

Mech-Mind Robotics

# AI + 3D Vision Solutions in Home Appliance Industry

Successfully deployed in worldwide leading companies in home appliances

**We Help Integrators WIN  
with best-in-class AI + 3D vision tools and services.**

Advanced Techs | Proven | Versatile | Fast and Easy | No Black-Box | Industry-Ready | Open | Best Services

# Mech-Mind AI + 3D Vision Pioneer in Home Appliance Industry

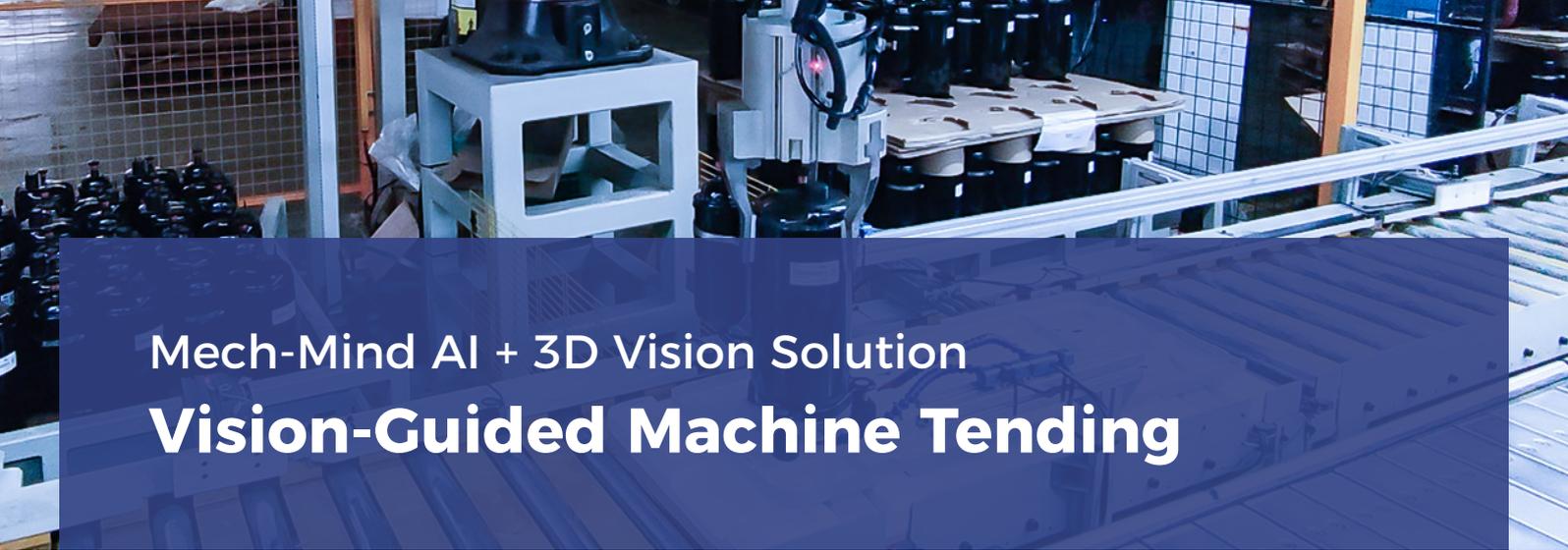
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The growing consumer demand has forced home appliance manufacturers to seek reliable approaches to boost output without increasing time and cost. And today, more and more home appliance manufacturers realize industrial robotic automation solution is second to none.

Industrial robotic automation solution adds speed, increases employee safety, and reduces inconsistency in appliance manufacturing processes. By combining advanced **AI technology** and **3D vision**, Mech-Mind Robotics empowers industrial robots with enhanced abilities to handle complex tasks, including **assembly**, **random bin picking**, **high-accuracy localization**, etc. We provide reliable solutions to help home appliance manufacturers worldwide improve safety and profitability.

Mech-Mind empowers global partners and integrators with cutting-edge automation solutions, exceeding their expectations with compelling ROI, the balance of cost, and technological maturity.





# Mech-Mind AI + 3D Vision Solution

## Vision-Guided Machine Tending

Vision-guided robots detect target parts, pick them from bins or pallets and place them correctly at the specific location (conveyor belts, fixtures, and machines) with high accuracy and stability.

### ► Capabilities

- **Handle a wide variety of parts and in-between layers**

Parts, whether reflective, finished, bulky, curve-edged, or complex-shaped, can be arranged in a random array, overlap, or be densely stacked in large bins, on pallets, separators, and more.

- **Agile loading**

Path planning and collision detection algorithms ensure reliable loading without collisions.

- **Accurate picking**

Powerful algorithms (multiple pick points, deep learning, pick anything, etc.), combined with the multifunction end effector, enable highly accurate picking of both parts and separators of a great variety.

