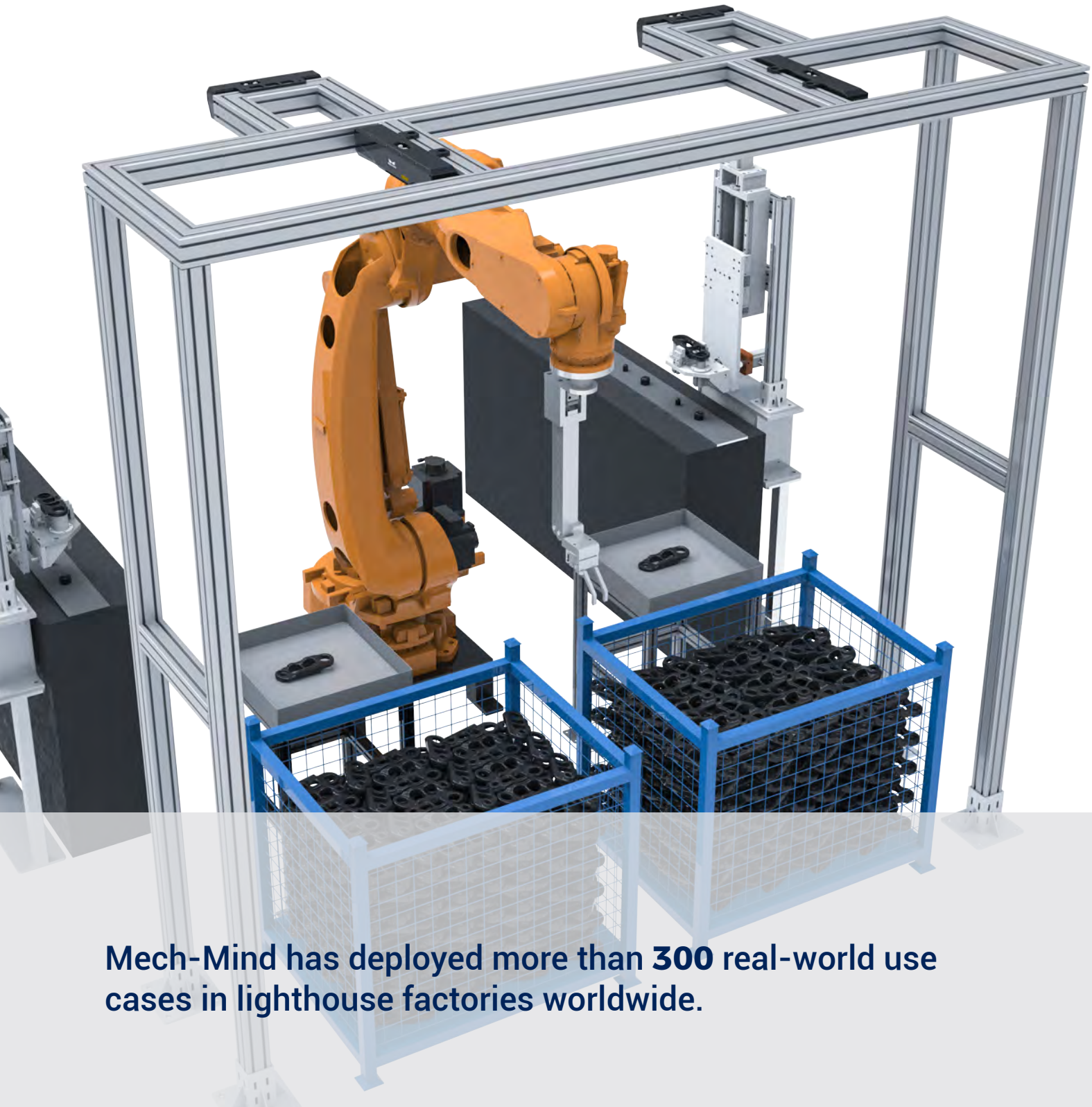
Mech-Mind Robotics

AI+3D Vision Solutions for Construction Machinery Industry



Mech-Mind has deployed more than **300** real-world use cases in lighthouse factories worldwide.

Mech-Mind AI+3D Vision Pioneer in Construction Machinery Industry

Aiming to drive the ubiquity of intelligent robots, Mech-Mind is committed to leveraging technical strength to pioneer the next frontier of manufacturing. Mech-Mind has made an unparalleled commitment to R&D and its product portfolio including Mech-Eye industrial 3D cameras, Mech-Vision graphical machine vision software, Mech-DLK offline training tool, Mech-Viz intelligent robot programming environment, etc.

Mech-Mind provides complete and cost-effective intelligent industrial robot solutions to customers in construction machinery industry, with **attractive products, attentive service and supporting software tools.**

Mech-Mind has delivered more than **2000** intelligent industrial robot solutions worldwide. In the field of construction machinery, we have deployed more than **300** successful cases at world-famous factories. Mech-Mind has become one of the AI+3D vision companies with the largest number of successful applications in construction machinery inindustry worldwide.

