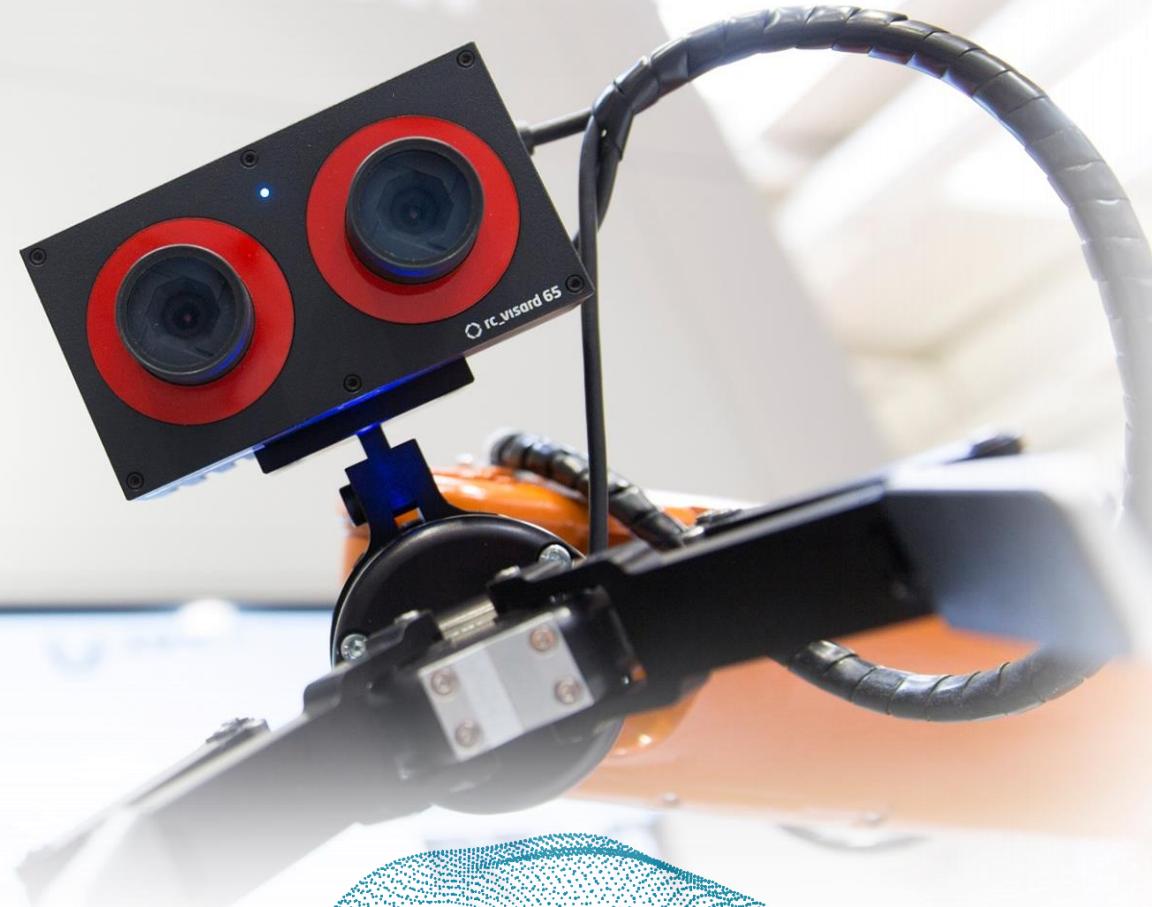


Sense. Reason. Act.

ROBOCEPTION GMBH

FTP ROSIN - VISARD4ROS



Company Profile

SENSE. REASON. ACT



Founded **03/2015** by three former employees of the Institute of Robotics and Mechatronics/ German Aerospace Center as a **DLR SPIN-OFF**

KUKA Deutschland GmbH
Shareholder since 08/2015

Based in **MUNICH** (Pasing)

18 employees (08/2018)

Mission

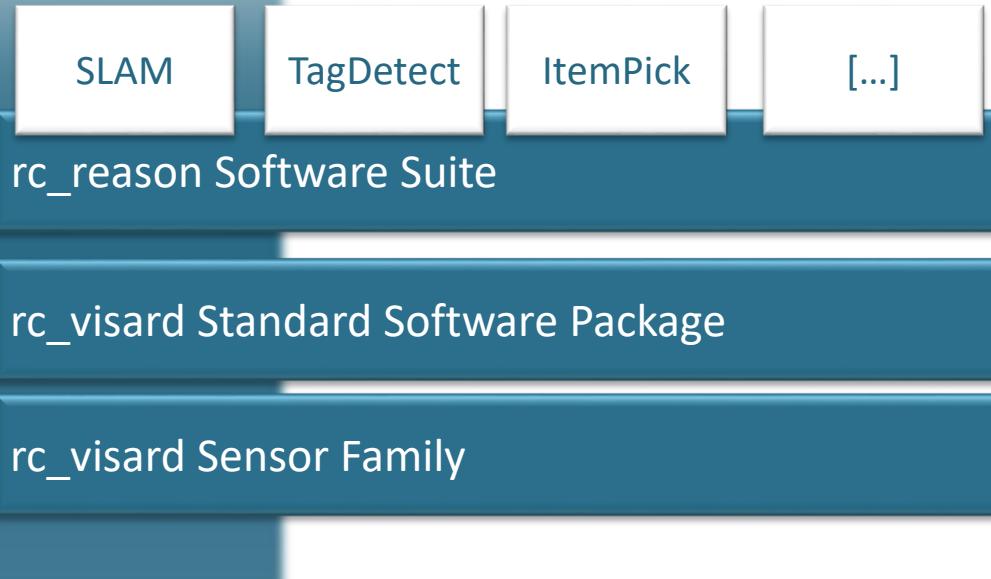
Sense. Reason. Act.

Going from pixel to action using perception.

Business Model

VERSATILE SENSOR AND INTUITIVE ROBOTICS SOFTWARE FOR REAL-TIME 3D

SENSE. REASON. ACT.



