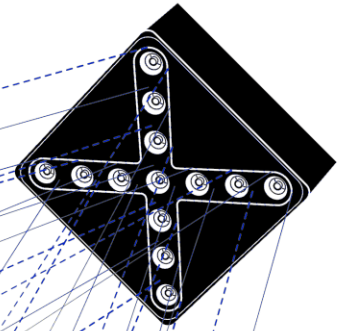


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Artificial Intelligence

# Light-Field Technology



**MKey Solution GmbH**

Michael Kunze - CEO



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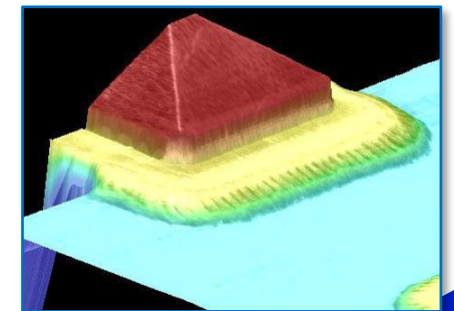
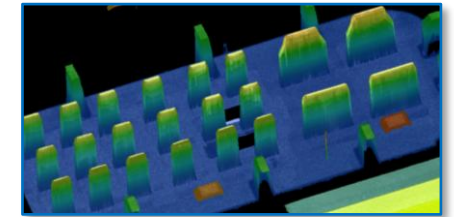
Michael Kunze, CEO MKey Solution GmbH



- Electrical Engineering Degree (University of Erlangen)
- Test engineer in a testing institute
- Former Head of Machine-Vision Keyence Deutschland (until 2014)
- Founder and CEO MKey Solution GmbH, System integration machine vision in 2D and 3D
- Expert in 2D and 3D Vision Systems and Machine Vision
- Global MV-Project Implementation
- Trainer and Consultant
- R&D Partner OEMs
- Keynote-Speaker

# Our Service Portfolio

- **Optical Inspections** – 2D and 3D inspections
- **Robotics** – 2D and 3D-assisted inspections, bin-picking, pick & place
- **Artificial Intelligence & Machine Learning**
- **Light-Field Technology**
- **AR Assistance Systems** – Guided support for work and assembly processes
- **Research & Development (R&D)** – Feasibility studies for OEMs
- **Databases & Data Management**
- **Maintenance & Service**
- **Training, Consulting & Validation**



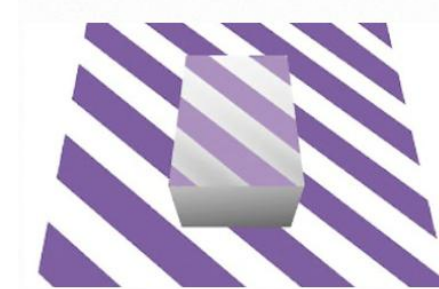
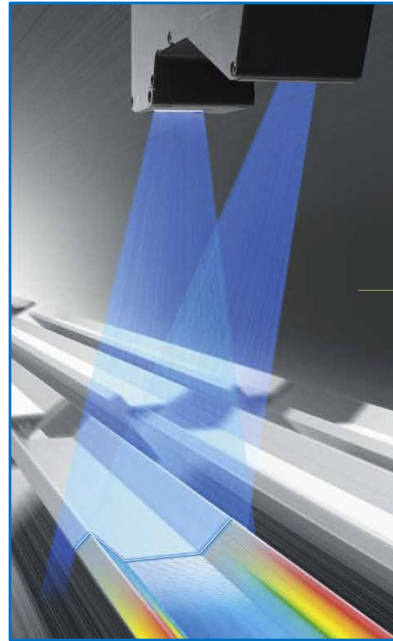
# Challenge: Shiny / High-Glossy Object Detection for Bin-Picking

