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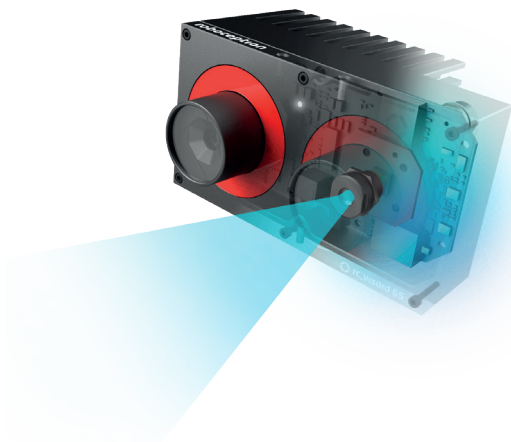
3D Stereo Sensor

The rc_visard sensor family enables robots to generate and process time and location-related data in real time. The sensors support a variety of robot applications, ranging from bin-picking to navigation.

With its onboard processing capabilities it can be integrated directly into applications obviating the need for external computers.

- Enabling robots to sense and process data in real-time

- Works in natural and artificial light

- Precise ego-motion estimations (VINS)

- Noise-reduced depth image using advanced smoothing

- Full camera stereo resolution – 1.2 MPx with 0.8 Hz

reddot award 2019 winner

iF DESIGN AWARD 2018

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GigE VISION

Specifications

Image Resolution	1280 x 960 Pixel	1.2 Mpixel
Baseline	rc_visard 65: rc_visard 160:	65 mm 160 mm
Field of View	horizontal 61°, vertical 48° [6 mm lens variant: h 43°/ v 33°]	
Depth Range	rc_visard 65: rc_visard 160:	0.2–1 m 0.5-3 m
Depth Resolution	rc_visard 65: rc_visard 160: [6 mm lens variant: 0.06-2,2 mm]	0.04-0.9 mm 0.1-3.3 mm
Depth Image Resolution & FPS	1280x960 (F) @ 0,8 Hz 640x480 (H) @ 3Hz 320x240 (M) @ 15 Hz 214x160 (L) @ 25 Hz	
Ego-Motion	200 Hz, low latency	
Computing Unit	Nvidia Tegra K1	
Interfaces	WebGUI, Rest-API, GenICam, GigEVision 2.0, UDP based ego-motion interface	
Connectors	8-pin A-coded M12 socket for GigE 8-pin A-coded M12 plug for GPIO, power	
Dimensions (LxWxH)	rc_visard 65: rc_visard 160:	135 x 75 x 96 mm 230 x 75 x 84 mm
Weight	rc_visard 65: rc_visard 160:	680 g 850 g
Power Supply	18-30 V	
Temperature Range	0-50°C, passive cooling	
Protection Class	IP54	

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RandomDot Projector

The rc_randomdot is a specifically tailored projector that can be used as an enhancement to the rc_visard when the perception of particularly difficult scenes with little or no natural visual texture is required.

The rc_randomdot increases the scene density and hence improves the quality of stereo matching when the natural scene texture is low.

- Tailored white LED projector
- Projects random dot pattern
- Enhances depth measurements if scene texture is low
- Can be mounted over scene or directly on sensor
- Suitable for use with any rc_visard (monochrome, color)

Specifications

Illumination Mode	Strobe mode
Wavelength	White light
Power Supply	24V, min. 65W
Connectors	M12, 8 contacts
Weight	660g
Dimensions	70 mm (diameter) 152 mm (incl. lens)
Temperature Range	0°C - 45°C (passive cooling)
Protection Class	IP54
Y-Cable (included)	M12 8pin, A-coded, 30 cm sensor-projector cable
Lens (included)	12,5 mm c-mount lens
Projection Angle	62° horizontal, 48° vertical
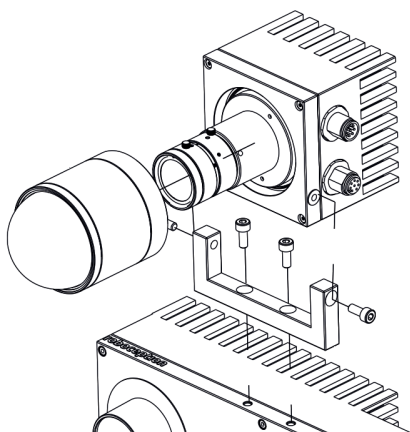
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TagDetect Module

The rc_reason TagDetect Module enables the rc_visard to rapidly detect QR codes and AprilTags.

