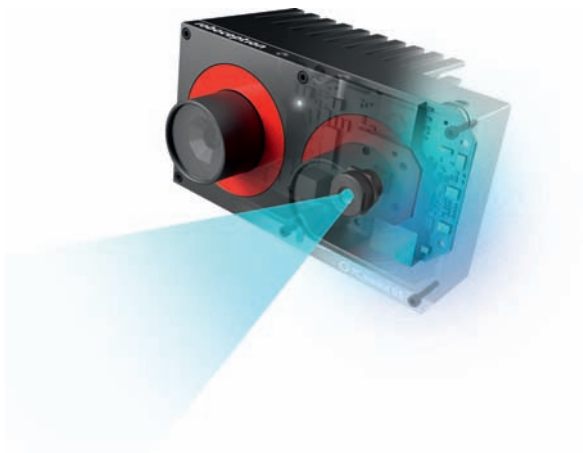


3D Stereo Sensor

The rc_visard enables robots to generate and process time and location-related data in real time.

The innovative sensors can be used in all areas of robotics, for example in data generation or navigation.

Functions such as object recognition and scene analysis as well as additional software modules e.g. for pick-and-place applications offer numerous application possibilities.



- 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

Specifications

| | | |
|--------------------------------------|--|---------------------------------------|
| Image Resolution | 1280 x 960 Pixel | 1.2 Mpixel |
| Baseline | rc_visard 65: 65 mm | rc_visard 160: 160 mm |
| Field of View | Horizontal: 61°, Vertical: 48° | |
| Depth Range (for full resolution) | rc_visard 65: 0.2–1 m (0.3 –1m) | rc_visard 160: 0.5-3 m (0.7–1m) |
| Depth Resolution | rc_visard 65: 0.5-15 mm | rc_visard 160: 1.5-50 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: 135 x 75 x 96 mm | rc_visard 160: 230 x 75 x 84 mm |
| Weight | rc_visard 65: 680 g | rc_visard 160: 850 g |
| Power Supply | 18-30 V | |
| Temperature Range | 0-50°C, passive cooling | |
| Protection Class | IP54 | |

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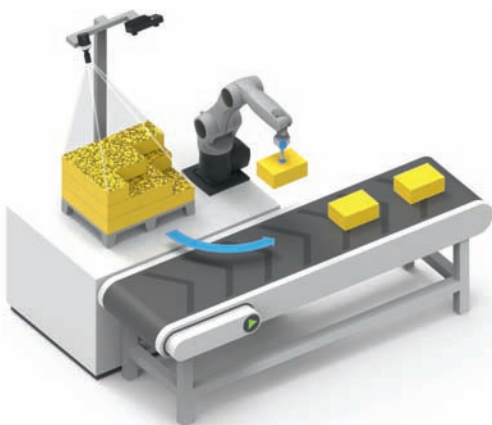
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BoxPick Module

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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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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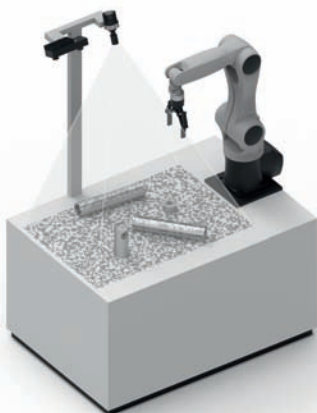
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RandomDot Projector

While the rc_visards are perfectly suitable for reliably detecting and handling a large variety of objects, there are limitations when objects and workspaces have little or no natural texture.

The RandomDot Projector can be used as an enhancement to the rc_visard when the perception of particularly difficult scenes with little or no natural texture is required.



- Tailored white LED projector - random dot pattern
- Enhanced perception results when scene/object texture is low
- Can be mounted over scene or directly on sensor
- Particularly useful for pick applications; coupled with IOControl and ItemPick Modules
- Suitable for use with any rc_visard (monochrome and color)

Specifications

The RandomDot Projector increases the scene density and hence improves the quality of stereo matching when natural scene texture is insufficient.

The projector can be combined with any rc_visard, mono-chrome and color. It contains a special driver ensuring compatibility with the sensors.

The scope of delivery includes the C-Mount lens and the Y-cable required for its connection as well as a mechanical adapter that can be used to attach the projector directly onto the rc_visard.

The RandomDot Projector requires the IOControl Module.

| | |
|--------------------|--|
| Illumination mode | Continuous or strobe mode |
| Wavelength | White light, 5500 K +- 500 K |
| Power supply | 24 V, 60 W (combined with rc_visard) |
| Connectors | M12, 5 contacts |
| Weight | 400 g |
| Dimensions | 83 mm (diameter) x 180 mm (incl. lens) |
| Temperature Range | 0°C - 40°C (passive cooling) |
| Protection Class | IP54 |
| Y-Cable (included) | 8p male to 5p.fem + 8p.fem 0,3m |
| Lens (included) | 12.5 mm C-Mount lens |

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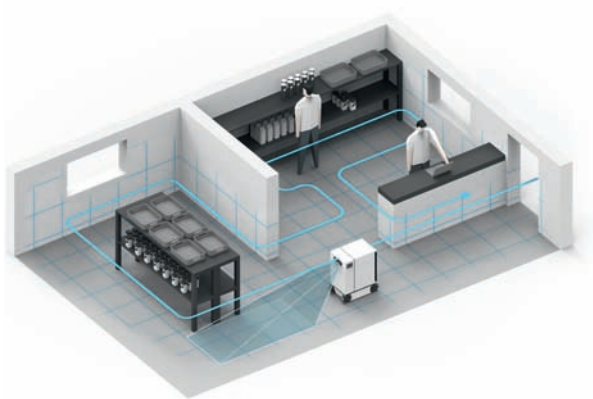
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SLAM Module

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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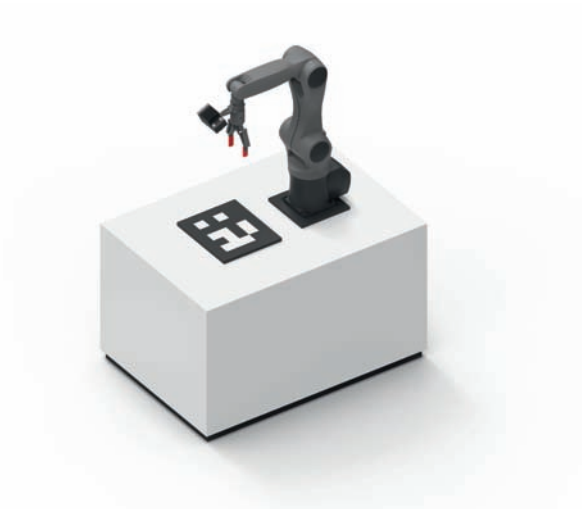
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TagDetect Module

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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