3D Bildverarbeitung in der Fabrikautomatisierung – Schnell, Einfach, Kosteneffizient

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AGENDA

- Company presentation
- Plug & Automate for robot guidance

- Depalletizing with MONO2.5D
- Deracking with MONO3D
- Bin-Picking with SHAPESCAN3D
- All-in-One with APS3D
The global market and technology leader in MACHINE VISION
Customized systems, innovative production solutions and software intelligence for…

INDUSTRIAL AUTOMATION

SURFACE INSPECTION
CONTINUOUS GROWTH AND STABLE FINANCIALS

The global market and technology leader in **MACHINE VISION**
30 years of experience in **Industrial Automation** and **Surface Inspection**

- Established 1985
- Legal form AG, public company
- Sales (13/14) 102,5 mill. €
- R&D – Invest 18,3 mill. € p.a.
- Equity 130 mill. €

15 years: <10M€ up to >102M€
CONTINUOUS GROWTH AND STABLE FINANCIALS

➡️ The global market and technology leader in MACHINE VISION
30 years of experience in Industrial Automation and Surface Inspection

➡️ Intense internationalization
ONE OF THE MOST GLOBALIZED COMPANIES

26 offices worldwide

TEAM
Over 660 employees globally – approx. 120 in R&D – 70 service employees

LOCATIONS
Germany Darmstadt (HQ) – Aachen – Berlin – Bielefeld – Erlangen – Herten – Karlsruhe – Mainz - München
USA Atlanta – Detroit China Shanghai – Tianjin Korea Seoul Japan Tokyo Russia Moscow Taiwan Taiyuan
India Mumbai – Calcutta Brazil Sao Paulo Turkey Istanbul UK Hampshire - London Finland Helsinki France Paris
Italy Rovereto Spain Barcelona
INNOVATION

... or your perfect partner to drive the future!

Winner of the „Innovationspreis der deutschen Wirtschaft 2015“ - „German Business Innovation Award“
Innovating Machine Vision

Plug & Automate

Maximizing Automation Efficiency

3D Robot Guidance
3D In-Line Gauging
3D Surface Measurement

Ready-To-Use for Factory Automation
PLUG & AUTOMATE – Philosophy

No expert needed

Optimal suited sensors

Independent from robot brand

Ready-to-use software
Optimized for Touch

Guided setup
No need for training

No programming necessary

Supporting all industrial communication interfaces

Ready-to-run within hours
Product portfolio covers all major 3D technologies for robot guidance.

- Photogrammetry
- Stereometry
- Triangulation
- Point Cloud
Product portfolio covers all major 3D technologies for robot guidance.

... for all robot types!
PLUG & AUTOMATE – 3D Machine Vision Product Line

Product Line for 3D Robot Guidance

**MONO\(^{2\frac{1}{2}D}\)**
- Contour Matching

**MONO\(^{3D}\)**
- Photogrammetry

**STEREO\(^{3D}\)**
- Stereo Vision

**SHAPEMATCH\(^{3D}\)**
- Shape Matching

**SHAPESCAN\(^{3D}\)**
- Stereo Vision
- Laser Profiling

**APS\(^{3D}\)**
- All-in-One Sensor
PLUG & AUTOMATE – Application Package

**Software**
- Software on CD / USB-Stick
- Robot communication package for KUKA, ABB and Fanuc
- Profinet / Ethernet/IP SW-Stack “on-board”
- Profibus, Interbus, DeviceNET, CC-Link, EtherCAT
- Manual

**Hardware**
- Application specific sensor
- Sensor cable GigE
- Sensor cable power (24V)
- Calibration plate or mark
- Dongle
PLUG & AUTOMATE – Applications

**Depalletizing**
- Unblock parts from pallets
- 2D and 2.5D method
- Multiple parts in one image
- Technology: Contour Matching

**Deracking**
- Unblock parts out of racks
- 3D method (DOF restricted)
- One part in one image
- Technology: Photogrammetry

**Bin Picking**
- Unblock parts out of bin
- 3D method (DOF unrestricted)
- Multiple parts in one scan
- Technology: 3D Point Cloud
PLUG & AUTOMATE – System Portfolio

**Depalletizing**
- **MONO21/2D**
  - Single or multiple sensor and software solution

**Deracking**
- **MONO3D**
  - Single or multiple sensor and software solution

**Bin Picking**
- **SHAPESCAN3D**
  - Static point cloud sensor and software solution
Technology for Depalletizing
Object recognition at any rotation