This capability is highly useful for efficient identification and manipulation of labeled objects, e.g. in pick-and-place use cases. Further, it can significantly facilitate mobile applications, as the rc_visard can localize itself in space using pre-installed QR codes or AprilTags as a reference.

A detection time of less than one second and the ability to detect multiple codes or tags in one shot make applications time-efficient.
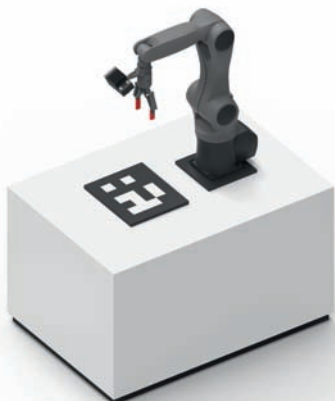
- Identification and localization of labeled objects
- Reliable localization of rc_visard in 3D space
- Time-efficiency: detection time < one second
- On-board data processing: no external hardware
- Out-of-the-box: easy installation and operation

Specifications

The rc_reason TagDetect Module is an optional software component that can be easily activated on-board the rc_visard and operated through the sensor's standard interface. It enables a robust detection of QR codes and AprilTags. In addition, it calculates the 3D position and orientation of each tag relative to the sensor.

|		
Hardware Requirements	Any rc_visard; on-board installation, no additional hardware required	
Supported AprilTag Families	16h5, 25h7, 25h9, 36h10, 36h11	
Capturing Mode	one-shot mode	
Detection Time	< 1 second	
AprilTag Precision (at 30 cm)	Lateral: 0.4 mm Z axis rc_visard 65: 0.9 mm	Z axis rc_visard 160: 0.8 mm
AprilTag Precision (at 1 m)	Lateral: 0.7 mm, Z axis: 3.3 mm	
QR Code Precision (at 30 cm)	Lateral: 0.6 mm Z axis rc_visard 65: 2.0 mm	Z axis rc_visard 160: 1.3 mm
QR Code Precision (at 1 m)	Lateral: 2.6 mm Z axis rc_visard 65: 15 mm	Z axis rc_visard 160: 7.9 mm

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SLAM Module

The rc_reason SLAM Module enables drift-free navigation with the rc_visard. With the SLAM Module, the rc_visard maps the environment during operation and uses the map for precise relocalization.
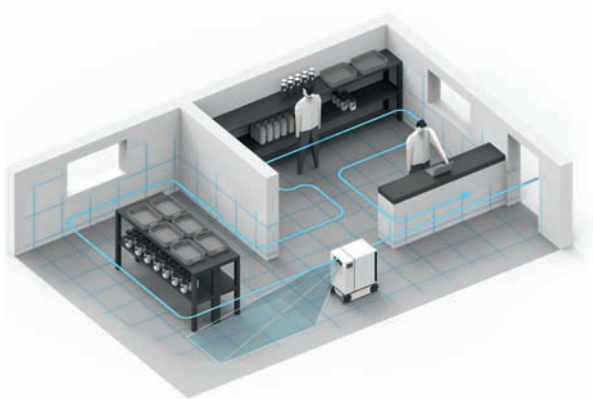
- Precise mapping and pose estimation in 3D
- Recognition of previously visited places
- Drift-free localization: online trajectory correction
- On-board data processing: no external hardware
- Out-of-the-box: easy installation and operation

Simultaneous Localization and Mapping

The rc_reason SLAM Module is an optional software component that can be easily installed on-board the rc_visard and operated through the sensor's standard interface. This software module enables the rc_visard to map its environment and to optimize its pose estimate through the recognition of revisited places.

The rc_reason SLAM Module is an essential element of most mobile navigation applications as it provides accurate and drift-free localization – with no GPS required. It is recommended to activate this add-on when mobile applications require longer robot trajectories within a confined area, including the return to previously visited places.

Corrections are applied directly to the real-time pose estimates of the rc_visard, as well as to the complete past trajectory, which is provided for 2D/3D map generation.

As the sensor is not restricted to planar motion, free movement in 3D is supported.

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ItemPick Module

The rc_reason ItemPick Module is a solution for robotic pick-and-place applications using suction grippers: it computes surface grasp poses for a suction device on any given object.

