

Mech-Mind Robotics

AI + 3D Vision Applications in Construction Machinery Industry

About 2,000 cameras successfully deployed in the construction machinery industry

**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 Construction Machinery Industry

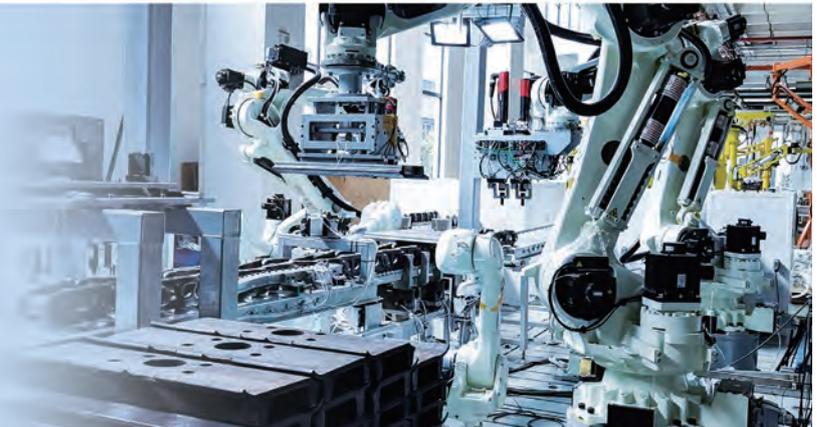
The landscape of the construction machinery industry becomes more and more sophisticated every year due to the ever-evolving technologies and fierce global competition. This also requires the construction machinery producers to continuously optimize their products while maximizing production capacities.

By combining advanced AI technology and 3D vision with industrial robots, Mech-Mind provides construction machinery manufacturers and **system integrators** with **proven vision solutions** and **best services**, helping them stay ahead of the industry and global market. Mech-Mind has been innovating versatile AI and 3D vision tools to accelerate the full transformation of the construction machinery industry.

01 Machine Tending



02 Localization and Assembly



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

- **Recognize and handle complex parts**

Parts can be reflective, finished, glossy, tiny, thin, curve-edged, or complex-shaped;

Parts can be arranged in a random array, overlap, or be densely stacked in large bins, on pallets, or racks.

- **Pick with dexterity**

Path planning and collision detection algorithms ensure efficient and reliable robotic operation without colliding or dropping parts.

- **Pick with accuracy**

Powerful algorithms (multiple pick points, deep learning, etc.) combined with the multifunction end effector to enable highly accurate picking.

- **Reliable performance**

Mech-Eye industrial 3D cameras secure solid performance under challenging light conditions and in the harshest industrial environments.

► Recommended Cameras

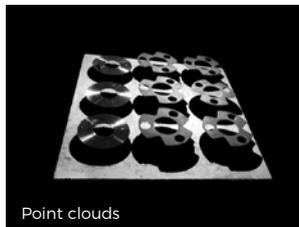
- Mech-Eye LSR
- Mech-Eye PRO

► Examples of Parts

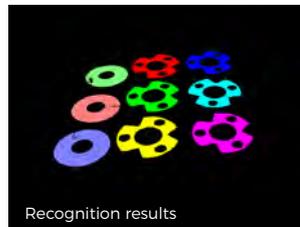
- Track links, axles, connecting rods, gears, sheet metals, etc.

► Point Clouds and Recognition Results

Planet carriers

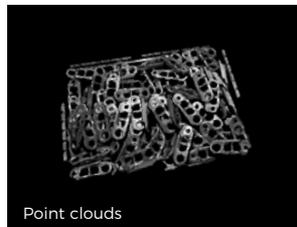


Point clouds



Recognition results

Track links



Point clouds



Recognition results

Case Study

Vision-Guided Bin Picking and Machine Tending of Track Links Construction machinery giant

► The Challenge

While track links are in random positions in the material bin, vision-guided robots should accurately and quickly pick overlapping and entangled track links without dropping and colliding.