Solution Advantages

- **High Intelligence:** It can handle various objects (including steel plates, steel rods, track links, valve blocks, planet carriers, pinion gears, creeper treads, etc.). Support tightly-packed steel plates, randomly-placed metal parts, parts with considerably reflective surfaces, etc.
- **Competitive Price:** The price is only half of the same type of typical products.
- **Easy Deployment:** The plug-and-play solutions save a lot of deployment time. The fully visualized, code-free programming interface dramatically lowers the threshold for operators to deploy .
- **Easy Integration:** Our products can be adapted to various mainstream brands' robots and support integrating with various systems.
- **Various Application Cases:** The scope of application covers mixed case palletizing and depalletizing, order picking, logistic parcels picking, and assembly. Our solutions have been successfully applied in hundreds of leading companies worldwide.


800 X 1200
800 X 1200

Typical Solutions

Vision-Guided Randomly Piled Parts Picking

Robot picks randomly piled metal sheets from bins and places them on the conveyor.

Solution Advantages

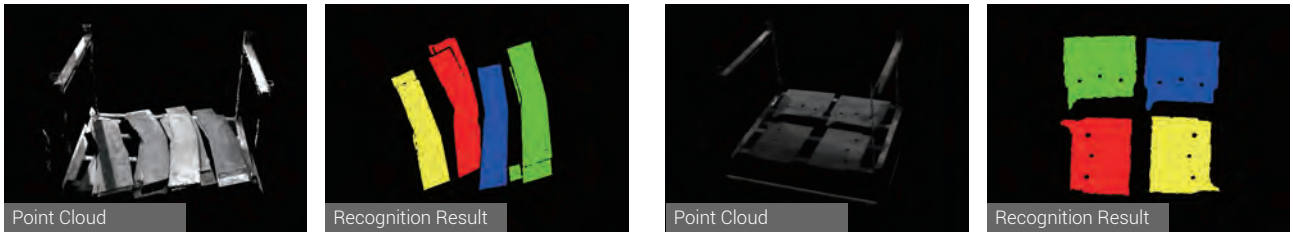
- With high precision and an extended field of view, our self-developed industrial 3D vision camera can provide high-quality 3D data.
- Dust and water proof with IP65 standards. It can operate long hours in complex and hush factory environment.
- Able to handle complex situations such as considerably reflective parts, part with dark surfaces, and tightly-packed.
- The robot system can analyze the nesting layout in advance and handle various metal sheets.
- Built-in path planning and collision detection algorithms ensure flexibility and stability.
- Convenient communication with robots via TCP/IP.
- Self-calibration and fast adaptation to new types of sheets.

Specification

Accuracy	Up to 0.1 mm @ 1.0 m
Speed	Single cycle time can reach 3 s (actual speed is related to layout and objects)
Success Rate of Recognition	> 99.9%
FoV	Up to 3.0 m × 2.4 m @ 3.0 m
Typical Scenarios	Metal sheets picking.
Common Camera Models	Mech-Eye LSR, Mech-Eye PRO
Maturity	Hundreds of our solutions have been deployed in construction machinery industry.

Point Cloud and Recognition Result

Randomly Located Metal Sheets



Typical Solutions

Vision-Guided Randomly Placed Workpieces Sorting

The vision-guided robot picks tightly packed workpieces from the material bin one by one, and place them on the conveyor belt.

Solution Advantages

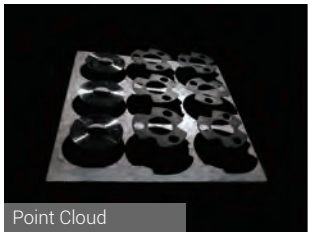
- Able to handle various workpieces (including track links, planet carriers, steel rods, crankshafts, connecting rods, steel track shoes, valve blocks).
- Able to handle randomly placed objects with considerably reflection, dark surfaces, complex structures, or rich details.
- With high precision and an extended field of view, our solution is suitable for picking workpieces from large and deep material bins.
- Mech-Eye LSR 3D camera is able to deal with problems such as ambient light interference to ensure stability.
- Built-in advanced algorithms including motion planning and collision detecting help to improve operating stability.
- Production line can be seamlessly integrated with the upstream and downstream processes.

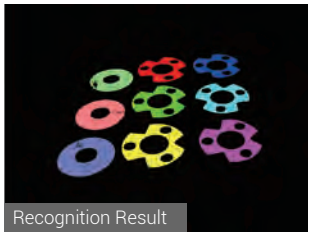
Specification

Accuracy	Up to 0.1 mm @ 1.0 m
Speed	3 s / piece (from taking pictures to giving poses)
Success Rate of Recognition	> 99.9%
FoV	Up to 3.0 m × 2.4 m @ 3.0 m
Robot Reachability	Meet the requirements of typical scenarios.
Typical Scenarios	Machine tending, double-sided milling, etc.
Common Camera Models	Mech-Eye LSR, Mech-Eye PRO
Maturity	Lots of our solutions have been deployed in construction machinery industry.

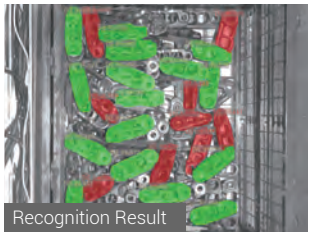
Point Cloud and Recognition Result

Randomly Placed Workpieces (Planet Carriers)





Randomly Placed Workpieces (Track Links)



Typical Solutions

Vision-Guided Assembly

Vision-guided robot can identify and pick randomly-placed workpieces and assemble them to the specified positions as required. With Mech-Eye Industrial 3D Camera, robots can quickly locate the assembly positions, and accurately assemble the workpieces without damaging them.