Hardware/ basic software enhanced by modular software components (> scalable)

3D information in real-time, on-board processing

Software products for real-time perception and manipulation of robotic systems

Navigation and perception solutions for innovative applications

Intuitive: No expert knowledge required

rc_visard Sensor Family

3D INFORMATION IN REAL-TIME

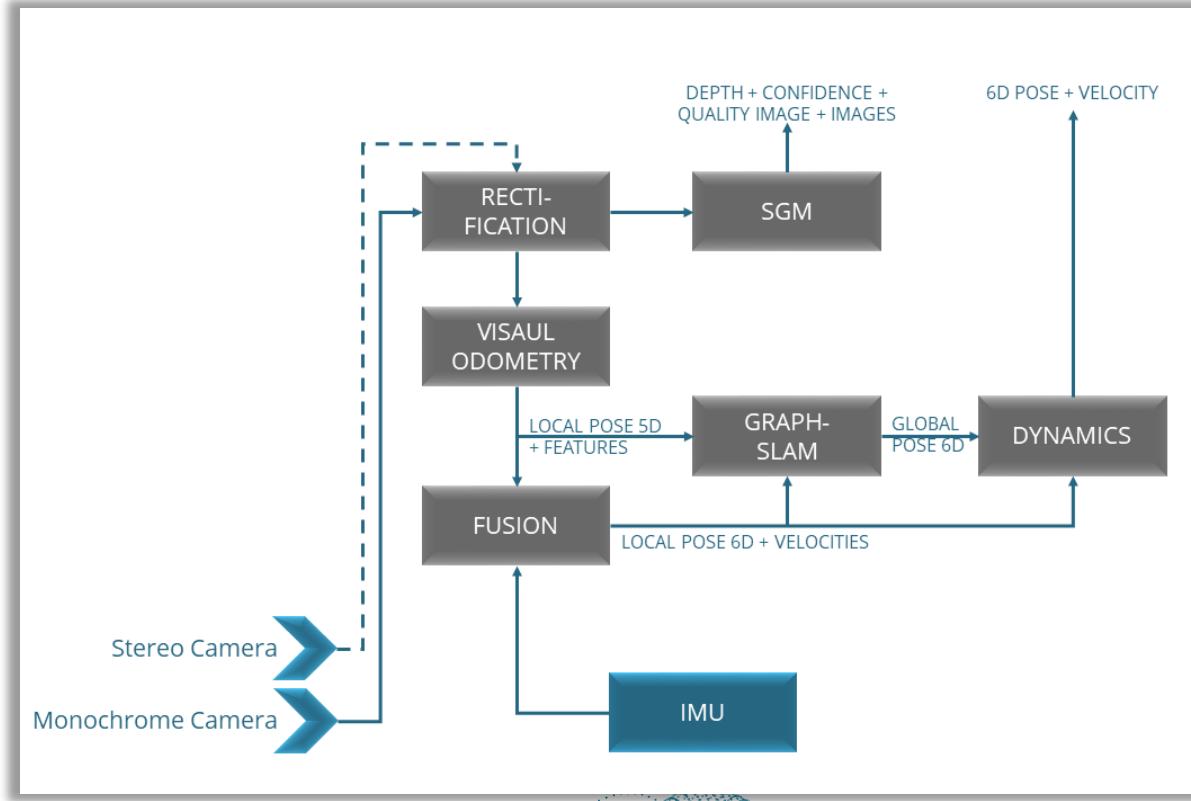


Sensor in four variants (baseline 65 mm / 160 mm, monochrome/ color capacity) delivering reliable 3D data for the perception-action-loop

- Stereo, depth images and ego-motion
- On-board processing capabilities
- Intuitive plug-and-play interfaces