- **Reliable performance**

Mech-Eye industrial 3D cameras deliver robust performance in challenging light conditions (> 30,000 lx) and harshest industrial environments.

### ► Recommended Cameras

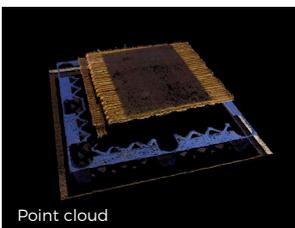
- Mech-Eye LSR
- Mech-Eye PRO

### ► Examples of Parts

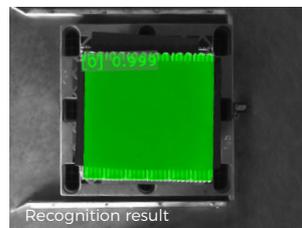
- Condensers, compressors, washing machine shells, refrigerator door hinges, compressor bearings, crankshafts, cylinders, compressor rotors, AC feet, counterweights, accumulators, shaft sleeves, etc.

### ► Point Clouds and Recognition Results

Air conditioner condensers



Point cloud

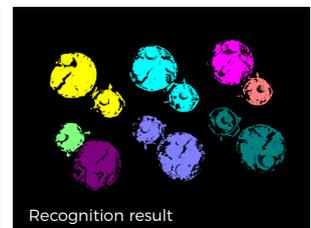


Recognition result

Air conditioner compressors



Point cloud



Recognition result

# Case Study

## Vision-Guided Bin Picking of AC Feet

Large air conditioner factory

### ► The Challenge

The vision-guided robot should quickly pick up AC feet and place them on the conveyor belt in the right orientation.



### ► The Mech-Mind Solution

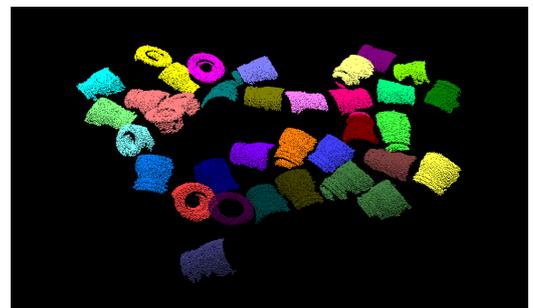
- Mech-Eye PRO M, featuring high accuracy, provides **high-quality 3D point clouds** of AC feet with dark surfaces.
- Not only are AC feet small in physical size, but also they are randomly arranged in the material bin. Mech-Mind's powerful AI algorithms calculate **pick points** for the robots, enabling fast and accurate picking.
- **Path planning** and **collision detection** algorithms enable collision-free picking and placing.
- By installing Mech-Eye PRO M above the workstation, the FOV is large enough to cover the entire bin.

### ► The Result

- Cycle time: < 3 s/piece
- Bin emptying rate: > 99.9%



Point cloud



Recognition result

# Case Study

## Vision-Guided Compressor Crankshaft Loading

Large compressor factory

### ► The Challenge

There're hundreds of types of compressor crankshafts in the factory. The vision-guided robots should be able to recognize various crankshafts and check their orientation before placing them at the desired location.



### ► The Mech-Mind Solution

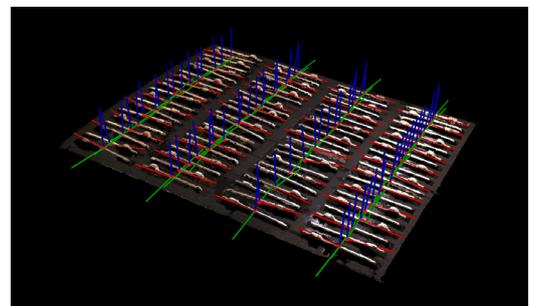
- Mech-Eye LSR L, featuring high accuracy, provides **high-quality 3D point clouds of crankshafts with reflective surfaces and oil coating.**
- The 3D vision system detects parts and checks the part orientation; advanced AI algorithms calculate **the best pick point** and guide robots to pick each part fast and accurately.
- With a multifunction gripper, the robot can also perfectly handle deformable intermediate foam boards after finishing picking an entire layer of parts.
- Mech-Eye LSR L secures solid performance under strong ambient light interference (> 30,000 lx).

### ► The Result

- The vision recognition success rate is > 99.99% thanks to built-in advanced deep learning algorithms.
- Stable operation without manual intervention.



Point cloud



Recognition result



# Mech-Mind AI + 3D Vision Solution

## Vision-Guided Assembly

Assembly applications, whether fastening a screw or inserting an item, require extremely high accuracy and stability across the process. Vision-guided robots can locate and handle a wide variety of objects with remarkable accuracy and dexterity.