Contour based object recognition

Detection of multiple objects in one image

Object recognition at any level

Detection of slip sheets

Accuracy in x/y < 1mm
PLUG & AUTOMATE – Process

Sensor captures image

Image trigger

GigE

Image transfer to Software

IN: Product ID, Start

Fieldbus or Ethernet

OUT: x/y-position, z-rotation, z-height

Contour matching for pose detection

Cycle from 100 ms

PLUG & AUTOMATE – Process

Contour matching for pose detection

Fieldbus or Ethernet

IN: Product ID, Start

OUT: x/y-position, z-rotation, z-height

Contour matching for pose detection
PLUG & AUTOMATE – Highlights for Depalletizing

- Fastest setup with guided GUI
- Easiest calibration procedures
- Aligned tech package for robot communication
- Different picking order methods
- Integrated slip sheet detection
- Perfectly suited hardware – ready for industrial use
Technology for Deracking
OBJECT RECOGNITION WITH UP TO 5° ROTATION

FEATURE BASED OBJECT RECOGNITION

MONO3D
READY-TO-USE

OBJECT RECOGNITION AT ANY DISTANCE

ACCURACY IN X/Y < 1MM

The More You See..
Contours can stem from

- Holes
- Corners
- General shapes

Locations of contour based object features describe objects

IN: Product ID, Start
Fieldbus or Ethernet

OUT: x/y/z-position, x/y/z-rotation

Sensor captures features

Image trigger

Image transfer to Software

Cycle from 100 ms
PLUG & AUTOMATE – Highlights for Deracking

- 6 DOF with only one camera
- Fastest setup with guided GUI
- Easiest calibration procedures
- Aligned tech package for robot communication
- Shortest cycle time through high speed algorithms
- Perfectly suited hardware – ready for industrial use
Technology for Bin Picking
PLUG & AUTOMATE – Overview

- Parts can be cylindrical or have a complex shape
- Different material characteristics (rusty to shiny)
- Software for grasp-point determination and collision detection required
- No expert needed, Setup within hours
- Teach-In by loading from CAD-Model

Fast scanning <2s
Connect two or more sensors with one PC and one software
Typical size of box or pallet: up to 1200 x 1000 x 800 mm³
PLUG & AUTOMATE – Sensor technology

- Robust housing for industrial use (IP 65)
- High time savings through factory pre-calibrated sensor
- Laser illumination for
  - optimum contrast
  - optimum depth of field
  - reduced extraneous light
  - Eye safety (Class 2M)
- Fixed installation above the box, so no additional kinematics is necessary (no additional expense for hardware and control)
- Cycle time optimization by up to 7 laser lines
- Distance between sensor and box (about 2 m) offers enough space for robot

Robust and cycle time optimized process

3 or 7 laser lines parallel
PLUG & AUTOMATE – Sensor types

SHAPESCAN3D - 1000
1300 x 1100 x 850 mm³

Scan lines: 3 or 7

SHAPESCAN3D - 800
1300 x 900 x 850 mm³

Scan times: 1,5 – 3,5 s

SHAPESCAN3D - 600
900 x 700 x 550 mm³

SHAPESCAN3D - 400
700 x 500 x 350 mm³
SHAPESCAN3D sensor mounted above container

Acquired 3D-points

Transmission over fieldbus (PROFINET, PROFIBUS, DeviceNet, etc.)

New scan

Grasp pose

SHAPESCAN3D software locates objects and computes grasp pose

Scan

Process

PLUG & AUTOMATE – Process
PLUG & AUTOMATE – Highlights for Random Bin-Picking

• 6 degrees of freedom with dedicated sensor system
• Fastest setup with guided GUI
• Easiest calibration procedures
• Aligned tech package for robot communication
• Perfectly suited hardware – ready for industrial use
Max. robust recognition of workpieces by using multiple laser lines

Shortest cycle times and high output rates by measuring time <2s

Maximum availability through monolithic software (all functions in one program) and elimination of additional kinematics (linear axis)

Exclusion of risk of collision by a large distance between sensor and container

Simple operation with intuitive, modern software with touch controls in Windows 8/10 style

Switch to new parts within a few minutes

Easy integration, regardless of the robot manufacturer

No reliance on subcontractors, because software and hardware are from a single source
thank you