Product Concept

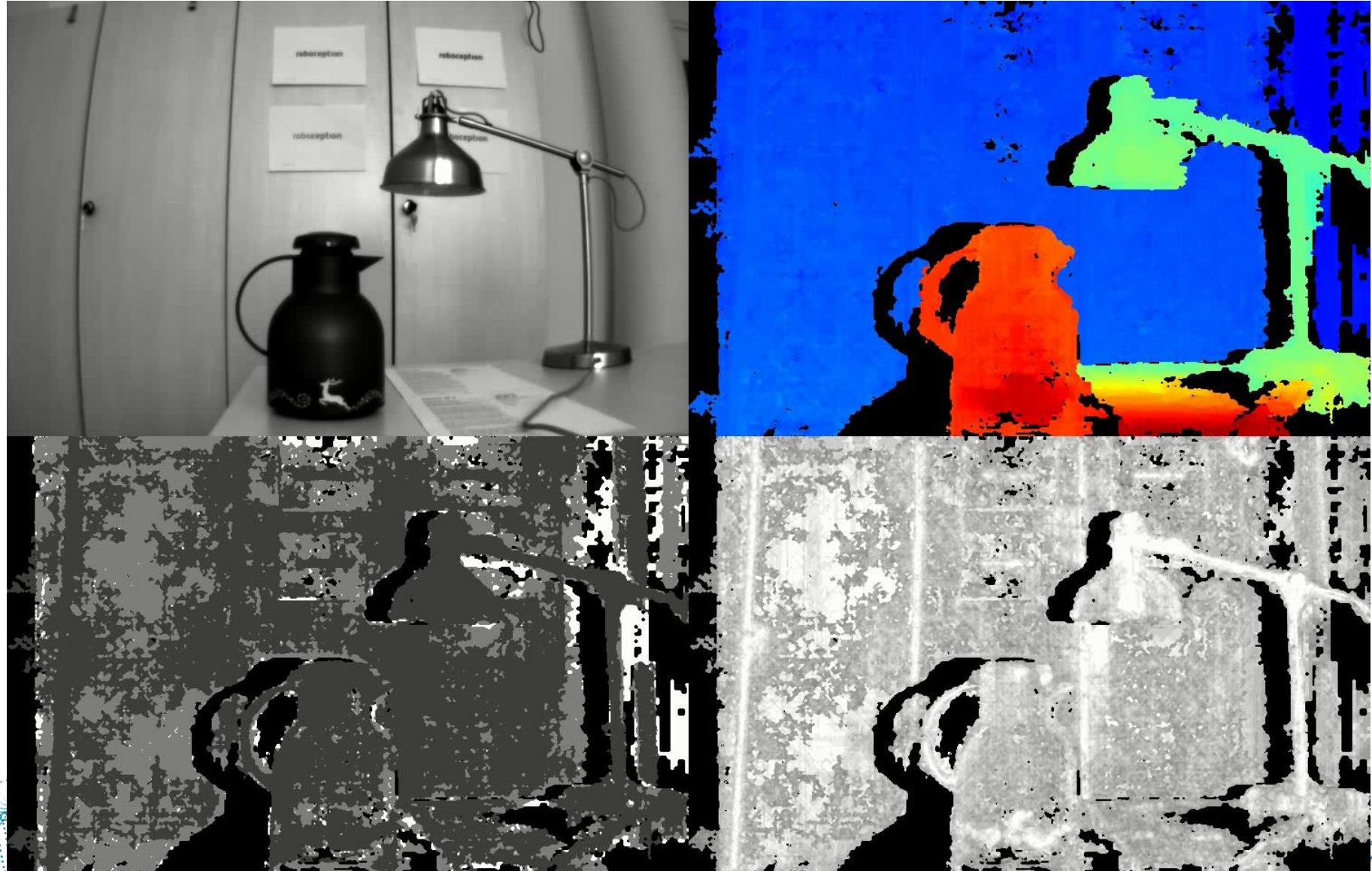
PERCEPTION AND NAVIGATION SOLUTIONS



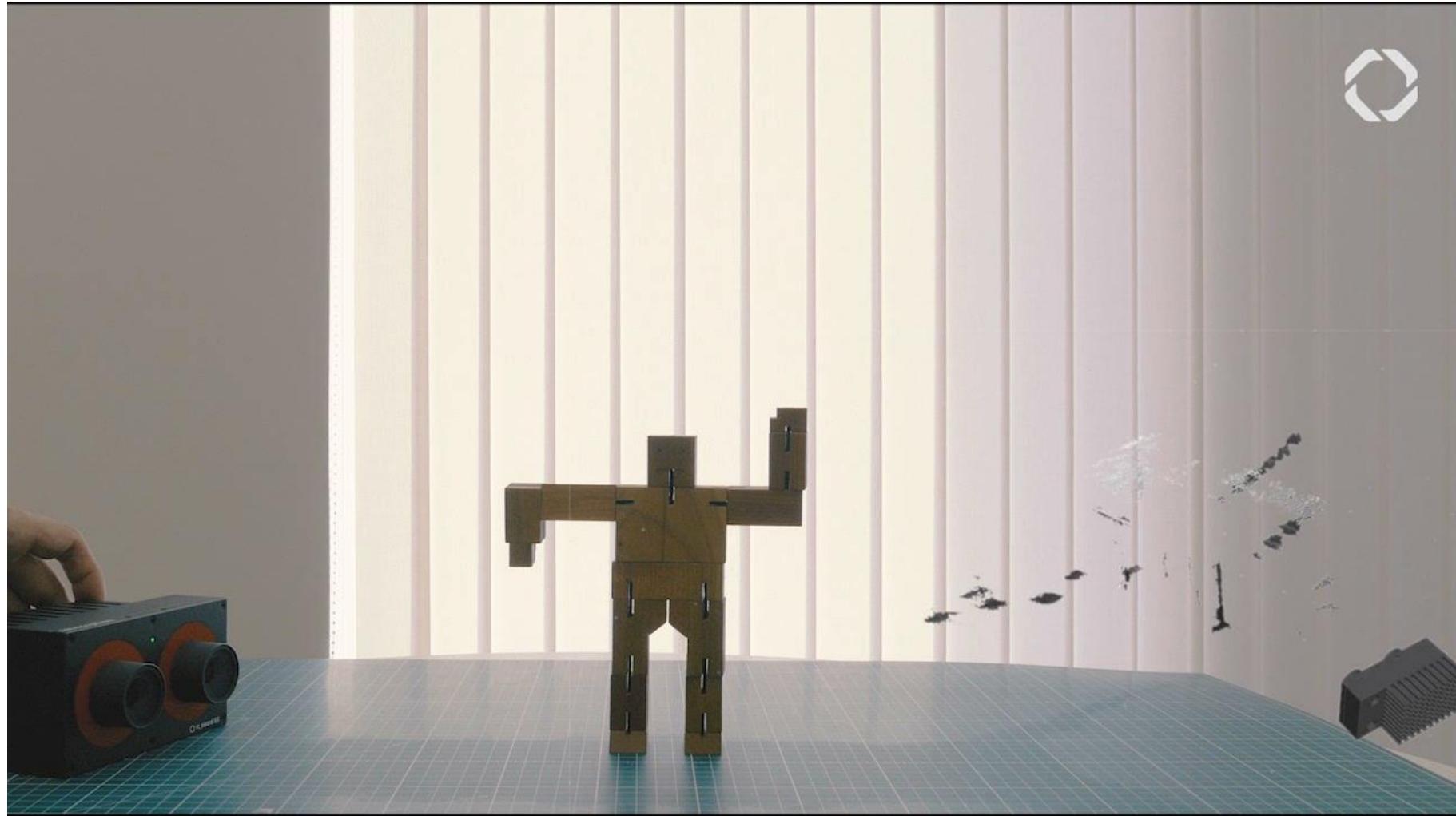
Four versions: rc_visard 65 m I 65 c I 160 m I 160 c

- Stereo and depth images as well as ego-motion
- On-board processing, no external hardware
- Intuitive plug-and-play interfaces
- Precise determination of position and orientation
- Low latencies
- Works in natural and artificial light
- Reliable ego-motion (even in case of vibrations)
- Multiple sensors operate in same work space
- Robust fusion of stereo and inertial data
 - object recognition
 - indoor navigation
 - grasp planning
 - world modelling

rc_visard STEREO DATA PROCESSING RESULTS



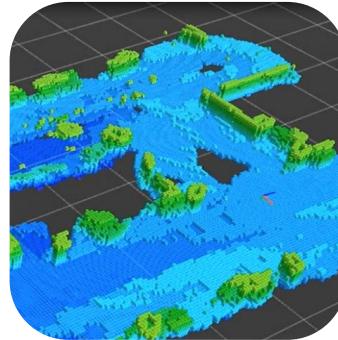
rc_visard Ego-Motion POINT CLOUD GENERATION



<https://youtu.be/chJ0rs4Ozog>

rc_reason Software Suite

ON-BOARD ENHANCEMENT OF BASIC SOFTWARE



SLAM: Precise mapping and pose estimation in 3D for a drift-free navigation

TagDetect: Identification and pose estimation of QR codes and AprilTags

ItemPick: Computation of grasp poses for suction grippers in pick-and-place applications