### ► Capabilities

- **Assemble with accuracy**  
Detects and locates objects with extraordinarily high accuracy, no matter size, location, and orientation.
- **Assemble with flexibility**  
With its compact and lightweight design, Mech-Eye industrial 3D camera enables flexible handling of challenging assembly tasks even in a compact space.
- **Assemble with reliability**  
Path planning and collision detection algorithms ensure reliable robotic operations without collisions.
- **Assemble with dexterity**  
Performs assembly tasks fast and stably thanks to the advanced 3D vision system and AI technology.

### ► Recommended Cameras

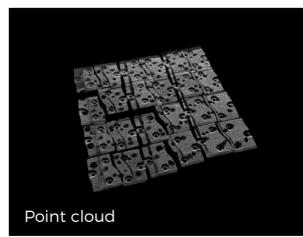
- Mech-Eye LSR
- Mech-Eye PRO
- Mech-Eye NANO

### ► Examples of Parts

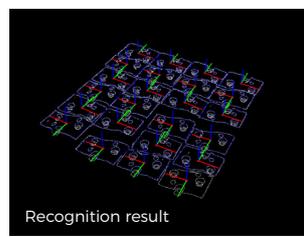
- Compressor accumulators, washing machine inner and outer drums, etc.

### ► Point Clouds and Recognition Results

Counterweights

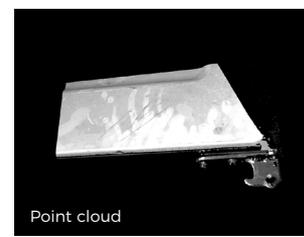


Point cloud

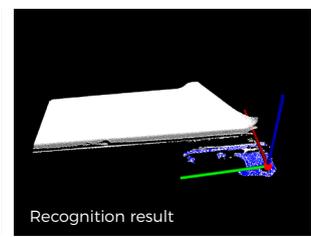


Recognition result

Refrigerator door hinges



Point cloud



Recognition result

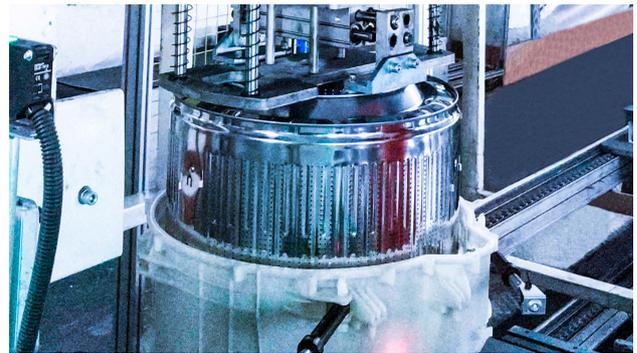
# Case Study

## Vision-Guided Washing Machine Drum Assembly

Large home appliance factory

### ► The Challenge

While the washing machine drums are bulky and picking them manually can be extremely labor-intensive, the large home appliance factory wanted to automate the washing machine assembly process. Vision-guided robots should recognize the orientation of inner drums and assemble them into the outer drum accurately and quickly.

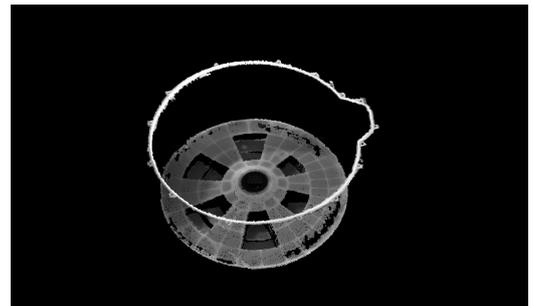


### ► The Mech-Mind Solution

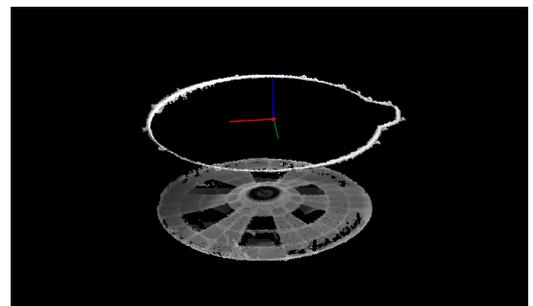
- Mech-Eye PRO M generates **high-quality 3D point clouds** of the **thin-walled outer drums** with complex structures.
- The 3D vision system checks the outer drums' orientation and locates the bearing holes' exact positions at drum bottoms.
- Designed **compact** and **lightweight**, Mech-Eye PRO M is easily installed at the end of the robot arm and shows outstanding flexibility in compact space.
- **Path planning** and **collision detection** algorithms guide the robots to accurately assemble the inner drums into the outer drums without collisions.