Initial identification of load carrier for bin-picking

Reliable detection of flat surface(s) on items

Works with static and robot-mounted rc_visards

On-board data processing: no external hardware

Out-of-the-box: easy installation and operation

A Highly Efficient Pick-and-Place Solution

This optional software component can be easily activated on-board the rc_visard and operated through the sensor's standard interface: Equipped with the ItemPick Module, the rc_visard computes a configurable number of grasp poses for a suction device on all items identified inside a predefined workspace.

A grasp order (that can easily be modified by the operator) is proposed; each suggested grasp includes a quality value related to the surface available for grasping.

ItemPick is useable with any common suction device, it works on any kind of object and with any common robot. A tailored URCap graphical interface enables a particularly easy plug-and-play installation on your UR robot (version 3.7.0 and above). Additional robot integration tools are provided on Roboception's Github.

ItemPick applications can be further optimized by equipping the rc_visard with Roboception's RandomDot Projector and the corresponding IOControl Module. This enhancement is recommended in particular for objects with e.g. a low natural texture and/or a complex geometry.

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BoxPick Module

The rc_reason BoxPick Module is a perception solution for robotic pick-and-place applications such as de-/palletizing and sorting of packets.

It allows the detection of stationary items with rectangular surfaces and the determination of their position, orientation and size for picking.
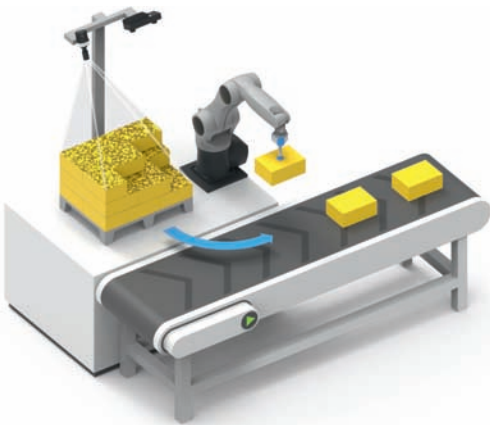

- Initial identification of load carrier for bin-picking

- Reliable detection of flat, rectangular surface(s)

- Identification of size, position and orientation of rectangular objects

- Works with static and robot-mounted sensors coupled with RandomDot Projector

- On-board data processing

Pick-and-Place Rectangular Items

The rc_reason BoxPick is an optional software component that can be easily installed on-board the rc_visard and operated through the sensor's standard interface.

Equipped with the BoxPick Module, the rc_visard detects rectangular surfaces over pre-defined size ranges and optionally computes potential grasp points. It allows the detection of the position, the orientation and the size of the objects and enables the robot to place the objects in a defined position.
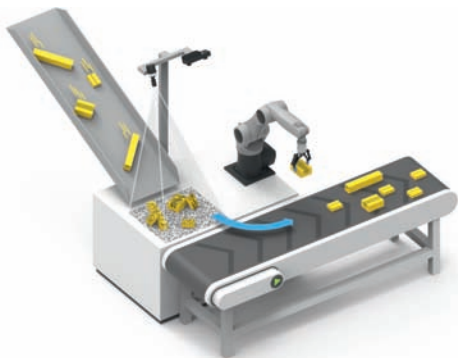
The BoxPick Module enables robots to pick unsorted and unordered packets out of a bin and palletize these items in a defined oriented way. It can also be used for de-palletizing packets to a conveyor belt, e.g. for cross-belt sorters.

The use of the RandomDot Projector is mandatory with this module.

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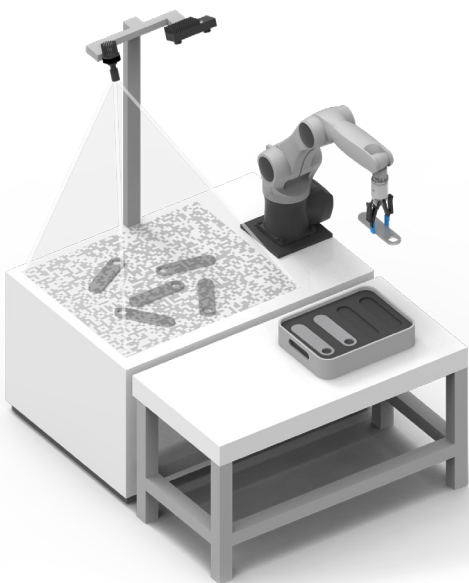# SilhouetteMatch Module

The rc_reason SilhouetteMatch Module detects position and orientation of comparatively flat objects that are positioned on a plane, by matching the scene at hand to a previously taught template.