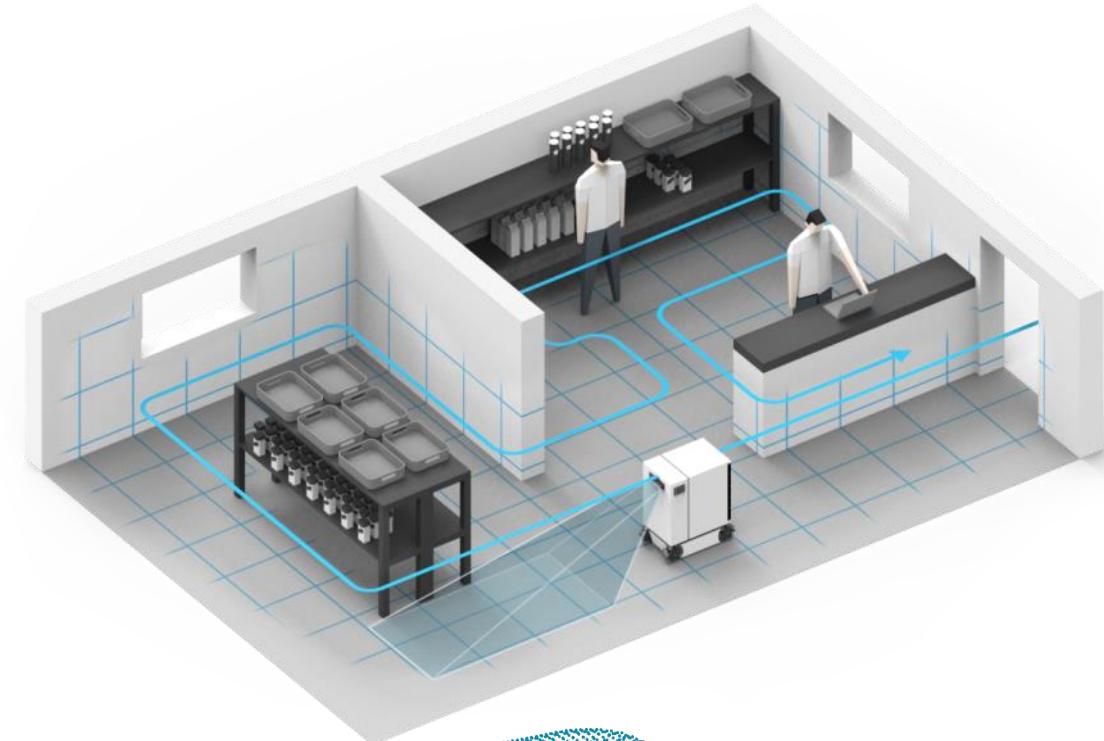
& MORE TO COME

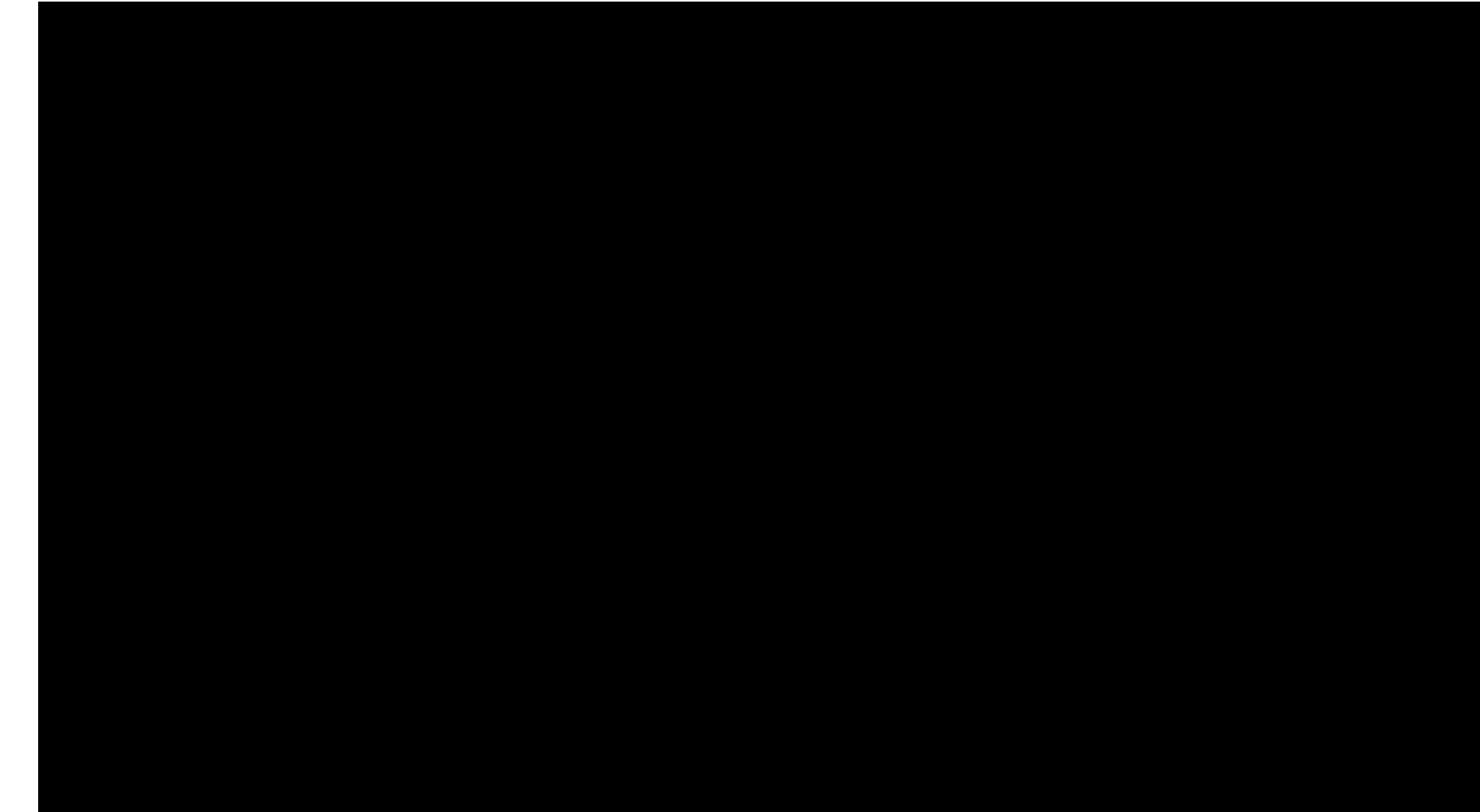
rc_reason SLAM Module

SIMULTANEOUS LOCALIZATION AND MAPPING

rc_visard captures its environment in a map and simultaneously estimates its current location for optimized navigation.