► The Mech-Mind Solution

- Mech-Eye LSR L, featuring high accuracy, provides **high-quality 3D point clouds** of entangled track links with **complex structures** and **dark surfaces**.
- Installed above the workstation, the camera's FOV is large enough to cover the entire material bin.
- Powerful AI algorithms calculate **pick points** for the robots, ensuring accurate picking.
- **Path planning** and **collision detection** algorithms enable collision-free picking and placing.
- Mech-Eye LSR L secures solid performance under strong ambient light interference (> 30,000 lx).

► The Result

- Dozens of workstations have been automated, improving productivity drastically.
- By implementing Mech-Mind's solution, the customer reduced costs by **80%**.



Point clouds



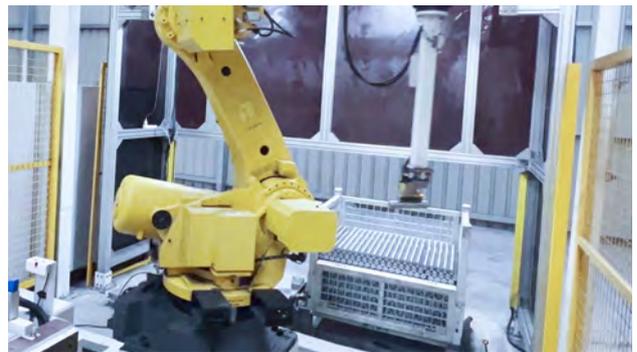
Recognition results

Case Study

Vision-Guided Bin Picking of Axle Steel Bars Construction machinery giant

► The Challenge

The axles are stacked closely together, with a shiny surface that presents a significant imaging challenge. Guided by the Mech-Mind 3D vision, the industrial robot is tasked with picking the axles from the material bin and placing them into the secondary positioning device. After this, the axles are inserted into the machine tool for processing.



► The Mech-Mind Solution

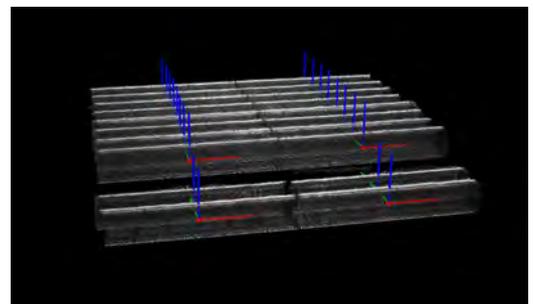
- Mech-Eye LSR L industrial 3D camera generates high-quality 3D point cloud data of overlapping axle steel bars with **highly-reflective surfaces**.
- Utilizing advanced AI algorithms, the vision system calculates **the optimal motion path and pick point**, guaranteeing a reliable and seamless operation.
- Support for dozens of different axle steel bar types.
- The Mech-Eye LSR L is designed to withstand strong ambient light conditions, ensuring excellent performance even in demanding light conditions of **30,000 lx**.

► The Result

- Fully automated process needs no manual intervention.



Point clouds



Recognition results

Case Study

Vision-Guided Sheet Metal Loading and Beveling Construction machinery giant

► The Challenge

There're thousands of types of sheet metals in the factory. Most of them are symmetric parts or very similar in geometric construction. The vision-guided robots should recognize geometrically similar and symmetric sheet metals, all while performing stably under strong ambient light interference.

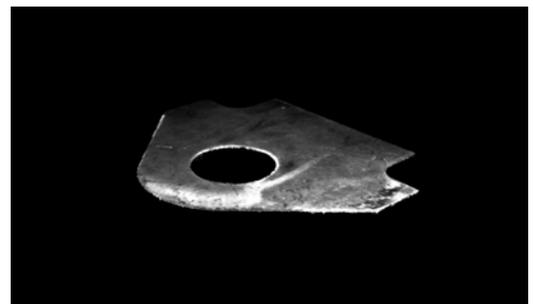


► The Mech-Mind Solution

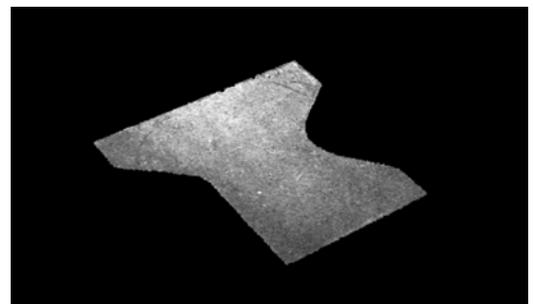
- The robust 3D vision system combines model matching algorithms to accurately recognize and locate **geometrically similar** and **symmetric sheet metals**.
- The 3D vision system supports **thousands of** sheet metal types, ensuring consistent loading and beveling.
- Advanced AI algorithms calculate pick points, combined with a **magnetic suction gripper**, to ensure accurate picking.
- Automated beveling trajectory generation **without pre-programming and pre-learning**, improving beveling efficiency.