- Detection of shallow objects, calculation of their 3D pose
- Teaching of new objects provided as a service
- Automatic and flexible detection of the base plane
- Works with static and robot-mounted sensors
- On-board data processing: No external hardware

Reliable Detection of Shallow Objects

The rc_reason SilhouetteMatch Module enables the rc_visard to detect comparatively flat objects lying on a planar surface in unmixed scenes. For each object, the 3D position and orientation is determined.
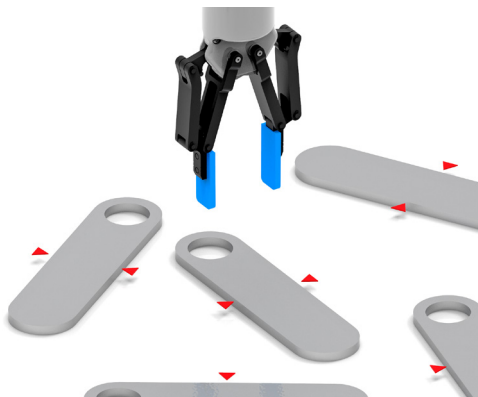
Typical applications include machine tending or emptying load carriers of several (separated) layers of objects.

This optional software component can be easily activated on-board any rc_visard and operated through the sensor's standard interface. It requires a template of the objects that are to be detected. Creation of this template is offered as a service.

Depending on scene / object complexity, and especially when the base plane is detected using the rc_visard's point cloud, coupling the module with a RandomDot Projector is advisable.

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CADMatch Module

The rc_reason CADMatch Module enables a robotic system to reliably detect, localize and pick items from unmixed load carriers - fully independent of the object's position and orientation - based on its CAD model.

This application can significantly increase the efficiency of production processes, e.g. by automating machine tending.
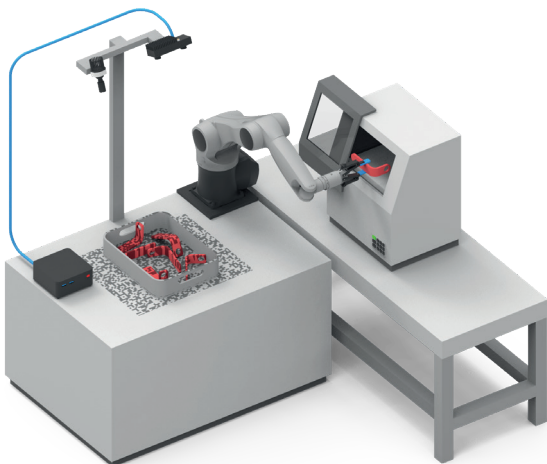
- Detection and localization of objects based on CAD data
- Delivers grasp point(s) for reliable pick-and-place
- Intuitive interface for configuration of grasp points
- Template creation provided as a service
- Increases efficiency of automation processes

Pick-and-Place from Unmixed Bins

The rc_reason CADMatch module uses a CAD model as input, AppliedAI-based machine learning processes and highly intuitive user interfaces: Non-experts are hence able to configure the grasp points and implement the pick-and-place process with just a few mouseclicks.
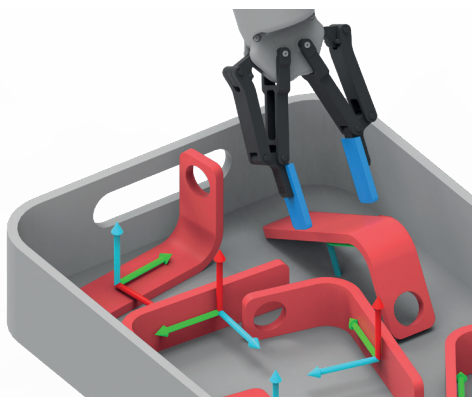
The software allows the specification of one or more grasp points per object, hence enabling picking by a two-finger gripper or a suction device.

This module runs off-board the rc_visard on an rc_cube computer and is operated through an intuitive WebGUI interface that includes a grasp-teaching interface.

The CADMatch Module requires a template of the object to be detected. This serves as input to an AppliedAI-based detection process. The creation of this template from the object's CAD data is available as a service.

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