- Precise mapping and pose estimation in 3D
- Enables a recognition of previously visited places
- Drift-free: Online correction of trajectory
- Out-of-the-box: Easy installation and operation





rc_reason
VISUAL ODOMETRIE

rc_reason SLAM/ ROBOT NAVIGATION



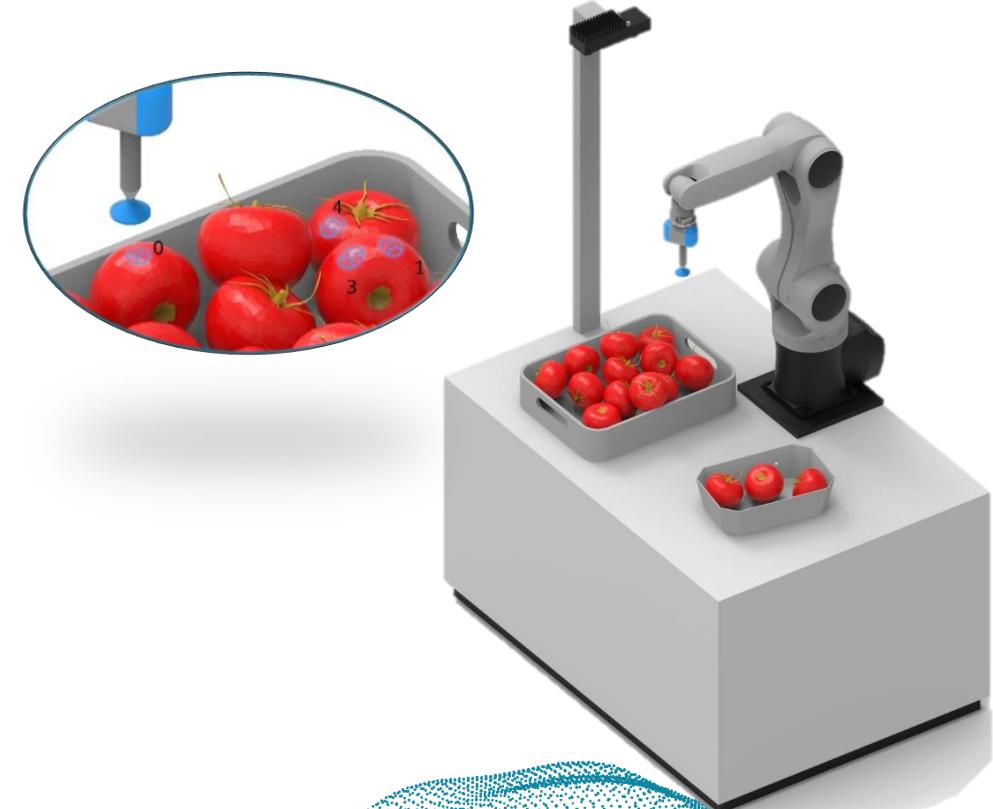
<https://youtu.be/qqqvwhVcbvQ>

rc_reason ItemPick

FOR ROBOTIC PICK-AND-PLACE APPLICATIONS USING SUCTION GRIPPERS

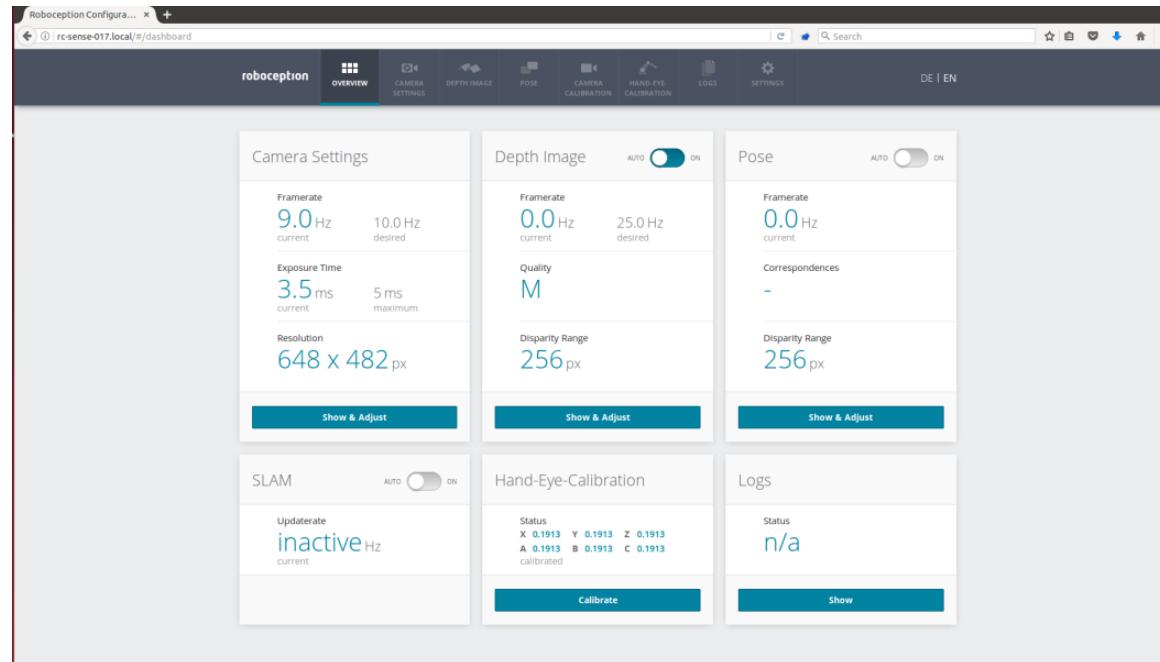
Computes surface grasp poses for a suction device on a given object.