- High Glare
- Difficult Recognition
- Handling Issues

# 3D – Standard Technologies



Laser-cutting methods

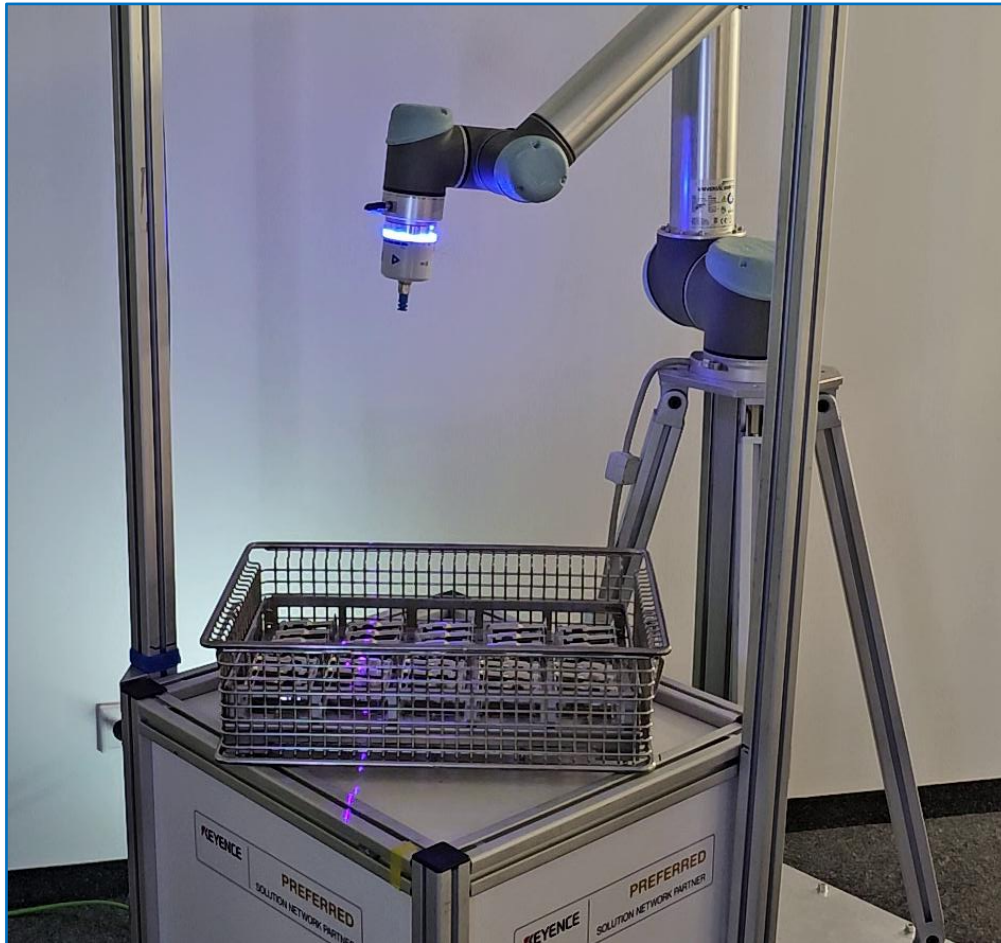


Structured Light



# Real conditions:

Laser-cutting methods

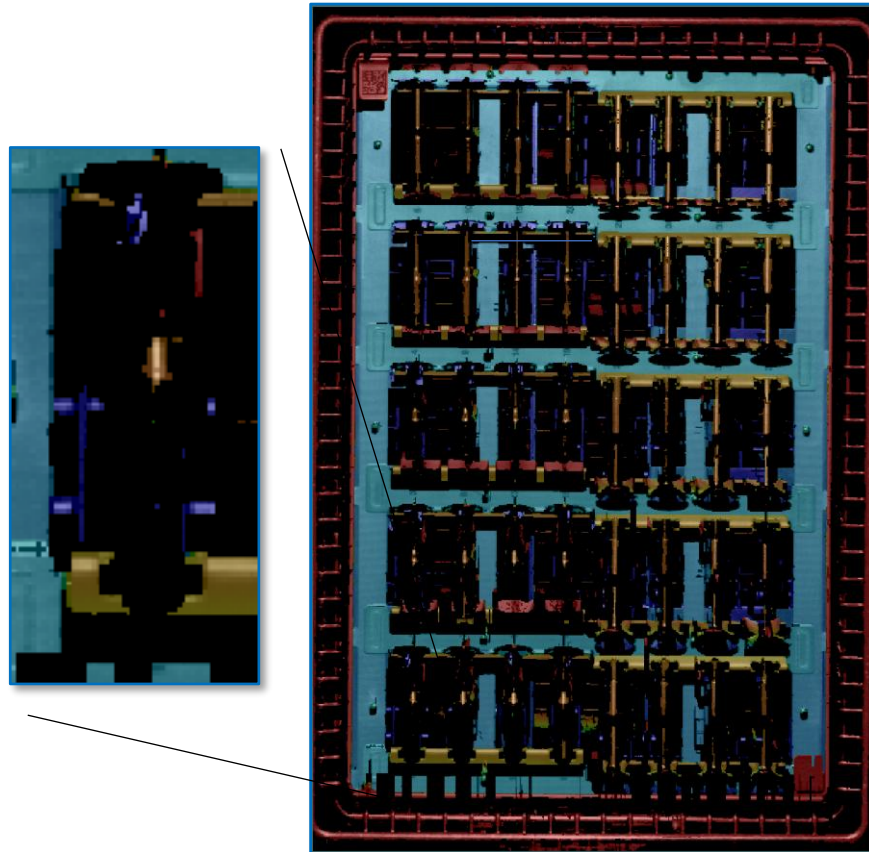


Structured Light

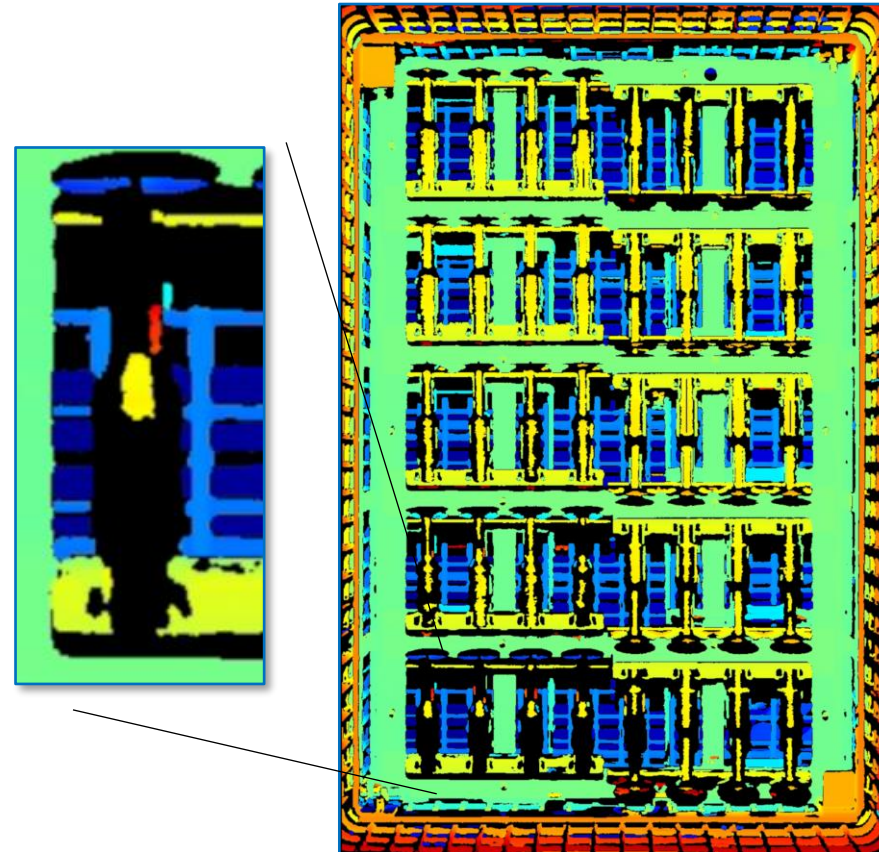