### ► The Result

- The fully automated assembly process eliminates errors, increases assembly accuracy, and improves production efficiency.
- **24/7** stable operation without manual intervention.



Point cloud



Recognition result

# Mech-Mind AI + 3D Vision Solution

## Quality Inspection

Accuracy is essential for inspection applications. The Mech-Mind 3D vision system identifies, gauges, and inspects various parts to maximize quality control and defect detection.

### ► Capabilities

- **See the subtlest features and fine details**

Inspects and gauges height, flatness, etc.  
Inspects both object dimensions and colors.

- **Plug & play software**

Users can fast implement various inspection and measurement applications utilizing our intuitive AI software.

- **Accurate and fast inspection**

Advanced algorithms enable fast inspection and measurement by optimizing the overall processing speed.

- **Traceability and data management**

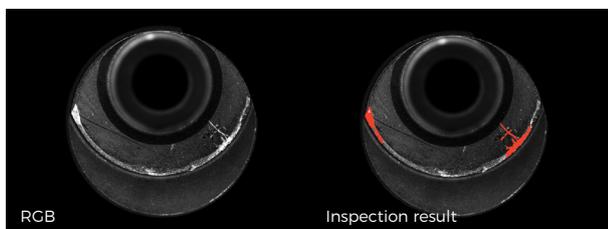
Effortless data management and organization make it a breeze to filter custom historical data and seamlessly export reports.

### ► Applications

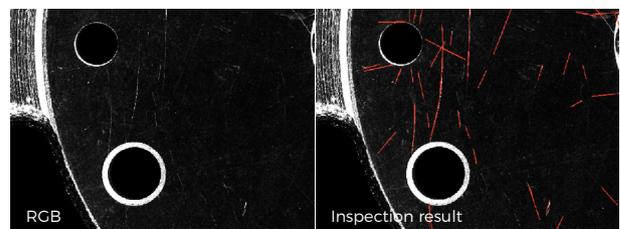
- Crankshaft defect detection, cylinder scratch inspection, compressor rotor measurement, etc.

### ► Inspection Results

Crankshaft defect detection



Cylinder scratch inspection



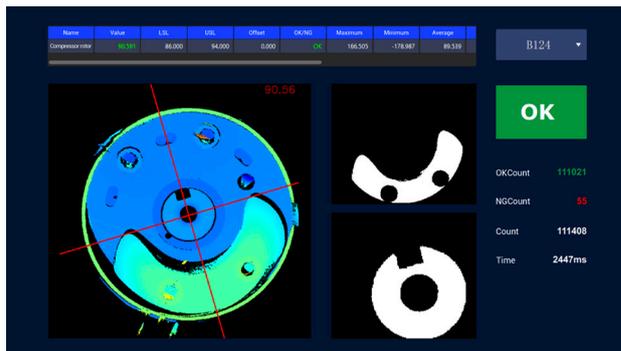
# Case Study

## Compressor Rotor Measurement

Large home appliance factory

### ► The Challenge

The rotor is among the most critical components of the compressor. However, the manual rotor inspection using plug gauges is labor-intensive and poor in accuracy. The customer finally decided to automate the rotor inspection process using Mech-Mind industrial inspection solution.

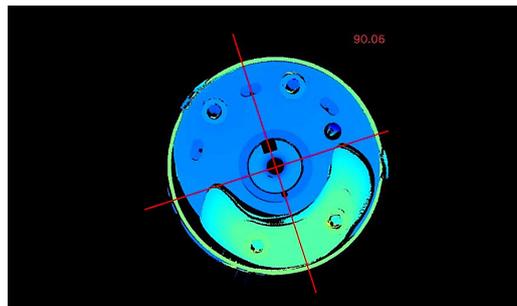


### ► The Mech-Mind Solution

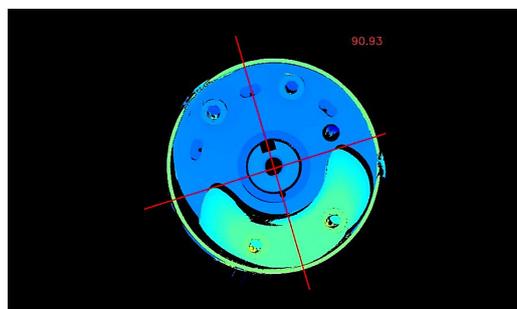
- Mech-Eye industrial 3D camera generates highly accurate 3D point clouds of target objects.
- Measures the angle between the rotor corner block and the center of the crankshaft to ensure adherence to the exact standard ( $90 \pm 4^\circ$ ).
- Measures the height difference between the points inside the rotor and the edge shell with **narrow tolerance**.
- Rotors are produced in various sizes and types. Mech-Mind's vision solution supports various compressor rotors and can **quickly adapt to new types**.