► The Result

- **No need for fixtures** for fine positioning, saving fixed costs.
- Mech-Mind's solution guides robots to perform loading with high consistency, improving overall beveling efficiency by **four times**.



Point clouds



Point clouds



Mech-Mind AI + 3D Vision Solution

Vision-Guided Localization and Assembly

Vision-guided robots locate and pick randomly arranged parts and place them in designated locations with remarkable dexterity.

► Capabilities

- **Assemble with accuracy**

Detects small features, enabling accurate assembly of a wide range of parts, including those of complex shapes and various sizes and with reflective surfaces, providing flexibility in both size and shape.

- **Assemble in motion**

Synchronizes robots with the assembly line for fast and accurate joining, inserting, and more.

- **Perform reliably in harsh environments**

Mech-Eye industrial 3D camera delivers solid performance in harsh environments with dust, vibrations, humidity, electromagnetic interferences, and high temperatures.

- **Collision-free operation**

Path planning and collision detection algorithms ensure reliable robotic operation without collisions.

► Recommended Cameras

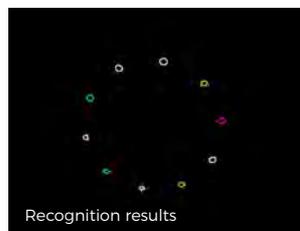
- Mech-Eye LSR
- Mech-Eye PRO

► Examples of Parts

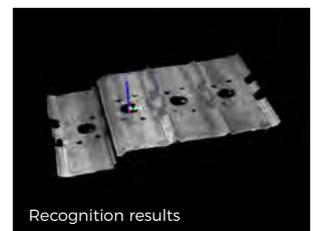
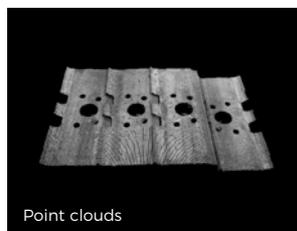
- Track shoes, connecting rods, wheel hubs, etc.

► Point Clouds and Recognition Results

Wheel hub



Track shoes



Case Study

Vision-Guided Track Shoe Assembly

Large construction machinery factory

► The Challenge

While the track shoes are bulky and picking them manually can be extremely labor intensive, the large construction machinery factory wanted to automate the assembly process of track shoes. The robots should accurately pick track shoes with different orientations and stably place them in designated locations for assembly.



► The Mech-Mind Solution

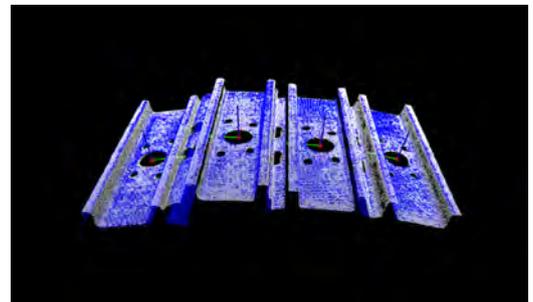
- Mech-Eye LSR L generates high-quality 3D point clouds of overlapping track shoes, ensuring accurate positioning.
- The robust 3D vision system can recognize **parts with extremely similar geometric structures**.
- **Path planning** and **collision detection** algorithms guide the robots to pick and assemble track shoes without collisions.
- Mech-Eye LSR L, featuring strong ambient light resistance, secures solid performance under light conditions of **> 30,000 lx**.

► Results

- Dozens of production lines have been replicated and daily output has increased significantly.



