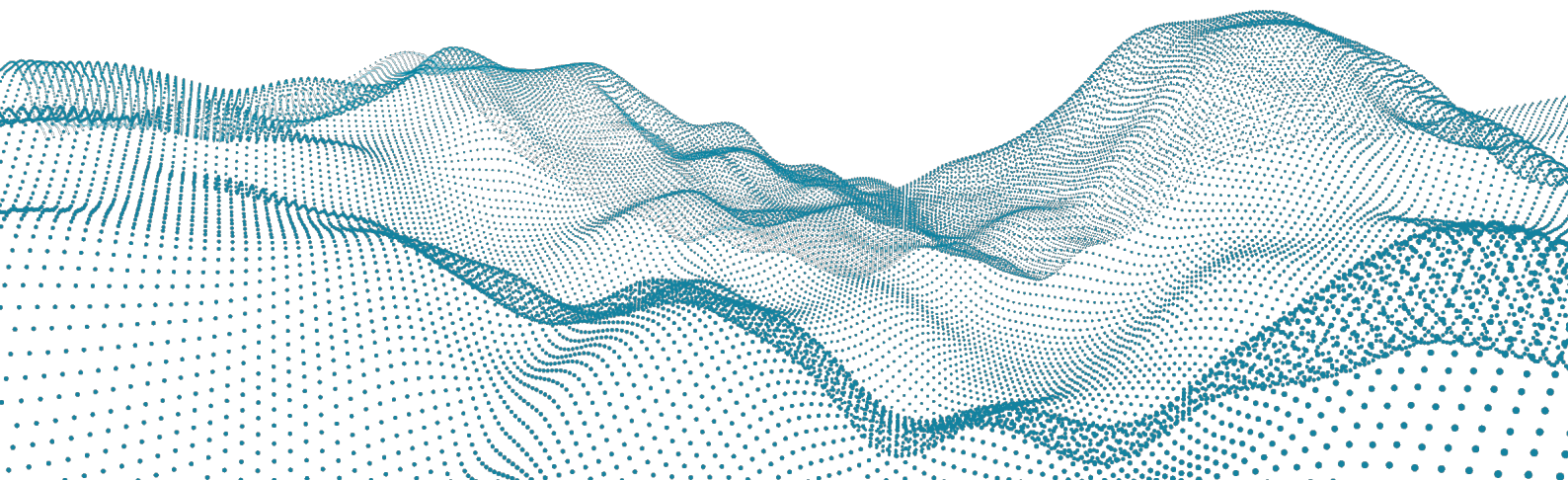




Roboception GmbH | October 2021

rc_cube Accelerator for rc_visard

FIRMWARE CHANGELOG



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1 21.10.0 (2021-10-26)

1.1 New Components

- **UserSpace**: New component that enables users to deploy and manage their own containers running on the rc_cube.

The UserSpace can be used for running e.g.:

- Collision-free motion planner
- Web service and cloud access, monitoring
- Vision pipelines
- Application programs

The REST API and gRPC interfaces can be used inside the UserSpace to obtain grasp points and image data, giving access to all activated rc_reason modules and connected sensors.

1.2 New Features

- StereoMatching (rc_stereomatching):
 - add [exposure_adapt_timeout](#) parameter
- CADMatch (rc_cadmatch):
 - add support for “partial” object templates. This feature enables CADMatch to detect only portions of a complete CAD model. Some of the use-cases that can benefit from a “partial” object template are:
 - * Large objects that cannot be entirely in one camera view
 - * Objects that are highly occluded when placed in a bin (e.g. large stacks of flat parts)
 - * Configurable objects (e.g. a switch that can change between two configurations)
 - * Partially solid objects: object that have a partially soft or changing structure (e.g. brushes)
- REST API:
 - parameters are now always saved automatically so save_parameters is not necessary anymore and hence deprecated
- GigE Vision/GenICam:
 - add ChunkRcAutoExposureAdapting
 - add DepthExposureAdaptTimeout