### ► The Result

- The overall measurement time has been reduced by 30%.
- Online inspection instantly monitors and reports production status. Data such as production time, point cloud images, and more are traceable.



Inspection result



Inspection result

# More Cases

Scan QR code  
to watch videos



**Vision-Guided  
Air Conditioner Condenser Loading**



**Vision-Guided  
Air Conditioner Compressor Loading**



**Vision-Guided  
AC Halogen Leak Detection**



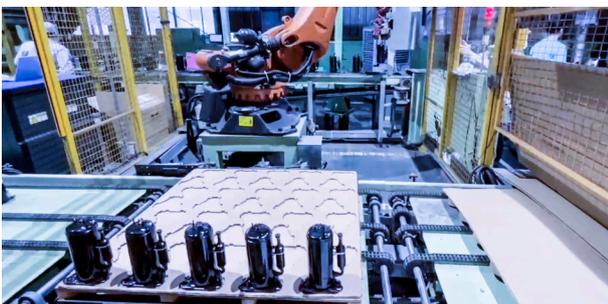
**Vision-Guided  
Counterweight Loading**



**Vision-Guided  
Washing Machine Drum Loading**



**Vision-Guided  
Compressor Rotor Loading**



**Vision-Guided  
Compressor Unloading**



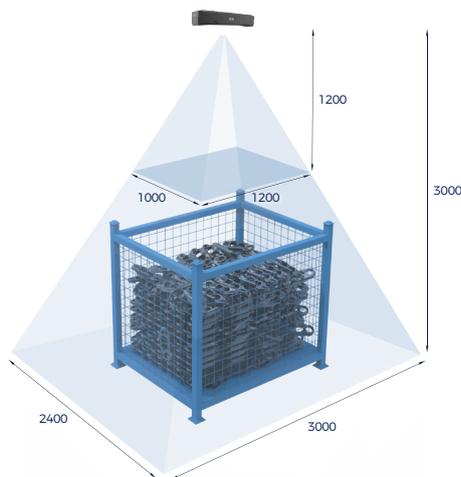
**Vision-Guided  
Compressor Bearing Loading**

# Mech-Eye Industrial 3D Cameras

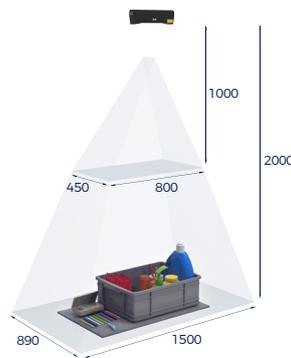
High-performance industrial 3D cameras for the most demanding automation applications

Specification	LSR L	PRO M	PRO S	NANO
Recommended working distance	1200-3000 mm	1000-2000 mm	500-1000 mm	300-600 mm
Near FOV	1200 × 1000 mm @ 1.2 m	800 × 450 mm @ 1.0 m	370 × 240 mm @ 0.5 m	220 × 150 mm @ 0.3 m
Far FOV	3000 × 2400 mm @ 3.0 m	1500 × 890 mm @ 2.0 m	800 × 450 mm @ 1.0 m	440 × 300 mm @ 0.6 m
Resolution	Depth map: 2048 × 1536	1920 × 1200	1920 × 1200	1280 × 1024
	RGB: 4000 × 3000 / 2000 × 1500			
Megapixels	/	2.3 MP	2.3 MP	1.3 MP
Point repeatability Z ( $\sigma$ ) <sup>[1]</sup>	0.5 mm @ 3.0 m	0.2 mm @ 2.0 m	0.05 mm @ 1.0 m	0.1 mm @ 0.5 m
VDI/VDE accuracy <sup>[2]</sup>	1.0 mm @ 3.0 m	0.2 mm @ 2.0 m	0.1 mm @ 1.0 m	0.1 mm @ 0.5 m
Typical capture time	0.5-0.9 s	0.3-0.6 s	0.3-0.6 s	0.6-1.1 s
Baseline	380 mm	270 mm	180 mm	68 mm
Dimensions	459 × 77 × 86 mm	353 × 57 × 100 mm	265 × 57 × 100 mm	145 × 51 × 85 mm
Weight	2.9 kg	1.9 kg	1.6 kg	0.7 kg
Light source	Red laser (638 nm, Class 2)	Blue LED (459 nm, RG2)/White LED(RG2)		
Image sensor	Sony CMOS for high-end machine vision			
Operating temperature	-10-45°C	0-45°C		
Communication interface	Gigabit ethernet			
Input	24V DC, 3.75 A			24V DC, 1.5 A
Safety and EMC	CE/FCC/VCCI/KC/ISED/NRTL			
IP rating	IP65			
Cooling	Passive			