# Results

Laser-cutting methods



Structured Light

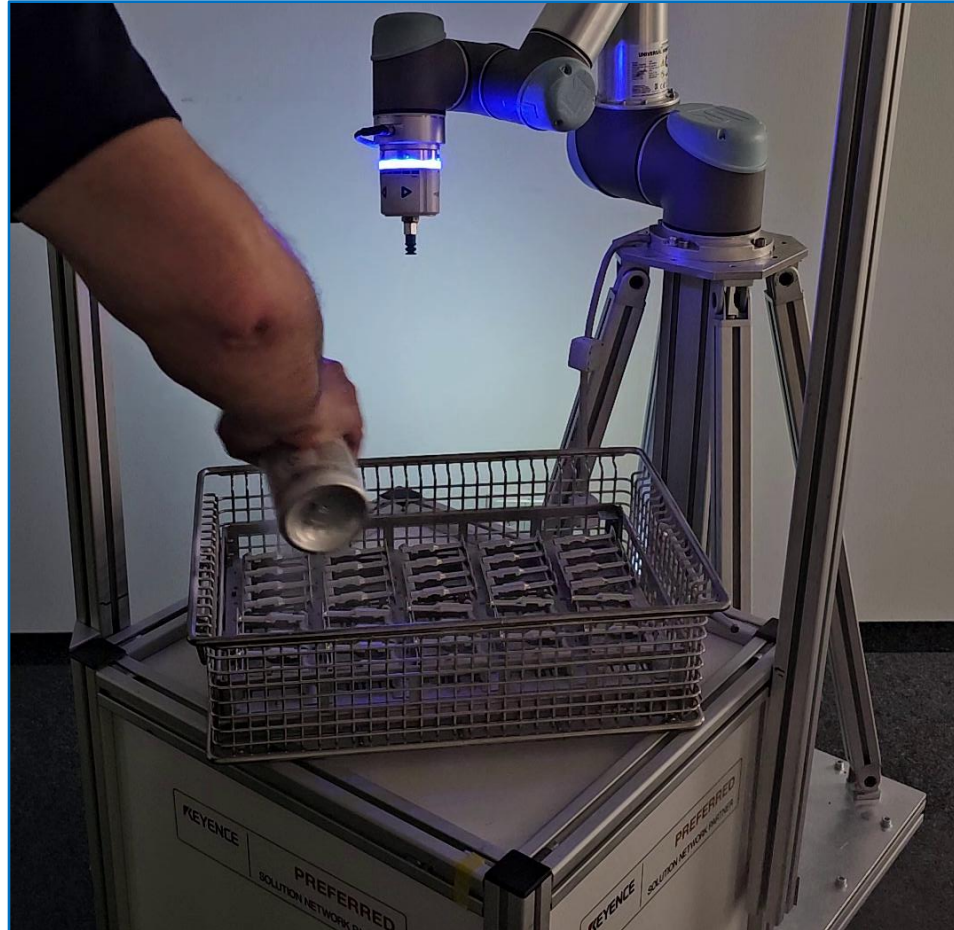


# The problem with shiny/high-glossy parts

- Workpieces with shiny, high-glossy, oily surfaces
  - Standard 3D-methods get unstable pointclouds
  - Reflections prevent accurate detection
  - Handling becomes more difficult

