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 3D cameras, machine vision algorithms and software, an offline deep learning tool, and an intelligent robot programming environment.

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

Mech-Mind has delivered more than **1000** intelligent industrial robot solutions worldwide. In the field of construction machinery, we have deployed more than **300** successful cases at world-famous factories both at home and abroad. 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,besides-star wheels, creeper treads, gears, etc.). Support complex situations like tightly-packed steel plates, randomly-placed metal parts, a certain degree of reflection, etc.

- **Competitive Price:** The price is only half of the same type of typical products.

- **Easy to Deploy and Use:** 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' robot and support integrating with various systems.

- **Wide-range Application Cases:** Previous applications cover machine tending, vision-guided automatically path planning, gluing, oiling, high precision assembling, etc. Our solutions have been successfully applied in hundreds of leading companies in construction machinery industry.

Typical Solutions and Applications

Vision-Guided Sorting of Unordered Workpieces

3D Vision-Guided Steel Plates Sorting

3D vision-guided robot grabs steel plates of various specifications and place them in a specified location or beveling/bending machine.

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 enclosures standards. It can operate long hours in complex and hush factory environment.

- Able to handle complex situations such as considerably reflective objects, objects with dark surfaces and small cutting seams, and tightly-packed workpieces.

- Intelligent analysis of steel plate templates, which can handle steel plates of various specifications.

- Built-in path planning and collision detection algorithms ensure flexibility and stability.

- The communication between vision systems and mainstream brand robots/truss robots is done via TCP/IP using Mech-Mind native command.

- Our solution can quickly and automatically calibrate and easily handle workpieces of new specifications.

Specification

Accuracy	Up to 0.1 mm @ 1 m
Speed	Single cycle time can reach 4 s (actual speed is related to layout and objects)
Recognition Accuracy	> 99.9%
FOV	Up to 3 m × 2.4 m @ 3 m
Typical Scenarios	Steel plates cutting, plate distribution, beveling & bending machine tending etc.
Common Camera Models	Mech-Eye Laser, Mech-Eye Pro Enhanced
Maturity	Hundreds of our solutions have been deployed in construction machinery industry.

Point Cloud and Recognition Result

Steel Plates of Various Specifications Stacked Layer by Layer
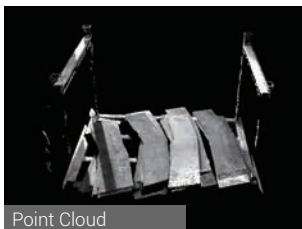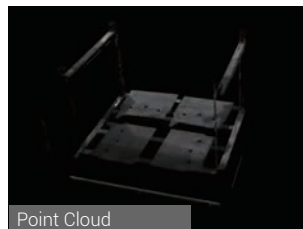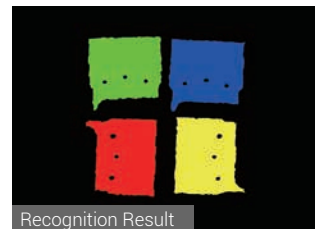
Point Cloud

Recognition Result

Cutting Steel Plates of Various Specifications with Small Seams

Point Cloud

Recognition Result

Typical Solutions and Applications

Vision-Guided Sorting of Unordered Workpieces

3D Vision-Guided Feeding of Workpieces / Structural Parts

Vision-guided robot picks tightly-packed, structurally-complex workpieces/structural parts from the material bin one by one, and then place them on the conveyor belt or in a specified location.

Solution Advantages

- Able to handle various workpieces/structural parts (including track links, planet carriers, steel rods, crankshafts, connecting rods, creeper treads, valve blocks).

- Able to handle complex situations such as objects with considerably reflection, dark surfaces, complex structures, and rich details, and randomly stacked objects.

- With high precision and an extended field of view, our solution is suitable for picking workpieces from large and deep material bins.

- Mech-Eye Laser 3D camera is able to deal with problems such as ambient light interference to ensure stability.