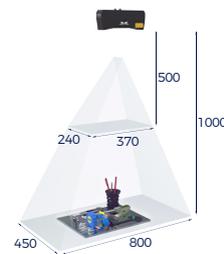
Mech-Eye LSR L



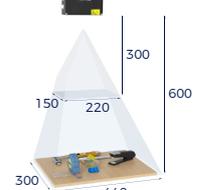
Mech-Eye PRO M



Mech-Eye PRO S



Mech-Eye NANO



Field of view (mm)

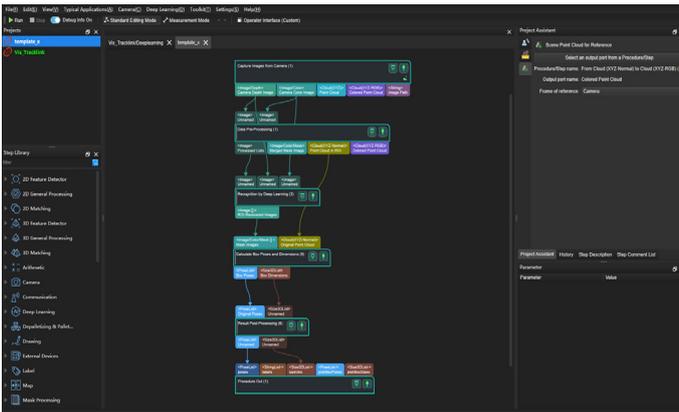
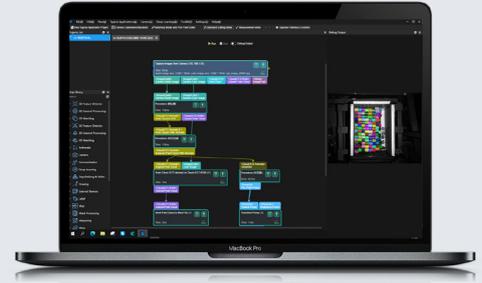
[1] One standard deviation of 100 Z-value measurements of the same point. The measurement target was a ceramic plate.

[2] According to VDI/VDE 2634 Part II.

# Mech-Vision

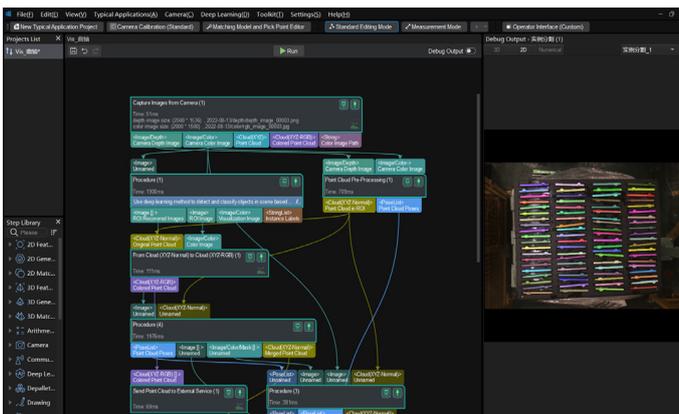
## Machine Vision Software

Mech-Vision is an industry-leading machine vision software. It is designed to quickly build vision applications, whether simple or complex. With Mech-Vision, users can manage a wide range of vision tasks, including identification, localization, inspection & measurement, etc.



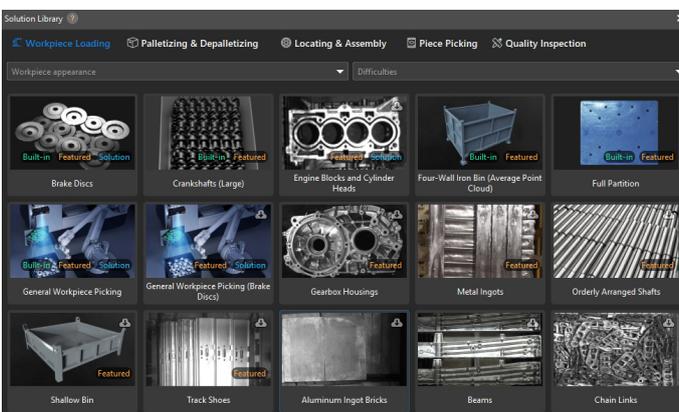
### Build your vision applications efficiently

- Intuitive solution-oriented graphical user interface
- Drag-and-drop programming simplifies setup without writing a line of code
- Visualized configuration