Point clouds



Recognition results

Case Study

Vision-Guided Screw Driving Construction machinery giant

► The Challenge

The 3D vision system precisely locates the bolts on the side flaps of the wheel loader chassis, guiding the gantry robot to tighten the bolts and accomplish the accurate assembly of the wheel loader's drive axle and chassis. The vision system instructs the robot to tighten the bolts and nuts from both ends, applying consistent force and torque to ensure the proper connection of each bolt. This ensures that every bolt is tightened correctly.

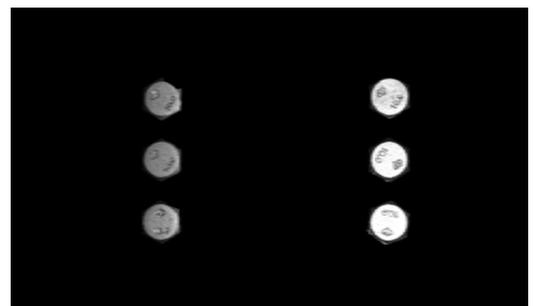


► The Mech-Mind Solution

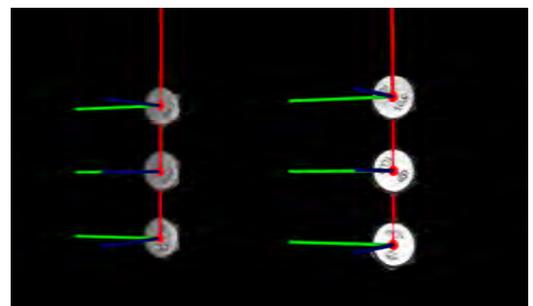
- Bolts have reflective surfaces, scratches, and oil stains. The Mech-Eye PRO M can generate high-quality point clouds of bolts, **capturing clear edges and detailed 3D data**.
- The system ensures **precise positioning of the bolt's center point**, allowing the tightening gun to apply complete torque and tighten bolts and nuts properly and accurately.
- All bolts on a single side of the flaps can be precisely positioned with just one capture. The 3D vision system guides the robot to tighten the bolts sequentially, significantly improving efficiency.
- The 3D vision system can be pre-configured with matching templates to be compatible with different wheel loaders and **quickly adapt to new products**.

► The Result

- AI algorithms guarantee **collision-free** operation even in a compact space.
- **24/7** in production, significantly improving productivity.



Point clouds



Recognition results

More Cases

Scan QR code
to watch videos



Machine Tending of Drive Gears



Train Wheel Handling



Sheet Metal Picking



Machine Tending of Track Rollers



Bin Picking of Axle Pins



Rebar Labeling



Sheet Metal Bending



Angle Steel Handling

Mech-Eye Industrial 3D Cameras

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

| Specification | LSR L | PRO M | PRO S | NANO | UHP-140 |
|---|---------------------------------------|--|---------------------------|--------------------------|--|
| Recommended working distance | 1200-3000 mm | 1000-2000 mm | 500-1000 mm | 300-600 mm | 300 ± 20 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 | 135 × 90 mm @ 0.28 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 | 150 × 100 mm @ 0.32 m |
| Resolution | Depth map: 2048 × 1536 | 1920 × 1200 | 1920 × 1200 | 1280 × 1024 | 2048 × 1536 |
| | RGB: 4000 × 3000/2000 × 1500 | | | | |
| Megapixels | / | 2.3 MP | 2.3 MP | 1.3 MP | 3.0 MP |
| Point repeatability Z (σ) ^[1] | 0.5 mm @ 3.0 m | 0.2 mm @ 2.0 m | 0.05 mm @ 1.0 m | 0.1 mm @ 0.5 m | 2.6 μ m @ 0.3 m |
| | | | | | Region ^[2] : 0.09 μ m @ 0.3 m |
| VDI/VDE accuracy ^[3] | 1.0 mm @ 3.0 m | 0.2 mm @ 2.0 m | 0.1 mm @ 1.0 m | 0.1 mm @ 0.5 m | 0.03 mm @ 0.3 m |
| Typical capture time | 0.5-0.9 s | 0.3-0.6 s | 0.3-0.6 s | 0.6-1.1 s | 0.6-0.9 s |
| Baseline | Approx. 380 mm | Approx. 270 mm | Approx. 180 mm | Approx. 68 mm | Approx. 80 mm |
| Dimensions | Approx. 459 × 77 × 86 mm | Approx. 353 × 57 × 100 mm | Approx. 265 × 57 × 100 mm | Approx. 145 × 51 × 85 mm | Approx. 260 × 65 × 142 mm |
| Weight | Approx. 2.9 kg | Approx. 1.9 kg | Approx. 1.6 kg | Approx. 0.7 kg | Approx. 1.9 kg |
| Light source | Red laser (638 nm, Class 2) | Blue LED (459 nm, RG2)/White LED (RG2) | | Blue LED (459 nm, 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 | 24V DC, 3.75 A |
| Safety and EMC | CE/FCC/VCCI/UKCA/KC/ISED/NRTL | | | | |
| IP rating | IP65 | | | | |
| Cooling | Passive | | | | |