- Built-in advanced algorithms such as path planning, collision aviodance, and grasp planning improve the flexibility and stability of the production line.

- Production line can be seamlessly integrated with the upstream and downstream processes.


Specification

Accuracy	Up to 0.1 mm @ 1 m
Speed	Single cycle time can reach 3 s（actual speed is related to layout and objects）.
Recognition Accuracy	> 99.9%
FOV	Up to 3 m × 2.4 m @ 3 m
Bin Clearance Rate	Meet the requirements of typical scenarios.
Typical Scenarios	Machine tending of unordered workpieces.
Common Camera Models	Mech-Eye Laser, Mech-Eye Pro Enhanced
Maturity	Hundreds of our solutions have been deployed in construction machinery industry.

Point Cloud and Recognition Result
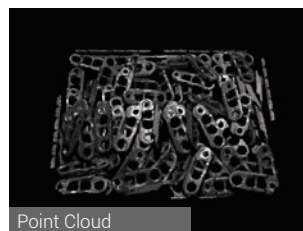
Randomly Placed Workpieces (Planet Carriers)
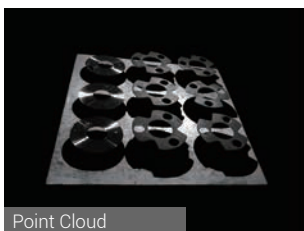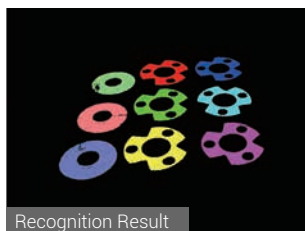
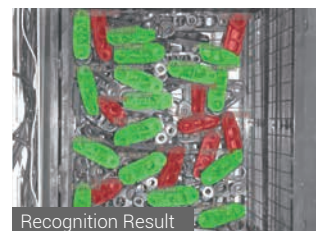Scattered Workpieces (Track Links)

Point Cloud

Recognition Result

Point Cloud

Recognition Result

Typical Solutions and Applications

3D Vision-Guided Assembly

Vision-guided robot can identify and pick randomly-placed workpieces and assemble them to the specified positions as required. With Mech-Mind's self-developed 3D cameras, assembly positions can be located quickly and accurately, and practical problems such as workpiece deformation can be handled.

Solution Advantages

- Able to identify typical workpieces of various materials and sizes (e.g. hubs, tires, creeper treads, longeron, pins).

- Able to handle complex situations such as large-size, complex structured, considerably reflective, dark, or deformed workpieces.

- Mech-Eye Laser 3D camera is designed to handle ambient light interference at workshops.

- With high precision and an extended field of view, our solution can locate assembly positions accurately, satisfying the actual needs of typical scenes.
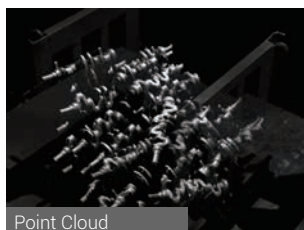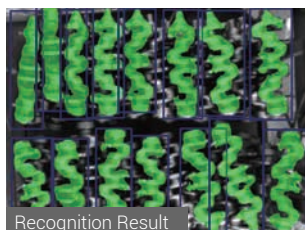
Specification

Accuracy	Up to 0.1 mm @ 1 m
Speed	Single cycle time can reach 3 s
Recognition Accuracy	> 99.9%
FOV	Up to 3 m × 2.4 m @ 3 m
Typical Scenarios	Assembly creeper treads, track links, hubs, tires, etc.
Common Camera Models	Mech-Eye Laser, Mech-Eye Pro Enhanced
Maturity	Hundreds of our solutions have been deployed in industries such as automobiles, construction machinery, home appliance, etc.