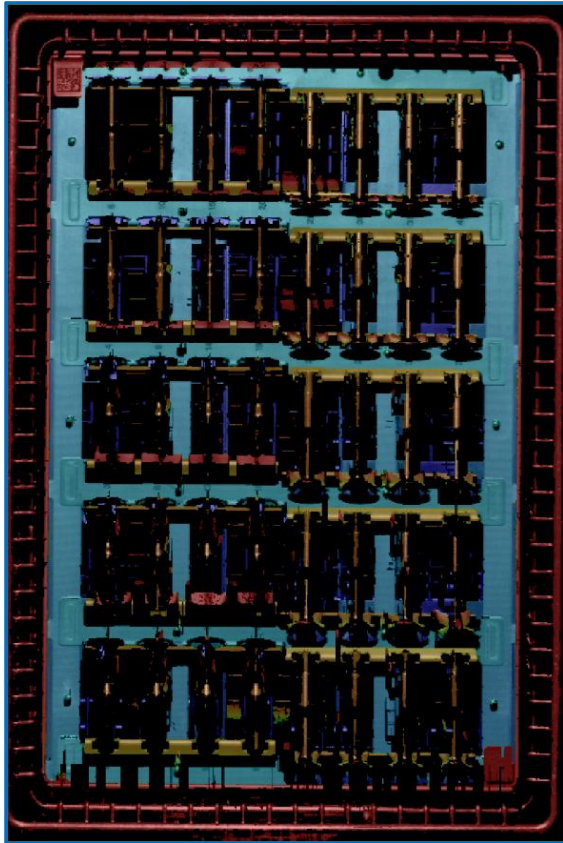


Solution? → Anti-glare spray



# Results

Laser-cutting methods

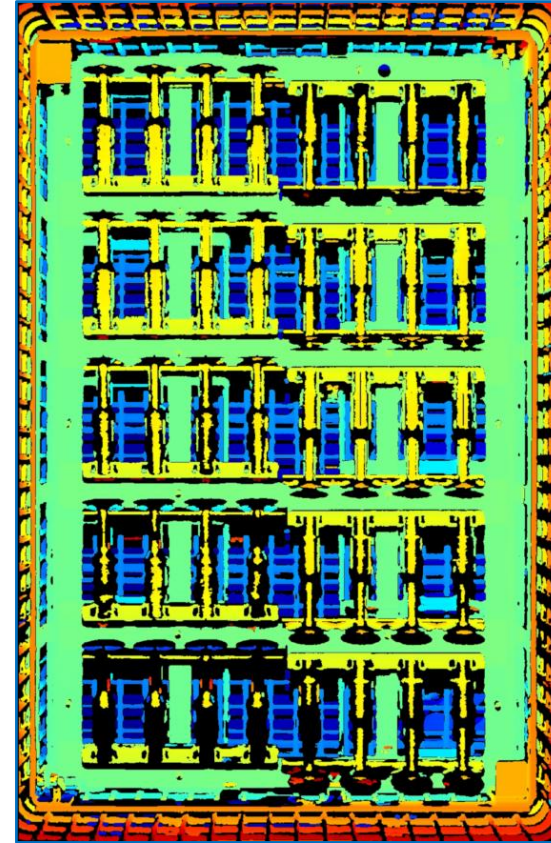


Before

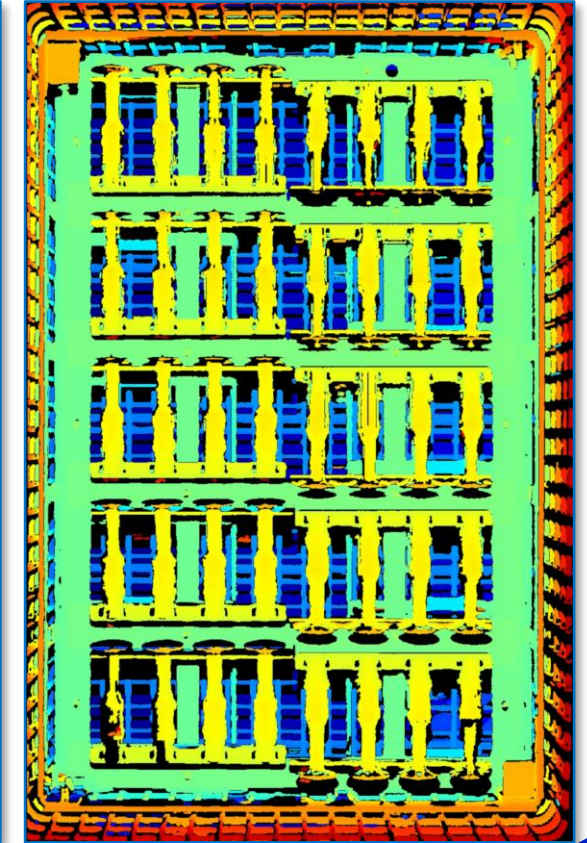


After