- Identification of load-carrier for bin picking
- Reliable detection of flat surface(s) on items
- Works with static and robot-mounted sensors
- On-board data processing: No external hardware required
- Out-of-the-box: Easy installation and operation



Configuration, Calibration and Operation

INTUITIVE WEB INTERFACE ENABLES NON-EXPERT USE



Configuration

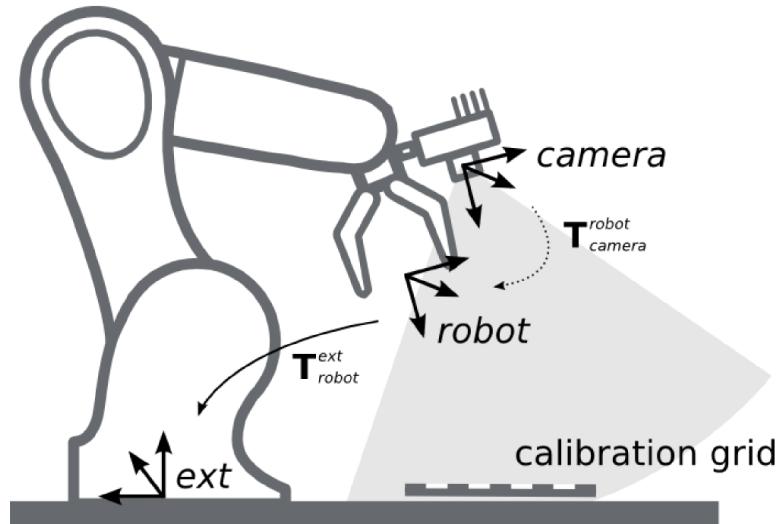
- Gain & Exposure
- Visual Control

Calibration

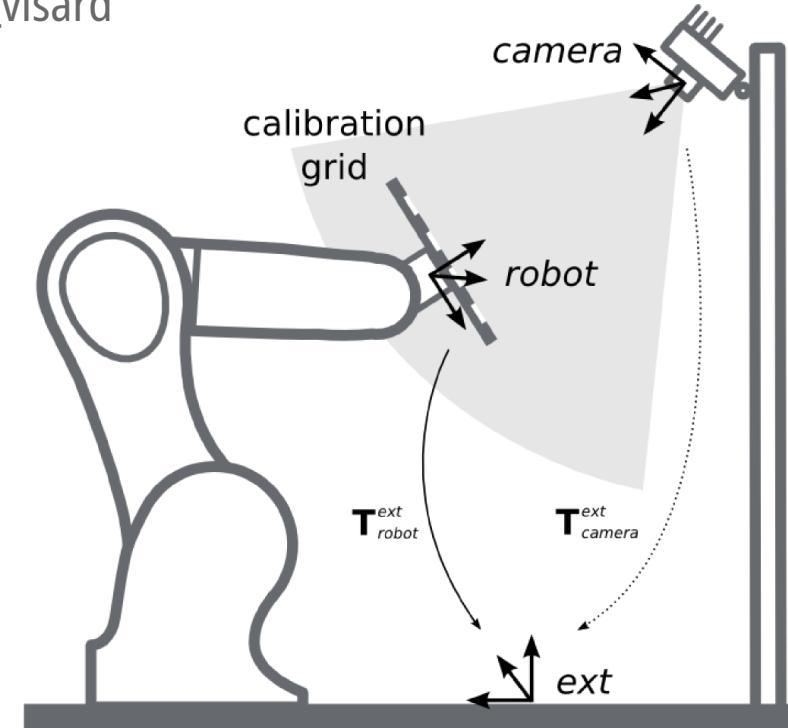
- Intrinsic and stereo calibration (factory setting)
- Self-calibration during operation (automatic)
- Hand-eye calibration by using wizards

ROSIN FTP – Visard4ROS

Ease of use – hand-eye calibration with rc_visard



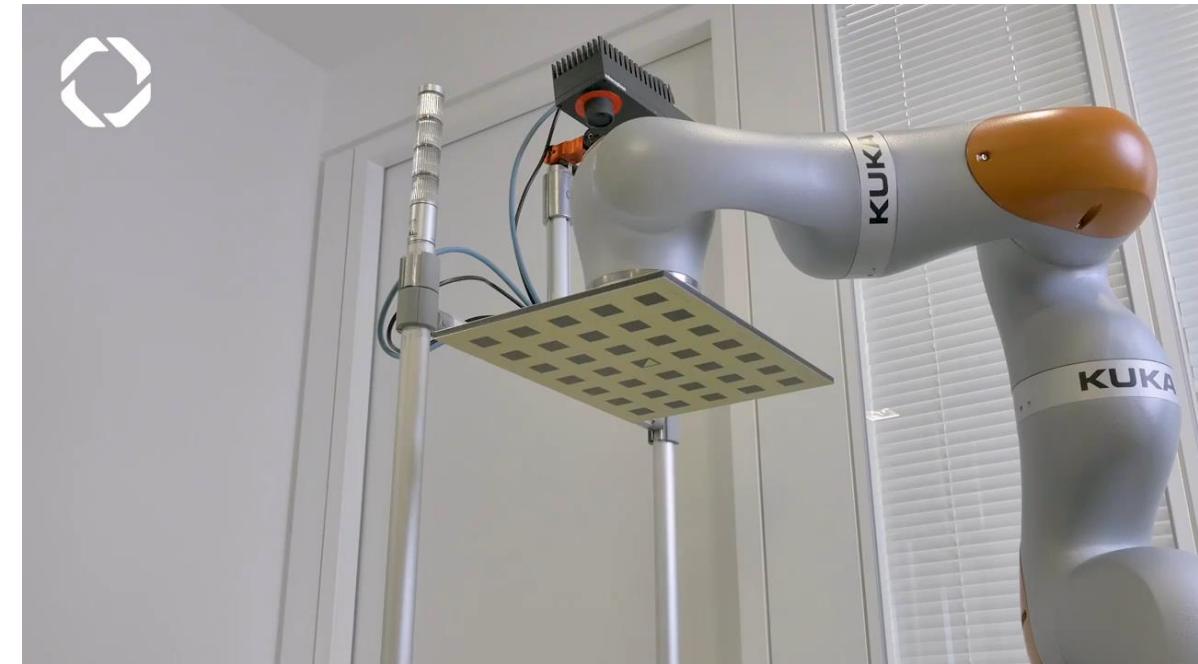
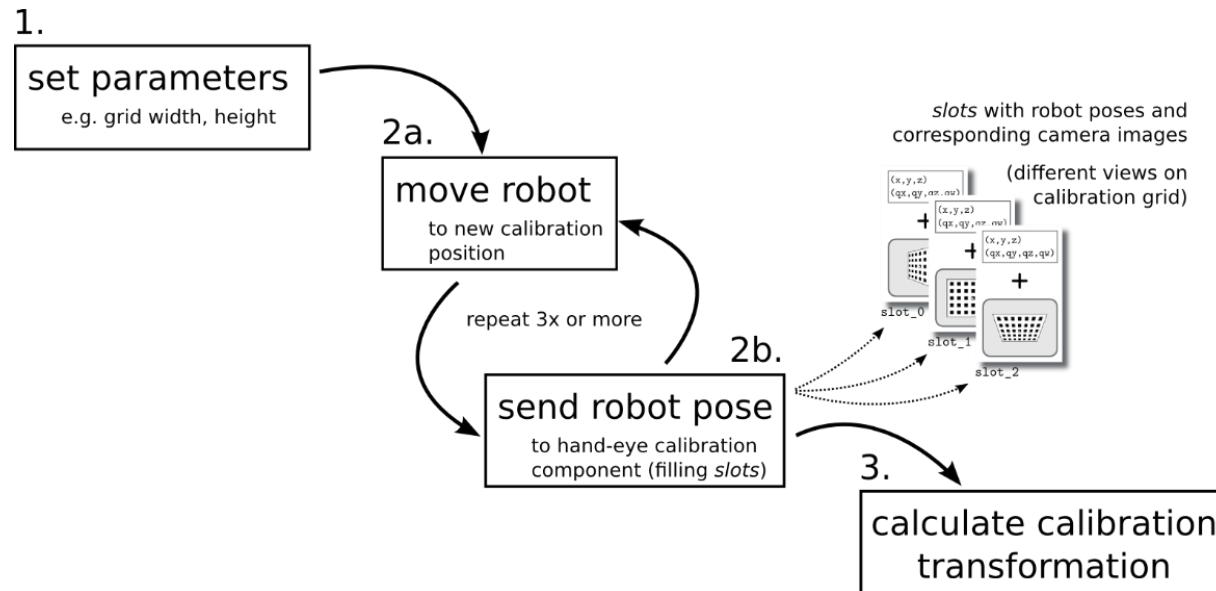
robot-mounted
rc_visard



