EINSATZ VON **CAMERA_ARAVIS2** ZUR KAMERAKONFIGURATION AUF ROBOTERSYSTEMEN

ROSCon DE '24

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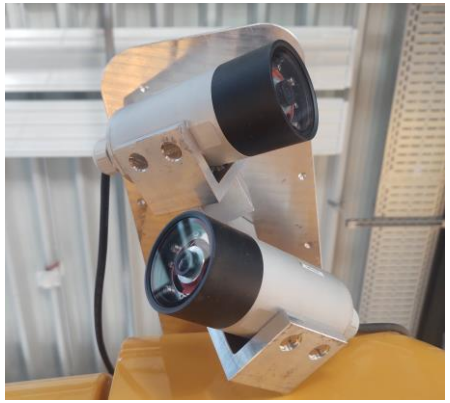

- LiDAR
- Stereokamera
- INS/GNSS, Odometry
- Winkelgeber
- Surround-kameras
- Teleoperations-kamera

Kettenbagger:
Liebherr R 924, 24 t

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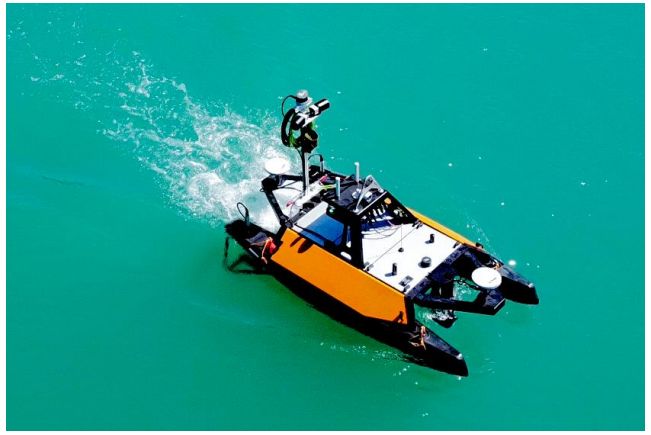

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Viele Kameras – viele SDKs

wavelab/
ximea_camera

ROS drivers for the ximea xiQ USB 3.0 Cameras

4 Contributors · 4 Issues · 12 Stars · 15 Forks

Bildquelle: https://visionlink.it/wp-content/uploads/2021/04/spinnaker-sdk.jpg

rock-drivers/**drivers-camera_prosilica**

Camera interface implementation for GigE Prosilica cameras.

6 Contributors · 0 Issues · 0 Stars · 5 Forks

pylon 6

Bildquelle: https://www.baslerweb.com/

Was ist ein Kameratreiber?

GiGE VISION USB3 VISION

GenICam Kamera

camera_aravis2

libaravis

ROS 2

camera_info
image_raw

image_proc

image_mono
image_color
image_rect

launch file + calibration

```
parameters = [
        {
            "DeviceControl": {
                "DeviceLinkThroughputLimit": 125000000,
                "DeviceLinkThroughputLimitMode": "On"
            },
            "TransportLayerControl": {
                "GevSCPSPacketSize": 9000,
                "PtpEnable": True
            },
            "ImageFormatControl": {
                "PixelFormat": "BayerRG8",
                "Width": 1920,
```

```
image_width: 1920
image_height: 1200
camera_name: u1_camera_front_left
camera_matrix:
  rows: 3
  cols: 3
  data: [1778.591345, 0.000000, 964.276439,
         0.000000, 1789.714953, 804.364652,
         0.000000, 0.000000, 1.000000]
distortion_model: plumb_bob
distortion_coefficients:
  rows: 1
```


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Device & Transport Control

```
...
parameters=[{
                # Driver-specific parameters
                ...

                # GenICam-specific parameters
                "DeviceControl": {
                    "DeviceLinkThroughputLimit": 125000000,
                    "DeviceLinkThroughputLimitMode": "On"
                },
                "TransportLayerControl": {
                    "GevSCPSPacketSize": 9000,
                    "PtpEnable": True
                },
                ...
            }]
...
```