Point Cloud and Recognition Result
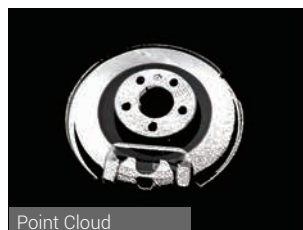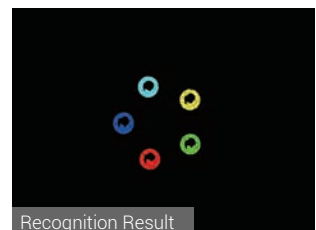
Tightly-packed Workpieces (Crankshafts)

Tires Assembly (Positioning Hole)

Point Cloud

Recognition Result

Point Cloud

Recognition Result

Typical Solutions and Applications

Vision-Guided Automatically 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 scenarios, and then perform the next process along the path.

Solution Advantages

- No need to make templates in advance, our product is able to handle typical workpieces of various materials (including steel plates, shafts) and can automatically generate a proper path without templating in advance.

- The extended field of view and high precision can meet the requirements of vision and precision in typical scenarios such as path gluing/oiling/bevel cutting.

- Able to handle complex situations such as considerably reflection, dark colors, small cutting seams and tightly-packed workpieces.

- The fast scanning speed and the overall beat can completely satisfy the clients' requirements.

- Our solution can quickly and automatically calibrate and easily handle workpieces of new specifications.

- The communication between vision systems and mainstream brand robots/truss robots is done via TCP/IP using Mech-Mind native command.

- Seamless integration with logistic equipment such as AGV improves efficiency.

Specification

Accuracy	Up to 1.0 mm @ 2 m
Speed	Single cycle time can reach 4 s
Recognition Accuracy	> 99.9%
FOV	Up to 3 m × 2.4 m @ 3 m
Typical Scenarios	Beveling cutting, gluing, spraying, oiling, etc.
Common Camera Models	Mech-Eye Laser, Mech-Eye Enhanced
Maturity	Hundreds of our solutions have been deployed in industries such as automobiles, construction machinery, home appliance, etc.

Point Cloud and Recognition Result

Workpieces of Different Sizes and Specifications (Window Glasses)

Point Cloud

Recognition Result

Point Cloud

Recognition Result
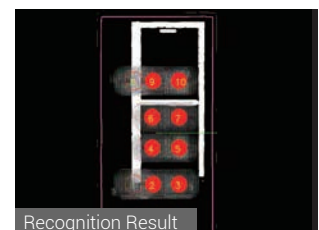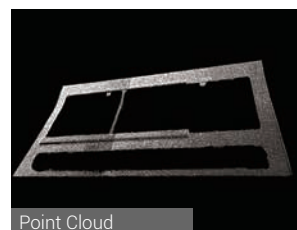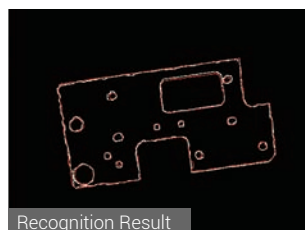
Typical Solutions and Applications

A large machinery factory

Vision-Guided Automatic Machine Tending (Track Links)

Background

This project serves a domestic private construction machinery giant. The customer hopes to use the vision-guided machine tending to solve the problem that the harsh environment at the worksite such as the loud noise and dusty air endanger the health of workers. At the same time, the customer hopes to improve efficiency and guarantees 24 hours uninterrupted production. Besides, the customer expects our product can cope with the 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 3D laser camera Mech-Eye Laser L, typical ambient light interference in the plant building 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.

- Our solution can seamlessly integrate with the upstream and downstream processes of the production line.

Point Cloud

Performance

- Dozens of work stations of the production line have completed the automatic transformation, ensuring the daily output of each station up to **1000+**.