Highlights

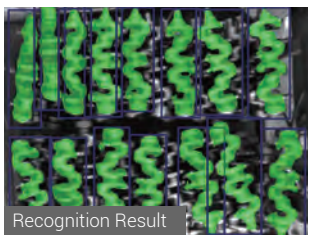
- Able to identify a variety of parts and workpieces (e.g. hubs, tires, creeper treads, longeron, pins).
- Able to handle large-size, complex structured, considerably reflective, dark, or deformable workpieces.
- Mech-Eye LSR 3D camera can well handle ambient light interference at workshops.
- Equipped with high precision and an extended field of view, our solution can locate assembly positions accurately.

Specification

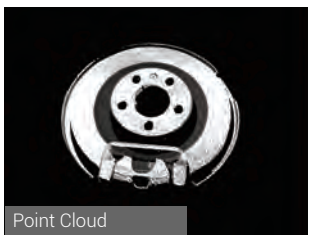
Accuracy	Up to 0.1 mm @ 1.0 m
Speed	Single cycle time can reach 3 s
Success Rate of Recognition	> 99.9%
FoV	Up to 3.0 m × 2.4 m @ 3.0 m
Typical Scenarios	Assembly creeper treads, track links, hubs, tires, etc.
Common Camera Models	Mech-Eye LSR, Mech-Eye PRO
Maturity	Our solutions have been deployed inautomobiles, construction machinery, home appliance industry, etc.

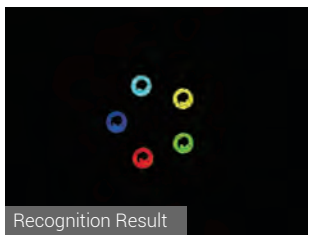
Point Cloud and Recognition Result

Tightly-Packed Crankshafts



Wheel Assembly Position





Typical Solutions

Vision-Guided Path Generation

Vision-guided robots identify specified materials/workpieces (such as car doors, outer edges of steel plates, slew bearings), generate the path in real time according to the recognition result.

Solution Advantages

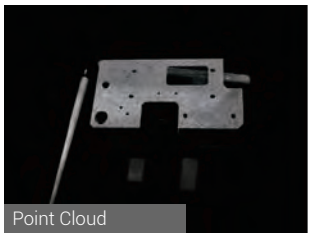
- Support for various large parts in different sizes and shapes.
- Support for complex-structured parts with dark or considerably reflective surface. Resistance to strong ambient light.
- The speed can meet the requirements of customer.
- Convenient communication with robots via TCP/IP.
- Seamlessly integration with common logistic devices including AMR.

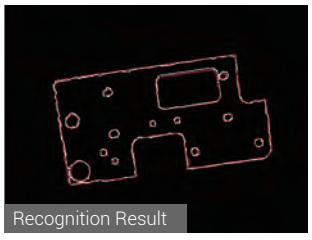
Specification

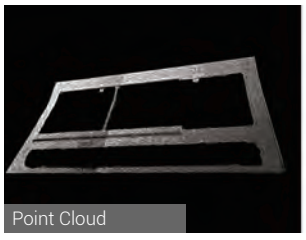
Accuracy	Up to 1.0 mm @ 2.5 m
Success Rate of Recognition	> 99.9%
FoV	Up to 3.0 m × 2.4 m @ 3.0 m
Typical Scenarios	Beveling, gluing, etc.
Common Camera Models	Mech-Eye LSR, Mech-Eye PRO
Maturity	Hundreds of our solutions have been deployed in industries such as automobiles, construction machinery, home appliance, etc.

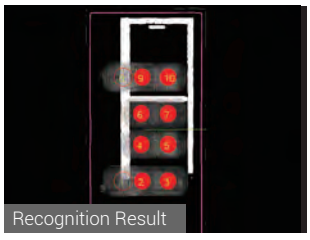
Point Cloud and Recognition Result

Different Parts









Typical Use Cases

A Large Machinery Factory

Vision-Guided Machine Tending of Track Links

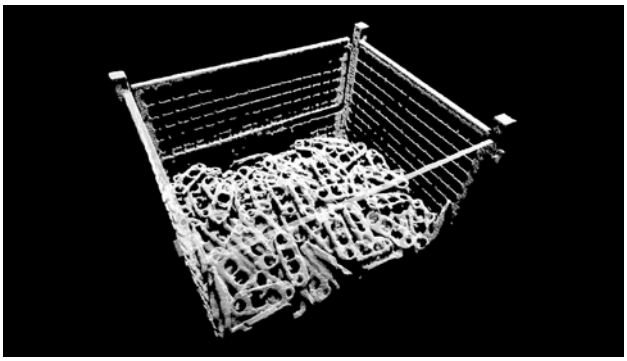
Challenges

The customer hopes to improve efficiency and guarantees 24 hours uninterrupted production. Besides, they need product to cope with problem of ambient light interference in the workshop.

