



Aplikace integrovaného strojového vidění B&R

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Představení

PERFECTION IN AUTOMATION
A MEMBER OF THE ABB GROUP



Tomáš Kohout

Obchod

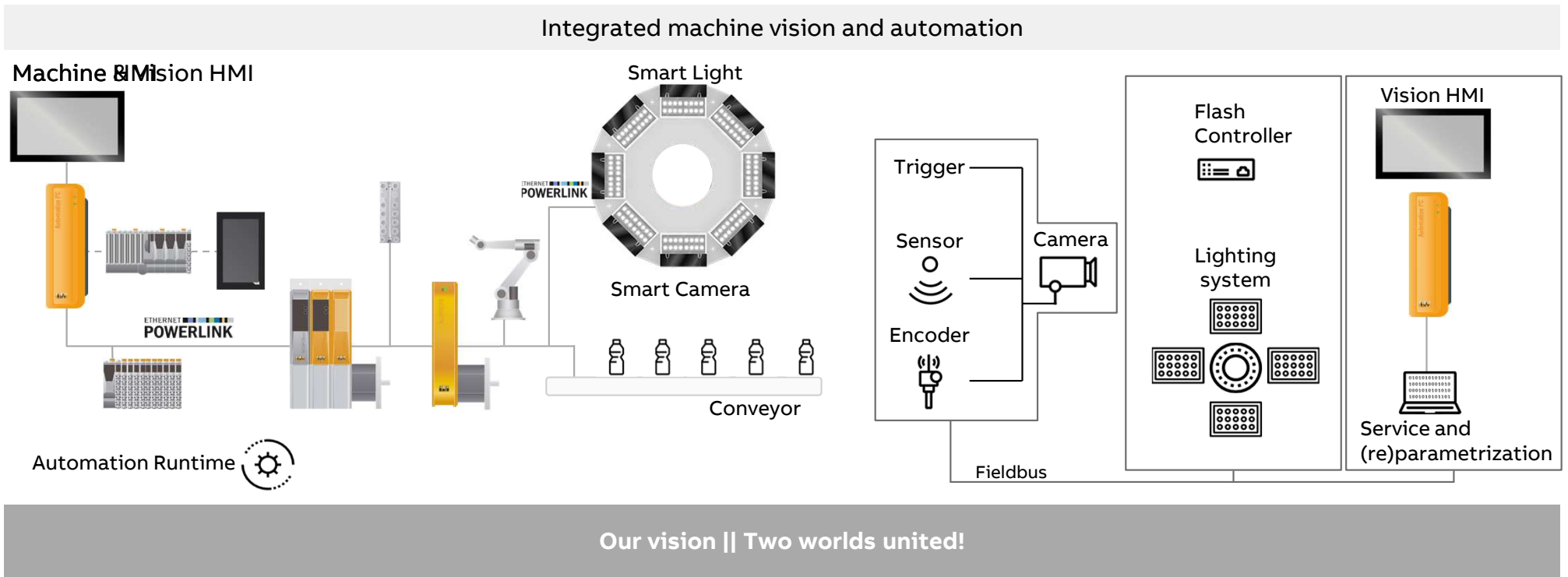
B+R automatizace, spol. s r.o.