- Labor costs are reduced by nearly 60%, and the parameters such as bin emptying rate, speed, stability can meet the clients' needs.
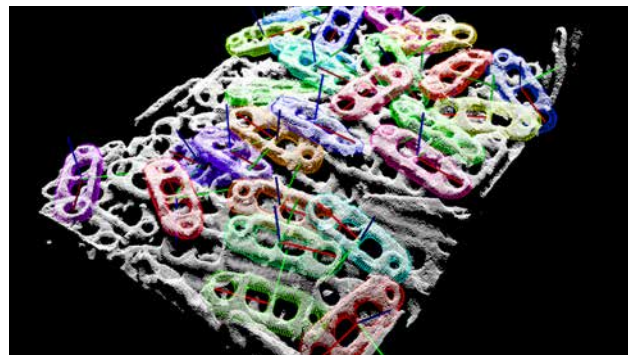
Recognition Result

Typical Solutions and Applications

A construction machinery factory
Vision-Guided Bevel Cutting

Background

The client of this project is a domestic construction machinery industry giant. Due to factors such as low efficiency, harsh environment, and rising labor costs, our customer hopes to use robots to improve the automation level of the bevel cutting process.


Steel plates of various specifications

The actual field of beveling cutting

Highlights

- No need for laser positioning, our 3D vision system can quickly and accurately locate the steel plate, and automatically generate the cutting track, which is more efficiency and has a better beat.

- With self-developed Mech-Eye Laser 3D camera, problems such as considerably reflective objects can be solved.

- With high precision and an extended field of view, our solution, which is stable and reliable, enables the beveling cutting to have high consistency.

- Our solution can seamlessly integrate with the upstream and downstream (e.g. steel plates distribution) of the production line.
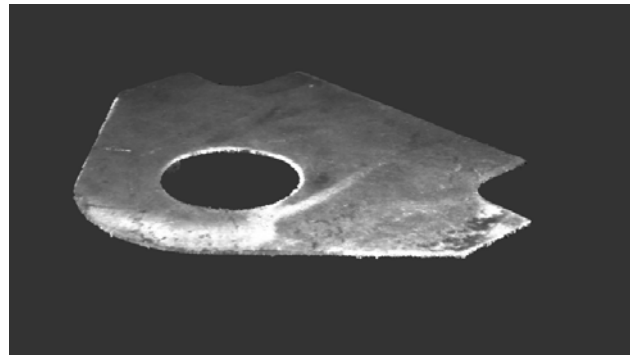
Point Cloud

Performance

- Labor costs are reduced by nearly 40%; Efficiency has been significantly improved by 30%.

- Our solution can deal with various kinds of workpieces, ensuring automated production line can operate flexibly.
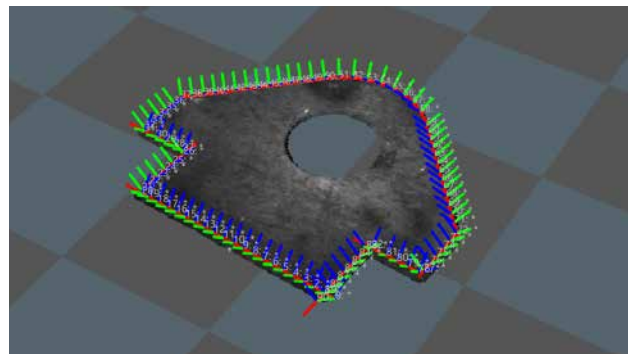
Recognition Result

Typical Solutions and Applications

A large construction machinery enterprise
Vision-Guided Carton Depalletizing

- Steel plates in different sizes that are stacked layer by layer can be quickly identified.
- Steel plates 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 workpieces stacked in a large material bin.
- The vision-guided robot can seamlessly work with the upstream and downstream processes, making the production operate stably.


A large automobile plant
Vision-Guided Wheel Assembly

- Able to handle workpieces in various sizes such as tires and wheels.
- Support considerably reflective and dark workpieces.
- Assembly can operate precisely, quickly, and stably while the production line is running.