Workpieces are severely stacked in a deep bin, accompanied by typical ambient light interference in the workshop.

Highlights

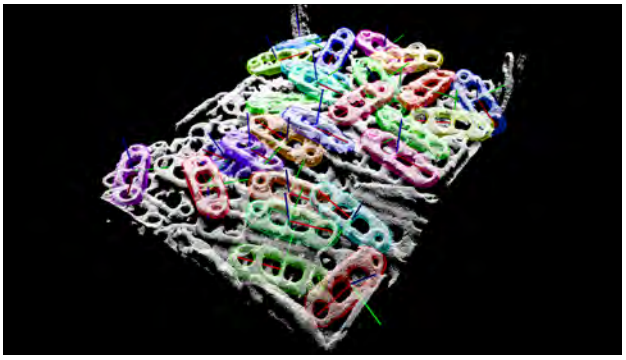
- Our solution enables the robots to pick links stacked randomly in the deep material bin, and place them in a specified location after determining the links' front and back sides.
- With self-developed high precision Mech-Eye LSR, typical ambient light interference can be handled, significantly reducing the demand for shading facilities.
- Variable end effectors, multi picking point strategies and intelligent path planning algorithms are adopted to avoid collisions and improve stability.
- Production line can be seamlessly integrated with the upstream and downstream processes.



Point Cloud

Outcomes

- Dozens of work stations of the production line have completed the automatic transformation, ensuring the daily output of each station up to **1000+**.
- The reachability of robot in limited space has been greatly improved, and the speed and stability can meet the clients' needs.



Recognition Result

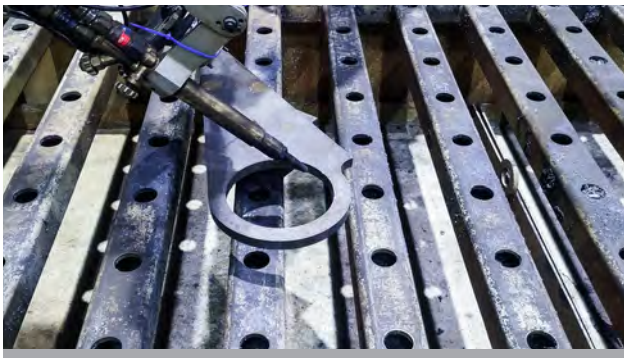
Typical Use Cases

A Construction Machinery Factory
Vision-Guided Beveling

Challenges

The client is a construction machinery industry giant. Traditional beveling is low-efficient and cost-intensive. Therefore our customer expects Mech-Mind industrial robot solutions to boost efficiency and productivity.

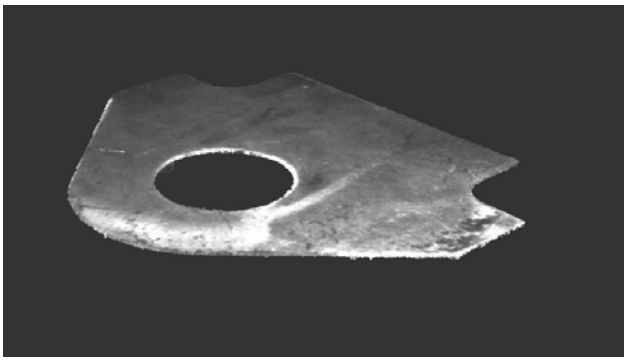
Various Different Steel Plates



Real-World Image of Beveling

Highlights

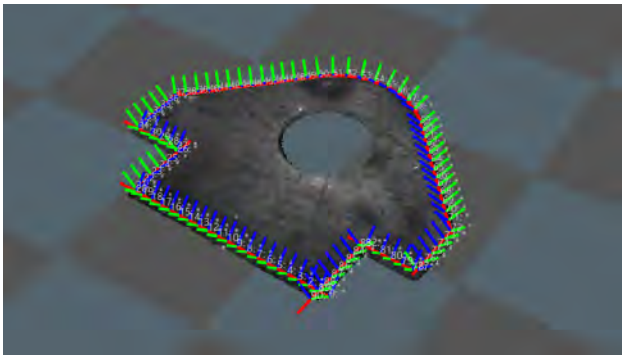
- Our 3D vision system can quickly and accurately locate the steel plate, and automatically plan the optimal cutting trajectory.
- Mech-Eye LSR 3D camera, can easily recognize considerably reflective objects.
- With high precision and an extended field of view, our solution enables robots to excute beveling with excellent stability and consistency.
- Our solution can seamlessly integrate with the upstream and downstream (e.g. steel plates distribution) of the production line.



Point Cloud

Outcomes

- Efficiency has been improved by 50% with a 40% cost reduction.
- Our solution can various kinds of workpieces.