Maximaler Durchsatz auf dem Interface, in B/s

MTU, muss auf dem Netzwerkinterface entsprechend gesetzt sein

PTP-basierter Kamera-Trigger

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AcquisitionControl

Externer Trigger

Modi: “Off“, “Timed“, “TriggerWidth“ und “TriggerControlled'

```
...
parameters=[{
                ...
                "AcquisitionControl": {
                    "ExposureMode": "Timed",
                    "ExposureAuto": "Continuous",
                    "AcquisitionFrameRate": 30.0
                },
                ...
            }]
...
```

„FPS“

Modi: 'Continuous', 'Once‘, und 'Off'

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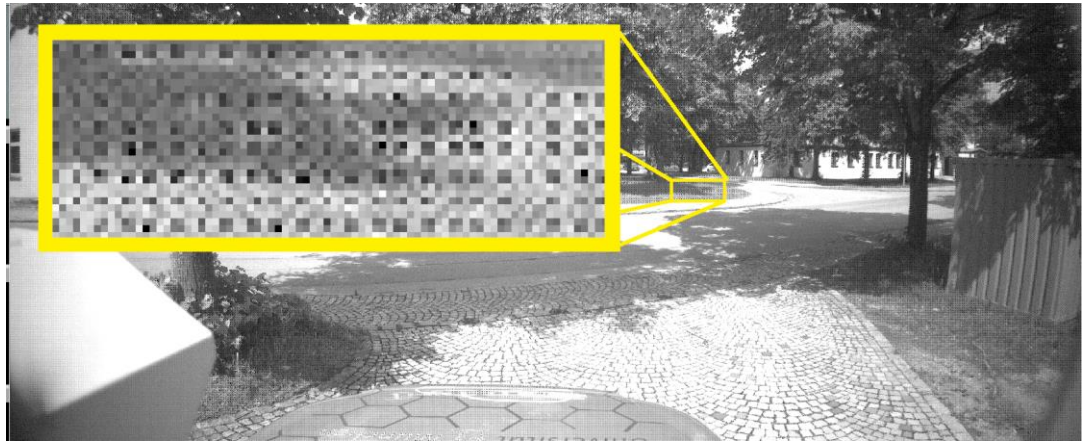
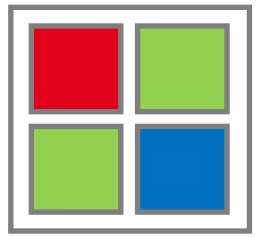
ImageFormatControl

```
...
parameters=[{
                ...
                "ImageFormatControl": {
                    "BEGIN": {
                        "BinningSelector": "Digital"
                    },
                    "PixelFormat": "BayerRG8",
                    "Width": 1920,
                    "Height": 1200
                },
                ...
            }]
...
```

Kamera-spezifischer Parameter,
wird unverarbeitet durchgereicht.



Debayering: Rekonstruktion des Farbbildes anhand eines Farbfilters mit einem Bayer-Pattern



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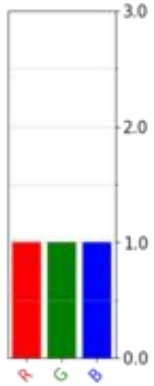
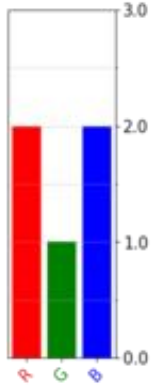
AnalogControl

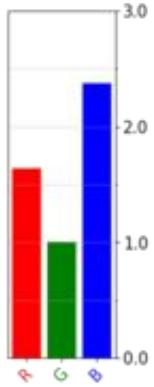
- **Weißabgleich:** Anpassung der Kanäle rot (R), grün (G) und blau (B), sodass Weiß unter verschiedenen Lichtbedingungen neutral erscheint.