Stránského 39, CZ-616 00 Brno

www.br-automation.com

Worlds of Machine Vision and Automation

Our vision

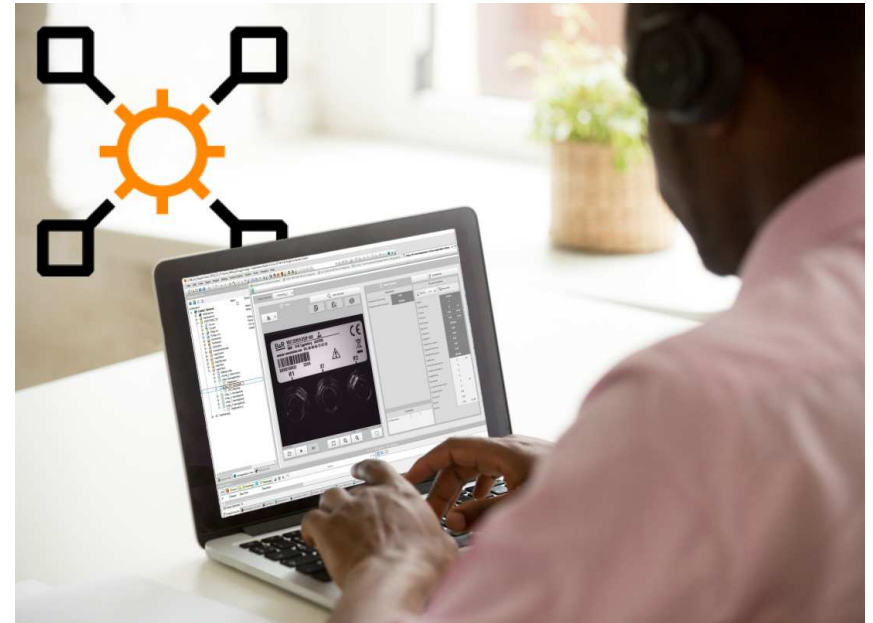


Benefits of integrated image processing

Integrated Machine Vision

Tool Integration

- Easy creation and simulation of image processing applications
- Single source data handling of all automation components



Perfect integration into the B&R automation landscape

C:\projects\Powerlink_daisy_chain\Powerlink_daisy_chain.apj\Config1 - Automation Studio V 4.12.4.107 SP # AS Single Computer License

File Edit View Insert Open Project Debug Source Control Online Tools Window Help

Hardware.hwt [System Designer] x

Logical View Configuration View Physical View

Debugger Console Callstack Breakpoints Debugger Watch Contextual Watch Output Find in Files Cross Reference Reference List Output Results

For Help, press F1 tcpip/COM1=2500/RT=1000/SDT=5/DAIP=pfeflers_vision.brdev.net... OFFLINE

Toolbox - Hardware Catalog

Catalog Favorites Recent

Product Group

Machine Vision

Machine Vision

Camera Lightbar Backlight

Network Type

POWER...

Protection

IP67

Name	Description
VSC122Q22.041P-000	VSC, 800MHz 4C, 1.3MP LS...
VSC122Q25.051P-000	VSC, 800MHz 4C, 5.3MP LS...
VSC122R22.042P-000	VSC, 800MHz 4C, 1.3MP LS...
VSC122R22.041P-000	VSC, 800MHz 4C 4PP, 1.3MP...
VSLB11800.54DP-000	BL 1x1, IP54, PLK, R, Dff.
VSLB11F00.54DP-000	BL 1x1, IP54, PLK, W, Dff.
VSLB11G00.54DP-000	BL 1x1, IP5x, PLK, RGBL, Dff
VSLB11R00.54DP-000	BL 1x1, IP54, PLK, RBIRW, D
VSLB12800.54DP-000	BL 1x2, IP54, PLK, R, Dff.
VSLB12F00.54DP-000	BL 1x2, IP54, PLK, W, Dff.
VSLB12R00.54DP-000	BL 1x2, IP54, PLK, RBIRW, D
VSL11820.67AP-000	LB Std, PLK, R, 37', clear
VSL11830.67AP-000	LB Std, PLK, R, 23', clear
VSL11F20.67AP-000	LB Std, PLK, W, 37', clear
VSL11F30.67AP-000	LB Std, PLK, RGBL, 74', clear
VSL11G20.67AP-000	LB Std, PLK, RGBL, 37', clear
VSL11G30.67AP-000	LB Std, PLK, RGBL, 23', clear
VSL11R10.67AP-000	LB Std, PLK, RBIRW, 74', cle
VSL11R20.67AP-000	LB Std, PLK, RBIRW, 37', cle
VSL11R30.67AP-000	LB Std, PLK, RBIRW, 23', cle

Toolbox - Hardware Catalog Properties - VSC122R22.041...