Recognition Result

Typical Use Cases

A Large Construction Machinery Enterprise

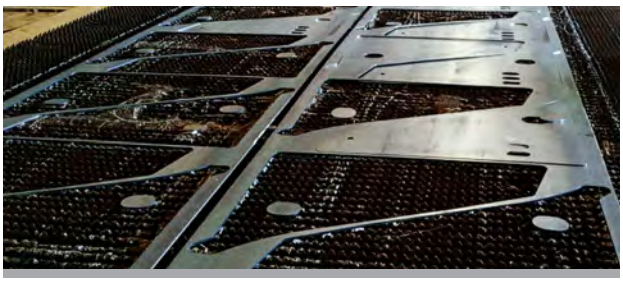
Vision-Guided Sheets Picking

- Metal sheets in different sizes that are stacked layer by layer can be quickly identified.
- Metal sheets of various thicknesses (the thinnest is only 0.4 cm) can be well handled.
- With an extended field of view, the vision-guided robot can pick sheets stacked in a large bin.
- The vision-guided robot can seamlessly work with the upstream and downstream devices.

A Construction Machinery Giant

Drive Gear Machine Tending

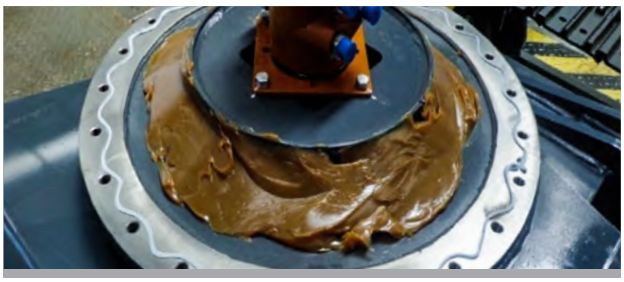
- Mech-Eye LSR L Industrial 3D Camera, featuring a large FoV and high precision, can resist typical ambient light interference (> 30,000 lx).
- The industrial-grade 3D camera, featuring waterproof and dustproof design, can operate in a high-temperature environment (50 - 120 degrees Celsius).
- The robot system can handle parts with complex structures, or dark/considerably reflective surfaces.
- The single robot station can help to increase production efficiency by 2 times.



A Large Construction Machinery Enterprise

Vision-Guided Steel Plate Sorting and Feeding

- Mech-Eye LSR L Industrial 3D Camera, featuring large FOV and high precision, can resist typical ambient light interference (>15,000 lx).
- The robot system can analyze the nesting layout in advance and generate appropriate grasping points intelligently.
- The robot system can count, sort and palletize sheets according to the requirements of the fabrication process.
- The robot system can handle the small kerf width (0.4 mm) of sheets.
- Gantry robot helps to pick heavy cut sheet metal (e.g., more than 200 kg) easily.
- The whole intelligent robot production line has been a benchmark in thecustomer's Lighthouse Factory.



A Large Construction Machinery Enterprise

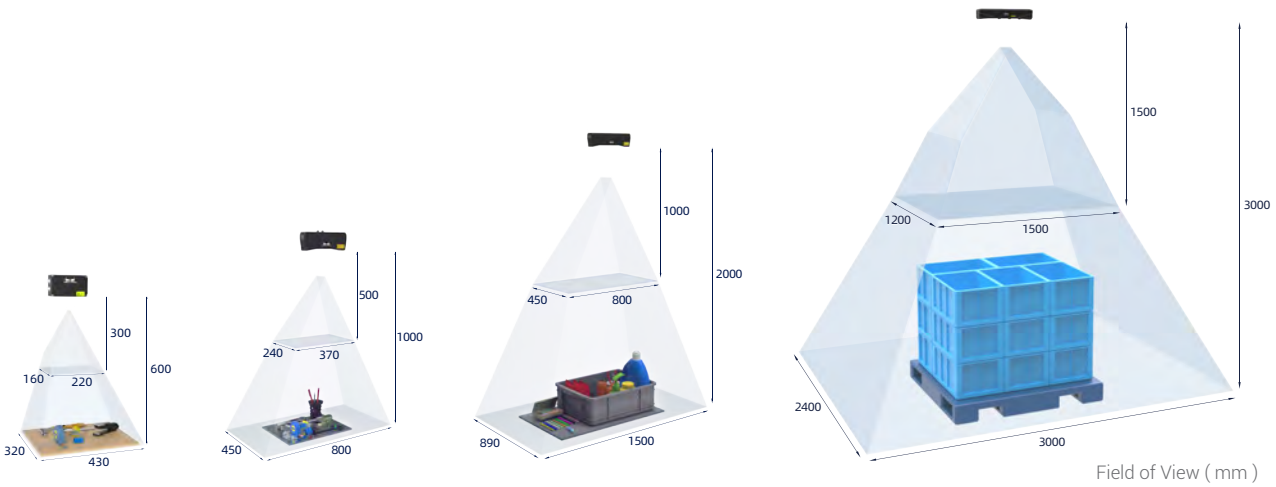
Vision-Guided Oil Coating of Shaft Parts

- Mech-Eye PRO S industrial 3D camera, featuring high precision and excellent imaging, can produce high-quality 3D point cloud data for various types of slewing bearings.
- The robot can generate the appropriate grease applying trajectory immediately according to the recognition result from Mech-Mind's vision system.
- Mech-Eye is mounted on the robotic arm, which enables robots to handle quite large slewing bearings.
- Fast adaptation to newly added types of slewing bearings.