### Manage complex vision applications with extensive tools

- Powerful algorithms: 2D/3D matching, 2D/3D deep learning, 2D/2.5D measurement, etc.
- Integrated machine vision tools: matching model, pick point editor, automatic calibration, caliper, etc.
- The **3D Workpiece Recognition** tool delivers recognition results in 1 sec, enabling easier and faster deployment of various loading and handling applications



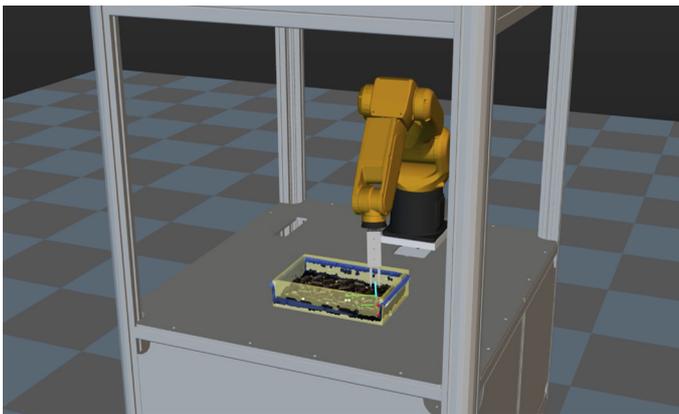
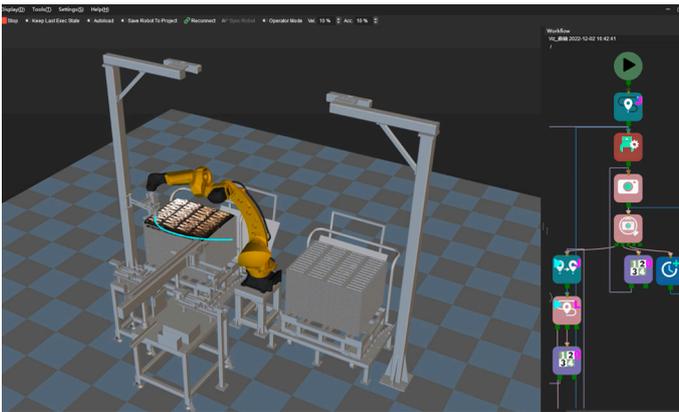
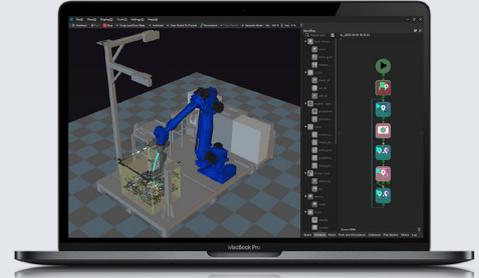
### Develop vision applications easily and flexibly

- **Robust Solution Library:** get faster application deployment by adapting an existing project after simple modifications
- **Production Interface** for easy production status monitoring and data reporting
- Multiple languages: English, Japanese, Chinese, and Korean

# Mech-Viz

## Robot Programming Software

Mech-Viz is a software product for efficiently implementing robotic applications without writing a line of code. Mech-Viz enables robots to manage demanding automation tasks with excellent stability, extraordinary flexibility, and outstanding consistency.



### Intuitive Robot Programming

- Intuitive graphical user interface
- Code-free programming environment
- One-click simulation of robot path

### Powerful Algorithms for Reliable Robotic Operation

- Motion planning and collision detection
- Multi-pick depalletizing algorithms
- Picking strategies: multiple pick points, rotational symmetry, etc.

<b>ABB</b>	<b>KUKA</b>	<b>YASKAWA</b>	<b>FANUC</b>	<b>Kawasaki</b>
<b>NACHI</b>	<b>DENSO</b>	<b>UNIVERSAL ROBOTS</b>	<b>STÄUBLI</b>	<b>EFORT</b>
<b>GREE</b>	<b>ROKAE</b>	<b>ELITE ROBOTS</b>	<b>BEIPEITIAN ROBOTICS</b>	<b>TM ROBOT</b>
<b>ESTUN ROBOTICS</b>	<b>TURIN</b>	<b>AUBO</b>	<b>DOBOT</b>	<b>QJAR</b>
<b>HAN'S ROBOT</b>	<b>HYUNDAI</b>	<b>JAKA</b>	<b>SIASUN</b>	<b>DELTA</b>