1.3 Improvements and Fixes

- CADMatch (rc_cadmatch):
 - improve grasp selection for continuous symmetric templates
 - sort matches as well according to the selected sorter
 - fix no colliding grasps visualized
 - fix increasing memory usage on rc_cube S
- Hand-Eye calibration (rc_hand_eye_calibration):
 - fix corner case when entering wrong poses for 4DOF
- SilhouetteMatch (rc_silhouettematch):
 - improve grasp selection for continuous symmetric templates
 - sort matches as well according to the selected sorter
 - accept templates with zero height
 - improve match duplicate filter
 - limit minimum value of match_max_distance to 0.1
- WebGUI:
 - add UserSpace management to navigation menu if available
 - show placeholder when system is not connected or not ready
 - improve general warning and error messages

- removed "save parameters" buttons from module pages as they are auto-saved now
- improved marquee selection for 2D ROI and exposure region and added button to reset exposure region
- improved template modal
 - * add tab with more details of the template
 - * show gripper in grasp visualization
 - * made grasp list more compact
- add camera connection info to system page
- add hint in preferred orientation visualization when z axis points towards the camera

1.4 Other Changes

- REST API:
 - Renaming of `rc_stereocamera` to `rc_camera`. For backwards compatibility the now deprecated name `rc_stereocamera` will redirect to `rc_camera`.
 - Renaming of `rc_stereocamera_tl` to `rc_camera_tl`. For backwards compatibility the now deprecated name `rc_stereocamera_tl` will redirect to `rc_camera_tl`.

1.5 Deprecations

- The `load_carrier` services and parameters in the `ItemPick`, `BoxPick`, `SilhouetteMatch` and `CADMatch` nodes are deprecated and **will be removed in January 2022 with version 22.01**. Please use the [services](#) and [parameters](#) provided by the `rc_load_carrier` module.
- The `item_model_tolerance` parameter in the `ItemPick` node is deprecated and **will be removed in January 2022 with version 22.01**.
- The node names `rc_stereocamera` and `rc_stereocamera_tl` are deprecated and will be removed in a future version. Please use `rc_camera` and `rc_camera_tl`.
- The `save_parameters` service call is deprecated and will be removed in a future version.

2 21.07.1 (2021-08-04)

2.1 Improvements and Fixes

- WebGUI:
 - fix support for gitterboxes (Early Access preview feature)
 - fix interactive grasp rotation in `SilhouetteMatch` template modal
- REST API:
 - return 503 (instead of 500) if service is unavailable
 - cache dongle/license validity to speed up `GET system/license`

3 21.07.0 (2021-07-21)

3.1 New Components

- OPC UA Server: New module that allows communicating with the `rc_visard` and the `rc_cube` via the [OPC UA](#) communication protocol.

The OPC UA Server is available as an Early Access preview feature. Please contact us if you would be interested in testing the OPC UA interface.

3.2 New Features

- add grasp sorting strategy selection to [ItemPick](#), [BoxPick](#), [SilhouetteMatch](#) and [CADMatch](#)
- include grasps when downloading [SilhouetteMatch](#) and [CADMatch](#) templates
- LoadCarrier (`rc_load_carrier`):
 - add detection of gitter boxes/pallet cages by extending load carrier definition. This is available as an Early Access preview feature. Please contact us if you would be interested in testing this feature.
 - add `pose_type` to load carrier model to support [Exact Poses and Orientation Priors](#)
- WebGUI:
 - 3D visualization of grippers and colliding grasps in [CADMatch](#) detection result
 - add 3D result visualization to [SilhouetteMatch](#)
 - add interactive Menus to all 3D visualizations with Controls and View Options