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Benefits of integrated image processing

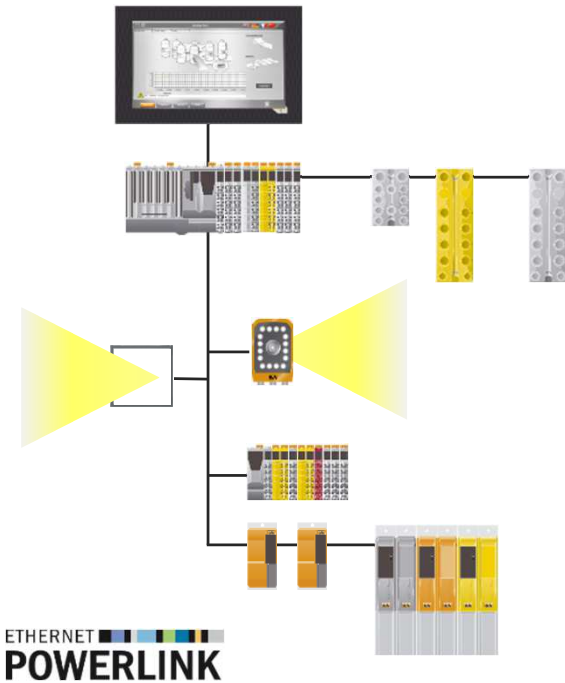
Integrated Machine Vision

Tool Integration

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Network Integration

- Real-time data exchange and product status
- μ s precision for camera and lighting



Perfect integration into the B&R automation landscape

Benefits of integrated image processing

Integrated Machine Vision

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Real-time data exchange and product status

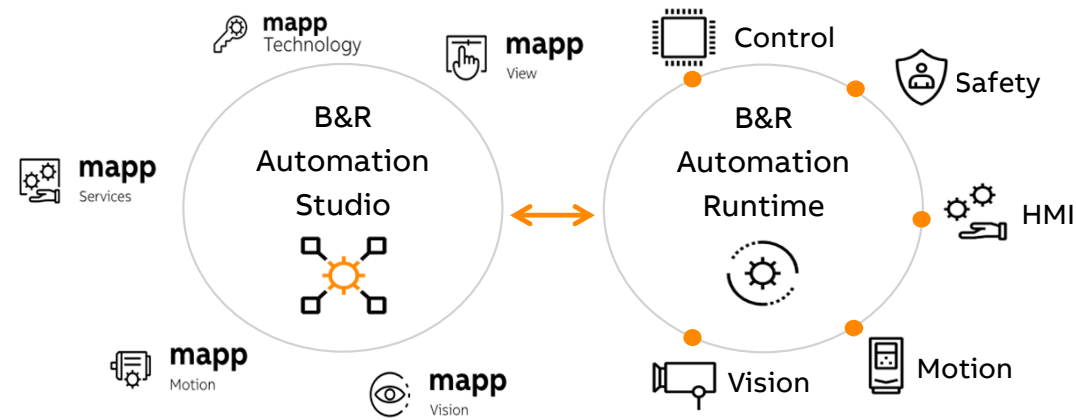
- μ s precision for camera and lighting

System Integration

Participate in the possibilities of a B&R automation ecosystem

- mapp and Automation Runtime Support

Easy to use, upload of constant firmware versions at system start, remote maintainability, ...



Perfect integration into the B&R automation landscape



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Factory calibration



Calibrated all lighting relevant elements

- Lens
- Sensor
- LED, LED Optic and cover



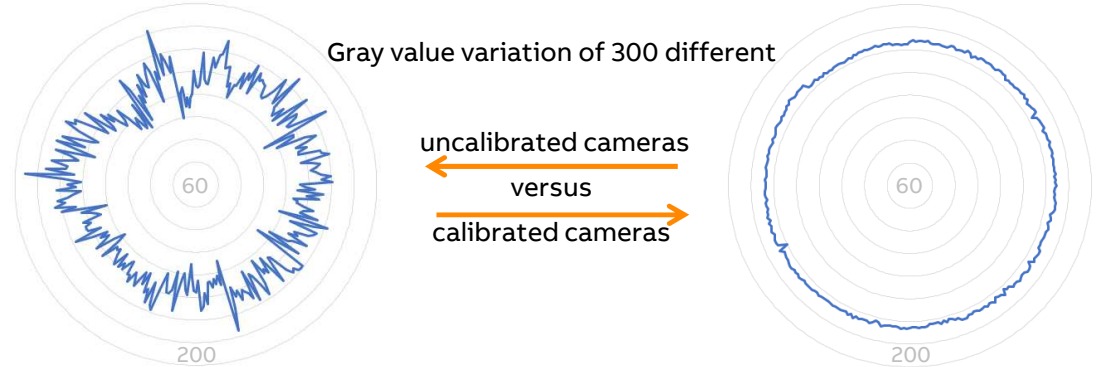
No need for reparameterization while using different cameras