static
rc_visard

ROSIN FTP – Visard4ROS

Ease of use – hand-eye calibration with rc_visard



<https://youtu.be/bnbTcweB7RA>

ROSIN FTP – Visard4ROS

rc_visard interfaces

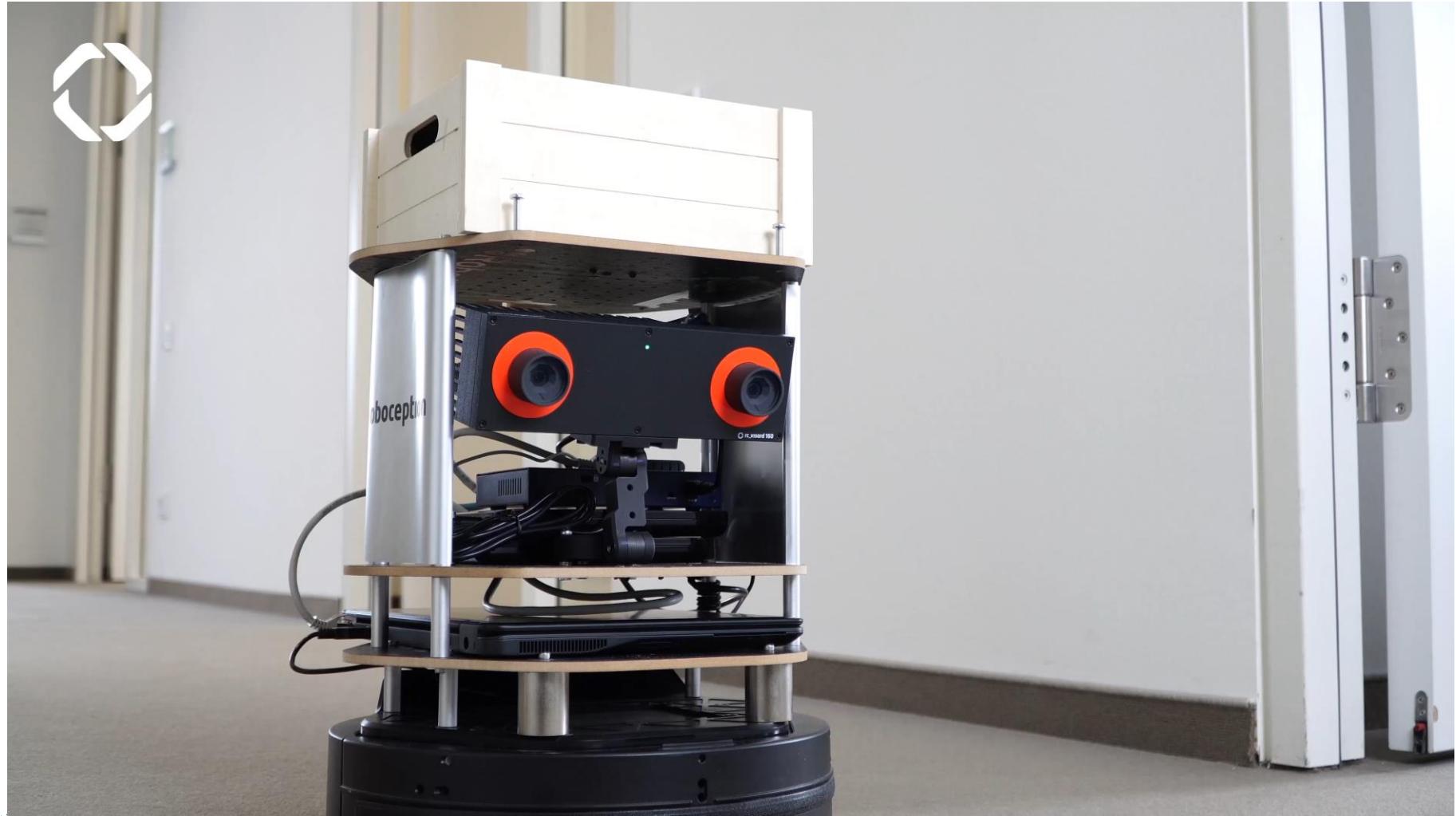
- **REST-API**
 - Powers the web interface
 - Configuration of the rc_visard and it's onboard modules
- **Standard GenICam/GigE Vision interface**
 - for configuring camera related parameters and streaming images
- **Interface for realtime dynamics (UDP/protobuf)**
 - 200Hz IMU and pose information