Structured Light



Before



After

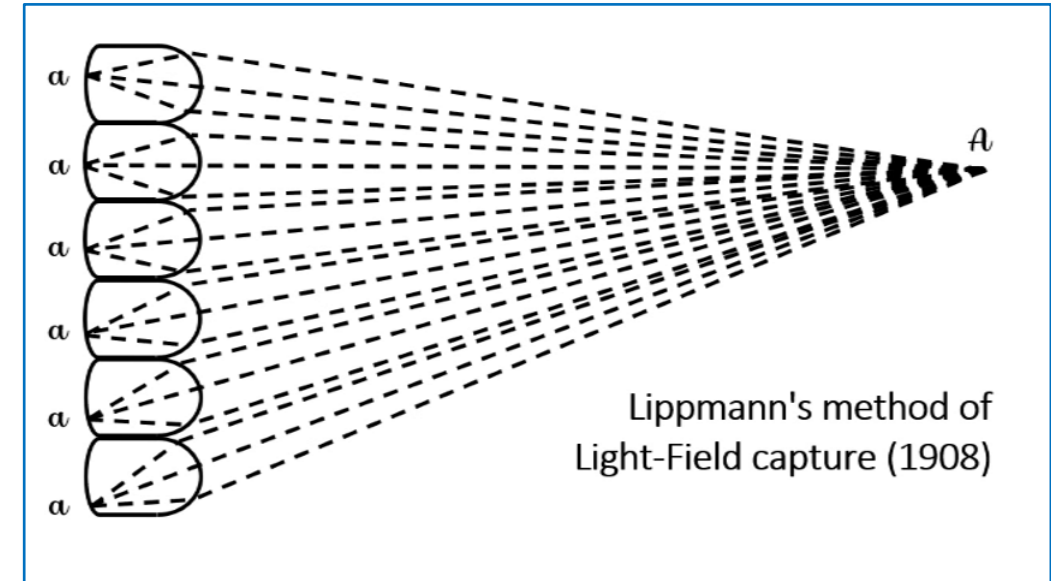
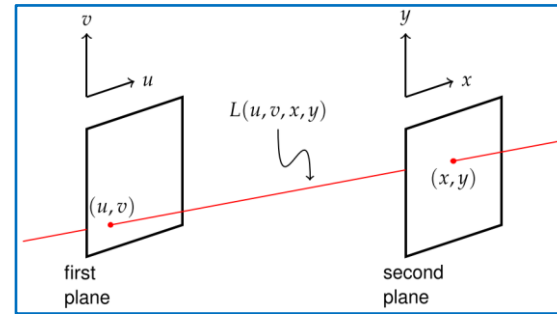
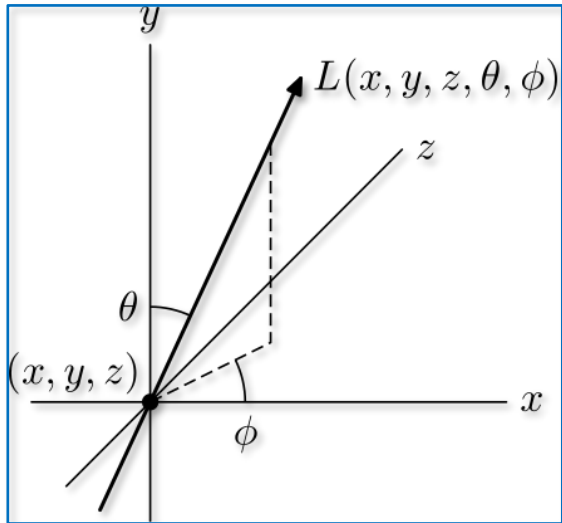
However, an anti-glare spray in production is not realistic.