- Same camera type produces equal results with the identically parameters



The focus adjustment

- Calibrated focus settings in sub-millimeter resolution
- Adjust the focus point when the LED color changes



>> Repeatability 10 times better than with uncalibrated devices <<

Camera



Smart Light



● **Flash Controller**
4x20A – in total 80A/3840W

● **Backlight variants**
150 x 150mm
150 x 300 mm
150 x 450 mm
150 x 600 mm
300 x 300 mm
300 x 450 mm

● **Light bars LED optic**
wide, regular, narrow

● **Light bars variants**
Light bar row
Assembly of two, three or four light bars
Light bar ring
Assembly of four, six or eight light bars



● **Colors (light bar and backlight)**
IR, red, green, lime, blue, white

● **Filter options (backlight 150x150 mm)**
Polarizing filter
Colimator filter

● **Light bar functions**
Electronic angle adjustment
from -45° to +90°

Smart Camera / Smart Sensor

Vision funkce / vision aplikace



Smart Sensor



Smart Camera



Jedna vision funkce

Kombinace vision funkcí

- | | | | |
|--|--|---|--|
|  Reading
→ Data code
→ Text/Numbers |  Find
→ Position
→ Location |  Preprocessing
→ Filter
→ Transform |  Compare
→ Geometry
→ Colors |
|  Calibration
→ Standardization
→ Aberrations |  Measurement
→ Length
→ Area |  Orientation
→ Edges
→ Shape |  Inspection
→ Pre-/Absence
→ Surface |

2.5 D

3rd dimension as gray values

2 ½ D Sensor

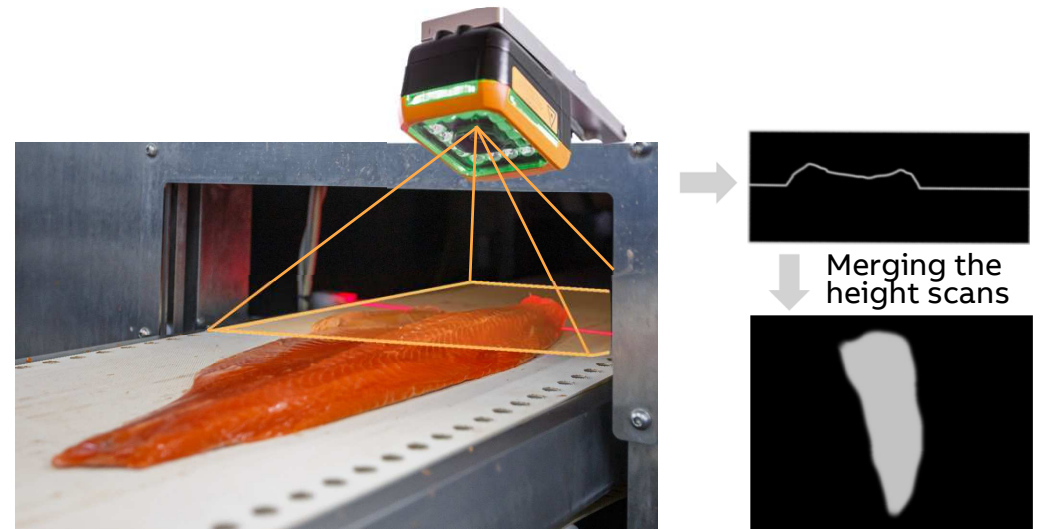
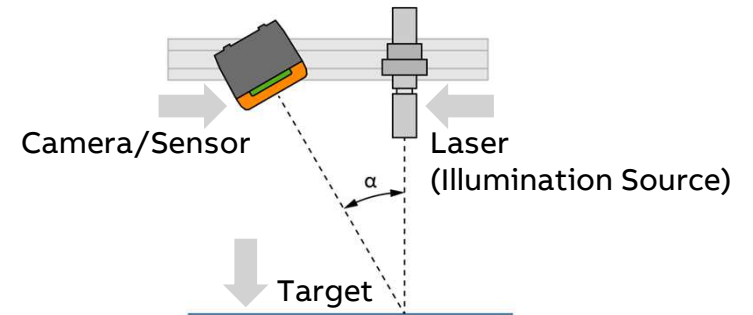
- Triangulation sensor with gray values instead of a pixel cloud
 - Laserline generates profile
 - Line course is converted into gray value