3.3 Improvements and Fixes

- persist parameters across [firmware updates](#)
- support writing to vfat and exfat USB flash drives
- improve system ready notification at boot
- add sensor unavailable return code for cases where the sensor is not connected or not ready
- LoadCarrier (`rc_load_carrier`):
 - add snapshot dumps for last detection
- CADMatch (`rc_cadmatch`):
 - performance and latency improvements
- SilhouetteMatch (`rc_silhouettematch`):
 - fix bug that caused less object to be detected in some scenes
 - extend data included in snapshot dumps for last detection
- BoxPick (`rc_boxpick`):
 - improve detection with small dimension ranges
- ItemPick (`rc_itempick`):
 - fix segmentation for small clusters far away from camera
- WebGUI:
 - allow download of templates in [SilhouetteMatch](#) and [CADMatch](#)
 - new 3D orbiting control for unconstrained rotations
 - only show min distance warning if depth range is actually reduced
 - show hint if new `rc_randomdot` projector is connected
 - allow editing and deleting elements in Try-Out dropdowns
 - show if system requires a reboot when dongle is reconnected
- GEV server:
 - add `ChunkLineStatus`

3.4 Other Changes

- [reject IPs in internally used subnets](#): 172.23.42.0/24, 172.17.0.0/16
- Grasps and load carriers are internally migrated to new storage format and not available any more if a rollback to a previous firmware version is performed. It is advised to create a [backup](#) before upgrading if a rollback might be desired.
- CADMatch (`rc_cadmatch`):
 - `pose_frame` is always required in `detect_object` arguments
- REST API:
 - node status: rename `stale` to `idle` and add `initializing`
- IOControl [get_io_values service](#) changed to support varying number of IOs

3.5 Deprecations

- The `load_carrier` services and parameters in the `ItemPick`, `BoxPick`, `SilhouetteMatch` and `CAD-Match` nodes are deprecated and will be removed in a future version. Please use the [services](#) and [parameters](#) provided by the `rc_load_carrier` module.

4 21.04.1 (2021-04-20)

4.1 Fixes

- network settings: fix check if IP is already in use when no route to given IP is available
- WebGUI:
 - fixed rotation of grid for `SilhouetteMatch` template visualization
 - only show full screen icons for depth images in continuous acquisition mode

5 21.04.0 (2021-04-15)

5.1 New Components

- `LoadCarrier` (`rc_load_carrier`): New module that allows setting and retrieving load carriers, as well as detecting load carriers and their filling levels.

The `LoadCarrier` module is an optional on-board module of the `rc_cube` and is licensed with any of the modules `ItemPick`, `BoxPick`, `SilhouetteMatch` or `CADMatch`. Otherwise it requires a separate `LoadCarrier` license to be purchased.

- [gRPC image streaming interface](#): New `rc_cube` interface that can be used as an alternative to the GigE Vision / GenICam interface for getting camera images and synchronized sets of images (e.g. left camera image and corresponding disparity image).

5.2 New Features

- `CADMatch` (`rc_cadmatch`):
 - add [check_collisions_with_matches](#) parameter
- `SilhouetteMatch` (`rc_silhouettematch`):
 - add [check_collisions_with_matches](#) and [check_collisions_with_base_plane](#) parameters
- REST API:
 - add [backup/restore functionality](#) to download and upload the complete configuration of an `rc_cube`
- WebGUI:
 - organize modules into detection modules and configuration modules
 - add import/export of grasps for `CADMatch` and `SilhouetteMatch` templates
 - new `LoadCarrier` detection module
 - new Regions of Interest page for configuring regions of interest for all detection modules
 - possibility to directly update the firmware of the connected `rc_visard`
 - add optional item maximum dimensions to `ItemPick` Try-Out section
 - add fullscreen control to images in stream view

5.3 Improvements and Fixes

- LoadCarrier (rc_load_carrier)
 - return estimated dimensions of detected load carriers
 - improve load carrier detection in low contrast scenes
- CADMatch (rc_cadmatch):
 - performance improvements
 - allow collision check with all detectable objects
 - disambiguate equally good grasps for symmetric templates
 - fix parsing of symmetries during refinement
- SilhouetteMatch (rc_silhouettematch):
 - grasp sorting combines orientation and distance to preferred orientation
 - allow collision check with all detectable objects
 - disambiguate equally good grasps for symmetric templates
 - enforce detection timeout of 5 seconds
- ItemPick (rc_itempick) and BoxPick (rc_boxpick):
 - improve detection of small rectangles at large camera distances
 - added compartment to load carrier visualization
- REST API:
 - return object_uuid for CADMatch and SilhouetteMatch templates
- WebGUI:
 - allow up to 8 poses during Hand-Eye Calibration
 - moved Try-Out sections below image streams in all detection modules
 - add shortcuts to create Load Carriers, Regions of Interest and Grippers from the Try-Out section of all detection modules
 - show positions with four digit precision in detection result tables
 - show SilhouetteMatch 3D collision model when configuring grasps
 - show default values for all parameters in info boxes
 - ask if firmware update should be applied if filename indicates wrong image
 - show message if websocket connection is not available
 - also use port 80 for websocket
 - enforce max length of 60 characters for all IDs
 - show logs for EKI bridge
 - show why network setting could not be applied