A large factory
Vision-Guided
Steel Plate Sorting and Feeding

- Our solution provides intelligent analysis of the nesting diagram and magnetic attraction configuration so that magnetic attraction points can be configured in advance.
- Complex problems such as small laser cutting seams (about 0.4-0.5mm), considerably reflective objects, and typical ambient light interference at plants can be handled.
- The intelligent palletizing strategy improves the utilization of bin space, prevents workpieces from collapsing, and improves stability.
- The vision-guided robot can be seamlessly connected to the upstream and downstream of the production line.
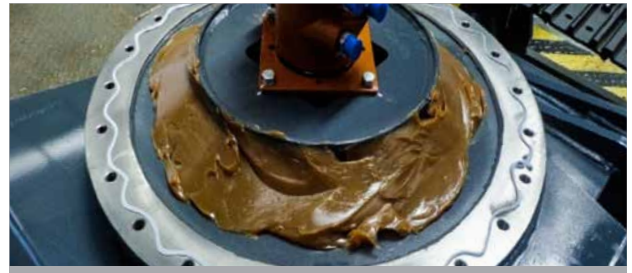
A large construction machinery enterprise
Vision-Guided
Oil Coating of Shaft Parts

- Shaft workpieces of different specifications can be identified.
- With high precision and an extended field of view, the vision-guided robot is well applied in the oil coating of large workpieces.
- The robot is able to handle complex situations such as randomly placed workpieces, poor hole position consistency, etc.
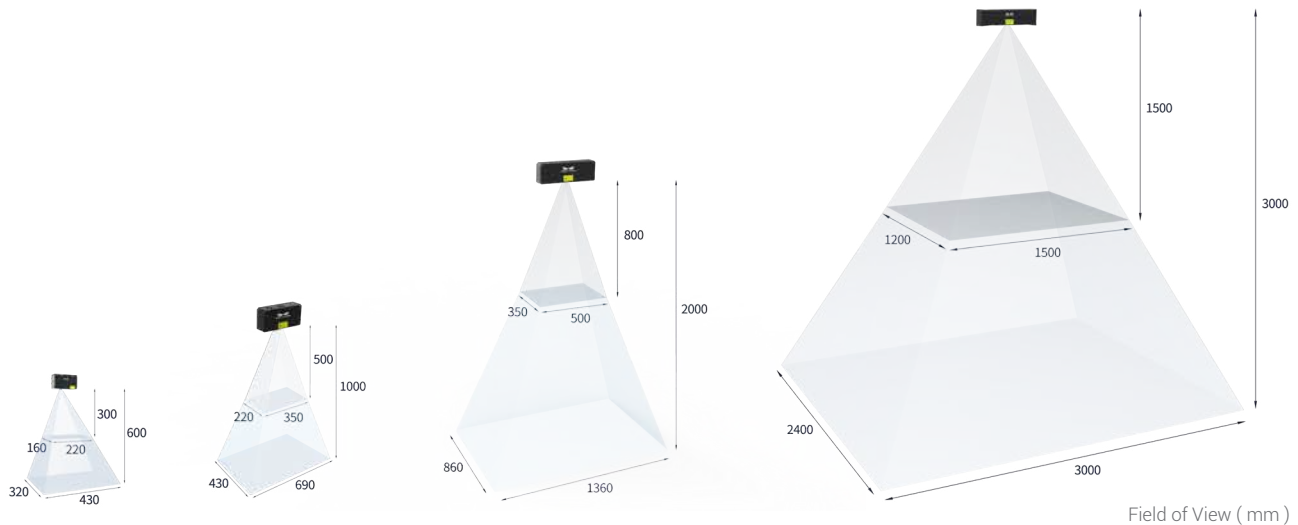
Mech-Eye Industrial 3D Camera
A Perfect Combination of Excellent Performance and Cost Effectiveness