Precondition

- Relative movement between camera and product

Applications

- Finding objects on a low-contrast background
- Height monitoring of products on belt streams
- Volume estimation of products
- Separation of seamlessly arranged products
- Tracking a depression or elevation of the product



Deep Learning



Deep OCR

- No training for characters, read a wide variety of fonts, even on inhomogeneous backgrounds (textures or reflections)



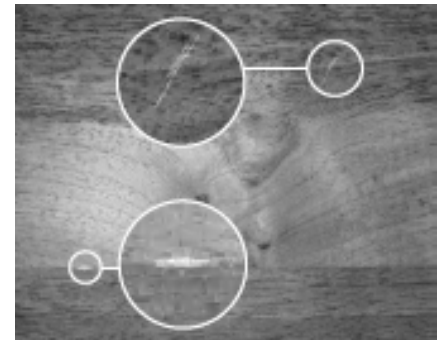
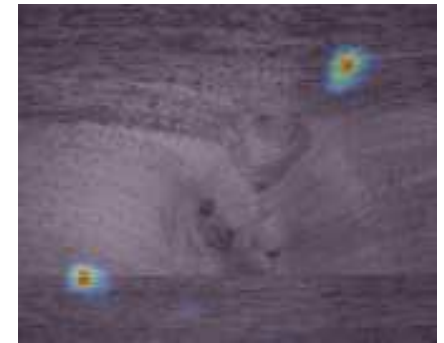
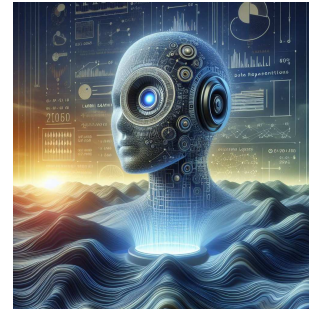
Global Context - Anomaly Detection