5.4 Other Changes

- support NTFS and exFAT formatted USB flash drives
- GigE Vision/GeniCam:
 - set model_name to rc_cube_S or rc_cube_X
- REST API:
 - report if userspace is available in system

6 21.01.0 (2021-01-29)

6.1 New Features

- BoxPick (rc_boxpick):
 - add prefer_splits parameter
- CADMatch (rc_cadmatch):
 - collision check with other detected objects
 - add grasp_filter_orientation_threshold parameter
- SilhouetteMatch (rc_silhouettematch):

- collision check with other detected objects
- REST API:
 - UBJSON support, via `application/ubjson` mime type in `Content-Type` and/or `Accept` headers
- WebGUI:
 - Download last detection of `ItemPick`, `BoxPick`, `SilhouetteMatch` and `CADMatch` as tarball with visualization images

6.2 Improvements and Fixes

- `ItemPick (rc_itempick)`:
 - improve segmentation of objects with dimensions and few 3D edges
- `BoxPick (rc_boxpick)`:
 - improve box detection using confidence image for 2D edges as well
- `CADMatch (rc_cadmatch)`:
 - improve refinement for flat objects
- Hand-Eye calibration (`rc_hand_eye_calibration`):
 - minimize geometric loop closure error instead of reprojection error and return more error values
- WebGUI:
 - downloadable JSON response of try-outs now matches full REST-API response
 - visualization image selection via dropdown
 - show version of connected `rc_visard` and warn if `rc_visard` firmware is not supported
 - improve grasp teaching and visualization of large CAD models

6.3 Other Changes

- REST-API:
 - return image version without device and 'v' prefix

7 20.11.0 (2020-11-23)

7.1 New Features

- `SilhouetteMatch (rc_silhouettematch)`:
 - Add collision detection with base plane
- `StereoMatching (rc_stereomatching)`:
 - New `double_shot` mode: Combine images from two subsequent stereo image pairs. This is meant for the use with a random-dot projector in `ExposureAlternateActive` or `SingleFrameOut1` acquisition mode.
- `Camera (rc_stereocamera)`:
 - New `Out1High` auto exposure mode: Adapt exposure time using only images with GPIO Out1 high. This is meant for the use with a random-dot projector in `SingleFrameOut1` acquisition mode.
- WebGUI:
 - Japanese translation
 - Add snapshot download on depth image page (with disparity and pointcloud as ply)
 - Optionally show image that is actually used by stereo matching on depth image page
 - Download try-out requests as JSON

7.2 Improvements and Fixes

- BoxPick (rc_boxpick):
 - Fix missing detections in packed scenes
 - Also draw detected box in grasp visualization
- SilhouetteMatch (rc_silhouettematch):
 - Improve refinement
- Hand-Eye calibration (rc_hand_eye_calibration):
 - Service get_calibration strictly returns only saved result. Before it returned values of calibrate call, even if save_calibration was not called
 - Service set_calibration implicitly calls save_calibration
 - Extended collinearity check to ensure that positions are at least 3 mm apart from each other
- CADMatch (rc_cadmatch):
 - Updated grasp sorting to also consider the matching score of the object the grasp is located on

7.3 Other Changes

- GigE Vision/GenICam:
 - add DepthDoubleShot feature
 - add Out1High to ExposureAuto enum
 - rename RcAdaptiveOut1Reduction to RcOut1Reduction

8 20.10.0 (2020-10-13)

First release



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FIRMWARE CHANGELOG

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