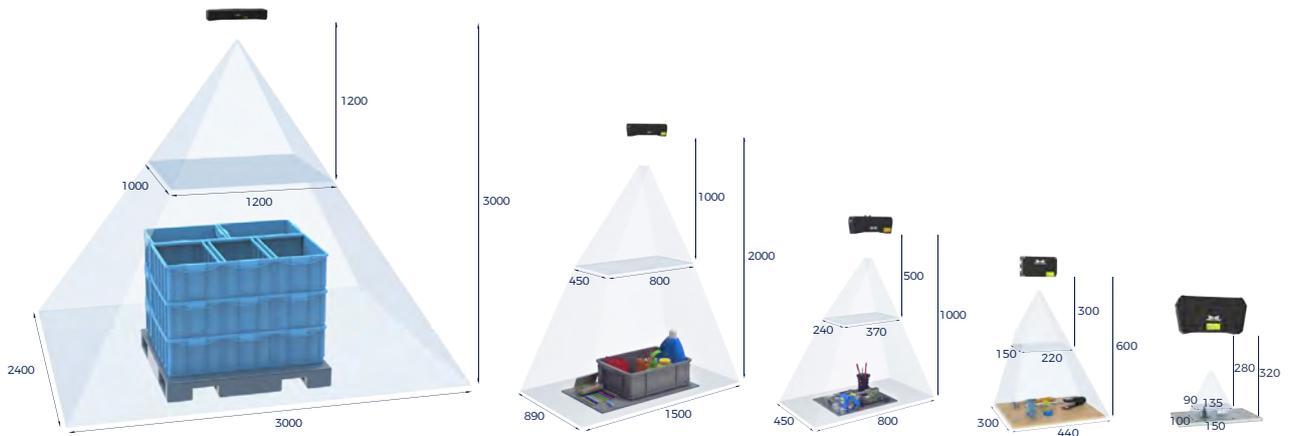
Mech-Eye LSR L

Mech-Eye PRO M

Mech-Eye PRO S

Mech-Eye NANO

Mech-Eye UHP-140



Field of view (mm)

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

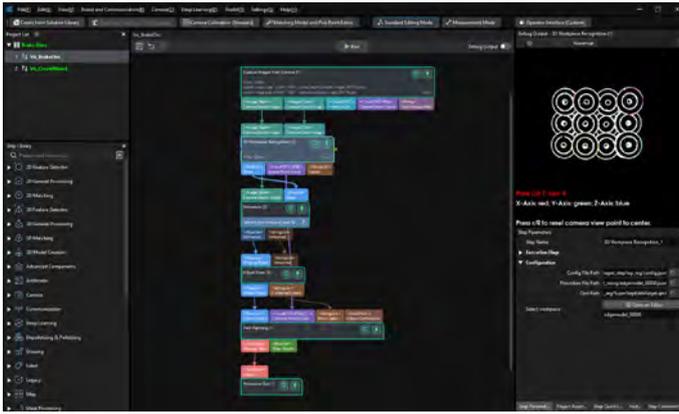
[2] One standard deviation of 100 measurements of the difference between the Z-value means of two same-sized regions. The measurement target was a ceramic plate.

