial setup and to speed up the entire integration, which results in an improvement of the application accuracy. Additional solutions based on vision systems are the iRVision Weld Tip Inspection, which prevents wear and tear of the weld tip, and the iRTorchMate, which inspects the ArcTorch, calculates and corrects a possible misalignment.

**DIFFERENT iRCALIBRATION FUNCTIONS AVAILABLE**

- **iRCalibration vision mastering /mastering recovery function**

  Supports quicker and simpler mastering/mastering recovery of FANUC robots, independent of the operator’s skills.

- **iRCalibration vision tool center point (TCP) setting**

  Supports simpler and more accurate setting of the robot TCP, independent of the operator’s skills.

- **iRCalibration vision frame setting**

  Supports simpler and more accurate setting of robot UFRAME. Function is available as a manual, one time setup function or as an automated UFRAME setting, independent of the operator’s skills.

- **iRCalibration vision multi group calibration**

  Supports simpler and more accurate setting of relationships between two robots, or between a robot and a positioner coordinated by a single controller, independent of the operator’s skills.

**iRVision Weld Tip Inspection for spot welding**

Supports the optical wear and condition control of a WeldTip during automatic production. Based on the result, the tip can be reworked or replaced without a production interrupt.

**iRTorchMate for arc welding**

Supports the optical control of an e.g. ArcTorch during automatic production. Based on the result, ArcTorch offset can be added or other actions can be executed.

**iRTorchMate**

Prevents alignment issues from occurring by keeping the tool center point exactly on the tool path, ensuring consistent weld quality.
Efficient long-time productivity:
FANUC Maintenance Services
To minimise impact on production and get the most out of your machine, we offer maintenance services designed to lower your machine’s TCO. Whatever your production scenario, FANUC solutions keep your machine running via dedicated preventive, predictive and reactive maintenance procedures that maximise uptime and keep downtime to a bare minimum.

Efficient service worldwide
Wherever you need us, our comprehensive FANUC network provides sales, support and customer service all around the world. That way, you can be sure you have always got a local contact that speaks your language.

Efficient training:
FANUC Academy
The FANUC Academy offers everything you need to upskill your teams and increase productivity – from introductory programs for beginners through to courses tailored to the needs of expert users and specific applications. Fast and effective learning, on-site training or cross machine training, make up the extensive educational offering.

Efficient supply:
Lifetime OEM spare parts
As long as your machine is in service, we will provide you with original spare parts – for a minimum of 25 years. With more than 20 parts centres all over Europe, dedicated service engineers and direct online access to FANUC stores, availability checks and ordering, we keep you running whatever happens.

Different 2D Process Types available:
• 2D Single-View Visual Tracking, X,Y,R robot coordinates for moving parts
• 2D Multi-View Visual Tracking, X,Y,R robot coordinates for moving parts. Increased accuracy for huge parts based on more than 1 camera snap

iRPickTool’s highly functional software package includes:
• Various system layouts by default supported
• Linear and Circular conveyor systems by default supported
• Multiple robots by default supported, connected by TCP/IP
• Queue Management by default integrated in the standard iRPickTool software package
• Load balancing by default integrated. Amount of parts to be handled by each robot can easily be manipulated during runtime
• Recipe management by default supported to quickly switch between different production scenarios

• Tray function (Box or blister) by default integrated. Completeness check of outgoing tray and tray management is easy to setup, fully supported by load balance and additional special functions
• Conveyor stop/start function by default integrated. Infeed part check and outgoing tray completeness check could be combined with the conveyor stop/start and/or ejector function to eject incomplete trays
• Different sorting functions by default integrated
• Wide conveyors can be equipped with several parallel mounted cameras to increase part detection accuracy
• Pre-Grouping by default integrated. Creation of pre-groups on the same conveyor to save time when complete groups can be picked and placed in downstream area
• Sensor task customization can be performed by users to have full control over complex detection methods and queue feed. This is supported by default
• Servo conveyor and Indexer function by default supported to control conveyor by FANUC servo motor

iRVision functions
iRVision 2D functionality can be added to iRPickTool to support the detection of randomly placed parts on a moving conveyor. This way, the iRPickTool equips single or multiple robots with the ability to identify, pick and place items in linear and/or circular conveyor tracking. This is supported by a wide range of features including advanced queue management, buffering and tray functionality.

24/7 support

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ROBOTS
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Machines

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Compact
CNC Machining
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