Specification	Nano	Pro S Enhanced	Pro M Enhanced	Laser L
Optimal Scanning Range (mm)	300 - 600	500 - 1000	800 - 2000	1500 - 3000
Near FOV (mm)	220 × 160 @ 0.3 m	350 × 220 @ 0.5 m	500 × 350 @ 0.8 m	1500 × 1200 @ 1.5 m
Far FOV (mm)	430 × 320 @ 0.6 m	690 × 430 @ 1.0 m	1360 × 860 @ 2.0 m	3000 × 2400 @ 3.0 m
Resolution	1280 × 1024	1920 × 1200	1920 × 1200	2048 × 1536
Megapixels (MP)	1.3	2.3	2.3	3.0
Z Repeatability(σ)	0.1 mm @ 0.5 m	0.05 mm @ 1 m	0.2 mm @ 2 m	0.5 mm @ 3 m
Accuracy	0.1 mm @ 0.5 m	0.1 mm @ 1 m	0.2 mm @ 2 m	1.0 mm @ 3 m
Typical Capture Time (s)	0.6 - 1.1	0.5 - 0.8	0.5 - 0.8	0.5 - 0.9
Baseline (mm)	68	150	280	400
Dimensions (mm)	145 × 51 × 85	270 × 72 × 130	387 × 72 × 130	459 × 89 × 145
Weight (kg)	0.7	2.2	2.4	3.7
Operating Temperature	0 - 45°C			-10 - 45°C
Communication Interface	Ethernet			
Power Supply	24V DC			
Safety and EMC	CE/FCC/VCCI			
Protection Class	IP65			
Cooling	Passive			

Mech-Eye Nano	Mech-Eye Pro S Enhanced	Mech-Eye Pro M Enhanced	Mech-Eye Laser L

Field of View (mm)

Mech-Eye Industrial 3D Camera
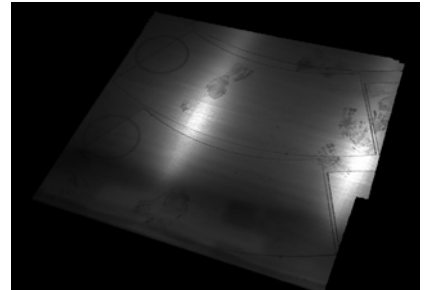## High-quality Images of Various Objects

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 surface and complex structure.
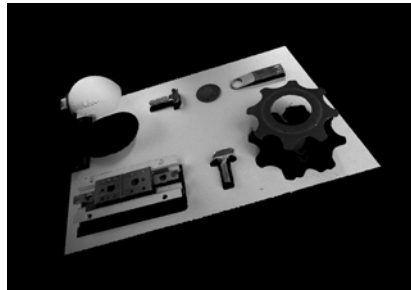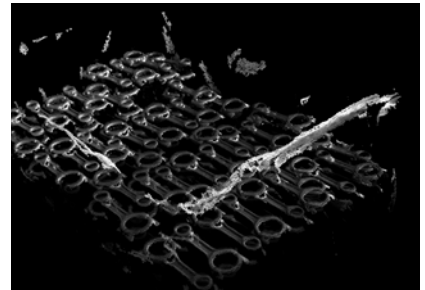
Metal Parts

Screw Nut

Cutting Steel Plates of Various Specifications with Small Seams

Tightly-Packed Steel Plates of Various Specifications
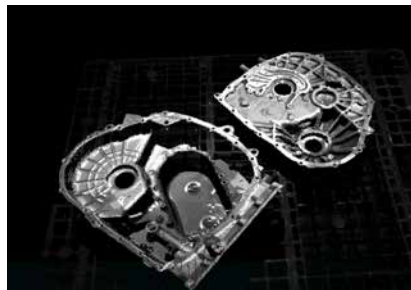
Considerably Reflective or Dark Workpieces

Randomly-piled Workpieces

Mech-Eye Laser 3D camera can generate complete, detailed, and accurate 3D point cloud data for a wide range of workpieces at typical ambient light (intensity >15000 lx) of the actual plants.