Mech-Eye Industrial 3D Camera

A Perfect Combination of Excellent Performance and Cost Effectiveness

Specification	NANO 	PRO S 	PRO M 	LSR L 
Optimal Scanning Range (mm)	300 -600	500 - 1000	1000 - 2000	1500 - 3000
Near FOV (mm)	220 × 160 @ 0.3 m	370 × 240 @ 0.5 m	800 × 450 @ 1.0 m	1500 × 1200 @ 1.5 m
Far FOV (mm)	430 × 320 @ 0.6 m	800 × 450 @ 1.0 m	1500 × 890 @ 2.0 m	3000 × 2400 @ 3.0 m
Resolution	1280 × 1024	1920 × 1200	1920 × 1200	2048 × 1536 (Depth Resolution) 4000 × 3000/2000 × 1500 (RGB)
Megapixels（MP）	1.3	2.3	2.3	3.0
*Point Repeatability Z （σ）	0.1 mm @ 0.5 m	0.05 mm @ 1.0 m	0.2 mm @ 2.0 m	0.5 mm @ 3.0 m
**VDI/VDE Accuracy	0.1 mm @ 0.5 m	0.1 mm @ 1.0 m	0.2 mm @ 2.0 m	1.0 mm @ 3.0 m
Typical Capture Time（s）	0.6 - 1.1	0.3 - 0.6	0.3 - 0.6	0.5 - 0.9
Baseline (mm)	68	180	270	380
Dimensions（mm）	145 × 51 × 85	265 × 57 × 100	353 × 57 × 100	459 × 77 × 86
Weight（kg）	0.7	1.6	1.9	2.9
Operating Temperature	0 - 45℃			-10 - 45℃
Communication Interface	Ethernet			
Image Sensor	Sony CMOS for High-end Machine Vision			
Power Supply	24V DC			
Safety and EMC	CE/FCC/VCCI			
Protection Class	IP65			
Cooling	Passive			



Field of View (mm)

Mech-Eye NANO	Mech-Eye PRO S	Mech-Eye PRO M	Mech-Eye LSR L

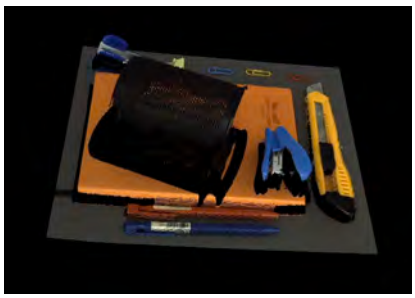
*The standard deviation of the single point Z value for 100 measurements. The measurement target is a ceramic plate.

**Refer to VDI/VDE 2634 Part II.

Mech-Eye Industrial 3D Camera

High-quality Images of Various Objects

Mech-Eye can generate high-quality 3D data for common workpieces in the fields of construction machinery, steel, automotive, etc., and can handle complex situations such as considerably reflective objects, objects with dark surfaces and complex structures.

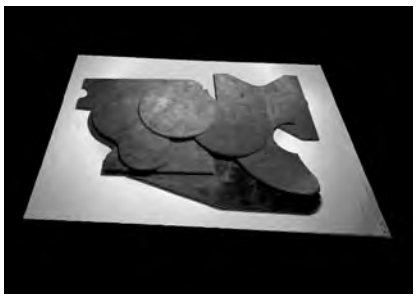


Multicolored Office Supplies

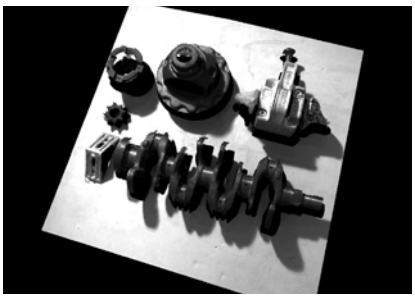
Reflective Objects

Dark Objects

Densely-Stacked Track Shoes



Steel Plates



Metal Parts

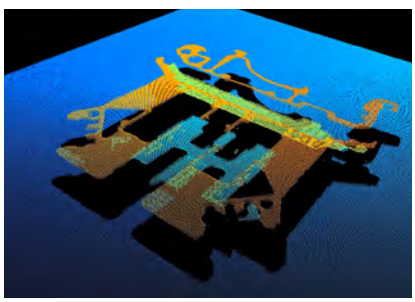
Mech-Eye LSR 3D camera can generate complete, detailed, and accurate 3D point cloud data for a wide range of workpieces at typical ambient light (intensity >30,000 lx) of the actual plants.

Track Links

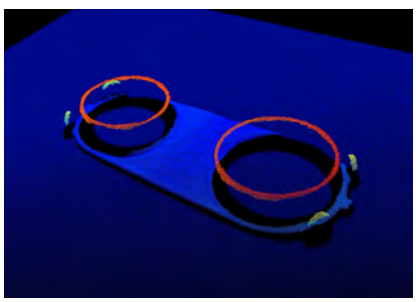
Gearbox Housings

Auto Seat Side Panel

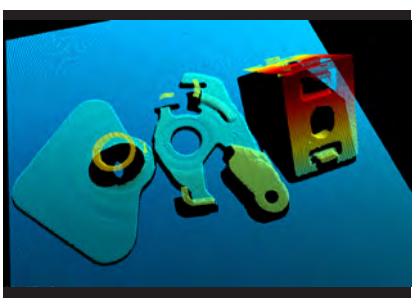
Mech-Eye can output high-quality 3D imaging of a broad range of objects (including metal materials, plastics, wood, etc.)