Modi: 'Continuous', 'Once‘, und 'Off'

```
...
parameters=[{
                ...
                "AnalogControl": {
                    "GainAuto": "Continuous",
                    "BalanceWhiteAuto": "Off"
                    "BalanceRatio": {
                        "Red": 1.6,
                        "Blue": 2.0
                    }
                }
                ...
            }]
...
```

Lessons Learned

- Der GenICam „Standard“ bedeutet kein einheitliches Interface
- Zu viele Abstraktionslayer können zur Verwirrung führen
- Plug&Play vs. Generisch: Man muss immer noch das Datenblatt lesen, um eine neue Kamera einzubinden.
- Bei Treiberentwicklung sind Logs / Diagnostics und sinnvolle Fehlerbehandlung essenziell
- ROS 2 ist noch nicht feature-complete (Matched Events seit Jazzy)

AutoExposureTimeLowerLimit

ExposureAutoMin

ExposureAutoControlMin

```
parameters=[
        {
            ...
            "ImageFormatControl": {
                "Width": 1920,
                "Height": 1080,
                "OffsetX": 18,
                "OffsetY": 5
            },
            ...
        }]
```

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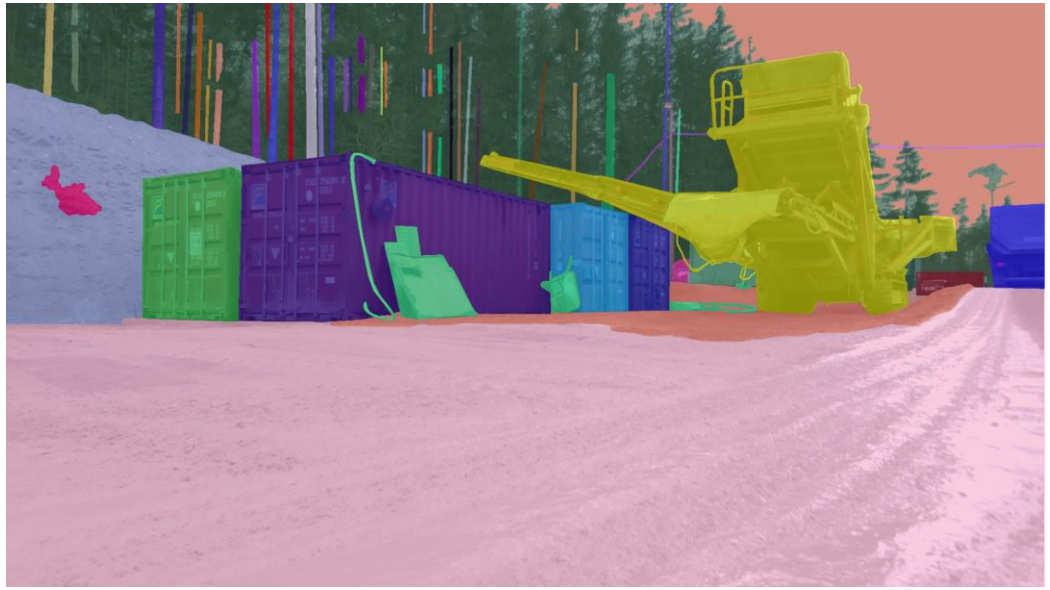
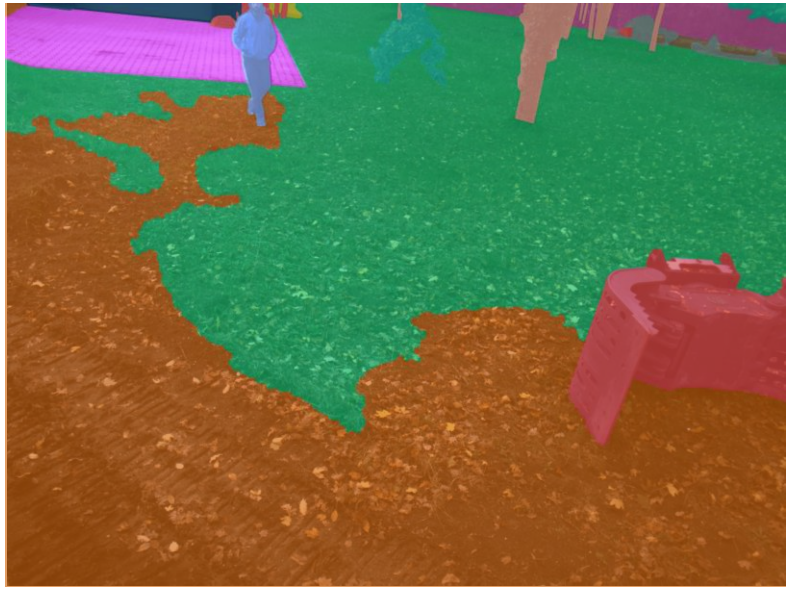
```
parameters=[
        {
            ...
            "ImageFormatControl": {
                "BEGIN": {
                    "Width": 1920,
                    "Height": 1080,
                    "OffsetX": 18,
                    "OffsetY": 5
                }
            },
            ...
        }]
```

```
[u1_camera_front_right] [WARN]   YAML file cannot be loaded: bad file: /home/mrd/ws2/u1/install/u1/share/u1/config/camera_dynamic_
[u1_camera_front_right] [WARN]   Dynamic parameters will not be available.
[u1_camera_front_right] [INFO]   Spawning camera stream with ID 0 (stream0)
```