Crankshafts

Structural Parts

Track Links

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

Cards

Considerably Reflective Objects

Stationery with Detailed Surface

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.

Graphical Interface with No Code, Easy to Use

Graphical interface with no code, concise UI design, and clearcut functional partitions. Professional programming skills are not required for users to realize visual engineering construction. The software enables integrator to develop models autonomously.

Built-in Advanced Algorithm Modules Such as Deep Learning

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, carton depalletizing, express parcel feeding, registrationfree goods grasping, high precision positioning, guided gluing, etc., users can easily deploy multiple typical applications of intelligent robots.

Mech-DL Kit
Offline Training Tools for Deep Learning

Mech-DL Kit 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.
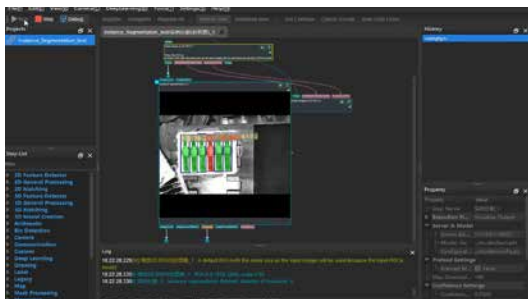
All-in-one Solution

It makes Mech-DL Kit well suited for complex materials and components for mobile, 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.

Easy to Develop and Use

End-users can operate Mech-DL Kit by controlling a few parameters offline, rather than repeated manual setting and wide parameter operation.

Smaller Image Sets Required

The deep learning algorithm's internal analysis process enhances upstream to reduce overkill and underkill rates to optimize quality and yield.
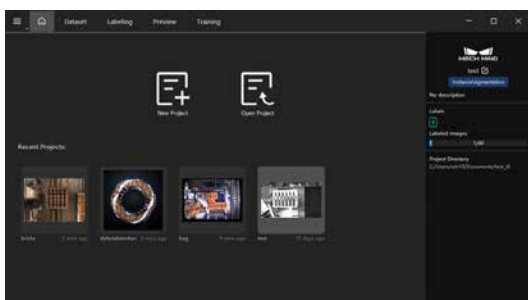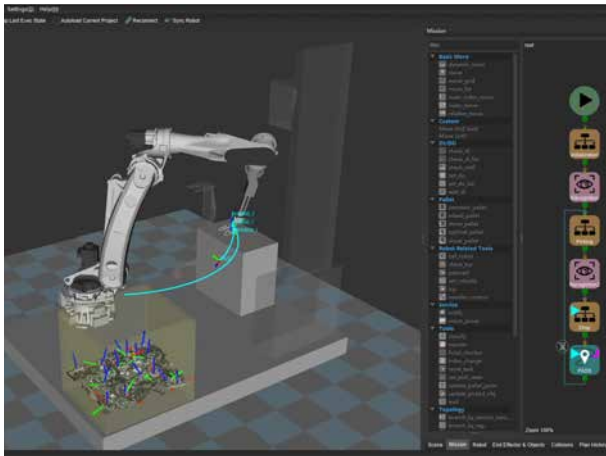
Mech-Viz
Intelligent Robot Programming Environment

The new generation intelligent robot programming environment is equipped with a visualized and code-free programming interface which can realize one-click simulation. Intelligent algorithms such as path planning, collision detection and picking planning are built in. 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 which can realize one-click simulation. Code programming experience is not required for users to operate the robot.

Built In Intelligent Algorithms Such as Path Planning, Etc.