Precision Component



Parts of Merely 0.68 mm Thickness

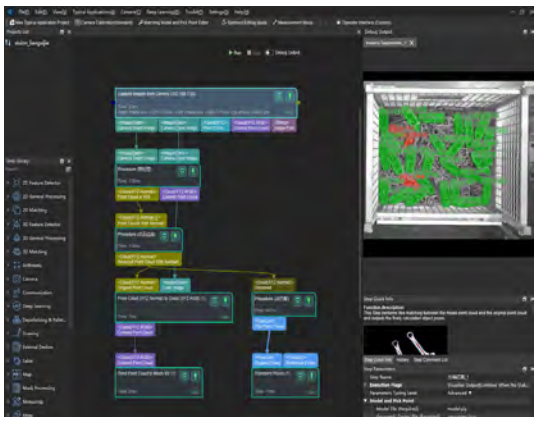


Various Small Workpieces

Mech-Vision

Graphical Machine Vision Software

Mech-Vision is the new generation machine vision software, which can complete depalletizing, machine tending, registration-free order picking, gluing/spraying, precise locating, defect detection, size measurement, etc. through a code-free graphical interface. The built-in advanced algorithm modules such as 3D vision and deep learning can meet complex and diverse practical needs.



Code-free Graphical Interface, Easy to Use

Code-free graphical interface, concise UI design, and clear-cut functional partitions. Professional programming skills are not required for users to realize visual engineering construction. The software enables integrators to develop models locally.

Built-in Advanced Algorithm Modules

Built-in advanced algorithm modules such as deep learning can meet complex and diverse practical needs, handle situations such as randomly-placed real objects, considerably reflective or dark objects. Visual functions such as recognition, positioning, and measurement also can work well under various complex situations.

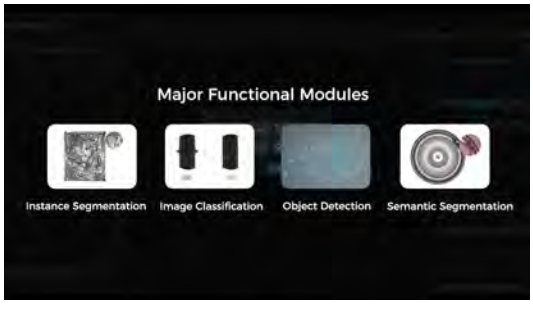
Various Built-in Typical Application Plug-ins

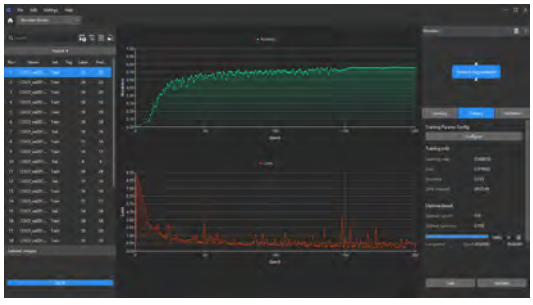
With integrated various application plug-ins such as random feeding, depalletizing, registrationfree goods grasping, high precision positioning, gluing, etc., users can easily deploy multiple typical applications of intelligent robots.

Mech-DLK

Deep Learning Software

Mech-DLK is a newly launched deep learning autonomous training tool, which integrates the entire process of data collection, screening, importing, labeling, model training, verification, and deployment of deep learning model training. The software is user-friendly, which improves training efficiency while ensuring data security throughout the process.





All-in-One Solution

It makes Mech-DLK well suited for complex materials and workpieces for electronics, and automotive industries.

Consistently Reliable & Validated Results

Its highly consistent inspections archives images that can be reviewed offline, enabling end-users to understand and quickly rectify anomalous results.

Efficient Training

Mech-DLK enables users to train deep-learning models for all kinds of parts with ease. The high-precision deep learning algorithms guarantee superb accuracy with fewer parameters required. The advanced data augmentation enables users to train a model with smaller image sets. And with the built-in finetune function that drastically increases training efficiency by optimizing the existing models, users don't have to train a model from scratch.

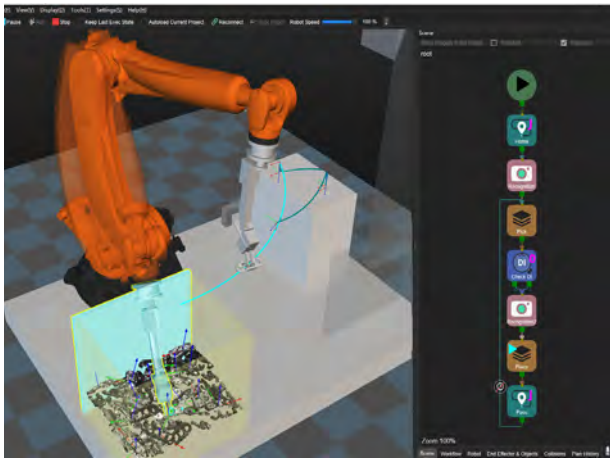
Easy Deployment

SDKs in multiple programming languages (C, C++, C#, etc.) made easy. Users can utilize Mech-Vision machine vision software for rapid deployment.