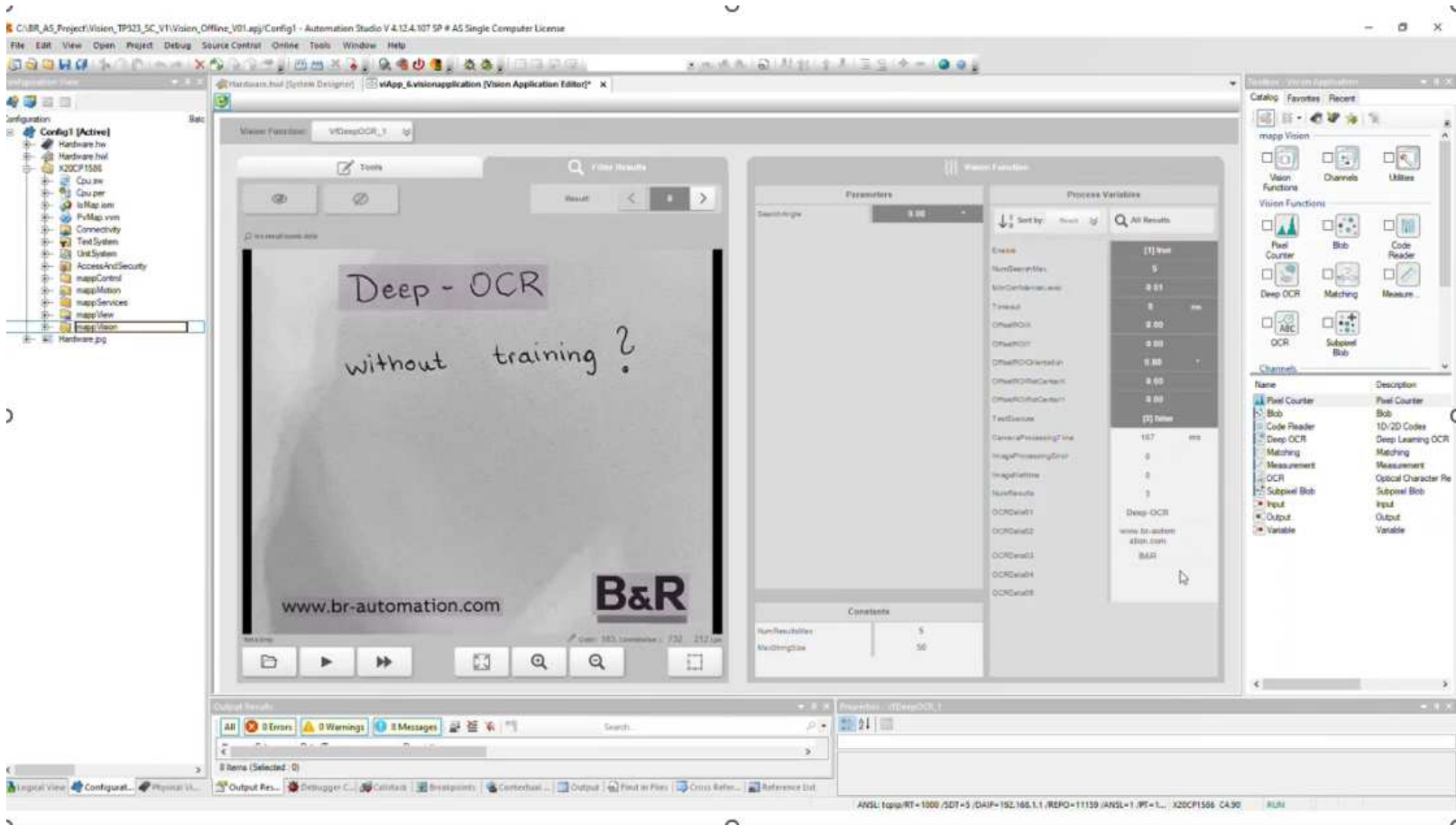
- No labeling required (as opposed to classification)
- No need for error images but only a few good images for training

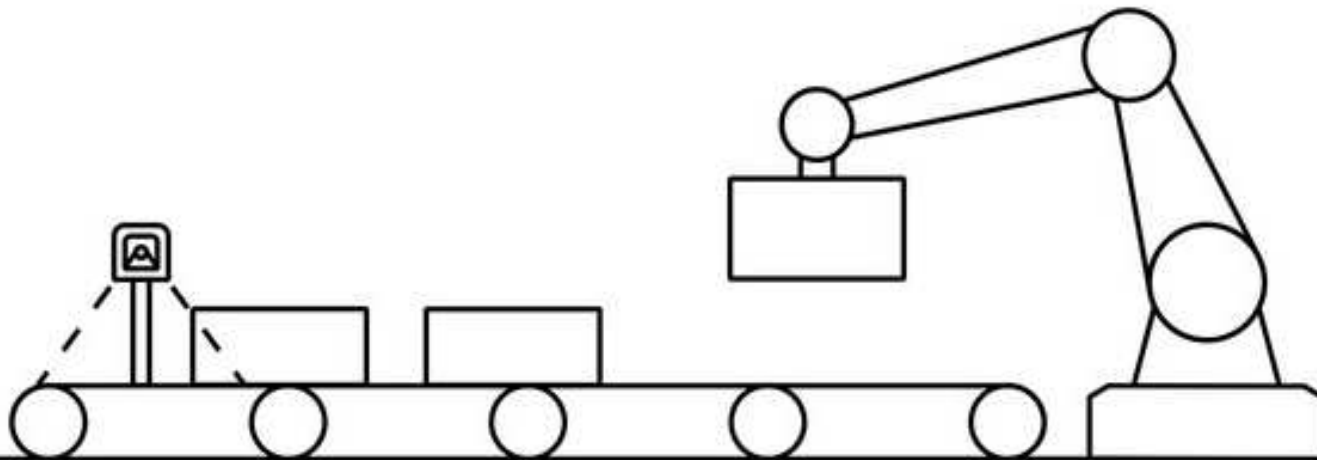


Algorithms and DL Network are based on HALCON

- Rule-based algorithms supplement the functionality, enabling better product quality in cooperation with the AI results
- Inference hardware is processed with 26 TOPS (tera operations per second)