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 in China and abroad. The adaption of a new brand robot only needs 3-5 days.
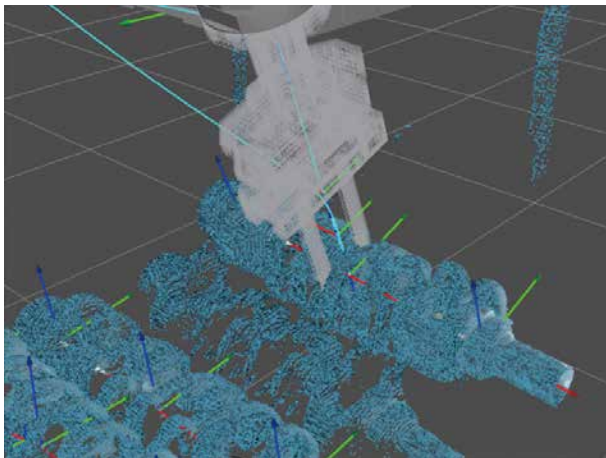
Intelligent Path Planning Algorithm

With built-in advanced algorithm modules, Mech-Viz can automatically select the appropriate robot motion path and entry angle to avoid collision. It can ensure stability and smooth production line.
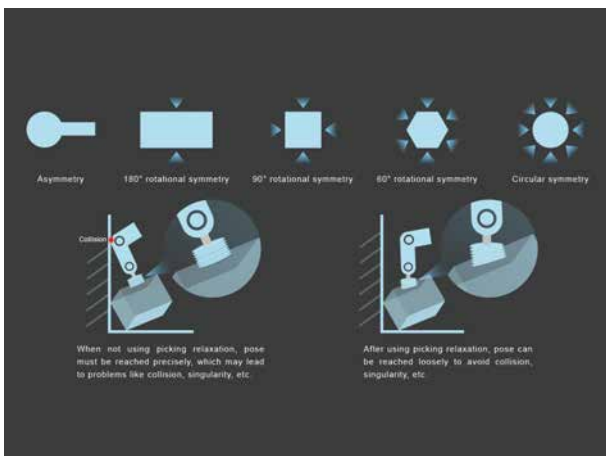
Grasping Planning

The software supports multiple grab points for workpieces, grab margin and symmetry settings, multiple TCP and other functions. With combining motion simulation and collision checking, Mech-Viz can guide the robot to accurately grasp the target under the premise of no collision.

Aiming to drive the ubiquity of industrial robots, Mech-Mind was founded in 2016, based in Beijing (R&D) and Shanghai (Sales and Deployment) with branch offices in Munich and Tokyo.

Fast Growth

Mech-Mind has launched a full infrastructure and products portfolio and exhibited at 2020 CIIF at Shanghai and iREX2019 at Tokyo. Mech-Mind has been selected as 2019 Intel AI 100 Best Innovation Incentive Program and Microsoft Scaleup Member Enterprise. We have also received multiple rounds of funding from IDG Capital, Meituan, Sequoia Capital China, Source Code Capital, Intel, Qiming Venture Capital, Delian Capital, and China Growth Capital.

World-Class Team

We currently have more than 500 members, including engineers who graduated from Tsinghua University, Beihang University, Zhejiang University, Harbin Institute of Technology, Carnegie Mellon University, Munich University of Technology, Delft University of Technology, California Institute of Technology, The University of Tokyo, and other top universities in China and abroad. We have deep technical accumulation in 3D sensing, vision and robotics algorithms, robotics software, and industry application solutions. Mech-Mind has dozens of patent and software copyright applications that are filed or under review.

Recognition from Industry-Leading Enterprises

We have already deployed solutions for automotive plants, home appliance plants, steel plants, food plants, logistic warehouses, pharmacy, and banks. The applications include depalletizing, palletizing, bin-picking, machine tending, assembly, gluing, and locating, etc. We have successfully deployed over 1000 solutions in for clients and partners from China, Japan, South Korea, Singapore, Germany, Italy, Switzerland, the United States, Turkey, Thailand, and other countries.

Compatible with Most Mainstream Robot Brands Globally

Customers and Partners

DRIVE THE UBIQUITY OF INTELLIGENT ROBOTS

Mech-Mind Robotics Technologies Ltd.

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