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

Mech-Vision

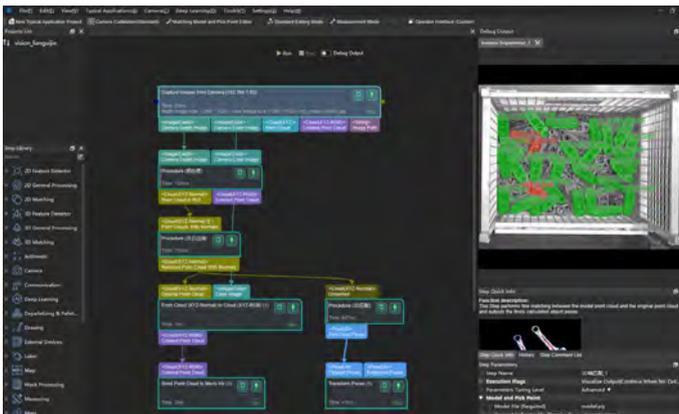
Machine Vision Software

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.



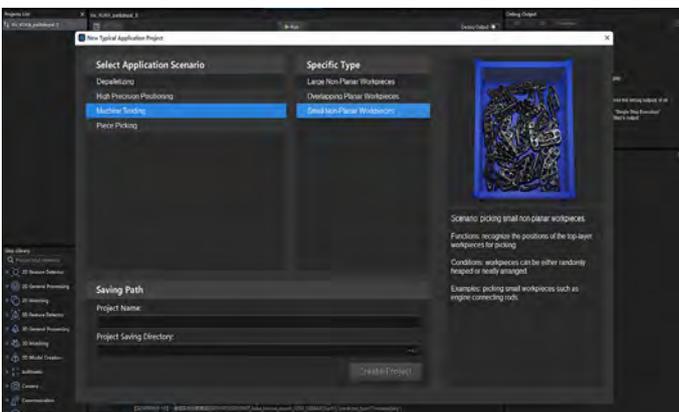
Build your vision applications efficiently

- 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, 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



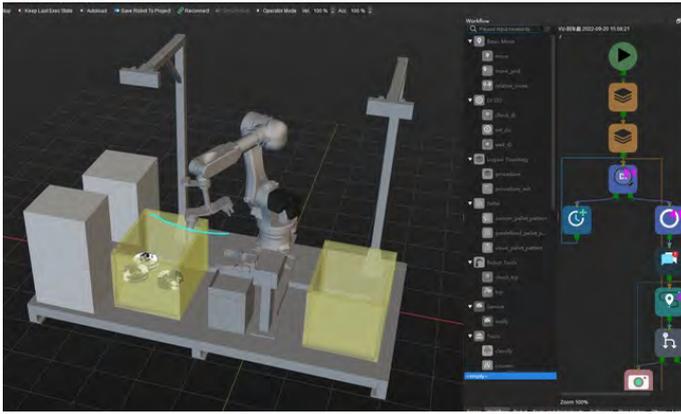
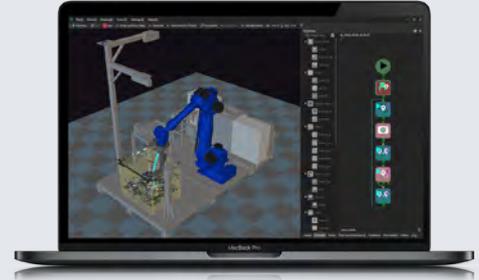
Develop vision applications easily and flexibly

- Robust Solution Library: get faster application deployment by adapting an existing project after simple modifications
- Support for embedded scripting, customization, and system integration
- Multiple languages: English, Japanese, Chinese, and Korean

Mech-Viz

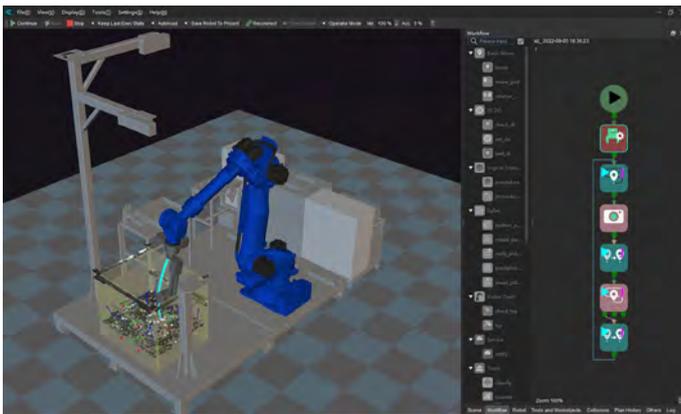
Robot Programming Software

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.