# New Solution: Light-Field Technology

## What is Light-Field Technology?



# Plenoptic Function



- Captures Amplitude/Color
- Records angle
- Calculates distance

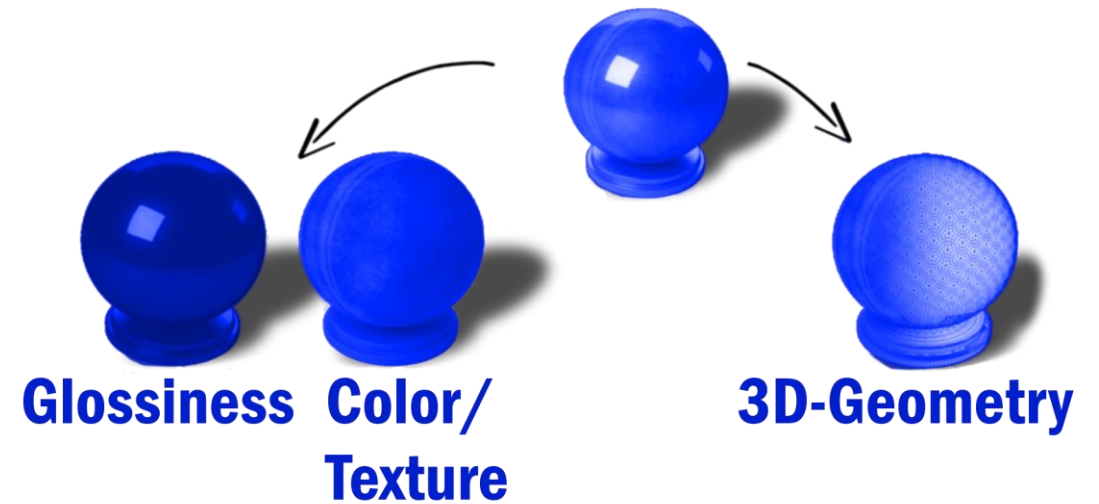
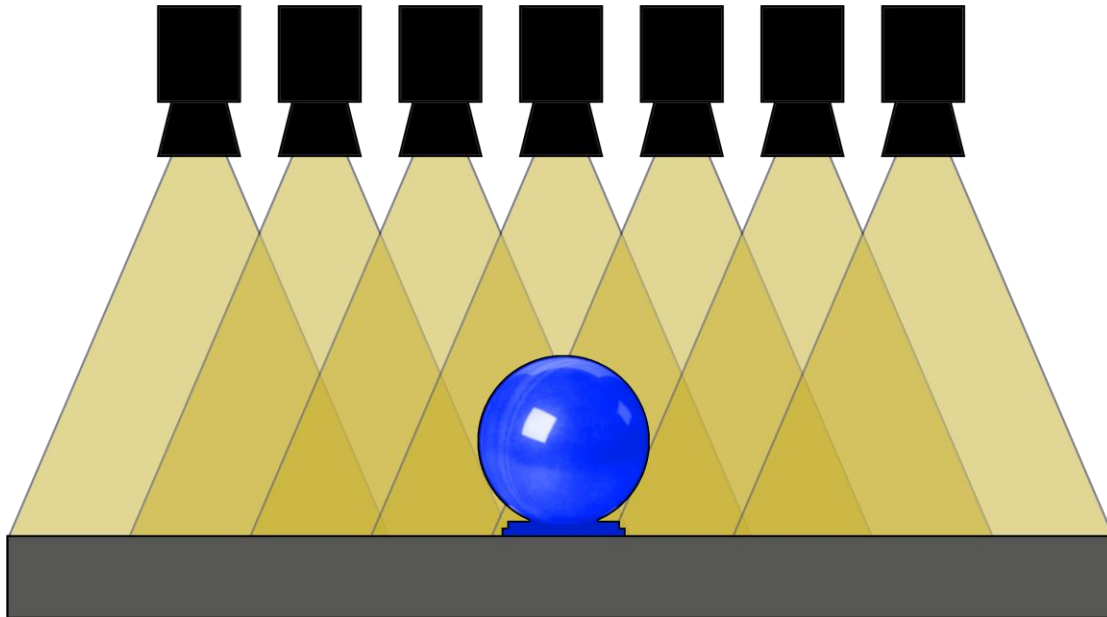


# Introduction to Light-Field Technology

- Light-Field technology captures light rays from different angles, creating a rich, multidimensional view of objects
- It enables precise depth perception and object recognition, crucial for automation tasks
- Game-changer in manufacturing, especially for complex environments like bin picking of reflective parts