GOOSE DATASET

German Outdoor and Offroad Dataset





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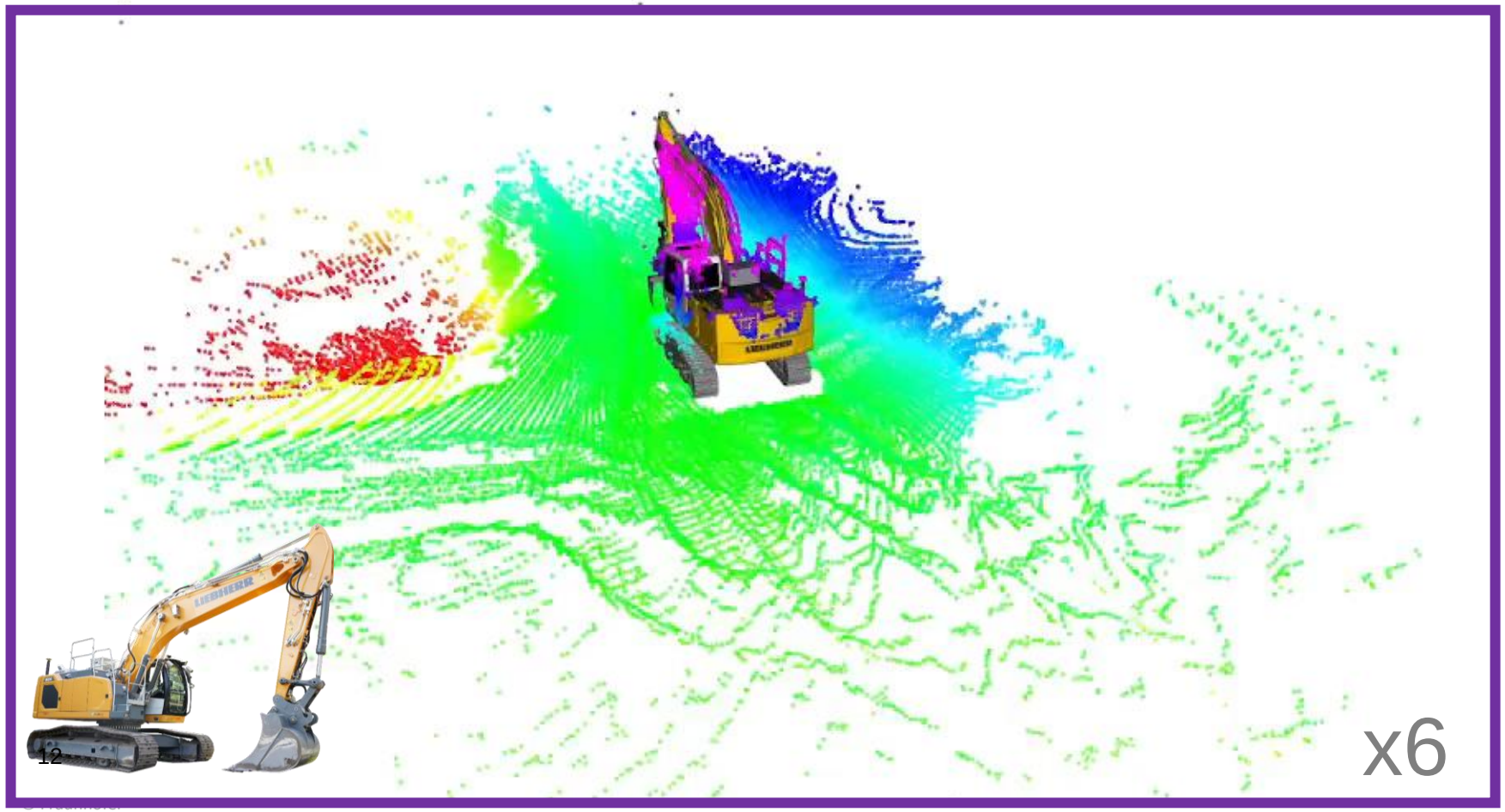
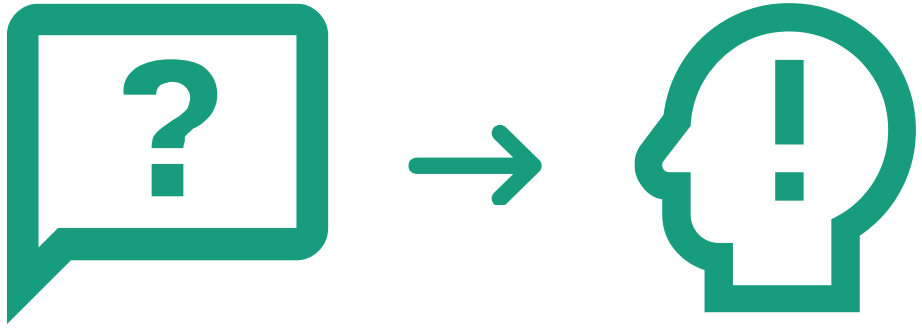
LiDAR Surround Camera Map RGB+NIR