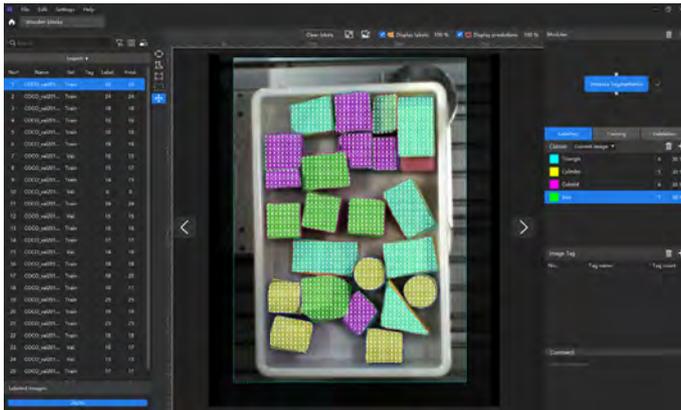
Flexible and Easy Implementation

- Support for almost all major-brand robots
- Provides robot path reporting and tracking to reduce debugging complexity and time significantly
- Multiple languages: English, Japanese, Chinese, and Korean

Mech-DLK

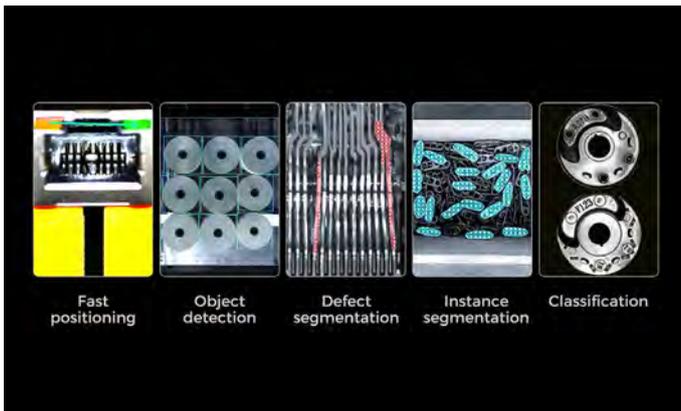
Deep Learning Software

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



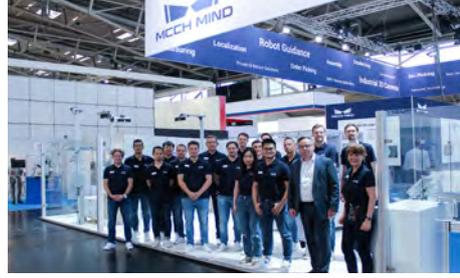
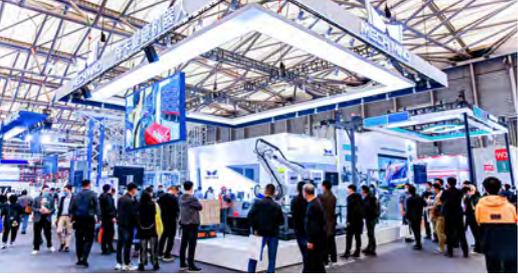
Manage complex machine vision tasks with speed and accuracy

- 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.

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.

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.

10,000+ Cameras Deployed for 1,500+ Global Customers

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 1,500+ global customers across diverse industries, including automotive, construction machinery, logistics, home appliances, food and beverage, etc.

10,000+ cameras
installed worldwide

1,500+
customers

700+
employees

50+
regions

Customers and Partners



Compatible with Major Robot Brands



3D VISION & AI FOR ROBOTS AND MORE



Mech-Mind Robotics Technologies Ltd.

Website: www.mech-mind.com

E-mail: info@mech-mind.net