ROSIN FTP – Visard4ROS

ROS integration

- Generic (vendor independent) interface for GenICam/GigE Vision cameras
 - [rc_genicam_api](#)
- Lib to handle UDP/protobuf messages for realtime dynamics
 - [rc_dynamics_api](#)
- ROS driver specifically for rc_visard leveraging the generic libs
 - http://wiki.ros.org/rc_visard
 - Visualization models for Rviz and Gazebo
 - Integration with onboard SLAM module
 - Documentation and tutorials

Applications
TagDetect, SLAM, ItemPick



<https://youtu.be/wdK23-gapqw>

PAL Robotics Integration



<https://youtu.be/IYNPL43ymx4>

An Innovation Pioneer

A PARTNER IN RESEARCH PROGRAMMES AND COLLABORATIONS

THOMAS Mobile dual arm robotic workers with embedded cognition
for hybrid and dynamically reconfigurable manufacturing systems [Proj. 723616/
EU Horizon 2020 FoF2-2016 programme]

FOR3D Schritthaltende 3D-Rekonstruktion und –Analyse [Bavarian Science Foundation (BFS)]

FORobotics Mobile, ad-hoc kooperierende Roboterteams [Bavarian Science Foundation (BFS)]

RoPha Robuste Wahrnehmungsfähigkeiten für Roboter zur Unterstützung älterer Nutzer im häuslichen Umfeld
[German Federal Ministry of Education and Research (BMBF)]

Topic Group **Perception** coordination [SPARC]

KUKAnnovation Challenge

Research Partners



Universität Bremen



UNI
FREIBURG



TECHNISCHE
UNIVERSITÄT
WIEN
Vienna University of Technology



KIT
Karlsruhe Institute of Technology



TU
GRAZ



An Award-Winning Endeavour

ROBOCEPTION AND RC_VISARD RECOGNIZED IN NUMEROUS COMPETITIONS



Photonics 4.0 [2016]

Stevie Award [2017]

iF Design Award [2017]

EU Robotics Technology Transfer Award [2018]

Best of Industry Award/ Start-Up [2018]



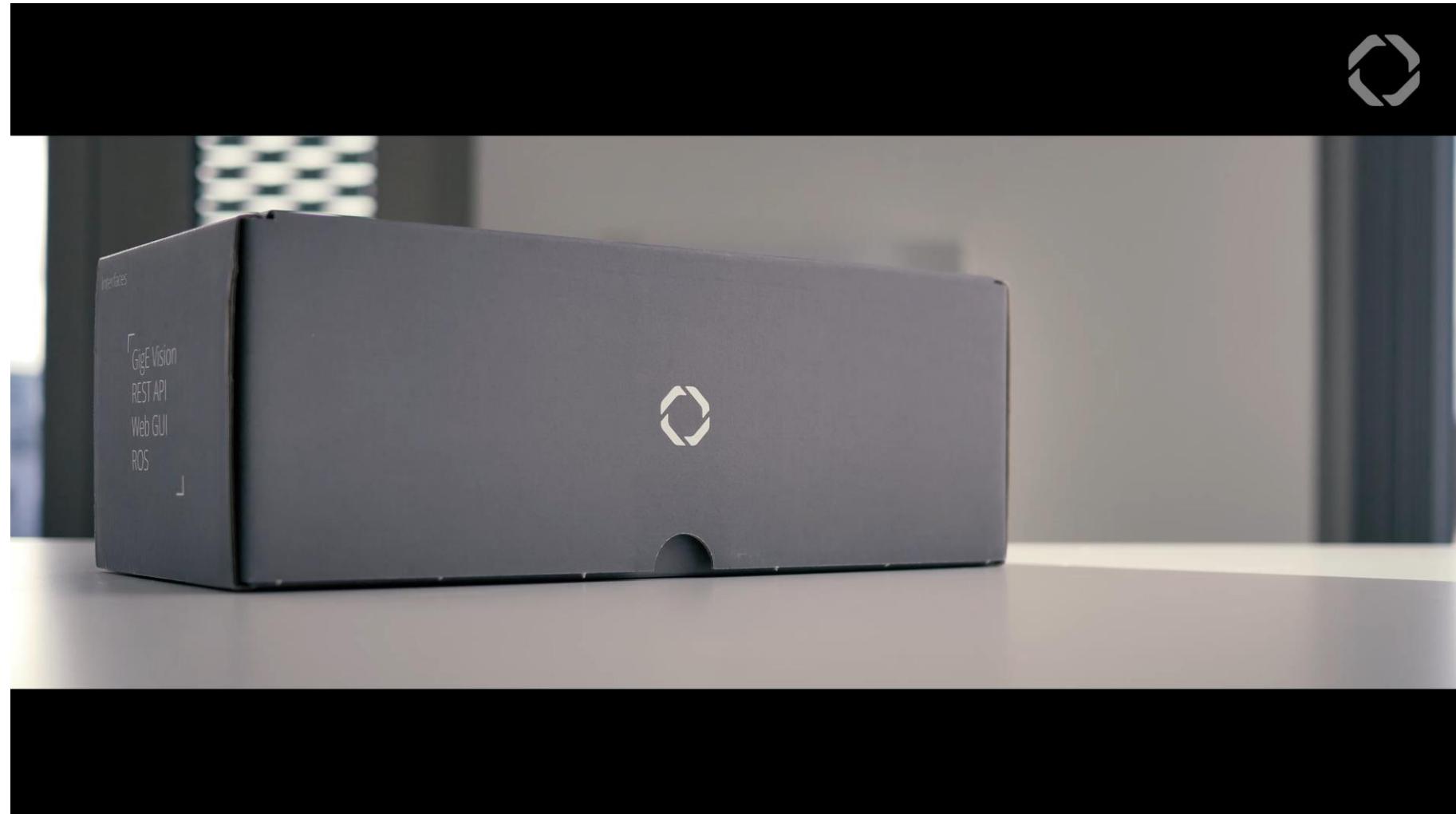
wiki.ros.org/rc_visard



Roboception GmbH

Kaflerstraße 2
81241 Munich

www.roboception.de



<https://youtu.be/kVEWcf4EWOE>