# Reconstruction with “LumiScanX”

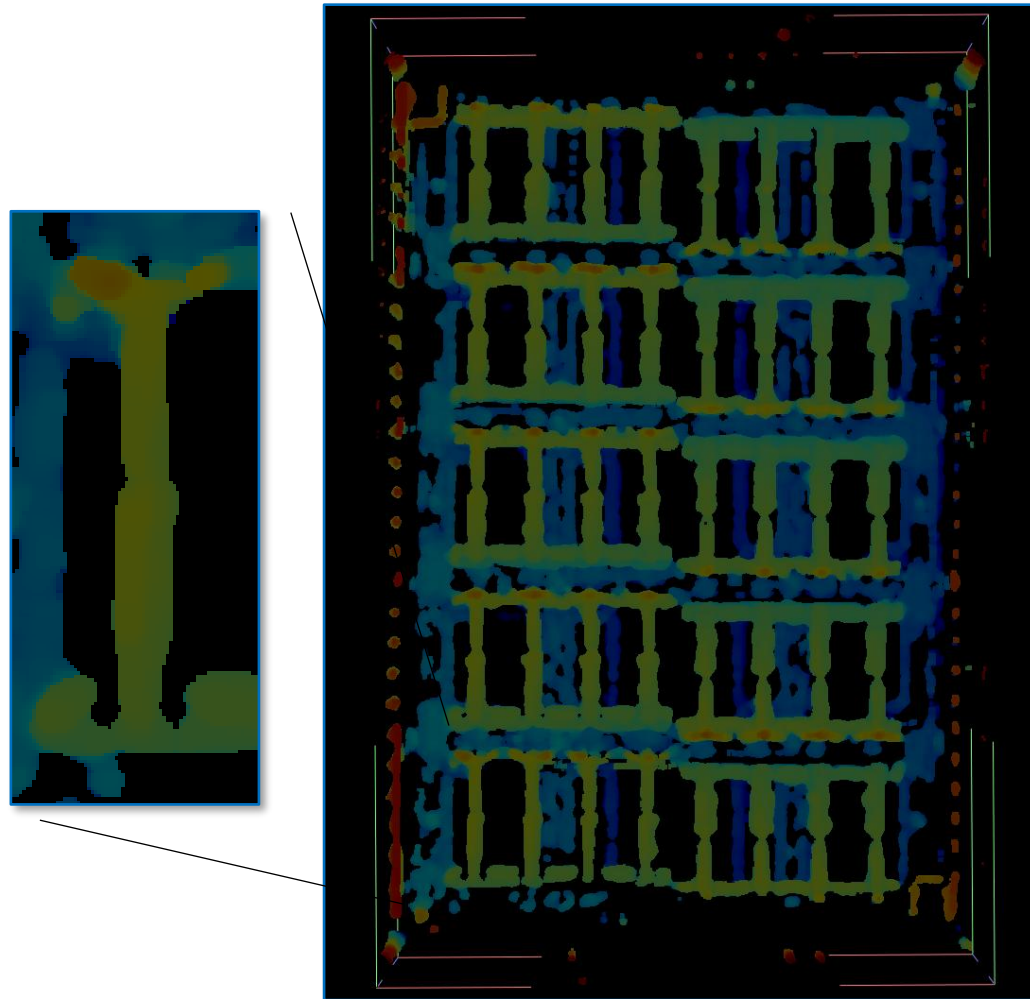
Precise 3D-models, Object recognition, robot guidance