mrd@mrd-u1:~$

New Feature: CameraFinder



Nutzerfeedback erwünscht!

Kontakt

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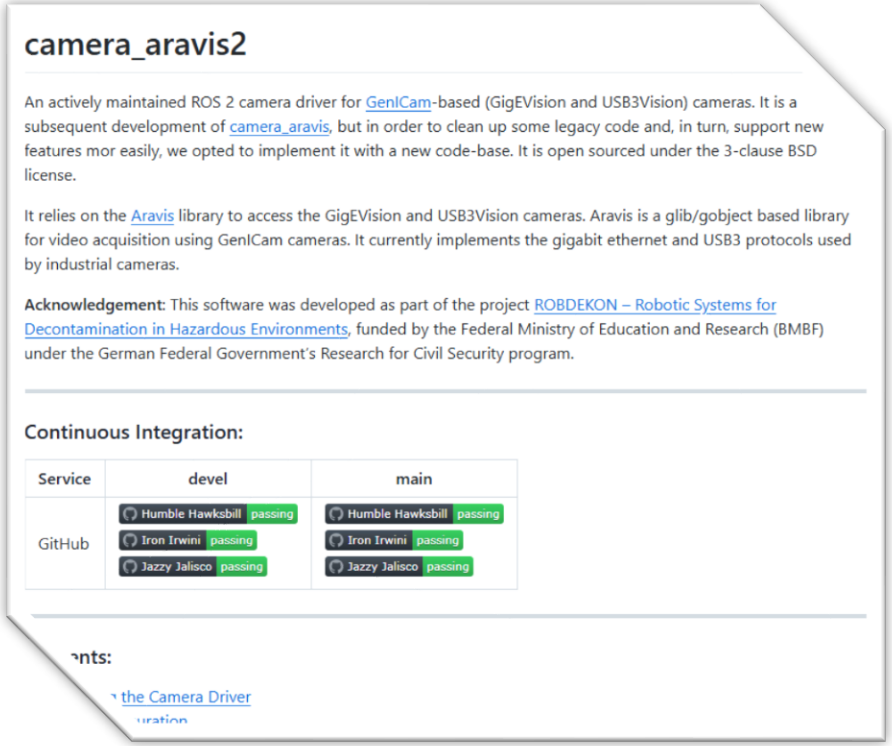
Credit an Maintainer:
Boitumelo Ruf & Contributors



https://github.com/FraunhoferIOSB/camera_aravis2

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