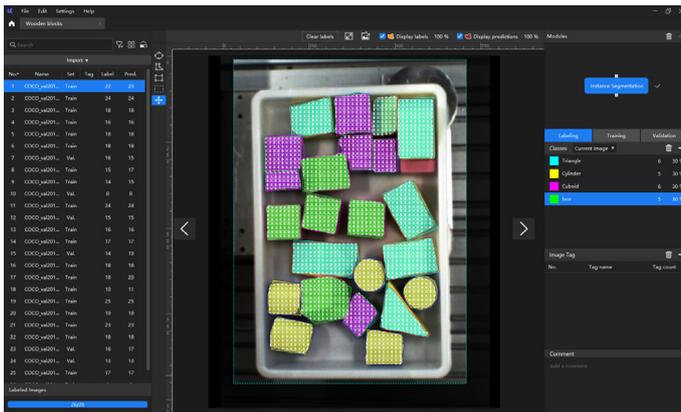
### Flexible and Easy Implementation

- Support for almost all major-brand robots
- Streamlines configuration and redeployment with robot path reporting and tracking capabilities
- Multiple languages: English, Japanese, Chinese, and Korean

# Mech-DLK

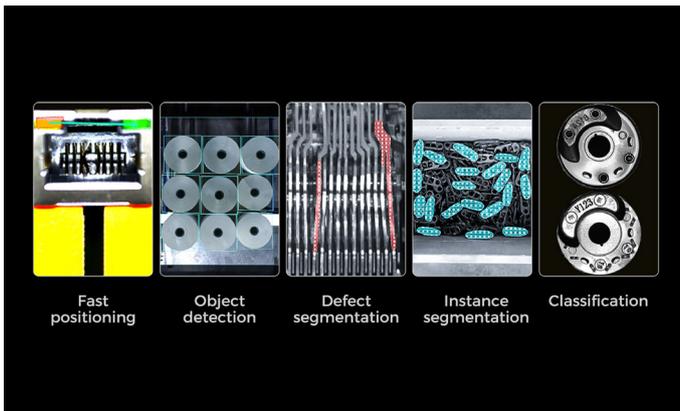
## Deep Learning Software

Mech-DLK is a versatile deep learning software solving complex machine vision tasks. It enables users to rapidly train models and easily solve demanding vision applications, including overlapping object recognition and classification, complex defect detection, character reading, etc.



### Train models efficiently without writing a line of code

- Intuitive code-free user interface
- Visualized model validation
- Advanced data augmentation: train models with smaller image sets
- **Finetune** function: leverage pre-trained models to expedite training, rather than train a model from scratch



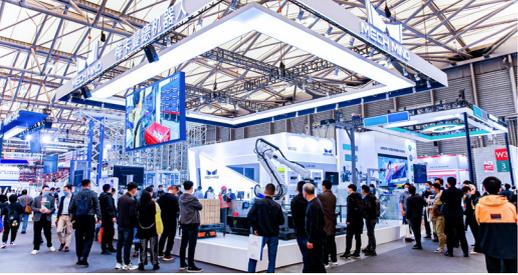
### Manage complex machine vision tasks with speed and accuracy

- Manages complex vision applications with powerful algorithms such as fast positioning, defect segmentation, and instance segmentation
- **Smart Labeling Tool** and **Template Tool** simplify the labeling process, saving time and effort



### Integrate your vision tasks into your production environment easily

- Multi-language SDKs: C, C++, C#, and Python
- Easy integration with Mech-Vision for quick deployment



## About Mech-Mind

Mech-Mind is an industry-leading company focusing on industrial 3D sensors and software suites for intelligent robotics. By combining 3D vision with AI technology, Mech-Mind brings automation to the next level and empowers partners and system integrators to manage the most challenging automation tasks, including bin picking, depalletizing & palletizing, picking & placing, and more.

### One of the Highest-Funded AI + Robotics Companies

Founded in 2016, Mech-Mind has closed its Series C+ with total funding of > USD 200 million. Backed by Intel and other global top investors, Mech-Mind has been one of the highest-funded AI + robotics companies all over the world.

### World-Class Team with Deep Technical Knowledge

Mech-Mind assembles a world-class team of 700+ amazing individuals. Our global team with highly qualified experts provides deep technical knowledge in 3D sensing, vision and robotics algorithms, robotics software, and intelligent robotic solutions.

### Create Success Together with Partners and Integrators

Excellent usability, approved quality, high flexibility, comprehensive service, and competitive price, that's what we stand for and how we help our customers and partners to exceed in their business. Our mature solutions empower system integrators and partners to solve the most demanding applications and bring automation to the next level.

### 10,000+ Cameras Deployed

Mech-Mind partnered with industry-leading companies and has deployed applications in 50+ regions. By delivering cutting-edge technology and reliable solutions, Mech-Mind has created visible ROI for global customers across diverse industries, including automotive, construction machinery, logistics, home appliances, food and beverage, etc.

10,000+ cameras  
installed worldwide

> \$200 million  
total funding

700+  
employees

50+  
regions

#### Customers and Partners



#### Compatible with Major Robot Brands



**3D VISION & AI FOR ROBOTS AND MORE**

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