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Overall Equipment Effectiveness (OEE) in practice

Injection molding machine for plastic cups (400M/Y)



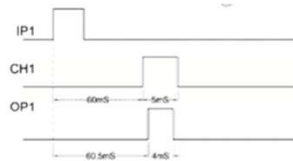
Source: <https://youtu.be/rXHkVqtMCYU>



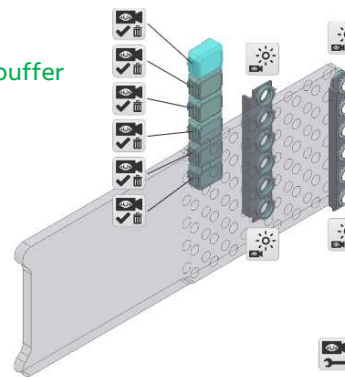
12 cameras, every 12 ms a new image, 96 images at all

- Traversing speed 9.8 m/s
- 2 μ s Exposure time
- 0,05mm accuracy

✓ 16-fold image buffer

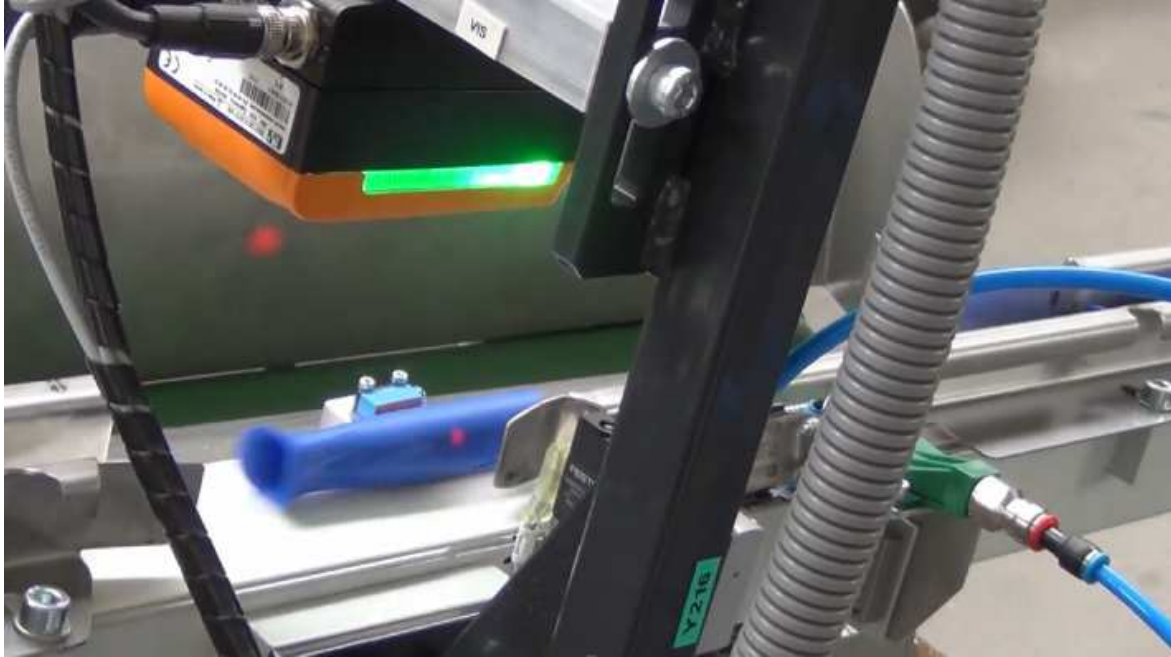


Synchronous trigger to ext. flash controller



Integrované strojové vidění

Wöhler Bohemia s.r.o.



https://www.youtube.com/watch?v=_O619uAbgcs