Mech-Viz

Intelligent Robot Programming Environment

The new generation intelligent robot programming environment is equipped with a visualized and code-free programming interface which can realize one-click simulation. Built-in intelligent algorithms such as path planning, collision detection, grasping strategy, etc. The environment can be adapted to various mainstream robot brands in China and abroad.



Process-Oriented Interface, One-Click Simulation, Easy to Operate

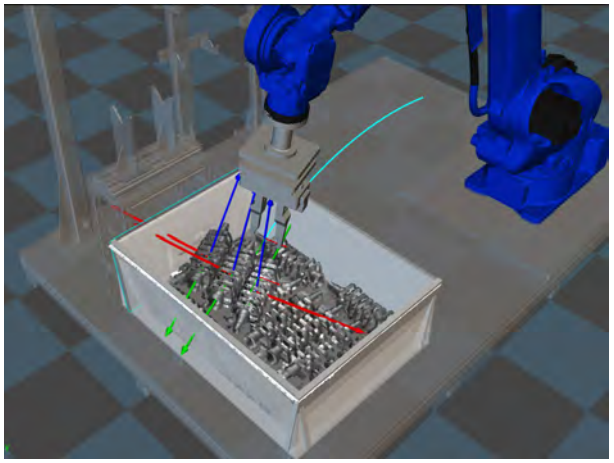
Visualized and code-free programming interface can realize one-click simulation. Code programming experience is not required for users to operate the robot.

Built-in Intelligent Algorithms

Intelligent algorithms such as path planning, collision detection and picking planning are built in to improve stability.

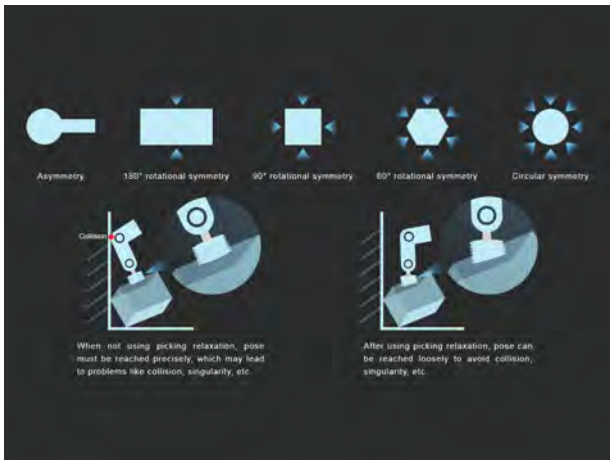
Adapted to Various Mainstream Robot Brands

The programming environment can be adapted to various mainstream robot brands worldwide. The adaption of a new brand robot only needs 3-5 days.



Intelligent Path Planning Algorithm

With built-in advanced motion planning algorithm, Mech-Viz can automatically plan the appropriate robot motion path and entry angle to avoid collision.



Grasping Planning

The software supports multiple grab points for workpieces, grab margin and symmetry settings, multiple TCP and other functions. With combining motion simulation and collision detection, Mech-Viz can guide the robot to accurately grasp the target under the premise.

Mech-Mind is an industry-leading company focusing on industrial 3D camera and software suite for intelligent robotics. Leveraging 3D vision and AI technologies, we enable industrial robots to manage the most challenging automation tasks, including bin picking, depalletizing & palletizing, pick & place, and more.

Fast Growth

Founded in 2016, Mech-Mind has developed a full-stack product portfolio, including patented industrial 3D camera Mech-Eye, graphical machine vision software Mech-Vision, deep learning platform software Mech-DLK, and intelligent robot programming environment Mech-Viz.

Backed by top VCs including Sequoia and Intel Capital, Mech-Mind has become one of the most funded AI + 3D Vision industrial robot companies in the world.

World-Class Team

Mech-Mind has assembled a world-class team of 700+ employees with 200+ masters and PhDs.

With our deep technical accumulation in 3D sensing, vision and robotics algorithms, robotics software, and intelligent robotic solutions, Mech-Mind has more than 500 patents and software copyright applications that are filed or under review.

Recognition from Industry-Leading Enterprises

Mech-Mind has already deployed 2000+ AI+3D robotic solutions in 50+ regions. By delivering cutting-edge technology and reliable solutions, Mech-Mind has created visible ROI for 1000 + global customers across diverse industries, including automotive, logistics, home appliances, food and beverage, etc.

Compatible with Most Mainstream Robot Brands Globally

ABB KUKA YASKAWA FANUC Kawasaki NACHI DENSO UNIVERSAL ROBOTS DOBOT
STÄUBLI EFORT GREE ROKAE PEITIAN ROBOTICS TM ROBOT ESTUN ROBOTICS TURIN ELITE ROBOTS
AUBO DELTA QIAR HAN'S ROBOT HYUNDAI JAKA SIASUN

Customers and Partners

SANY ZOOMLION XCMG LiuGong SIEMENS NISSAN
YUTONG Honeywell DHL YASKAWA ABB BOSCH Kawasaki DENSO brose
KUKA NACHI intel UNIVERSAL ROBOTS Continental GREE Midea

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