# Example high-gloss components



# Detection with Light-Field Technology





# Solution: Light-Field Technology

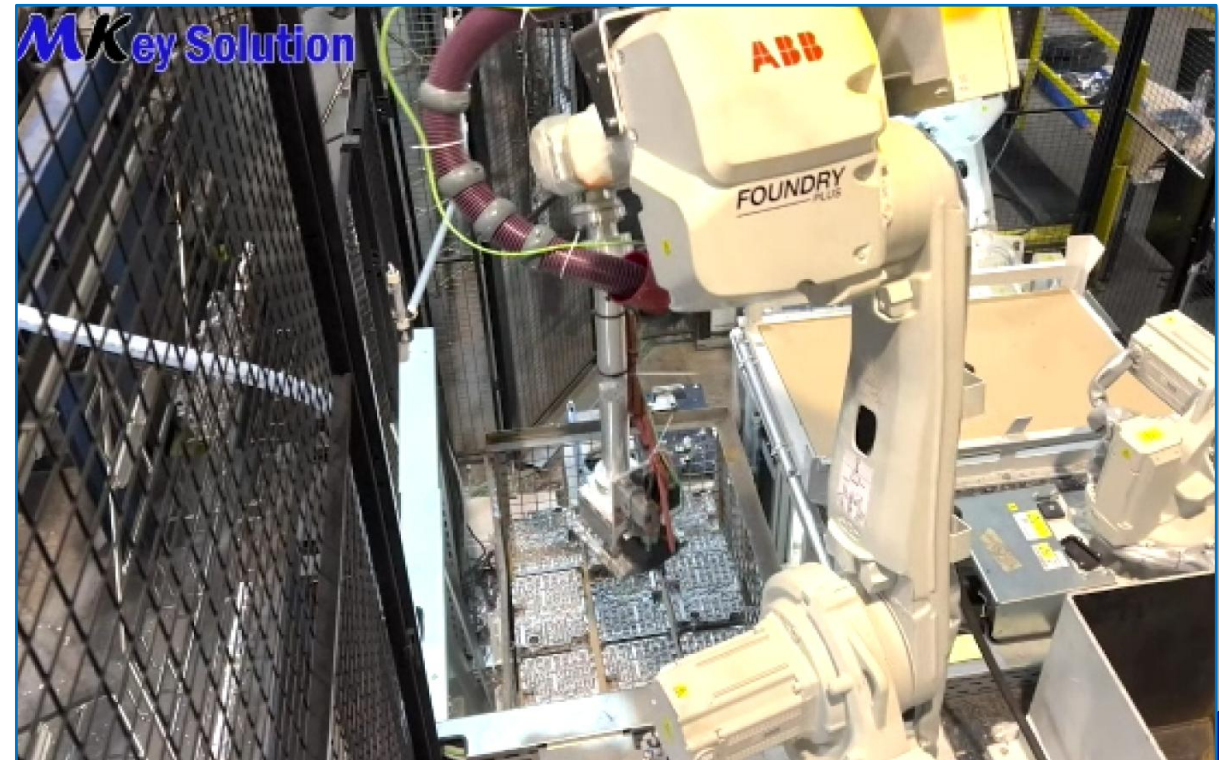
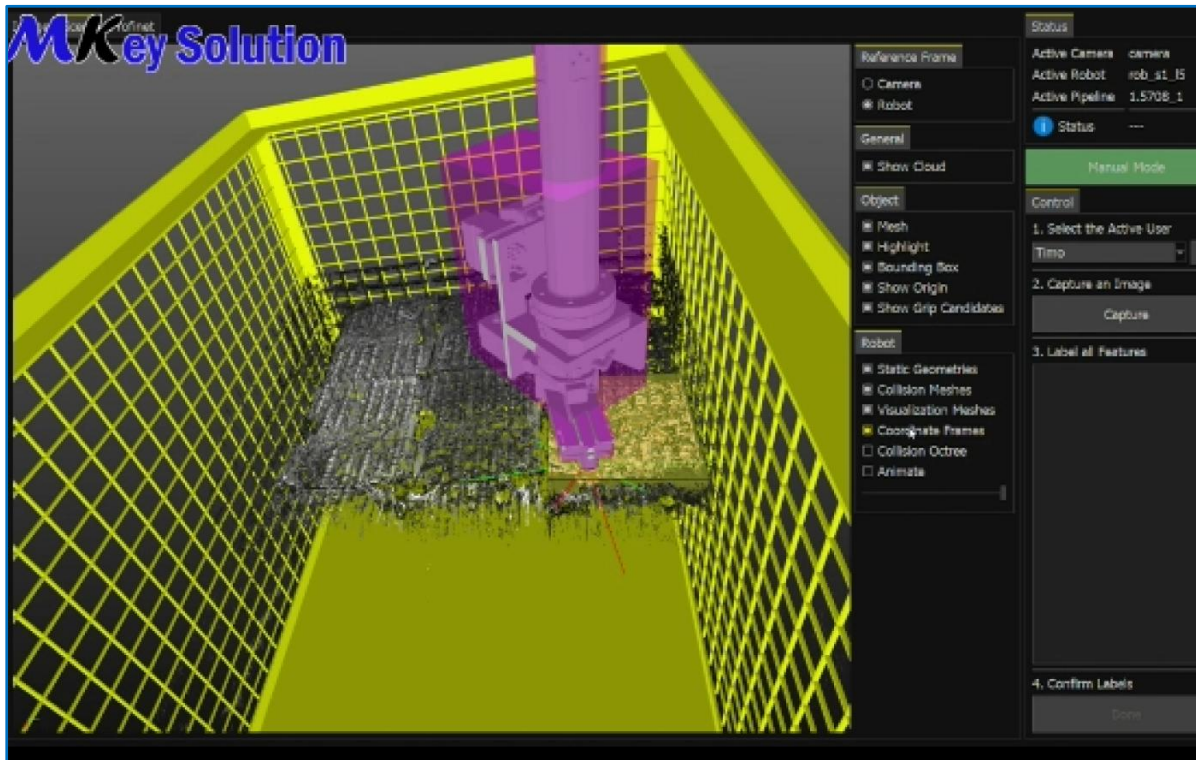
- Overcomes limitations of traditional vision systems by capturing 3D spatial information
- Provides robust solutions for detecting shiny and reflective surfaces
- Enhances accuracy and efficiency in bin picking tasks

# Use Cases

# Bin Picking of High-Glossy Parts



# Bin Picking of complex Parts





# Light-Field technology

- = High accuracy
- = Small occlusions
- = Surfaces: matt, shiny, oily, etc.
- = also in motion
- = Powered by AI-Technology

# Current fields of application for Light-Field technology

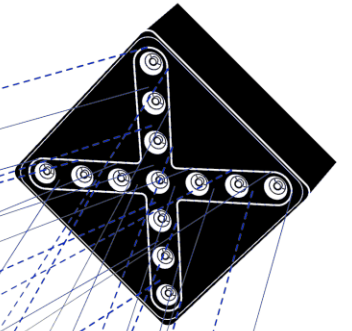
- Object detection
- Localization
- Positioning
- Classification
- Bin Picking
- Quality inspection and defect detection
- Object measurement

# Conclusion

- Lightfield technology improves automation in manufacturing
- Provides effective solutions for challenging tasks like bin picking of shiny / high-glossy and/or oily parts
- Represents a significant step forward in achieving high-efficiency automated systems

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# Light-Field Technology



**MKey Solution GmbH**

[www.mkey-solution.com](http://www.mkey-solution.com)



Partner des HC Erlangen

